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FOREWORD

Presented number of Silesian University of Technology. Scientific Papers. Organization and Management Series. Presented papers contain result of researches conducted by various universities. The number consists of 35 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about management in medicine, public management, service management, artificial intelligence usage in management, marketing, communication management, Smart City, innovation management, human capital, tourism management, human resource management, Society 5.0, economics, finances, customer management, sustainable development, project management, sustainability reporting, supply chain management and logistics.

Bożena Skotnicka-Zasadzień
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THE LEVEL OF LIVING IN EUROPEAN UNION COUNTRIES IN 2013-2022 BY THE APPLICATION OF TAXONOMIC METHODS

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Purpose: The purpose of this paper is to demonstrate the trend and extent of changes in the level of living in EU countries in 2013-2022.
Design/methodology/approach: Two examination methods were applied for the set of multidimensional objects, namely linear ordering in dynamic terms and grouping by similarity of diagnostic features. Using the linear ordering method, a synthetic variable was determined covering 7 selected indicators describing the level of living, on the basis of which the level of living in EU countries in 2013 and 2022 was compared. Groups of countries having similar values of the adopted indicators were selected on the basis of fuzzy classification, and then the trend and extent of changes in the value of those indicators in the analysed period was compared for the respective groups of countries. The research was carried out on the basis of Eurostat.
Findings: The data confirms gaps in the level of living across EU countries that have persisted for years. Belgium, Luxembourg and the Netherlands significantly outperform the other countries in terms of the level of living. The lowest level of living persists in Bulgaria, Estonia, Greece, Croatia, Latvia, Lithuania and Romania. In all the countries, the level of living indicator grew in the analysed period, but the extent of the change was uneven. Malta and Ireland, followed by Hungary, Czechia, Poland and Slovenia saw the biggest improvement in this respect.
Research limitations/implications: A limitation in the research process is the lack of availability of the full database. If full data availability is obtained, research can be conducted on a wider set of diagnostic variables.
Practical implications: What outcomes and implications for practice, applications and consequences are identified? How will the research impact upon the business or enterprise? What changes to practice should be made as a result of this research? What is the commercial or economic impact? Not all papers will have practical implications.
Social implications: The European Union is made up of countries that vary greatly in terms of the level of living of their populations, and the convergence of those difference is one of the main priorities of the EU policy, which justifies the need for the research discussed in this paper.
Originality/value: Research using two methods, especially the dynamic approach, allowed obtaining a more complete picture of changes in the standard of living in EU countries.

The dynamic approach allows, in addition to creating rankings, quantification of changes in the analysed phenomenon over time.
Keywords: EU countries, level of living, linear ordering method, fuzzy classification.
Category of the paper: Research paper.

1. Introduction

The level of living is a complex notion, affected by many factors, such as the level of economic development, the labour market situation (unemployment rate, poverty risk), the infrastructure level (transport availability), safety and security, living conditions and health protection, environmental protection.

The primary determining factor for the level of living is the economic standing of a given country, with the GDP value (per capita) underlying the improvement in the level of living. Countries with a high GDP enjoy a high level of living, while a low GDP is reflected by a low level of living.

Another important factor in the analysed phenomenon is the labour market situation, since it decides on the income of the population, hence translating into the level of living. Aspects of broadly understood unemployment are among vital topics of each country's social policy. This results both from problems associated with unemployment as such (increase in social dissatisfaction or increased budgetary burden), and problems that may arise from its presence (Kłos, Tomaszewska, 2014).

Poverty means that certain needs cannot be satisfied at a desirable level. In terms of social perception, poverty is understood as the lack of sufficient funds, or the absence of affluence. In most general terms, poverty can be defined as a condition of falling below a certain income level, variable over time, or below a certain threshold of satisfying needs of a person, family, or social group (Biernat-Jarka, Trębska, 2018). Therefore, the poverty indicator is an important component of the synthetic variable describing the level of living of a given country's residents.

An important metric of the level of living of the population is also the number of rooms per person. An apartment purchase is an expensive investment, and so that indicator reflects the affluence level of a given society. Housing conditions affect all citizens at each moment of their lives. An apartment is seen as an asset that satisfies basic needs. It also serves the purpose of satisfying needs of a higher level (security, affiliation, recognition, self-fulfilment).

Another constituent of the population's level of living is the transportation network. Development of an ever-more efficient transportation system and ensuring that it can develop steadily, and improvement in the form and methods of its operation, stimulates the social and economic development of the country, thus significantly affecting the level of living of its citizens.

Another inherent factor in the level of living is the natural environment. That is because the level of living is not only about the quantity of non-perishable consumer goods in one's possession,

but also about clean air, non-polluted water, landscape qualities, etc. (Migała-Warchoł, 2010).

To sum up, constituent metrics were selected for the examination in a purposeful manner, so that they represent various areas of life and possibly faithfully reflect the actual level of living of the population.

The purpose of this paper is to demonstrate the trend and extent of changes in the level of living in EU countries in 2013-2022. The European Union is made up of countries that vary greatly in terms of the level of living of their populations, and the convergence of those difference is one of the main priorities of the EU policy, which justifies the need for the research discussed in this paper.

Two examination methods were applied for for the set of multidimensional objects, namely linear ordering in dynamic terms and the grouping of objects by similarity of diagnostic features. Using the linear ordering method, a synthetic indicator for the level of living was determined, on the basis of which changes in the level of living in EU countries in 2013 and 2022 were compared. Groups of countries having similar values of the indicators describing the level of living were selected on the basis of fuzzy classification, and then the trend and extent of changes in the value of those indicators in the analysed period was compared for the respective groups of countries. The grouping was performed for the data from 2013 and 2022. The outcome of the research is a synthetic picture of the level of living of the EU countries' population in the analysed period. The research was carried out using the EUROSTAT database covering the selected features of the socio-economic development of EU countries in 2013-2022.

2. Literature review

The level of living is a conceptual category examined from multiple standpoints. Its scope is big, because human needs are very diverse. The literature on the subject provides many definitions covering the respective areas of how the society and individuals function. They are derived from the following definition formulated by a UN Committee of Experts in 1954: "The concept of the level of living covers the entirety of actual conditions of life of the population and the level of material and cultural satisfaction of their needs by the stream of non-gratuitous goods services, and coming from social funds" (UN report, 1954). The key element in all definitions of this category are consumption needs and their "sustainable" satisfaction, which constitutes the primary purpose of economic activity of each household in microeconomic, or local, scale and the primary purpose of economic activity of each country in macroeconomic, or global, scale (Murawska, 2014).

One of the first researchers dealing with this topic was A. Luszniewicz (Luszniewicz, 1982), who defined the level of living as the degree of satisfaction of material and cultural needs of households fulfilled by the streams of non-gratuitous goods and services and by the streams of collective consumption funds. The researcher also specified seven primary areas of the needs whose satisfaction determines the level of living. These are: nutrition, safety and security, health care, living conditions, transportation, education and culture, and environment.

Teresa Słaby (Słaby, 1990; Czech, Słaby, 2017) defines the level of living as the degree of satisfaction of material and cultural needs with the existing infrastructure enabling such satisfaction. Czesław Bywalec (Bywalec, 2007) defines that category as the degree of satisfaction of the needs resulting from the consumption of material goods and services created by the man. This approach is therefore akin to the position of Luszniewicz. Żekoński (Żekoński, 1974) defines the level of living as the entirety of conditions in which the society, a social-professional group, a household or an individual lives, which express themselves primarily as facilities that relate to the process of satisfying individual and collective needs.

The presented definitions of the level of living reveal a complex and multifaceted nature of that category, which cannot be observed directly, and therefore various socio-economic and economic indicators are employed to describe it, which not so much indicate the level of living, but rather are its manifestation. A comprehensive assessment of the degree of satisfaction of needs should be carried out both in terms of objective and subjective aspects. Objective measures of the level of living refer to phenomena or processes that take place independently of the subjects of consumption, while subjective measures express individual opinions of people about the extent to which their needs are satisfied (Majka, 2015).

Research on the level of living is also carried out by international institutions, and its results are used to diagnose and determine socio-economic policies of the respective countries. Such institutions include for example the United Nations Research Institute for Social Development (UNRISD) which, in the 60s of the 20th century, attempted to implement a new statistical procedure to quantity the population's level of living as a category using the so-called Geneva method (Dąbrowa, 2018) that enabled international comparisons. 1990 saw the launch of the research (still continuing today) on the level of living and development in almost all countries of the world (those that agreed to provide data) by the United Nations Development Programme (UNDP). The agency annually publishes the Human Development Report, which employs the so-called Human Development Index (HDI). It is derived from the aggregation of indicators describing three phenomena comprising the level of living, that is:

- long and healthy life (indicator: life expectancy at birth);
- knowledge – schooling (indicator: mean years of education and expected years of schooling);
- a decent standard of living (indicator: net national income, that is GNI per capita $ PPP) (Bywalec, 2022).

Even though HDI has dominated global social and economic statistics in recent decades, and almost entirely superseded a macroeconomic indicator used previously, that is GDP per capita, it is still not a perfect tool for international comparisons. Research on the level of living is also broadened by European statistics on income and living conditions (EU SILC), providing current and comparable data on income, poverty, social exclusion, and living conditions. The adoption of a harmonised research methodology by all countries conducting EU-SILC research enables data comparison at the EU level and analysis of the phenomena mentioned above at the European level as well (https://badania-ankietowe.stat.gov.pl/kategoria/1/badanie/44). The development of synthetic and objective, to the extent possible, indicatorsallows insight into changes in the level of living of societies at various aggregation levels, and allows to track social and economic development of countries.

3. Methodology

The level of living is a multidimensional phenomenon, described by multiple indicators (features, variables). Research on the subject has most commonly applied the linear ordering method for multidimensional objects in static terms (Kozera, A., Kozera, C., 2011; Murawska, 2014; Wawrzyniak, 2016; Kasprzyk, Wojnar, 2023). That method amounts to constructing a synthetic variable enabling the ranking of objects (for example countries) in terms of the level of the analysed phenomenon in the analysed years. This enables, for example, the identification of units in which the level of living is high or low. If the number of objects is large, in order to generalise the results, a division is typically made into groups marked by a high, medium and low level of the analysed phenomenon. It might then happen that members of the same group are objects where values of the respective features that describe the analysed phenomenon differ significantly. This prompted the authors of this paper to use multicriterial taxonomy, leading to the grouping of objects (countries) having a similar value of the diagnostic features being analysed. The analysis in question was performed in two stages. In the first stage, the level of living in EU countries was analysed using the linear ordering method in dynamic terms and then, on the basis of fuzzy classification method, countries were grouped on the basis of a similar value of the respective features. The analysis was carried out for data from 2013 and 2022. By doing so, a synthetic picture of differences in the level of living in EU countries in the analysed years was obtained, with negligible loss of input information.

The research was carried out using the EUROSTAT database covering the selected features of the socio-economic development of EU countries in 2013-2022.

The linear ordering method for multidimensional objects is divided into the following stages: selection of diagnostic variables, determination of importance indexes (weights) for the variables, variable normalisation, construction of a synthetic variable, ranking of objects.

Each stage offers a selection option, starting from the selection of the diagnostic variables, variable normalisation method, or the method of constructing the synthetic variable[1]. The researcher's choices at the respective stages of the research affect its outcome. The problem was discussed by multiple authors (Bąk, Szczecińska, 2015; Bożek, 2002; Dębkowska, Jarocka, 2013; Kukuła, 1999; Jarocka, 2015; Kisielińska, 2016; Pawełek, 2008; Walesiak, 2014).

The first stage involves the selection of a set of diagnostic variables (indicators) describing the phenomenon to be analysed. In practice, the selection of the variables is largely dependent on whether it is possible to gather complete, reliable and comparable statistics. Even though multiple authors deal with the level of living as a phenomenon, at the current stage of the research there is no commonly recognised and applied set of indicators describing it. This paper employs 7 diagnostic variables (indicators) describing the level of living in EU countries (table 1). The merit criterion was used in selecting the diagnostic variables, consisting in the selection of such indicators (features) that are important determinants of the analysed phenomenon, while the other criterion was data availability. (To note, there cannot be too many indicators adopted for the analysis because, in the grouping of objects in terms of a similar level of an indicator, increasing the number of diagnostic variables typically leads to intra-group diversification, resulting in the groups not being homogeneous. Thus, indicators describing objects belonging to those groups markedly differ from the group average, which means the outcome is burdened with a significant error).

The analysis was carried out on the assumption of identical weights for the adopted diagnostic variables.

The data comprise a set m of objects (27 countries), each being described by n variables (n = 7 for this paper) in $t = 1, \dots, T$ years (in this paper T = 10). It can be described as the observation matrix X:

$$X = [x_{ijt}] \; (i = 1, \dots, m; j = 1, \dots n; t = 1, \dots T) \tag{1}$$

where x_{ijt} is the value of *j-th* variable (feature, indicator) in *i-th* object (country) in year *t.*

The next stage is variable normalisation. The Strahl quotient transformation method in dynamic terms is used in this paper. A significant advantage of the Strahl method is the option to interpret results as percentages (Strahl, 1978; Bożek et al., 2022). The dynamic approach allows, next to creating rankings, quantification of changes in the analysed phenomenon over time. Variable normalisation in dynamic terms was employed to quantify changes in the level of development in the following publications: (Bożek, Szewczyk, 2021, Bożek et al., 2021a; Bożek et al., 2021b; Bożek et al., 2022; Lisek, 2023, Sompolska-Rzechuła, Kurdyś-Kujawska, 2022; Stec, 2012; Szewczyk et al., 2021). To note, the Strahl method can be used if all variables take non-negative values and if the maximum (for the stimulant) or the minimum (for the destimulant) is different from zero. This criterion is met for this paper.

[1] the list of publications where the authors apply the linear ordering method for multidimensional objects with different selection variants at the respective stages is given in the paper by (Kisielińska et al., 2021).

Variable normalisation using the Strahl method in dynamic terms is specified by the following formulae (Bożek et al., 2022):

$$z_{ijt}^{d} = \frac{x_{ijt}}{MAX_j} \text{ for stimulants} \tag{2}$$

$$z_{ijt}^{d} = \frac{MIN_j}{x_{ijt}} \text{ for destimulants} \tag{3}$$

where MAX_j – highest value of j-th variable in all analysed years and all analysed objects,
where MIN_j – lowest value of j-th variable in all analysed years and all analysed objects.
The index *d* refers to dynamic approach.

The variable normalised by the Strahl method in dynamic terms ($\mathrm{z_{ijt}^{d}}$) denotes, for the stimulant, what part (and, after multiplying by 100, what %) of the maximum value of j-th diagnostic variable in the entire analysed period constitutes the value of the variable describing i-th object in year t. Normalised variables adopt values from the range $\left[\frac{\mathrm{MIN_j}}{\mathrm{MAX_j}}, 1\right]$.

In the following year, for each *i*-th object (country), the value of the synthetic variable W_{it} and development level indicator P_{it}^{d} is calculated (Bożek, 2002):

$$W_{it}^{d} = \sum_{j=1}^{n} z_{ijt}^{d}, \quad (i = 1,2,...,m; t = 1,2,...,T) \tag{4}$$

$$P_{it}^{d} = \frac{W_{it}^{d}}{n} \tag{5}$$

where: P_{it}^{d} - dynamic development level indicator (DWPR). In this paper, P_{it}^{d} is the dynamic indicator for the level of living.

The indicator P_{it}^{d} adopts values from the range [0,1], where the higher its value, the higher the level of development (living) in year *t*. On the basis of DWPR values, the ranking of objects is created and the extent of changes to object *i* is specified over time from t_1 to t_2 (Bożek et al., 2021a):

$$\Delta DWPR = \Delta P_{i,t_1t_2}^{d} = P_{it_2}^{d} - P_{it_1}^{d} \tag{6}$$

If the reference object is such that the values of its features are maximum (in the analysed period), then the level of development of P_{it}^{d} *i*-th object denotes (after multiplying by 100) what % of the development level of the reference object is the development level of *i*-th object in year *t* (or what % of maximum values of diagnostic variables constitute, on average, variables describing *i*-th object in year t). In turn, indicator $\Delta DWPR$ denotes (after multiplying by 100), by how many percentage points (p.p.) the level of the analysed phenomenon changed in *i*-th object in the period from t_1 to t_2.

On the basis of the development level indicator P_{it}^{d}, countries are divided into 5 groups in each analysed year as follows:

$$\begin{aligned}
&\text{group I – very high level of living – } P_{it}^{d} \in (0.8; 1]\\
&\text{group II – high level of living – } P_{it}^{d} \in (0.6; 0.8],\\
&\text{group III – average level of living – } P_{it}^{d} \in (0.4;\ 0.6]\\
&\text{group IV – low level of living – } P_{it}^{d} \in (0.2; 0.4],\\
&\text{group V – very low level of living – } P_{it}^{d} \in [0; 0.2].
\end{aligned} \tag{7}$$

In order to identify groups having similar values of the indicators describing the level of living, fuzzy classification was used, relying on the concept of fuzzy sets, then transformed into the traditional classification. In the fuzzy classification, the grouping of objects into a given class is specified by the continuous membership function, adopting values from the range [0,1], whereas in the traditional classification, it is a zero-one function (Zadeh, 1965).

The fuzzy classification can be formulated as follows:

The set of objects $\boldsymbol{\Omega}$ (countries in this case) consisting of n-elements is given: $P_1, P_2, \ldots, P_n$. Each is described by r values of variables: $X_1, X_2, \ldots X_r$. (in this paper, X_l denotes the normalised value of l-th diagnostic variable describing the level of living in a given country. For the set Ω, the family of fuzzy classes $S_1, S_2, \ldots S_K$ $(1 < K < n)$ should be specified, and, for each object P_i, the degree of membership (similarity) in class S_j should be determined, that is the membership function $f_{S_j}(P_i)$ should be created, fulfilling the following conditions:

1. $0 \le f_{S_j}(P_i) \le 1 \quad (i = 1, \ldots, n; \quad j = 1, \ldots, K)$, where $f_{S_j}(P_i)$ – degree of membership of object P_i in class S_j,
2. $\sum_{j=1}^{K} f_{S_j}(P_i) = 1 \quad (i = 1, \ldots, n)$,
3. The objects where the degree of membership of the same class reaches a high value are very similar, whereas objects where the degree of membership of different classes reach a high value are dissimilar.

From among the available fuzzy classification methods (Jajuga, 1984), the iterative method was selected, which employs the concept of the fuzzy centre of gravity. In subsequent iterations, changes in the objects' value of the degree of membership of the respective classes are tracked. The procedure continues until the values no longer change significantly.

The fuzzy classification so obtained was then transformed into the traditional classification, assuming that an object P_i belongs to the class (typological group) S_j if

$$f_{S_j}(P_i) = \max_{l} f_{S_l}(P_i) \tag{8}$$

The presented classification method for multidimensional objects is useful for spatial and temporal research carried out in various thematic areas (Bożek, 2013; Bożek, J., Bożek, B., 2011; Bożek et al., 2020). It allows objective grouping of countries that share the analysed set of features, and a synthetic presentation of the analysed phenomenon over time, with a relatively insignificant loss of input information. Tables, figures and formulas – continuous numbering in the text.

4. Methodology

The paper analyses diagnostic variables described in table 1.

Table 1.
Diagnostic variables describing the level of living in EU countries

Symbol	Name and unit	Nature of the variable
X_1	GDP per capita in EUR	stimulant
X_2	mean equivalent income in PPS	stimulant
X_3	unemployment rate in %	destimulant
X_4	poverty risk in % of the population	destimulant
X_5	number of rooms per person	stimulant
X_6	motorways in km per 100 km^2	stimulant
X_7	emission of PM below 2.5 μm in kg per resident	destimulant

Source: authors' compilation.

Primary characteristics of the variables shows table 2.

Table 2.
Primary characteristics of diagnostic variables describing the level of living in EU countries

Detailing	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Mean							
2013	25 336	15722.7	11.5	8.1	1.6	2.0	4.8
2022	29 354	20094.7	5.9	7.5	1.7	2.2	3.9
Maximum							
2013	82 820	32357.0	27.7	14.3	2.2	7.1	11.7
2022	85 850	36744.0	13.0	16.2	2.3	7.5	9.8
Minimum							
2013	5700	4481.0	5.3	3.2	1	0.0	1.1
2022	7680	10158.0	2.3	3.4	1.1	0.0	0.6
Distance							
2013	78470	27876.0	22.4	11.1	1.2	7.1	10.6
2022	78170	26586.0	10.7	12.8	1.2	7.5	9.2
Coefficient of variation							
2013	68.1	42.3	48.5	42.3	23.6	92.1	58.6
2022	63.9	31.3	43.1	45.5	21.0	84.5	62.9

Source: authors' own compilation based on data (access on 10 January 2023).

The largest variability, between 84.5% and 92.1% is demonstrated by X_6 — motorways per 100 km^2. All variables except X_5 show variability in excess of 30%.

The highest GDP per capita, significantly different from the other countries, was reached by Luxembourg and, in 2013-2021, the indicator demonstrated a continuously growing trend, rising from EUR 82,400 to EUR 86,540. Ireland stands out among the countries in which the value of the indicator improved, as it demonstrated a very significant growth in GDP per capita in 2014, and maintained a growing trend throughout the period. All other countries in 2020 saw a major drop in that indicator, likely related to the start of the COVID-19 pandemic.

If we analyse mean net income per capita expressed in the purchasing power standard (PPS), a growing trend can be observed for most of the countries. The largest level of income in almost the entire analysed period was recorded for Luxembourg, with the exception of 2020, when Germany ranked first. The lowest income from among the analysed countries was recorded for the residents of Romania.

The unemployment rate is an important indicator of the economic standing of a country, indirectly affecting the level of living of its residents. We can see a very clear downward trend in the vast majority of EU countries when we analyse the value of that indicator in the period. That downward trend was reversed in 2020, but the rate began to decrease in most of the countries in the following years. The largest absolute drops in the value of that indicator were recorded for Greece (15.1 p.p.) and Spain (13.2 p.p.), however both countries showed the highest unemployment rates, markedly differing in that respect from the other countries.

An indicator that reflects the financial situation of households in a given country in relative terms, as compared to residents of other countries, is the risk of poverty. It shows the percentage of people in households in which the annual equivalent disposable income is below the poverty risk threshold. In this paper, the threshold is 40% of the mean equivalent income. The poverty risk indicator was the highest for Bulgaria, where the situation further deteriorated (indicator growth by 3.4 p.p.) and Romania, where, however, a falling trend can be seen in the second half of the analysed period. The lowest values of the indicator in the analysed period are observed in Czechia and Finland, and the values are stable over time.

The number of rooms per person is another indicator of the level of living. The variable was very stable in 2013-2022. In most countries, an increase by 0.1 room per person was recorded, with the highest growth recorded for Hungary (0.5 room per person). The lowest value was recorded for Romania, followed by Poland.

The analysed countries vary significantly in terms of motorway density. There are no motorways in Malta and Latvia, while Lithuania and Romania have the fewest of them (but more than zero). The highest motorway density is in the Netherlands, Belgium and Luxembourg, and there is a significant gap between those three countries and the remaining ones, led by Germany.

The highest indicator of the weight of PM below 2.5 μm per resident exists for Denmark and Latvia. The lowest value in the analysed period was recorded for the Netherlands, Malta, Cyprus and Luxembourg. The largest drop in PM emissions per resident was recorded for Estonia, followed by Czechia and Hungary.

According to the formulae given in the methodology section, values of the dynamic development level indicator (DWPR) were calculated for the respective countries for 2013 and 2022. Values of that metric are given in table 3. They are arranged from the highest to the lowest for 2013, thus providing the ranking of countries in terms of the level of living. The division of the countries into groups according to the formulae given in the methodology section (7) is also presented.

Table 3.
Ranking of EU countries in terms of the level of living in 2013 and 2022, values of the dynamic level of living indicator, membership of groups, increase in DWPR in 2013-2022

Country	2013 Rank	$P_{i\,2013}$	Group	2022 Rank	$P_{i\,2022}$	Group	ΔDWPR
Luxembourg	1	0.6390	II	1	0.7000	II	0.0610
Netherlands	2	0.6028	II	2	0.6808	II	0.0780
Belgium	3	0.5241	III	3	0.6032	II	0.0791
Germany	4	0.4671	III	6	0.5368	III	0.0697
Denmark	5	0.4434	III	7	0.5163	III	0.0729
Austria	6	0.4422	III	9	0.4763	III	0.0341
Cyprus	7	0.4296	III	8	0.5067	III	0.0771
Malta	8	0.4250	III	4	0.5750	III	0.1500
Finland	9	0.4215	III	12	0.4609	III	0.0394
France	10	0.3981	IV	14	0.4127	III	0.0146
Ireland	11	0.3961	IV	5	0.5431	III	0.1470
Sweden	12	0.3920	IV	13	0.4228	III	0.0308
Slovenia	13	0.3547	IV	11	0.4622	III	0.1075
Czechia	14	0.3429	IV	10	0.4733	III	0.1304
Spain	15	0.3380	IV	15	0.3838	IV	0.0458
Italy	16	0.3206	IV	18	0.3609	IV	0.0403
Portugal	17	0.3002	IV	17	0.3666	IV	0.0665
Slovakia	18	0.2468	IV	20	0.3300	IV	0.0832
Hungary	19	0.2467	IV	16	0.3783	IV	0.1317
Estonia	20	0.2400	IV	21	0.3125	IV	0.0725
Lithuania	21	0.2357	IV	22	0.3100	IV	0.0743
Croatia	22	0.2213	IV	23	0.2916	IV	0.0703
Greece	23	0.2168	IV	24	0.2694	IV	0.0526
Poland	24	0.2146	IV	19	0.3440	IV	0.1294
Latvia	25	0.1829	V	26	0.2324	IV	0.0495
Bulgaria	26	0.1813	V	25	0.2652	IV	0.0840
Romania	27	0.1757	V	27	0.2322	IV	0.0565
Mean		0.3481			0.4240		

Source: authors' own calculations based on data https://ec.europa.eu/eurosta (access 10 January 2024).

The calculations confirm differences in the development of the countries, demonstrated by significant differences in DWPR values for the countries with the highest and lowest level of living in the analysed years.

The highest ranking, in the analysed years, are 3 countries: Belgium, Luxembourg, and the Netherlands, whose DWPR is significantly higher than that of the rest. The lowest level of living was recorded for Romania, Latvia, Bulgaria, Croatia, that is post-communist countries, as well as for Greece. The ranking of countries did not change significantly in the analysed period. Movements by 1-3 places in the ranking were typically observed, notably for countries from the mid-range of the ranking. Only Ireland moved from place 11 to 5, Malta from 8 to 4, Czechia from 14 to 10, Poland from 24 to 19, while France went four places down, from 10 to 14.

All countries saw the growth in DWPR in the analysed period, which is a positive and desirable development, as it demonstrates the improvement in the indicators describing the level of living. The average value of the level of living in 2013 was 0.3481, growing to 0.4240 in 2022, and so the DWPR increase was 0.08. The pace of that growth was uneven, however, as shown by differences in the value of that indicator $\Delta DWPR$ (table 3). The largest DWPR growth in 2013-2022 was recorded for Malta (0.15) and Ireland (0.15), as well as for Hungary (0.13), Czechia (0.13), Poland (0.13), Slovenia (0.11), Bulgaria (0.08), Slovakia (0.08), that is countries from the bottom positions of the 2013 ranking, where there was the largest need to improve the situation in terms of the adopted set of features. The smallest positive changes occurred for France (0.01), Sweden (0.03), Austria (0.03), Finland (0.04). Despite those positive changes, DWPR of five countries, that is Romania, Latvia, Bulgaria, Croatia, and Greece did not exceed 0.3 in 2022, which means that, on average, the level of living indicators (adopted for the study) constitute less than 30% of their maximum values, which means that there is a still a lot to be improved in those countries in this respect.

The distance between the country with the highest and lowest level of living grew in the analysed period, which is not a favourable phenomenon, in particular in the context of the policy aiming at the convergence of regional differences. In 2013, the smallest value of the development indicator was 0.1757, while the highest was at 0.6390, which means that the distance between the two was 0.4633. The distance further increased to 0.4678 in 2022. When we exclude group two from the comparison, with countries having the highest level of living, the gap is smaller, and shows a slightly downward trend: 0.3484 in 2013 and 0.3046 in 2022.

The improvement in the level of living in EU countries in the analysed period is also reflected by the classification into groups, shown in table 3. In 2013, 3 countries belonged to group V, that is very low development level, for which DWPR did not exceed 0.20, 15 countries were in group IV - low development level, where DWPR did not exceed 0.40, and only 2 countries were in group II, where DWPR was above 0.6. The situation improved in 2022, as there were no more countries in group V, group IV had 13 countries, while there were no significant changes in respect of the ranking leaders, as only 3 countries exceeded 0.6 (group II). However, even for leaders of the ranking, the values describing those countries do not reach the maximum. In no country did the level of living indicator exceed 0.8.

The basis for the ranking shown in table 3 is the value of the synthetic variable, and therefore there are significant differences among objects in terms of the values of the respective features. For example, Ireland and Slovenia are in group III for 2022, whereas GDP in those countries was, respectively, 77,430 and 21,870, and the motorway density was 1.4 km/100km^2 and 3.0 km/100km^2, respectively. Poland and Spain, in turn, belonging to group IV, differ greatly in terms of the unemployment rate, at 2.9% in Poland, and at 13.0% in Spain. In the second stage of the analysis, on the basis of the fuzzy classification, the countries were grouped by similarity of the values of diagnostic features describing the level of living in EU countries in 2013 and 2022. The calculations were performed in the authors' proprietary software which[2], for a given set of multidimensional objects, determines the centre of gravity for clusters, and calculates the value of the membership function of the clusters for the respective objects.

On the basis of the calculations, 6 multiple member groups and one single member group were created. Members of the groups are shown in table 4.

Table 4.
Groups of EU countries having similar values of the level of living indicators in 2013 and 2022

Group	Group composition	
	2013	**2022**
1	Belgium, Luxembourg, Netherlands	Belgium, Luxembourg, Netherlands
2	Austria, Germany	Austria, Germany, Denmark, Cyprus
3	Denmark, France, Ireland, Sweden	France, Ireland, Sweden, Finland
4	Czechia, Finland, Malta	Czechia, Hungary, Poland, Slovenia, Slovakia
5	Spain, Portugal, Italy, Slovenia	Spain, Portugal, Italy
6	Bulgaria, Estonia, Greece, Croatia, Latvia, Lithuania, Poland, Hungary, Slovakia, Romania	Bulgaria, Estonia, Greece, Croatia, Latvia, Lithuania, Romania
7	Cyprus	Malta

Source: authors' compilation.

In order to present differences in the indicators in the respective groups, average values of the variables in the groups and the average level of living indicator were calculated. For each country group, intra-group variances were calculated: standard deviation – s(x) and variance index – V(x). The groups are characterised in table 5.

Table 5.
Average, values, standard deviation s(x), variance index V(x) of the level of living indicators in 2013 and 2022. Average development level indicator

	GDP per capita in EUR	**Mean equivalent income in PPS**	**Unemploy-ment rate**	**Poverty risk**	**Number of rooms per person**	**Motorways in km per 100 km²**	**Emission of PM below 2.5 µm**	**Indicator DWPR**
Group 1in 2013								
Mean	**51 356.7**	**24 963.3**	**7.2**	**5.0**	**2.1**	**6.2**	**2.1**	
s(x)	22 034.3	5 228.4	1.1	1.0	0.1	0.6	0.5	0.5886
V(x)	42.9%	20.9%	14.7%	19.2%	4.6%	10.1%	25.3%	
Group 1in 2022								
Mean	**55 563.3**	**30 061.7**	**4.6**	**5.4**	**2.1**	**6.5**	**1.5**	
s(x)	21 593.0	4 756.8	0.9	1.3	0.0	0.7	0.4	0.6613
V(x)	38.9%	15.8%	18.8%	23.5%	2.2%	11.1%	24.6%	
Group 2 in 2013								
Mean	**34 55.0**	**22 713.5**	**5.4**	**6.6**	**1.7**	**2.8**	**2.1**	
s(x)	1 425.0	361.5	0.1	0.5	0.1	0.8	0.1	0.4547
V(x)	4.1%	1.6%	0.9%	6.9%	5.9%	27.6%	4.5%	

[2] software in C++ calculates values of the membership functions of fuzzy classes for objects according to the algorithm presented in Bożek J., Bożek B. (2011).

Cont. table 5.

Group 2 in 2022								
Mean	**38 307.5**	**25 841.8**	**4.9**	**5.7**	**1.8**	**3.0**	**3.5**	
s(x)	8 672.6	1 797.8	1.3	1.0	0.2	0.6	3.6	0.5090
V(x)	22.6%	7.0%	27.4%	16.9%	8.8%	19.5%	102.4%	
Group 3 in 2013								
Mean	**38 292.5**	**21 345.8**	**10.0**	**5.8**	**1.9**	**1.6**	**5.6**	
s(x)	4 861.6	1 061.9	2.5	0.4	0.1	0.9	3.6	0.4074
V(x)	12.7%	5.0%	25.1%	7.2%	7.9%	54.0%	65.1%	
Group 3 in 2022								
Mean	**48 585.0**	**23 060.5**	**6.6**	**5.5**	**1.9**	**1.0**	**2.5**	
s(x)	17 296.9	482.2	1.2	1.4	0.1	0.6	0.5	0.4737
V(x)	35.6%	2.1%	18.1%	25.2%	6.8%	64.0%	19.9%	
Group 4 in 2013								
Mean	**22 500.0**	**16 855.3**	**7.2**	**3.8**	**1.8**	**0.4**	**4.3**	
s(x)	8 659.7	3 731.9	0.9	0.7	0.3	0.4	2.8	0.3965
V(x)	38.5%	22.1%	12.1%	18.1%	16.4%	102.8%	65.5%	
Group 4 in 2022								
Mean	**17 128.0**	**15 088.0**	**3.8**	**4.4**	**1.4**	**1.8**	**5.1**	
s(x)	2 788.9	3 710.7	1.3	0.9	0.2	0.8	1.6	0.3976
V(x)	16.3%	24.6%	34.9%	20.4%	16.8%	43.1%	31.2%	
Group 5 in 2013								
Mean	**20 170.0**	**15 263.3**	**16.5**	**9.9**	**1.6**	**2.9**	**4.7**	
s(x)	3 826.2	2 101.9	6.1	3.0	0.2	0.4	1.4	0.3284
V(x)	19.0%	13.8%	37.3%	30.7%	11.7%	13.5%	30.1%	
Group 5 in 2022								
Mean	**24 156.7**	**18 495.0**	**9.2**	**10.2**	**1.7**	**2.6**	**3.4**	
s(x)	3 688.4	2 793.4	2.8	1.2	0.2	0.9	0.7	0.3704
V(x)	15.3%	15.0%	30.8%	12.2%	14.4%	33.4%	21.5%	
Group 6 in 2013								
Mean	**10 635.0**	**8 618.9**	**13.4**	**10.8**	**1.2**	**0.8**	**6.3**	
s(x)	2 989.6	1 782.1	5.5	2.9	0.1	0.7	2.2	0.2162
V(x)	28.1%	20.7%	41.1%	26.6%	12.5%	83.6%	35.3%	
Group 6 in 2022								
Mean	**13 661.4**	**14 500.1**	**7.0**	**11.9**	**1.3**	**0.9**	**5.6**	
s(x)	3 468.5	2 845.8	2.5	2.4	0.2	0.8	2.0	0.2733
V(x)	25.4%	19.6%	35.3%	19.8%	13.8%	85.0%	35.1%	
Single-element group in 2013								
Cyprus	20450	21006	16.1	7.4	2	2.8	1.2	0.4490
Single-element group in 2022								
Malta	24560	24338	3	6.6	2.3	0	0.6	0.6043

Source: authors' own calculations based on data https://ec.europa.eu/eurosta (access: 10 January 2023).

Group 1 is composed of three countries with the highest level of living: Belgium, Luxembourg, the Netherlands Those countries are markedly outperform the remaining groups in terms of GDP, mean income by PPS, motorway density, and show the lowest PM pollution. The average GDP for those countries was EUR 51,357 in 2013, growing to 55,563 in 2022. The mean equivalent net income grew from 24,963 PPS in 2013 to 30,061 PPS in 2022. The densest (from among the other groups) motorway network, at 6.2 km/100km^2 in 2013, grew even denser, to 6.5 km/100km^2 in 2022. PM emission was the lowest, at 1.5 kg/person (2.1 kg/person in 2013). The level of living indicator grew from 0.61 to 0.68.

In group 2, covering only 2 countries in 2013, that is Austria and Germany, the level of living indicator was at 0.48 on average, so much less than for group 1. The group was joined by Denmark (from group 3) and Cyprus in 2022. Differences between group 1 and 2 are very significant. GDP per capita in group 2 countries was, on average, EUR 38,308 in 2022 (EUR 34,755 in 2013), with the mean equivalent net income growing from 22,713 PPS to

25,842 PPS, and the unemployment rate falling from 5.4% to 4.9%, and the poverty risk from 6.6% to 5.7%. DWPR grew to 0.51, and so the distance between group 1 and 2 increased from 0.1812 to 0.1876 in the analysed period.

In 2013, group 3 included 4 countries: Denmark, France, Irlandia, Sweden. In 2022, Denmark moved to group 2, and Finland to group 3 (it was in group 4 in 2013). As compared with the previous group, DWPR here is lower (0.43 in 2013 and 0.48 in 2022), even though GDP is higher in those countries: EUR 38,293 in 2013 and EUR 48,585 in 2022 on average). However, the above does not translate into the mean equivalent net income, lower in group 2, at 21,346 PPS in 2013, and 23,061 PPS in 2022. Similarly to the previous group, the situation improved in terms of the unemployment rate and PM emissions, with significant drops for both indicators: unemployment dropped from 10% to 6.6%, and PM emission was cut by nearly one half: from 5.6 kg/person to 2.5 kg/person.

Group 4 was made up of 3 countries in 2013: Czechia, Finland i Malta. In 2022, Finland moved to group 3, and Malta remained as the only member of the group. In 2022, group 4 was composed of: Czechia, Slovenia, Hungary, Poland, and Slovakia, with the latter 3 in group 6 in 2013, showing the lowest level of living. In group 4, mean net equivalent income and GDP per capita are markedly lower than for group 3 countries. In 2022,–the average GDP of group 4 countries was at EUR 17,128, which is less than one half of the average for group 3. The average for that indicator was lower only for group 6.

Group 5 was made up of 4 countries in 2013: Spain, Slovenia, Portugal, and Italy. The development indicator in those countries was 0.33 on average in 2013, growing to 0.37 in 2022. The unemployment rate (9.2% in 2022) and poverty risk at 10.2% are the highest among the remaining groups. In 2022, Slovenia moved to group 4 following positive changes.

Group 6 comprises countries with the lowest level of living. There were 10 members of the group in 2013: Bulgaria, Estonia, Greece, Croatia, Latvia, Lithuania, Poland, Hungary, Slovakia, Romania, so the group comprised nearly all of the post-communist countries (except for Czechia and Slovenia). DWPR in the group was at 0.22, almost 3 times less than for group 1 (highest level of living), and GDP in those countries was, on average 5 times smaller (10,635), and the mean income almost 3 times less, at 8,619 PPS. The situation improved significantly in Hungary, Poland and Slovakia in the analysed period, as a result of which those 3 countries joined group 4, where DWPR in 2022 was at 0.42 on average. Some level of living indicators also improved in the remaining group 6 countries: GDP grew from EUR 10,635 to EUR 13,661, the unemployment rate dropped from 13.4% to 7%, PM emissions fell from 6.3 kg/person to 5.3 kg/person, and the mean equivalent income increased from 8,619 PPS to 14,500 PPS. As a result of those changes, DWPR increased to 0.2733, which, however, still shows a low level of living and an urgent need for improvement in those countries.

5. Conclusion

The research confirms the persisting gap in the level of living in EU countries. In the analysed period, 3 countries: Belgium, Luxembourg and the Netherlands significantly outperformed the other countries in terms of the level of living. The lowest level of living persists in Bulgaria, Estonia, Greece, Croatia, Latvia, Lithuania and Romania. The synthetic level of living indicator (DWPR) grew in all countries in the analysed period, but the extent of the changes was uneven, while the smallest DWPR increase was recorded for France (1.4 p.p.), and the highest for Malta (15 p.p.). High increases of the value of that indicator were recorded for Ireland, Hungary, Czechia, Poland, and Slovenia.

In addition to France, low DWPR increases were recorded for Finland, Austria, and Sweden. Low increases are typically shown by countries where the level of living is relatively high, whereas the highest growths of the indicator are recorded mostly for post-communist countries (with the exception of Malta and Ireland).

All countries demonstrated largely positive trends for the adopted indicators, that is GDP and income, number of rooms per person, motorway density, unemployment rate drop, percentage of people at risk of poverty, and air pollution level. A slight disruption of those positive trends was observed in 2020, when most of the countries recorded a drop in GDP per capita, and the unemployment rate growth. However, the gaps between the countries remain very significant, as reflected by the grouping of countries in terms of similar values of the level of living indicators. 6 groups were created and one isolated object. There were differences in terms of group membership at the start and end of the analysed period, resulting from the uneven extent of changes in the respective countries. One of the factors showing the greatest difference among the countries was GDP, which, for the respective groups in 2022, was at: EUR 55,6k, EUR 38.3k, EUR 48.6k, EUR 17.1k, EUR 24.1k, EUR 13.7 k, which clearly shows the gaps among the countries.

The methods used for the research are complimentary and offer a synthetic picture of differences in the level of living in European Union countries.

The results of the research demonstrate the need for appropriate actions and development of new solutions (strategies) to improve and cause the convergence of the level of living in the respective EU countries.

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References

1. Bąk, I., Szczecińska, B. (2015). Zastosowanie metod taksonomicznych w badaniu warunków życia w gminach wiejskich województwa zachodniopomorskiego. *Journal of Agribusiness and Rural Development*, *1*, pp. 7-15.
2. Biernat-Jarka, A., Trębska, P. (2018). Ubóstwo w Polsce i Unii Europejskiej a formy jego przezwyciężania w kontekście zrównoważonego rozwoju i doświadczeń UE. *Zeszyty Naukowe SGGW w Warszawie – Problemy Rolnictwa Światowego*, *18(1),* pp. 38-47, doi: 10.22630/PRS.2018.18.1.3
3. Bożek, J. (2002). O niektórych metodach porządkowania liniowego. *Wiadomości Statystyczne. The Polish Statistician*, *9*, pp. 10-16.
4. Bożek, J. (2013). Klasyfikacja podregionów pod względem podobieństwa struktury agrarnej. *Wiadomości Statystyczne. The Polish Statistician*, *9*, pp. 1-16, doi: 10.59139/ws.2013.09.1
5. Bożek, J., Bożek, B. (2011). Typologia struktury agrarnej województw w ujęciu dynamicznym z zastosowaniem klasyfikacji rozmytej. *Metody Ilościowe w Badaniach Ekonomicznych*, *XII(2),* pp. 91-100.
6. Bożek, J., Nowak, Cz., Zioło, M. (2020). Changes in agrarian structure in the EU during the period 2010-2016 in terms of typological groups of countries. *Agricultural Economics-Zemedelska Ekonomika, 7(66),* pp. 307-316, doi: 10.17221/43/2020-AGRICECON
7. Bożek, J., Szewczyk, J. (2021). Ocena poziomu rozwoju społecznego powiatów województwa małopolskiego z zastosowaniem dynamicznego miernika syntetycznego. *Wiadomości Statystyczne. The Polish Statistician*, *66(4).* pp. 45-63, doi: 10.5604/01.3001.0014.8325
8. Bożek, J., Szewczyk, J., Badach, E., Lisek, S. (2022). Ocena poziomu rozwoju gospodarczego województw z zastosowaniem metod porządkowania liniowego w ujęciu dynamicznym. *Wiadomości Statystyczne. The Polish Statistician*, *12*, pp. 39-61, doi: 10.5604/01.3001.0016.1613
9. Bożek, J., Szewczyk, J., Jaworska, M. (2021a). Poziom rozwoju gospodarczego województw w ujęciu dynamicznym. *Rozwój Regionalny i Polityka Regionalna*, *57*, pp. 11-24, doi: 10.14746/rrpr.2021.57.02
10. Bożek, J., Szewczyk, J., Jaworska, M. (2021b). Zmiany w poziomie rozwoju społecznego województw w latach 2010 i 2019 z zastosowaniem dynamicznego miernika syntetycznego. *Nierówności Społeczne a Wzrost Gospodarczy*, *65(1),* pp. 109-123, https://doi.org/10.15584/nsawg.2021.1.6
11. Bywalec, Cz. (2007). *Konsumpcja w teorii i praktyce gospodarowania.* Warszawa: PWN.
12. Bywalec, Cz. (2022). Pomiar poziomu życia ludności – dylematy doboru wskaźników. *Optimum. Economic Studies*, *108(2),* pp. 3-21, doi: 10.15290/oes.2022.02.108.01

13. Czech, A., Słaby, T. (2017). Ocena poziomu życia gospodarstw domowych według województw – meandry analizy taksonomicznej. *Wiadomości Statystyczne. The Polish Statistician*, *10*, pp. 19-37, doi: 10.5604/01.3001.0014.1054
14. Dąbrowa, M. (2018). Wskaźnik rozwoju społecznego (HDI) jako miernik poziomu życia. Wykorzystanie metody dystansowej. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie*, *39(3),* pp. 159-172, doi: 10.25944/znmwse.2018.03.159172
15. Dębkowska, K., Jarocka, M. (2013). The impact of the methods of the data normalization on the result of linear ordering. *Acta Universitatis Lodziensis. Folia Oeconomika*, *286*, pp. 181-188.
16. *Europejskie badanie warunków życia ludności (EU-SILC)*. Retrieved from https://badania-ankietowe.stat.gov.pl/kategoria/1/badanie/44, 1.12.2024.
17. Jajuga, K. (1984). Zbiory rozmyte w zagadnieniu klasyfikacji. *Przegląd Statystyczny*, *3/4,* pp. 237-290.
18. Jarocka, M. (2015). Wybór procedury normalizacyjnej w analizie porównawczej obiektów wielocechowych. *Economics and Management*, *1*, pp. 113-126.
19. Kasprzyk, B., Wojnar, J. (2023). Dynamiczna analiza porównawcza rozwoju społeczno-gospodarczego i jakości życia w Polsce na tle krajów UE. *Nierówności społeczne a wzrost gospodarczy*, *74(2),* pp. 33-52, doi: 10.15584/nsawg.2023.2.3
20. Kisielińska, J. (2016). Ranking państw UE ze względu na potencjalne możliwości zaspokojenia zapotrzebowania na produkty rolnicze z wykorzystaniem metod porządkowania liniowego. *Zeszyty SGGW w Warszawie. Problemy Rolnictwa Światowego*, *3*, pp. 142-152.
21. Kisielińska, J., Borkowski, B., Czech, K., Górska, A., Koszela, G., Krawiec, M., Landmesser-Rusek, J., Ochnio, L., Pietrych, Ł., Pietrzykowski, R., Wasilewska E., Zielińska-Sitkiewicz, M. (2021). *Wielowymiarowa analiza danych w ekonomice rolnictwa*. Warszawa: SGGW.
22. Kłos, A., Tomaszewska, K. (2014). Bezrobocie jako zjawisko społeczne stanowiące zagrożenie dla kształtowania się rynku pracy w Polsce. *Społeczeństwo. Edukacja. Język*, *2*, pp. 187-198.
23. Kozera, A., Kozera, C. (2011). Poziom życia ludności i jego zróżnicowanie w krajach Unii Europejskiej. *Journal of Agribusiness and Rural Development*, *4(22),* pp. 123-133.
24. Kukuła, K. (1999). Metoda unitaryzacji zerowanej na tle wybranych metod normowania cech diagnostycznych. *Acta Scientifica Academiae Ostroviensis*, *4*, pp. 5-31.
25. Lisek, S. (2023). Standing finansowy przedsiębiorstw w Polsce według rodzajów działalności w okresie przedpandemicznym i pandemicznym. *Economic and Regional Studies*, *16(1),* pp. 65-80.
26. Luszniewicz, A. (1982). *Statystyka społeczna. Podstawowe problemy i metody.* Warszawa: PWE.

27. Majka, A. (2015). Przestrzenne zróżnicowanie poziomu życia ludności w Polsce w ujęciu dynamiczny. *Wiadomości Statystyczne The Polish Statistician*, *5*, pp. 27-41, doi: 10.5604/01.3001.0016.0848
28. Migała-Warchoł, A. (2010). Ocena zróżnicowania poziomu życia mieszkańców województwa podkarpackiego. *Metody Ilościowe w Badaniach Ekonomicznych*, *11(2),* pp. 222-231.
29. Murawska, A. (2014). Ocena poziomu życia w krajach unii europejskiej (UE-28) w aspekcie zrównoważonego rozwoju za pomocą wielowymiarowej analizy porównawczej, *Metody Ilościowe w Badaniach Ekonomicznych*, *XV(4),* pp. 80-90.
30. Pawełek, B. (2008). *Metody normalizacji zmiennych w badaniach porównawczych złożonych zjawisk ekonomicznych*. Kraków: Wydawnictwo Uniwersytetu Ekonomicznego.
31. *Report on International Definition and Measurement of Standards and Levels of Living* (1954). United Nations, New York
32. Słaby, T. (1990). Poziom życia, jakość życia. *Wiadomości Statystyczne*, *6*, pp. 8-10.
33. Sompolska-Rzechuła, A., Kurdyś-Kujawska, A. (2022). Generation of Young Adults Living with Their Parents in European Union Countries. *Sustainability*, *7*, pp. 1-27, doi: 10.3390/su14074272
34. Stec, M. (2012). Analiza porównawcza rozwoju społeczno-gospodarczego powiatów województwa podkarpackiego. *Nierówności Społeczne a Wzrost Gospodarczy*, *25*, pp. 180-190.
35. Strahl, D. (1978). Propozycja konstrukcji miary syntetycznej. *Przegląd Statystyczny*, *2*, pp. 205-215.
36. Szewczyk, J., Bożek, J., Jaworska, M. (2021). *Poziom rozwoju społeczno-gospodarczego wybranych regionów Polski Południowo-Wschodniej w latach 2010-2019*. Tyniec: Wydawnictwo Benedyktynów.
37. Walesiak, M. (2014). Przegląd formuł normalizacji wartości zmiennych oraz ich własności w statystycznej analizie wielowymiarowej. *Przegląd Statystyczny. Statistical Review*, *4*, pp. 363-372.
38. Wawrzyniak, D. (2016). Standard Of Living In The European Union. *Comparative Economic Research. Central and Eastern Europe*, *19(1),* pp. 139-153, doi: 10.1515/cer-2016-0008
39. Zadeh, L.A. (1965). Fuzzy Sets. *Information and Control*, *8*, pp. 338-353.
40. Żekoński, Z. (1974). Z problemów metodologicznych sformułowania społeczno-bytowych celów rozwoju. *Gospodarka Planowana*, *6*.

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NUTRITIONAL SERVICES FROM THE PATIENT'S PERSPECTIVE: IDENTYFICATION AND ANALYSIS OF PROBLEMS AREAS

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Purpose: The objective of this article is to identify attributes associated with nutritional services during the hospitalization process, classified from those deemed essential to those whose presence does not significantly impact perceived quality (as per the Kano methodology). The identified attributes simultaneously influence the formation of patient satisfaction. The primary aim is to elucidate the extent to which these factors determine the perception of nutritional services in satisfaction assessments and the degree to which they align with the expectations of hospitalized patients.
Design/methodology/approach: A systematic review of the literature was undertaken to identify determinants of satisfaction with nutritional services during hospitalization. The empirical component of the study is devoted to classifying these attributes using the Kano methodology, based on survey data. The subsequent stage of the research process involves evaluating hospitalized patients' satisfaction in domains corresponding to the Kano attributes—via survey research—and identifying discrepancies between patient expectations and their experienced satisfaction levels.
Findings: Among the attributes that notably enhance the perceived value of hospital wards, particular emphasis is placed on those related to the quality of meals, their adaptation to patients' specific dietary needs, and the organization of meal delivery processes. Key factors highlighted include the caloric adequacy of meals and their compliance with individual nutritional requirements. Additionally, adherence to a predefined meal delivery schedule is underscored as a critical factor influencing patient satisfaction.
Research limitations/implications: The findings presented are derived from a review of existing literature and are intended to serve as a foundation for future empirical investigations. A significant limitation of this study is the relatively narrow sample size of patients who participated in the satisfaction survey, both in terms of geographical coverage and the number of hospital facilities included. Furthermore, the study focuses solely on fundamental attributes related to the perception of nutritional services, omitting broader considerations such as staff-related factors or infrastructural conditions, which may also significantly impact patient satisfaction. These limitations underscore the need for further research to address these gaps.
Practical implications: The outcomes of this study offer practical applications for healthcare management. Insights gleaned from satisfaction surveys completed by hospitalized patients across diverse healthcare settings can facilitate the identification of critical areas where patient satisfaction with nutritional services is suboptimal. Consequently, these insights can inform the development of targeted strategies to enhance service quality. Furthermore, the Kano methodology provides a framework for prioritizing interventions by identifying which

attributes are most critical to patient satisfaction, enabling evidence-based decision-making regarding the sequence of improvements.
Social implications: The implementation of the recommendations proposed in this article, aimed at enhancing the quality of nutritional services, has the potential to elevate the overall standard of hospital care. This reflects the broader social responsibility of healthcare institutions to meet patient expectations comprehensively. For society, the value-added lies in improved access to hospitalization processes that are more aligned with patient needs, particularly in areas where absolute expectations are prevalent.
Originality/value: This article primarily targets hospital administrators and decision-makers responsible for the strategic development and optimization of healthcare processes. It provides a comprehensive framework for evaluating patient satisfaction with implemented processes and offers methodological guidance for assessing the relative importance of various quality attributes using the Kano model.
Keywords: nutritional services, quality of nutritional services, hospitalization process, patient satisfaction, Kano methodology.
Category of the paper: Research paper.

1. Introduction

The nutritional provision for patients in hospitals falls within the scope of healthcare services provided in medical facilities offering inpatient and round-the-clock care. Thus, a medical entity providing healthcare services is obligated, under the healthcare service agreement with the National Health Fund, to ensure nutrition tailored to patients' health conditions.

Modern healthcare faces numerous challenges, among which issues related to the organization and quality of nutritional services hold a special place (Kotynia et al., 2018; Rasmussen et al., 2006). Properly planned and implemented nutritional support constitutes a vital component of effective therapy (Ridley et al., 2019), contributing to the improvement of patients' health, shortening hospital stays, and reducing healthcare costs (Wyka et al., 2020; Cano-Torres et al., 2017). Despite substantial scientific evidence confirming the crucial role of nutrition in the treatment process, significant shortcomings persist in clinical practice in both the organization and adaptation of nutritional services to patients' needs (Anthony, 2008; Kondrup, 2004).

From the patient's perspective, nutritional services are not only a supporting element of the therapeutic process (Sullivan, 1995) but also an integral part of a holistic healthcare model, encompassing both physical and psychosocial aspects (Tappenden et al., 2013; Moisey et al., 2022). The rising incidence of diet-related diseases such as diabetes, obesity, and cardiovascular conditions further underscores the importance of individually tailored nutritional support (Schuetz et al., 2019; Wronka et al., 2009). However, in hospital practice, inadequacies are often observed in aligning meals with patients' dietary requirements, inconsistencies in educational efforts, and limited communication between medical staff and patients regarding diet planning (Kirkland et al., 2013; Ruthsatz, Candeias, 2020).

This article addresses the issue of nutritional services in the context of patient experiences, focusing on identifying and analyzing key challenges in this area. The study aims to deepen understanding of the quality and effectiveness of nutritional services in the healthcare system, with particular emphasis on their impact on subjective assessments of care and treatment outcomes. Including the patient perspective not only enhances understanding of existing problems but also highlights potential directions for reforms aimed at optimizing nutritional standards in medical facilities. In an era of increasing demands on the healthcare system, this analysis gains special significance, aligning with research trends in individualized and comprehensive patient care.

2. Literature research aimed at identifying factors determining the quality of the nutritional services during hospitalization

The provision of meals for hospital patients falls under the scope of healthcare services delivered by medical facilities providing inpatient and round-the-clock care (Gębska, 2014). Consequently, healthcare providers offering medical services are obliged, under their agreements with the National Health Fund, to ensure that patients receive meals appropriate to their health conditions (Rożdżeński, 2019).

Modern healthcare adopts a holistic model in which not only medical interventions but also broader non-therapeutic support play a crucial role (Pałyska et al., 2007). Key factors contributing to the improvement of a patient's health include accurate diagnosis and treatment, nursing care, pharmacology, the involvement of dietitians, and nutrition tailored to the patient's health status (Cardenas et al., 2021). In this context, nutritional services gain particular importance as an integral element of the treatment process (Wronka et al., 2009; Young et al., 2018). The literature frequently highlights the role of proper nutrition in reducing health complications, improving treatment outcomes, and shortening hospital stays. However, studies reveal that the quality of these services in medical facilities leaves much to be desired, with organizational problems and a lack of individualized dietary adjustments negatively impacting patient satisfaction and treatment effectiveness.

The fundamental role of nutrition in healthcare has been documented in numerous scientific studies. As Young et al. (2018) emphasize, a well-balanced diet can significantly enhance the body's recovery process, support the immune system, and reduce the risk of complications. Meta-analyses suggest that patients receiving individually tailored nutritional support achieve better clinical outcomes, underscoring the importance of including nutrition as a treatment component (Bally et al., 2016; Abd Aziz et al., 2017; Thibault et al., 2011). However, studies conducted in European healthcare facilities indicate that a significant number of patients experience malnutrition during hospitalization, negatively affecting treatment outcomes (Kieltyka et al., 2001; Namyslak et al., 2014). This often results from insufficient adaptation of meals to patients' individual dietary needs (Ostrowska, Jeznach-Steinhagen, 2017) and inadequate communication between medical staff and patients regarding diet planning and implementation (Jodczyk-Bargańska, 2024).

The organization of hospital nutrition services remains a critical challenge. The process involves several stages:

- Assessment of patients' nutritional status and dietary requirements.
- Menu planning.
- Food preparation and processing.
- Transportation and distribution of meals in hospital ward.
- Evaluation of meal quality.
- Assisting with feeding and hydration.
- Patient education.

Accurately assessing patients' nutritional status upon admission and tailoring diets to their medical conditions is essential. This is followed by preparing meals from high-quality ingredients while adhering to hygiene and sanitary standards during production, transportation, and distribution. Meals must meet appropriate caloric and nutritional requirements, be served regularly, and be adapted to the needs of patients with limited independence. Providing professional dietary assistance to patients who need to change their eating habits and lifestyles due to illness is equally critical (Boulhosa et al., 2020; Martínez-Ortega, 2022).

Studies indicate a lack of consistency in nutritional standards, resulting in significant quality disparities among hospitals (Grzesinska et al., 2014; Shimazu et al., 2021). The American Diabetes Association (2021) reports challenges in ensuring proper caloric balance and nutritional value in hospital meals, lowering the quality of services provided. Additionally, there is often a lack of systematic patient education about nutrition. Dietary education is a vital component of health prevention and therapeutic support, and its deficiency is cited as a significant limitation in treating diet-related diseases (Pasquel et al., 2021).

Incorporating the patient perspective is increasingly recognized as essential in evaluating healthcare service quality. Studies show that subjective assessments of meal quality and consumption experiences significantly influence overall satisfaction with medical care (Reber et al., 2019). Patients expect meals to be not only nutritionally valuable but also visually appealing, tasty, and culturally or dietarily appropriate (Ukleja et al., 2018). Failure to meet these expectations often leads to frustration and, in extreme cases, incomplete meal consumption, exacerbating malnutrition issues (Lean, Wiseman, 2008; Mitchell, Porter, 2016; Schuetz et al., 2021; Cass, Charlton, 2022; Uhl et al., 2022).

Qualitative studies also reveal significant communication barriers between medical staff and patients concerning nutritional services (Citty et al., 2019; Boaz et al., 2013). Patients are often uninformed about dietary options, and medical staff may lack sufficient knowledge to support them effectively in making dietary decisions (Henning, 2009).

In Poland, existing regulations do not specify nutritional standards in hospitals (Rams-Swietoniowska, Konecka-Matyjek, 2010). There are also no fixed daily nutritional allowances per patient for all medical entities. Hospital managers determine daily food allowances, and nutrition is financed under contracts with the National Health Fund, which cover both medical and accompanying services. However, treatment costs often exceed contract values, forcing providers to cut expenses, especially in patient nutrition (Riley et al., 2020; Neriz et al., 2014). Proper nutrition and dietary education are as critical as medical care for effective treatment in hospitals (Tymoszuk, Orkusz, 2015).

The Ministry of Health's pilot program "Good Meals in Hospitals" aims to improve patient nutrition by aligning it with their health conditions, integrating hospital diets into the treatment process. The program allocates an additional PLN 25.62 per patient for nutrition. From January to June 2024, the program was in its pilot phase, with evaluations continuing until October. These additional funds have the potential to significantly enhance meal quality in hospitals, focusing on high-quality ingredients such as premium cold cuts. However, challenges remain, particularly with the understanding and cooperation of hospital dietitians (Najwyższa Izba Kontroli, 2018).

Nutritional services are a crucial yet undervalued component of modern healthcare. Optimizing these services with a focus on patient perspectives can significantly enhance the quality of care and patient health outcomes. Further research on the efficiency of nutritional services, including systematic quality assessments and identifying key areas for improvement, is essential for advancing standards in this field (Thibault, 2021).

3. Research methodology

The main objectives of this article are as follows:

1. Identification of factors determining the quality of nutritional services and their categorization (Kano).
2. Assessment of patient satisfaction with their hospital stay in terms of factors determining the quality of nutritional services during the hospitalization process.
3. Identification of the gap between expectations (the highest desired level of patient satisfaction) and the actual state of patient satisfaction in terms of factors determining the quality of nutritional services during the hospitalization process.

4. Providing recommendations aimed at reducing or eliminating the identified discrepancies between the expected and actual states, as identified during the empirical research phase.

These specified research objectives have shaped the research methodology, and each stage of the research process has indicated desired outcomes at each stage (Table 1).

Table 1.
The research process stages along with the identification of results

No.	Stages of research process	Results of stages of research process
1.	Identification of factors determining the quality of nutritional services during the hospitalization process – based on literature review	List of identified determinants of the research process
2.	Selection and reduction of identified factors determining the quality of nutritional services during hospitalization based on a literature review, combined with participatory observation by the study authors and focus group research conducted with a randomly selected group of patients.	List of reduced determinants of nutritional services during hospitalization
3.	Based on the reduced list of determinants of nutritional services during hospitalization, development of a diagnostic tool to determine hospitalized patients' expectations (including absolutely essential factors and those whose absence is unacceptable) using the Kano methodology.	A survey identifying expectations regarding nutritional services during hospitalization.
4.	Based on the reduced list of determinants of nutritional services during hospitalization, development of a diagnostic tool to assess hospitalized patients' satisfaction in areas identified as factors determining the quality of the hospitalization process.	A survey evaluating satisfaction with hospital stay in terms of nutritional services during the hospitalization.
5.	Conducting research	• Completed surveys identifying expectations regarding nutritional services during the hospitalization. • Completed surveys evaluating satisfaction with hospital stay in terms of nutritional services during the hospitalization.
6.	Analysis and conclusions from the conducted research	Conclusions and Diagnosis. Identification of gaps between expectations and the actual level of satisfaction in the area of nutritional services during the hospitalization.
7.	Recommendations for business practice and directions for further research	Guidelines for hospitals. Recommendations for actions aimed at reducing or eliminating discrepancies between patients' expectations and their level of satisfaction in the determinants of nutritional services during hospitalization. Directions for further research.

Source: Own study.

As part of the research process, factors influencing the quality of nutritional services during hospitalization, initially identified through a comprehensive literature review, were refined and supplemented. This phase aimed to isolate the most significant and mutually exclusive determinants while incorporating areas not addressed in prior studies (van Loenen et al., 2014; Teng et al., 2007). The focus group session, conducted on February 10, 2024, at the Internal

Medicine Department of the Provincial Specialist Hospital of the Virgin Mary in Częstochowa, included ten participants selected at random. Participants represented diverse demographics in terms of gender, age, and educational background. The session was moderated by one of the authors, supported by a research team responsible for note-taking, recording proceedings, and identifying key insights and exceptional responses.

The outcome of the focus group was a delineated list of determinants of the quality of nutritional services during hospitalization. This list formed the basis for the development of two key research instruments:

1. Survey on Expectations Regarding Nutritional Services During Hospitalization (Kano).
2. Survey on Satisfaction with Nutritional Services During Hospitalization (Kano).

The focus group identified the following critical factors influencing the quality of nutritional services:

1. Quality of meals.
2. Meal delivery schedule.
3. Availability of hot meals and basic food items for purchase within the hospital.
4. Assessment of patients' nutritional status and individualized meal planning.
5. Assistance with feeding and hydration for patients requiring support.

The first research instrument was designed in alignment with the Kano model, a methodological approach frequently employed to assess quality in healthcare services (Jiayi Mao, 2022). The survey sought to identify and categorize patients' needs and expectations regarding nutritional services during hospitalization. The Kano model, noted for its versatility in evaluating customer satisfaction, is uniquely suited for assessing both essential attributes and those that constitute added value (Parasuraman, 1986). The model has been variously conceptualized, with terminologies such as the "asymmetric impact on overall customer satisfaction" (Mikulic, 2006), "customer requirements model" (Lee, 1996), and "two-dimensional quality model" (Schveneveldt et al., 1991).

Using this framework, the survey captured responses from a geographically diverse cohort, prioritizing the identification of critical factors influencing positive evaluations of nutritional services. Data were collected via the CAWI (Computer-Assisted Web Interview) method, yielding 315 responses. Participants assessed 41 attributes, each evaluated through paired functional ("What if it is this way?") and dysfunctional ("What if it is not this way?") questions, using a response scale ranging from "absolutely essential" to "unacceptable" (Matzler, Hinterhuber, 1998; Santhoshkumar et al., 2022).

The second instrument assessed actual satisfaction levels among patients from the studied hospital. Unlike the Kano methodology, this survey employed a Likert-type scale ranging from 1 (greatest dissatisfaction) to 5 (greatest satisfaction). It provided a distinct yet complementary perspective, focusing on the practical evaluation of identified attributes and their influence on patient experiences.

The empirical investigation highlighted critical areas for improving nutritional services during hospitalization, emphasizing attributes such as meal quality, scheduling adherence, and availability of additional food options. These factors were analyzed to identify discrepancies between patient expectations and satisfaction levels.

The study adopted a two-stage empirical framework, encompassing an exploration of patient expectations (Kano model) and an evaluation of satisfaction levels (Likert scale). This approach enabled a rigorous, multidimensional assessment of the quality of nutritional services and their impact on overall hospitalization experiences. The simultaneous use of the Kano model and Likert-scale satisfaction assessments provides a multidimensional view of patient perceptions; however, the relationship between the two methodologies warrants further clarification. While the Kano model categorizes service attributes based on their impact on satisfaction—classifying them as basic, performance, or attractive—the Likert scale offers a quantitative measure of how satisfied patients are with each attribute. By comparing the categorization from the Kano model with the satisfaction ratings from the Likert scale, it is possible to identify alignments and discrepancies. For instance, some attributes identified as "indifferent" in the Kano analysis received relatively high satisfaction scores on the Likert scale, suggesting that patients may rate an experience positively even if it does not strongly influence their overall satisfaction. Conversely, attributes categorized as "must-be" may receive lower satisfaction ratings, highlighting critical service gaps. This comparative approach enriches the analysis by revealing not only which features matter most to patients, but also how well these features are currently delivered. In future research, integrating these findings more explicitly—for example, through cross-tabulation or correlation analysis—would enhance analytical coherence and practical relevance.

The integration of the Kano methodology in this context represents a novel contribution to the field of healthcare quality assessment, addressing gaps in existing literature and providing actionable insights for hospital administrators aiming to enhance patient care.

The study underscores the necessity of optimizing nutritional services to meet and exceed patient expectations. By employing advanced methodological tools, it bridges the gap between theoretical frameworks and practical applications, offering a robust foundation for future research and quality improvement initiatives in hospital settings. Table 2 presents key attributes associated with nutritional services during hospitalization, as identified through empirical research. These attributes reflect critical aspects of meal quality, accessibility, and patient-centered care, forming the basis for evaluating and enhancing the overall nutritional experience in hospital settings.

Table 2.
Attributes related to the nutritional services during hospitalization

No.	Attribute
NSQ1	Quality of meals
NSQ2	Meal delivery schedule
NSQ3	Availability of hot meals and basic food items for purchase on hospital premises
NSQ4	Assessment of patients' nutritional status and meal planning
NSQ5	Feeding and hydrating patients requiring assistance

*NSQ (Nutritional Service Quality).

Source: Own study based on empirical research.

The example questions regarding the functional and dysfunctional aspects for attribute NSQ1 are presented in Table 3.

Table 3.
An example question related to attribute NSQ1

NSQ1. The quality of food products suitable for the individual nutritional needs of patients				
a. What if it is the case? (functional form of the question)				
like it	expect it	don't care	live with it	dislike it
b. What if it is not the case? (dysfunctional form of the question)				
like it	expect it	don't care	live with it	dislike it

Source: Own study based on Kano's Methods.

Next, in accordance with the Kano methodology guidelines, responses regarding each attribute were examined and assigned to a specific type, namely:

- ME (Must-be Elements) to elementy podstawowe – brak spełnienia tych atrybutów powoduje niezadowolenie klientów.
- OD (One-dimensional Elements) to elementy jednowymiarowe – wzrost poziomu spełnienia zwiększa satysfakcję klientów proporcjonalnie.
- AE (Attractive Elements) to elementy atrakcyjne – cechy, które zaskakują klientów i powodują ich entuzjazm, ale brak ich spełnienia nie powoduje niezadowolenia.
- IT (Indifferent Elements) to elementy obojętne – cechy, które nie mają większego wpływu na satysfakcję czy niezadowolenie klientów (Table 4).

Table 4.
Kano evaluation table

Requirements		**Disfunctional**				
		Like it	**Expect it**	**Don't care**	**Live with it**	**Dislike it**
Functional	Like it	QE	AE	AE	AE	OD
	Expect it	RE	IT	IT	IT	ME
	Don't care	RE	IT	IT	IT	ME
	Live with it	RE	IT	IT	IT	ME
	Dislike it	RE	RE	RE	RE	QE

Source: Own study based on Kano's Methods.

To investigate the correlations between specific attributes of hospital service organization and patient satisfaction, the analysis employed coefficients of satisfaction (CC) and dissatisfaction (DC), calculated according to the following formulas (Berger et al., 1993):

$$CC = (AE+OD)/(AE+OD+ME+IT) \quad (1)$$

$$DC = (OD+ME)/(AE+OD+ME+IT) \quad (2)$$

The satisfaction coefficient (CC) is quantified on a scale from 0 to 1, with values approaching 1 indicating a stronger influence on patient satisfaction. Conversely, the dissatisfaction coefficient (DC), when nearing a value of 1, signifies that patient dissatisfaction significantly impacts the associated quality attribute (Matzler, Hinterhuber, 1998).

4. Results of the research

In the preliminary phase of the analysis, the demographic profiles of respondents participating in both surveys were systematically examined. The survey employing the KANO methodology was administered utilizing the CAWI (Computer-Assisted Web Interviewing) technique, which mandated responses to all questions, thereby ensuring the acquisition of 315 fully completed questionnaires. In contrast, the survey conducted among patients of the studied hospital employed a traditional paper-based format, resulting in the collection of 149 questionnaires. However, a subset of these contained incomplete responses, introducing complexities into the analytical process. Key demographic characteristics, including the age and gender distribution of respondents from both datasets, are depicted in Figures 1 and 2.

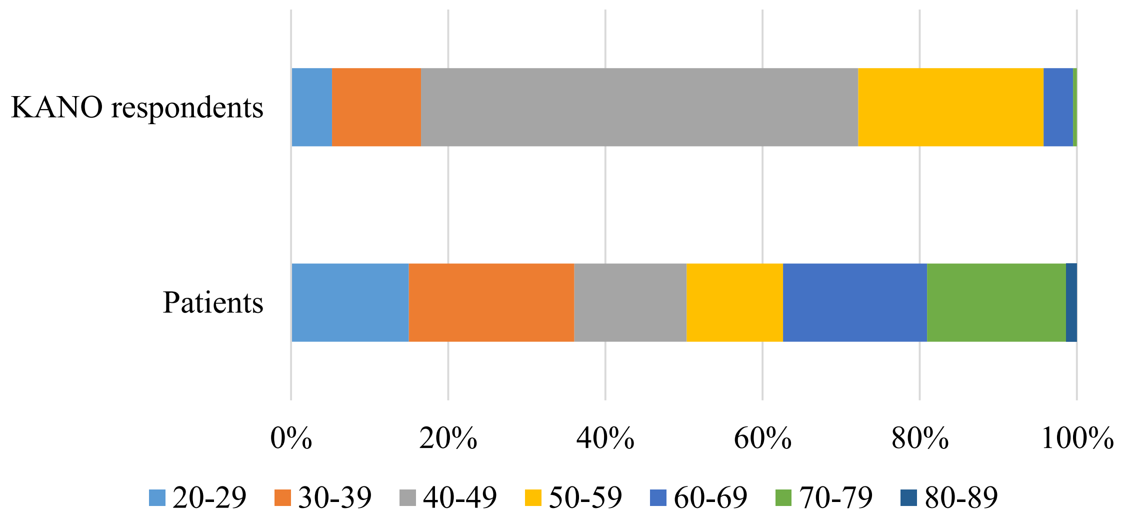

Figure 1. Age of respondents.

Source: Own study based on empirical research.

The analysis of age distribution among respondents in the two surveys revealed significant disparities. In the survey utilizing the Kano methodology, the majority of participants belonged to the 40-49-year age group. In contrast, the survey conducted with patients from the hospital under investigation exhibited a more balanced representation across the age cohorts of 20-29, 30-39, and 60-69 years, with comparable proportions of respondents within these groups.

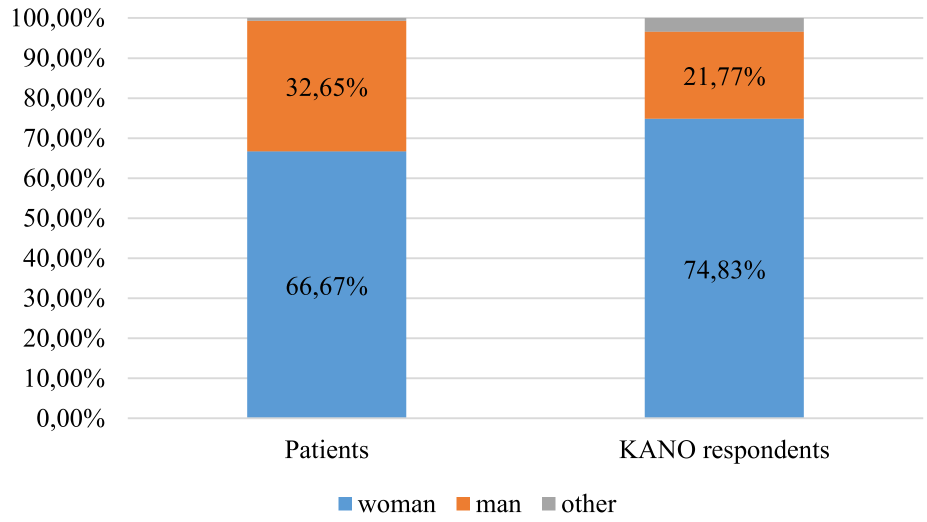

Figure 2. Gender.

Source: Own study based on empirical research.

The gender distribution of respondents in both surveys exhibited less pronounced differences compared to the age category. In both cases, female respondents constituted the majority, accounting for nearly 80% in the Kano study and approximately 70% among patients of the hospital under investigation.

In accordance with the Kano methodology, a statistical analysis of responses was conducted for each of the six evaluated attributes (NSQ1 to NSQ5), as detailed in Table 5. The analysis involved categorizing questions into two distinct types: functional (assessing reactions to the presence of a given feature: "What if it is like this?") and dysfunctional (assessing reactions to the absence of the same feature: "What if it is not like this?").

Table 5.
Set of response statistics from respondents according to the Kano methodology for attributes NSQ1 to NSQ5

	ME	OD	AE	IT	CLASS	CC	DC
NSQ1	19%	10%	24%	47%	IT	0,34	0,29
NSQ2	11%	12%	19%	57%	IT	0,32	0,24
NSQ3	23%	13%	24%	41%	IT	0,37	0,36
NSQ4	14%	0%	29%	57%	IT	0,29	0,14
NSQ5	12%	5%	20%	63%	IT	0,26	0,17

Source: Own study based on empirical research.

In the KANO analysis for attributes NSQ1-NSQ5, all attributes were classified as indifferent (IT). This classification indicates that their presence or absence does not have a significant impact on the level of customer satisfaction or dissatisfaction. The values of the satisfaction (CC) and dissatisfaction (DC) coefficients vary across individual attributes but are generally at a moderate level.

The highest CC and DC values were observed for NSQ3, suggesting that this attribute has a greater potential to influence both satisfaction and dissatisfaction reduction compared to the others. However, due to its classification as an indifferent attribute, its optimization should not be considered a priority in the context of improving overall customer satisfaction.

In the second phase of the study, data collected through questionnaires specifically designed for this research by the authors were subjected to analysis. The survey data were gathered over a two-month period, spanning July and August 2024, from two hospital units within the organizational group. The number of responses to individual survey items averaged approximately two hundred. For certain items, response rates were lower due to the voluntary nature of the questions, while in other cases, the option for respondents to select multiple answers led to an increased count of responses. In alignment with the research objectives, specific domains directly pertinent to the investigated factors were selected for detailed analysis. A subset of questions from the broader survey dataset was utilized to identify several areas necessitating improvement.

Table 6.
Basic statistics for attributes NSQ1 to NSQ5 in the patient satisfaction study

		NSQ1	NSQ2	NSQ3	NSQ4	NSQ5
N	**Important**	**145**	**141**	**135**	**133**	**132**
Mean		3,94	4,14	3,88	3,86	3,71
Standard error of the mean		0,090	0,078	0,106	0,119	0,127
Median		4,00	4,00	4,00	4,00	4,00
Mode		5	5	5	5	5
Standard deviation		1,085	0,930	1,234	1,371	1,454
Variance		1,177	0,865	1,523	1,881	2,115
Skewness		-0,914	-0,828	-0,835	-0,865	-0,740
Standard error of skewness		0,201	0,204	0,209	0,210	0,211
Kurtosis		0,186	-0,024	-0,422	-0,607	-0,856
Standard error of kurtosis		0,400	0,406	0,414	0,417	0,419
Range		4	4	4	4	4
Minimum		1	1	1	1	1
Maximum		5	5	5	5	5

Source: Own study based on empirical research.

For each evaluated attribute, the average scores ranged between 3.71 and 4.14, indicating that the overall assessment was rather positive, with a predominance of responses of "good" or "very good" (average scores close to or above 4) (Table 6). The highest-rated attribute was the meal schedule (average 4.14), while the lowest-rated was the availability of vending machines with drinks and snacks (average 3.71). The median for all categories is 4, confirming that most responses clustered around this level of evaluation. The mode for all categories is 5, indicating that the highest scores were dominant. Meanwhile, standard deviation and variance illustrate the diversity of respondents' answers. The least variability was observed for the meal schedule (standard deviation 0.930, variance 0.865), suggesting a high consistency of opinions in this area. Conversely, the greatest variability was found in the availability of vending machines with drinks and snacks (standard deviation 1.454, variance 2.115), indicating the most divergent opinions in this category.

The skewness in all categories is negative, signifying that the distribution of scores is asymmetrical, with a predominance of high ratings. Kurtosis for most categories is close to zero or slightly negative, suggesting a flat data distribution without prominent extreme values. The range in all categories is 4, indicating the full use of the rating scale by respondents and confirming diverse perceptions of individual attributes among the surveyed group.

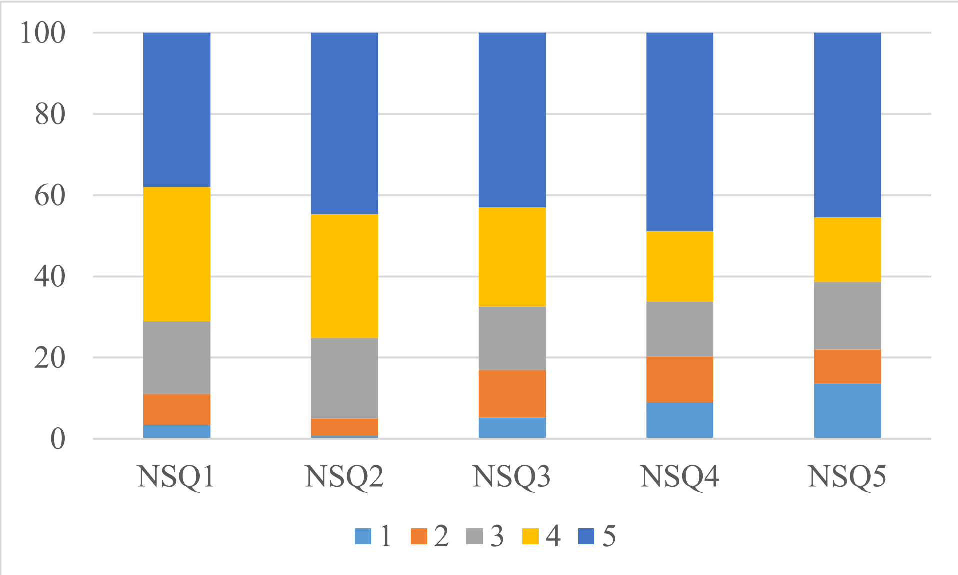

Figure 3. Evaluation of attributes SO1-SO6 in %.

Source: Own study based on empirical research.

Based on the distribution of ratings (Figure 3), it can be observed that high ratings, particularly "5" and "4", dominate, indicating a positive perception of the analyzed features by the respondents. The highest ratings have the largest percentage share in each attribute, highlighting a high level of satisfaction with these elements. The NSQ2 attribute stands out especially, where the rating "5" appears most frequently, suggesting that this aspect meets expectations to the greatest extent. The distribution of ratings for attributes NSQ1, NSQ2, NSQ3, and NSQ4 is similar, with high ratings prevailing and lower ones, such as "1" and "2", appearing relatively rarely. For NSQ5, a greater variation in opinions is noticeable, reflected in a higher proportion of lower ratings, such as "1", "2", and "3". This suggests that the perception of this attribute is more diverse compared to the others. Overall, a positive trend is visible in the ratings of the evaluated attributes, but NSQ5 may require more detailed analysis. The greater variation in ratings in this category could stem from differing expectations among respondents, indicating potential areas for improvement.

5. Conclusion and summary

The quality of nutritional services in medical facilities is a significant issue in the context of comprehensive healthcare, aimed not only at treating diseases but also at improving patients' overall health and well-being. Although this issue is increasingly raised in the academic literature, it remains insufficiently addressed in clinical practice. The complexity of the matter arises from the interdisciplinary nature of nutritional services, which require collaboration among dietitians, medical staff, hospital administration, and patients themselves.

In clinical practice, implementing effective nutritional services encounters numerous systemic, organizational, and interpersonal challenges. The most commonly identified difficulties include insufficient customization to individual patient needs and a lack of standardization in nutrition within medical facilities. Despite growing awareness of the importance of individualized nutritional therapy, in many cases, patients receive standard meals that do not meet their health needs, dietary preferences, or cultural considerations. This problem particularly affects patients with allergies, food intolerances, and diet-related diseases such as diabetes or chronic kidney disease. Many hospitals lack unified procedures for organizing nutritional services, resulting in significant variability in meal quality and their adaptation to patient needs. The lack of standardization encompasses logistical aspects, such as the timing and manner of meal service, as well as the absence of precise guidelines regarding diet composition for different patient groups.

It is worth noting that patient education on nutrition, which could support informed dietary decisions, remains underdeveloped. Meanwhile, studies indicate that dietary education can significantly improve treatment outcomes and enhance patient engagement in the therapeutic process. Considering the patient perspective is crucial in assessing the quality of nutritional services, as the subjective experience of the patient heavily influences the overall evaluation of medical care. Literature highlights that patients assess nutritional services not only in terms of the nutritional value of meals but also their taste, presentation, variety, and alignment with personal preferences. Here is a suggested paragraph in English that can be added to the conclusion of the article: Although this study highlights the importance of nutritional services in hospitals, it only minimally addresses the operational and systemic barriers that may hinder the implementation of improvements. Future research could expand on this by exploring constraints such as budget limitations, staffing shortages, and regulatory gaps. Investigating these factors would provide a more comprehensive understanding of the practical feasibility of proposed changes and support more effective, context-sensitive strategies for enhancing patient-centered nutritional care in healthcare settings.

Improving the quality of nutrition requires systemic solutions to elevate the importance of patient nutrition in medical care. This necessitates increased funding for hospitals or other entities providing inpatient and round-the-clock care to enhance both the quality of meals and nutritional care for patients, as well as to ensure adequate technical and sanitary standards in food preparation areas. Additionally, it is essential to introduce regulations on rational nutrition in healthcare facilities, precise oversight mechanisms for hospital nutrition implementation, and appropriate sanctions in cases of identified deficiencies in patient nutrition.

References

1. Abd Aziz, N.A.S., Teng, N.I.M.F., Abdul Hamid, M.R., Ismail, N.H. (2017). Assessing the nutritional status of hospitalized elderly. *Clinical interventions in aging*, 1615-1625.
2. American Diabetes Association (2021). Diabetes care in the hospital: Standards of Medical Care in Diabetes—2021. *Diabetes Care, 44(Supplement_1),* S211-S220.
3. Anthony, P. S. (2008). Nutrition screening tools for hospitalized patients. Nutrition in Clinical Practice, 23(4), 373-382.
4. Bally, M.R., Yildirim, P.Z.B., Bounoure, L., Gloy, V.L., Mueller, B., Briel, M., Schuetz, P. (2016). Nutritional support and outcomes in malnourished medical inpatients: a systematic review and meta-analysis. *JAMA internal medicine, 176(1),* 43-53.
5. Berger, C., Blauth, R.E., Boger, D., Bolster, C.J., Burchill, G., DuMouchel, W., Pouliot, F., Richter, R., Rubinoff, A., Shen, D., Timko, M., Walden, D. (1993). *Kano's methods for understanding customer-defined quality*.
6. Boaz, M., Rychani, L., Barami, K., Houri, Z., Yosef, R., Siag, A., Leibovitz, E. (2013). Nurses and nutrition: A survey of knowledge and attitudes regarding nutrition assessment and care of hospitalized elderly patients. *The Journal of Continuing Education in Nursing, 44(8),* 357-364.
7. Boulhosa, R.S.S.B., Lourenço, R.P., Côrtes, D.M., Oliveira, L.P.M., Lyra, A.C., De Jesus, R.P. (2020). Comparison between criteria for diagnosing malnutrition in patients with advanced chronic liver disease: GLIM group proposal versus different nutritional screening tools. *Journal of Human Nutrition and Dietetics, 33(6),* 862-868.
8. Cano-Torres, E.A., Simental-Mendía, L.E., Morales-Garza, L.A., Ramos-Delgado, J.M., Reyes-Gonzalez, M.M., Sánchez-Nava, V.M., Guerrero-Romero, F. (2017). Impact of nutritional intervention on length of hospital stay and mortality among hospitalized patients with malnutrition: a clinical randomized controlled trial. *Journal of the American College of Nutrition, 36(4),* 235-239.
9. Cardenas, D., Correia, M.I.T.D., Ochoa, J.B., Hardy, G., Rodriguez-Ventimilla, D., Bermúdez, C.E., .Barazzoni, R. (2021). Clinical nutrition and human rights. An international position paper. *Clinical nutrition, 40(6),* 4029-4036.

10. Carino, S., Porter, J., Malekpour, S., Collins, J. (2020). Environmental sustainability of hospital foodservices across the food supply chain: a systematic review. *Journal of the Academy of Nutrition and Dietetics, 120(5)*, 825-873.
11. Cass, A.R., Charlton, K.E. (2022). Prevalence of hospital-acquired malnutrition and modifiable determinants of nutritional deterioration during inpatient admissions: A systematic review of the evidence. *Journal of Human Nutrition and Dietetics, 35(6),* 1043-1058.
12. Citty, S.W., Cowan, L.J., Wingfield, Z., Stechmiller, J. (2019). Optimizing nutrition care for pressure injuries in hospitalized patients. *Advances in wound care, 8(7),* 309-322.
13. Gębska, K. (2014). Leczenie żywieniowe pacjentów to obowiązek, nie przywilej. *Menedżer Zdrowia, 5,* 64-68.
14. Grzesinska, W., Tomaszewska, M., Bilska, B., Trafialek, J. (2014). Optymalizacja uwarunkowań wyboru systemu dystrybucji posiłków w żywieniu szpitalnym. *Żywność Nauka Technologia Jakość, 21(4).*
15. Hager, K., Cudhea, F.P., Wong, J.B., Berkowitz, S.A., Downer, S., Lauren, B.N., Mozaffarian, D. (2022). Association of national expansion of insurance coverage of medically tailored meals with estimated hospitalizations and health care expenditures in the US. *JAMA Network Open, 5(10),* e2236898-e2236898.
16. Henning, M. (2009). Nursing's role in nutrition. *CIN: Computers, Informatics, Nursing, 27(5),* 301-306.
17. https://www.wspolczesnadietetyka.pl/wywiad/lepsze-jedzenie-lepsze-zdrowie-pacjentow-program-dobry-posilek-w-szpitalach
18. Jiayi Mao, Liling Xie, Qinghua Zhao, Mingzhao Xiao c, Shuting Tu, Wenjing Sun, Tingting Zhou (2022). Demand analysis of an intelligent medication administration system for older adults with chronic diseases based on the Kano model. *International Journal of Nursing Sciences, 9,* 63-70.
19. Jodczyk-Bargańska, A., Ukleja, A., Śliż, D. (2024). Czym żywimy naszych pacjentów? Analiza danych o jakości żywienia w polskich szpitalach ze szczególnym uwzględnieniem pacjenta kardiologicznego. *Folia Cardiologica, 19*, 242-247.
20. Jonsson Kvist, A.K., Klefsjo, B. (2006). Which service quality dimensions are important in inboundtourism? A case study in a peripheral location. *Managing Service Quality, vol. 16, no. 5,* pp. 520-537.
21. Jonsson, A.S., Öström, Å., Nyberg, M. (2021). Performance of hospitality within restricting meal frames: An observational study of four h
22. Kieltyka, A., Narojek, L., Kandefer, K. (2001). Ocena jakosci zywienia szpitalnego na podstawie badan w dwoch wybranych szpitalach o roznej stawce zywieniowej. *Żywienie Człowieka*.
23. Kirkland, L.L., Kashiwagi, D.T., Brantley, S., Scheurer, D., Varkey, P. (2013). Nutrition in the hospitalized patient. *Journal of hospital medicine, 8(1),* 52-58.

24. Kondrup, J. (2004). Proper hospital nutrition as a human right. *Clinical Nutrition, 23(2),* 135-137.
25. Kotynia, Z., Tuzikiewicz-Gnitecka, G., Szewczyk, P. (2018). Żywienie pacjentów w szpitalach-brak zasad odżywiania chorych w publicznych placówkach. *Kontrola Państwowa, 63(4(381))*, 77-86.
26. Lean, M., Wiseman, M. (2008). Malnutrition in hospitals. *BMJ, 336(7639),* 290-290.
27. Martínez-Ortega, A.J., Piñar-Gutiérrez, A., Serrano-Aguayo, P., González-Navarro, I., Remón-Ruíz, P.J., Pereira-Cunill, J.L., García-Luna, P.P. (2022). Perioperative nutritional support: a review of current literature. *Nutrients, 14(8),* 1601.
28. Matzler, K., Hinterhuber, H.H, (1998) How to make product development projects more successful by integrating Kano's model of customer satisfaction into quality function deployment. *Technovation, Vol. 18, Iss. 1,* 25-38, ISSN 0166-4972, https://doi.org/10.1016/S0166-4972(97)00072-2.
29. Mikulic, J. (2006). *The Kano model-a review of its application in marketing research from 1989 to 2006.* Proceedings of the 1st International Conference marketing theory challenges in transitional societies. University of Maribor, pp. 87-96.
30. Mitchell, H., Porter, J. (2016). The cost-effectiveness of identifying and treating malnutrition in hospitals: a systematic review. *Journal of Human Nutrition and Dietetics, 29(2),* 156-164.
31. Moisey, L.L., Merriweather, J.L., Drover, J.W. (2022). The role of nutrition rehabilitation in the recovery of survivors of critical illness: underrecognized and underappreciated. *Critical Care, 26(1),* 270.
32. Namyslak, M., Kanikowska, A., Grzymislawski, M. (2014). Analiza czynników ryzyka niedożywienia szpitalnego. *Żywienie Człowieka i Metabolizm, 1(41).*
33. Neaves, B., Bell, J.J., McCray, S. (2022). Impact of room service on nutritional intake, plate and production waste, meal quality and patient satisfaction and meal costs: a single site pre-post evaluation. *Nutrition & Dietetics, 79(2),* 187-196.
34. Neriz, L., Núñez, A., Ramis, F. (2014). A cost management model for hospital food and nutrition in a public hospital. *BMC health services research, 14*, 1-12.
35. Nilsson-Witell, L., Fundin, A. (2005). Dynamics of service attributes: a test of Kano's theory of attrac-tive quality. *International Journal of Service Industry Management, vol. 16, no. 2*, pp. 152-168.
36. Ostrowska, J., Jeznach-Steinhagen, A. (2017). Niedożywienie szpitalne. Metody oceny stanu odżywienia. *Forum Medycyny Rodzinnej, Vol. 11, No. 2,* pp. 54-61.
37. Pałyska, M., Janczewska, M., Raduj, J.O., Induska, A., Prot, K. (2007). Znaczenie zmiennych społecznych dla różnicowania ocen jakości usług medycznych przez pacjentów. *Postępy w Psychiatrii i Neurologii, 16,* 309-314.
38. Parasuraman, A. (1985). A Conceptual Model of Service Quality and Its Implications for Future Research. *Journal of Marketing Fall, vol. 49*, pp. 41-50.

39. Pasquel, F.J., Lansang, M.C., Dhatariya, K., Umpierrez, G.E. (2021). Management of diabetes and hyperglycaemia in the hospital. *The lancet Diabetes & endocrinology, 9(3),* 174-188.
40. Rams-Swietoniowska, M., Konecka-Matyjek, E. (2010). Systemy zarządzania bezpieczeństwem żywności w szpitalnych blokach żywienia zgodnie z wymaganiami normy ISO 22 000: 2006. *Żywienie Człowieka i Metabolizm, 3(37).*
41. Rasmussen, H.H., Kondrup, J., Staun, M., Ladefoged, K., Lindorff, K., Jørgensen, L.M., Wengler, A. (2006). A method for implementation of nutritional therapy in hospitals. *Clinical Nutrition, 25(3),* 515-523.
42. Reber, E., Gomes, F., Bally, L., Schuetz, P., Stanga, Z. (2019). Nutritional management of medical inpatients. *Journal of clinical medicine, 8(8),* 1130.
43. Ridley, E.J., Parke, R.L., Davies, A.R., Bailey, M., Hodgson, C., Deane, A.M., Cooper, D. J. (2019). What happens to nutrition intake in the post–intensive care unit hospitalization period? an observational cohort study in critically ill adults. *Journal of Parenteral and Enteral Nutrition, 43(1),* 88-95.
44. Riley, K., Sulo, S., Dabbous, F., Partridge, J., Kozmic, S., Landow, W., Sriram, K. (2020). Reducing hospitalizations and costs: a home health nutrition-focused quality improvement program. *Journal of Parenteral and enteral Nutrition, 44(1),* 58-68.
45. Rożdżeński, W. (2019). Niewłaściwe wyżywienie jako podstawa odpowiedzialności podmiotu leczniczego. *Przegląd Prawa Medycznego, 1(2).*
46. Ruthsatz, M., Candeias, V. (2020). Non-communicable disease prevention, nutrition and aging. *Acta Bio Medica: Atenei Parmensis, 91(2),* 379.
47. Santhoshkumar, F., Jeyarajasekar, T., Kumar, S.A. (2022). Kano's model for customer satisfaction analysis of a hospital. *International Journal Of Health Sciences, 6(S1),* 11081-11089. https://doi.org/10.53730/ijhs.v6nS1.7654
48. Schuetz, P., Fehr, R., Baechli, V., Geiser, M., Deiss, M., Gomes, F., Mueller, B. (2019). Individualised nutritional support in medical inpatients at nutritional risk: a randomised clinical trial. *The Lancet, 393(10188),* 2312-2321.
49. Schuetz, P., Seres, D., Lobo, D.N., Gomes, F., Kaegi-Braun, N., Stanga, Z. (2021). Management of disease-related malnutrition for patients being treated in hospital. *The Lancet, 398(10314),* 1927-1938.
50. Schveneveldt, S.J., Enkawa, T., Miyakawa, M. (1991). Consumer evaluation perspectives of service quality: evaluation factors and two-way quality. *Total Quality Management, vol. 2, no. 2,* pp. 149-161.
51. Shimazu, S., Yoshimura, Y., Kudo, M., Nagano, F., Bise, T., Shiraishi, A., Sunahara, T. (2021). Frequent and personalized nutritional support leads to improved nutritional status, activities of daily living, and dysphagia after stroke. *Nutrition, 83*, 111091.

52. Shuhaimi, N.A.M., Mohamad, M., Sudin, N. (2022). Development of Daily Meal Ordering System for Patient in Hospital using Web-Based Technology. *Evolution in Electrical and Electronic Engineering, 3(1),* 136-146.
53. Sullivan, D.H. (1995). The role of nutrition in increased morbidity and mortality. *Clinics in geriatric medicine, 11(4)*, 661-674.
54. Tappenden, K.A., Quatrara, B., Parkhurst, M.L., Malone, A.M., Fanjiang, G., Ziegler, T.R. (2013). Critical role of nutrition in improving quality of care: an interdisciplinary call to action to address adult hospital malnutrition. *Journal of the Academy of Nutrition and Dietetics, 113(9),* 1219-1237.
55. Thibault, R., Abbasoglu, O., Ioannou, E., Meija, L., Ottens-Oussoren, K., Pichard, C., Bischoff, S.C. (2021). ESPEN guideline on hospital nutrition. *Clinical Nutrition, 40(12),* 5684-5709.
56. Thibault, R., Chikhi, M., Clerc, A., Darmon, P., Chopard, P., Genton, L., Pichard, C. (2011). Assessment of food intake in hospitalised patients: a 10-year comparative study of a prospective hospital survey. *Clinical Nutrition, 30(3),* 289-296.
57. Tymoszuk, M., Orkusz, A. (2015). Ocena wartości energetycznej i odżywczej diet szpitalnych na podstawie jadłospisów dekadowych. *Nauki Inżynierskie i Technologie, 4(19).*
58. Uhl, S., Siddique, S.M., Bloschichak, A., McKeever, W., D'Anci, K., Leas, B., Tsou, A.Y. (2022). Interventions for malnutrition in hospitalized adults: A systematic review and meta-analysis. *Journal of Hospital Medicine, 17(7),* 556-564.
59. Ukleja, A., Gilbert, K., Mogensen, K.M., Walker, R., Ward, C.T., Ybarra, J. (2018). Standards for nutrition support: adult hospitalized patients. Task Force on Standards for Nutrition Support: Adult Hospitalized Patients, the American Society for Parenteral and Enteral Nutrition. *Nutrition in Clinical Practice, 33(6),* 906-920.
60. van Loenen, T., van den Berg, M.J., Westert, G.P., Faber, M.J. (2014). Organizational aspects of primary care related to avoidable hospitalization: a systematic review. *Family Practice, 31(5),* 502-516. https://doi.org/10.1093/fampra/cmu053
61. Volkert, D., Beck, A.M., Cederholm, T., Cruz-Jentoft, A., Hooper, L., Kiesswetter, E., Bischoff, S.C. (2022). ESPEN practical guideline: Clinical nutrition and hydration in geriatrics. *Clinical Nutrition, 41(4),* 958-989.
62. Wronka, L., Sinska, B., Wójcik, Z. (2009). Catering-sposób na żywienie pacjentów w szpitalach?. *Żywienie Człowieka i Metabolizm, 5(36),* 736-746.
63. Wyka, J., Wrona, A. (2020). Żywienie w szpitalach–dziś i jutro. *Bromatologia i Chemia Toksykologiczna, 3*.
64. Young, A.M., Banks, M.D., Mudge, A.M. (2018). Improving nutrition care and intake for older hospital patients through system-level dietary and mealtime interventions. *Clinical nutrition ESPEN, 24*, 140-147.

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CRIME IN THE COUNTRIES OF THE EUROPEAN UNION – TAXONOMIC ANALYSIS

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Purpose: This article aims to evaluate the variation in crime levels among European Union countries in relation to selected socioeconomic indicators. Additionally, the study seeks to examine the impact of these indicators on public safety for the years 2016 and 2023.
Design/methodology/approach: The study employed selected descriptive statistics and the TOPSIS method, a technique of multidimensional statistical analysis. The statistical data utilised in this research were obtained from Eurostat.
Findings: The results indicated the occurrence of a difference in the crime level. In 2023, residents of Slovenia, Czechia, and Poland (top three places in the ranking) can feel the safest. Seven years earlier, instead of Poland, Germany was in this group. The worst situation in terms of crime level in both years studied was in Latvia.
Research limitations/implications: The study utilised indicators available for all EU countries during the surveyed years. A significant limitation was the absence of a comprehensive set of indicators for all member states, necessitating the exclusion of specific data or the inclusion of indicators from earlier years in some cases. Furthermore, as the research was quantitative, future studies could incorporate qualitative methods to facilitate a more detailed analysis of crime-related issues.
Practical implications: The research presented in this paper can serve as a foundation for further analyses to diagnose and predict crime levels.
Social implications: The research findings presented in the article may prove useful for evaluating existing outcomes and identifying effective strategies for combating crime.
Originality/value: The article contributes to the body of knowledge and advances the discourse on crime prevention and the maintenance of public safety.
Keywords: crime, EU countries, socioeconomic indicators, TOPSIS method.
Category of the paper: Research paper.

1. Introduction

Crime, which in its everyday understanding refers to activities that violate legal norms, has been a persistent aspect of human society throughout history. While most individuals in developed Western societies have limited direct exposure to crime, either as victims or perpetrators, its impact permeates many aspects of daily life (Canter, Youngs, 2016), making it a highly pertinent issue. According to Thotakura (2014), crime is a public evil, with each society adopting its own perspective on defining this phenomenon. For a crime to occur, both criminal intent and a criminal act are required, stemming from various factors, including social, economic, biological, and psychological causes.

The detrimental effects of crime on both economic development and societal quality of life have positioned crime prevention as a top priority for many nations, leading to continuous research on this subject (Bąk, 2015).

This article aims to analyse the spatial diversity of crime across European Union countries in 2016 and 2023. By comparing these two periods, changes in public safety within the analysed countries can be assessed. Using statistical analysis and a taxonomic measure of development enabled the characterisation of crime levels in EU countries and their ranking based on crime risk. Data on identified crimes and other relevant factors influencing crime levels were sourced from the Eurostat database.

The structure of this article includes an introduction that outlines its purpose and the authors' motivation for exploring crime-related issues in EU countries. A literature review of the studied phenomenon is also provided. The following section details the methodology employed, the data sources used, and the presentation and discussion of research findings. The article concludes with a summary of the study's outcomes.

2. Crime – general characteristics

Crimes are typically categorised based on the severity of the act, with seriousness often determined by the type or length of punishment prescribed by law (Mamchia, 2023). Various classifications of crimes are presented in the literature, differentiating between broader or more specific groups. For instance, Bąk (2015) and Bąk and Cheba (2018) classify crimes into three main categories: criminal (offences against property and life and health), economic, and traffic-related crimes. A more detailed classification is offered by Sowmyya (2014) and Thotakura (2014), who identify eight distinct categories of crime:

1. Personal crimes – Offenses directed against an individual (e.g., murder, assault, sexual assault).
2. Crimes against property – Offenses targeting material property (e.g., burglary, theft, arson, vandalism).
3. Victimless crimes – Acts violating personal moral values (e.g., prostitution, illegal gambling, illegal drug use).
4. Organised crime – Coordinated offences committed by two or more individuals as part of an organised operation (e.g., kidnappings, robberies, trafficking in prohibited goods, money laundering, human trafficking, voter manipulation).
5. Juvenile delinquency – Crimes committed by individuals under 18.
6. Cybercrimes – Offenses involving computers and the Internet (e.g., cyberterrorism, online harassment, spamming, online fraud).
7. Public security violations – Offenses threatening public safety (e.g., terrorism, driving under the influence of alcohol or drugs).
8. White-collar crimes – Non-violent offences committed by individuals in positions of authority or trust (e.g., embezzlement, identity theft, fraud, corruption).

Most efforts to classify crime types tend to focus on superficial characteristics, grouping crimes with similar behavioural elements (Durrant, 2021). The challenges of distinguishing crime types have been addressed by authors such as Ward, Durrant, and Dixon (2021) and Carter, Ward, and Strauss-Hughes (2021). These scholars argue that the choice of classification method creates obstacles to advancing the understanding and management of crimes. They emphasise that identifying and categorising phenomena is essential for capturing key similarities and differences, facilitating description, prediction, and explanation. However, they contend that achieving a universal classification system is unattainable in any scientific discipline, including categorising crime types.

Many criminals exploit new and emerging opportunities provided by the Internet, with victims often unable to keep pace. Canter and Youngs (2016) highlight a paradox at the core of most cybercrimes: Internet users frequently perceive themselves as operating in a private domain, unaware that they are exposing themselves to the broader World Wide Web. This underscores a significant challenge in addressing cybercrime – the need to shift people's understanding of their role in online society and the nature of the digital environment.

Conversely, detecting white-collar crimes presents distinct challenges, primarily due to the difficulty of identifying such crimes, the perpetrators' upper-class status, and their reliance on sophisticated methods. Furthermore, existing laws and regulations are often insufficient to combat the growing prevalence of these crimes and their detrimental impact on social and state structures, exacerbated by the financial and professional dominance of the upper class (Uddin, 2024).

Each country, influenced by its unique historical, geopolitical, social, and environmental conditions, can identify specific factors that drive criminal behaviour within its borders. Understanding these causes is essential for fostering the economic development of nations and regions. Using international data is crucial to identifying common factors influencing crime rates. Such data enable governments to comprehend better the mechanisms underlying criminal activity and devise effective strategies to counteract this negative phenomenon. Since 1955, the United Nations has held congresses on crime prevention every five years in various locations worldwide. These congresses facilitate the exchange of information and best practices among nations and professionals in the field, aiming to promote more effective crime prevention and criminal justice measures globally. At the Twelfth United Nations Congress on Crime Prevention and Criminal Justice (2010), three main approaches to crime prevention were outlined:

- social crime prevention strategies aim to improve the quality of life for targeted groups by increasing access to social goods such as healthcare, a safe and healthy environment, employment, and education. The focus is on reducing factors that push socially excluded groups toward crime as their only perceived option;
- environmental crime prevention, which involves enhancing living conditions in disadvantaged neighbourhoods with low social cohesion, where crime participation or victimisation rates are high;
- situational crime prevention aims to limit opportunities and reduce the attractiveness of criminal activities while increasing the risk of detection. Techniques include the appropriate design of public spaces and housing, as well as providing support to victims.

Extensive experience and scientific research have demonstrated that the methods outlined for crime prevention, whether applied individually or in combination, are highly effective in reducing crime levels. Building on these approaches, the Fourteenth United Nations Congress on Crime Prevention and Criminal Justice (2021) expanded on the themes of the Thirteenth Congress (2015), focusing on four interconnected components: enhancing the quality of education for children and youth in the context of the rule of law, strengthening judicial integrity and combating corruption within the justice system, supporting prisoner rehabilitation and social reintegration, and preventing youth crime through sports initiatives. Despite significant global efforts to mitigate crime, the problem persists, necessitating ongoing research and the development of innovative solutions.

No one is inherently predisposed to criminality; criminal intentions and behaviours arise from numerous factors – social, economic, biological, and psychological (Sowmyya, 2014). Several scholars have explored the influence of these factors on crime, including Khan et al. (2015), Abbas et al. (2018), Jonathan et al. (2021), and Gokmenoglu, Yildiz, and Kaakeh (2022). Their research identifies key socioeconomic problems associated with crime, such as poverty, unemployment, education levels, economic growth, and drug use. These authors collectively highlight that poverty and unemployment can lead to elevated stress levels and mental health issues, which, in turn, may drive individuals toward criminal behaviour. Anhyana and Bursa (2019) investigated the relationship between unemployment and crime rates in the EU-28 countries from 1993 to 2016. Their findings confirmed a positive correlation between these factors, indicating that efforts to reduce unemployment can also lower crime rates, thereby fostering safer and more prosperous societies.

Khan et al. (2015) found a negative relationship between crime rates and higher education levels, suggesting that greater access to education can serve as a deterrent to criminal behaviour. However, affluent areas with high GDP per capita tend to attract more criminal activity due to the more significant opportunities for illicit gains. Nonetheless, advancements in the rule of law are shown to mitigate crime rates in such regions (Gokmenoglu, Yildiz, Kaakeh, 2022). Crime often serves as a significant obstacle to socioeconomic development, as it discourages investment, increases transaction costs, and prompts migration, ultimately contributing to global disparities in economic development (Jonathan et al., 2021).

Kim, Seo & Hong (2020) examined the influence of income inequality on crime, conducting a systematic review and meta-analysis of published studies focused on European countries. Their findings revealed that income inequality significantly correlates with crime in Eastern and Northern Europe. In contrast, this relationship was weak or non-existent in Western and Southern Europe, likely due to robust welfare systems that alleviate the adverse effects of poverty.

The study by Van Dijk, Nieuwbeert, and Larsen (2022) encompasses 166 countries worldwide (including 40 in Europe, 2 in North America, 26 in Latin America and the Caribbean, 49 in Africa, 47 in Asia, and 2 in Oceania), challenges traditional theories regarding the macro causes of crime. According to the authors, conventional factors such as poverty and social inequality explain common crimes, such as theft and violence, but are less applicable to homicides and organised crime. Common crimes appear to be significantly influenced by the availability of easy theft targets and diminished social control in urban settings. However, the authors argue that urbanisation does not correlate with homicide rates or the occurrence of organised crime. Additionally, they identified governance as a critical factor, noting that all types of crime are more prevalent in countries with weaker state and democratic institutions.

Crime, as a complex phenomenon, exhibits dynamics that are not always predictable in relation to economic factors. Research by Karpavicius et al. (2024) in six European countries (Lithuania, Germany, Greece, Portugal, Finland, and Sweden) reveals that an increase in per capita consumption correlates with higher crime rates, potentially reflecting a rise in economic crime in wealthier societies. Moreover, the study suggests that increased security spending does not necessarily lead to a reduction in crime, as criminal behaviour adapts to advancements in detection methods. These findings underscore the intricate nature of the problem and emphasise the necessity for multifaceted research to develop effective strategies for combating crime and improving public safety.

3. Characteristics of selected indicators related to crime

The justice indicators utilised in this study include the number of crimes recorded by the police; however, information on the total number of legal violations is unavailable (cf. Bąk, Cheb, 2018). Each data source has inherent limitations. Police statistics may not accurately reflect the actual scale of crime, surveys can be subjective, and data from international reports may be outdated. These challenges necessitate a careful approach to data analysis that considers the specificity and potential limitations of the data (Sources of Crime..., 2024).

Analysing crime data also involves addressing issues related to privacy, the risk of data manipulation, and the need for standardisation. Protecting personal data is crucial to safeguarding the privacy of victims, witnesses, and suspects, and adherence to data protection regulations, such as the General Data Protection Regulation (GDPR) in the European Union, is imperative. Data manipulation risks include deliberate falsification, errors in data collection, and processing inaccuracies, which require transparency and accountability in data management. Furthermore, standardising data collection and reporting methods is essential to ensure consistency and comparability across different jurisdictions (Okmi et al., 2023).

The number of crimes committed in the European Union, including murder, and theft, has generally declined in recent years (Eurostat, 2024). For instance, the homicide rate across the EU-27 decreased by 6% in 2021 compared to 2016. Latvia recorded the highest number of homicides per 100,000 people in both periods, while Luxembourg (2016) and Ireland (2021) reported the lowest rates. Among the 17 countries that experienced reduced homicide rates, Malta recorded the most significant decrease, at 78%. Conversely, the largest increase occurred in Luxembourg, where the rate rose by 120%.

Even though Denmark and Sweden reported the highest theft rates per 100,000 people, these rates declined in both countries between 2016 and 2022 by 37% and 25%, respectively. In contrast, Greece and Spain were the only EU countries to experience an increase in theft rates during this period, with rises of 28% and 9%, respectively.

A concerning trend is the significant increase in cases of sexual violence registered by the police per 100,000 population in the majority (23 out of 27, or more than 85%) of EU countries in 2022 compared to 2016. Notably, the incidence of such crimes nearly tripled in Sweden and more than doubled in France and Cyprus. Conversely, reductions in sexual violence cases were observed in Lithuania, Greece, Hungary, and Slovakia.

Table 1.
Crimes by type per 100,000 population in European Union countries

Specification	Murders		Theft		Sexual Violence	
	2016	2021	2016	2022	2016	2022
Belgium	1.10	0.66	2055.54	1686.00	69.24	92.04
Bulgaria	1.08	1.00	457.48	413.08	7.74	8.29
Czechia	0.50	0.49	674.86	330.65	13.20	17.32
Denmark	0.47	0.60	3951.31	2496.21	66.46	107.19
Germany	0.46	0.39	1570.39	1254.11	45.23	59.70
Estonia	2.65	2.00	682.55	602.72	20.59	27.26
Ireland	0.52	0.15	1312.17	1230.87	53.85	62.75
Greece	0.77	0.82	530.04	680.03	4.57	3.93
Spain	0.57	0.58	351.16	383.04	18.79	35.40
France	0.47	0.82	2197.79	1964.18	53.22	126.08
Croatia	1.23	0.76	303.98	287.06	17.11	18.59
Italy	0.51	0.41	1867.31	1431.39	7.44	11.54
Cyprus	1.25	1.52	86.17	67.76	2.83	6.30
Latvia	4.54	3.55	739.99	512.91	11.17	21.27
Lithuania	3.63	1.66	691.11	343.12	7.20	5.02
Luxembourg	0.45	0.99	1727.38	2520.00	45.64	60.74
Hungary	0.97	0.67	952.06	501.76	6.10	6.06
Malta	0.80	0.18	1661.58	687.95	19.54	27.06
Netherlands	0.62	0.67	1790.76	1324.88	27.89	33.17
Austria	0.50	0.39	1651.67	1081.86	50.53	55.33
Poland	0.76	0.59	332.90	321.08	8.31	8.96
Portugal	0.78	0.87	863.57	708.70	23.91	29.21
Romania	1.56	1.34	466.08	311.37	9.05	14.15
Slovenia	0.69	0.55	1036.44	1022.60	11.14	13.72
Slovakia	0.74	0.51	407.83	250.21	12.09	11.04
Finland	1.17	1.19	2309.58	2249.83	58.10	92.07
Sweden	0.94	0.94	3810.73	2858.48	69.24	200.34

Source: Own elaboration based on Eurostat (2024).

Figure 1 compares EU countries regarding the number of prisoners per 100,000 population. In 2016, the highest rates (exceeding 200) were observed in Lithuania, Estonia, Latvia, and Czechia. These countries collectively reduced this indicator by an average of 22% over the subsequent five years. By 2022, Hungary had the highest number of incarcerated individuals per 100,000 population, reflecting an 11% increase compared to 2016. Notably, Cyprus, Croatia, and Sweden also exhibited significant increases during this period, with rises of 53%, 43%, and 40%, respectively, raising concerns about unfavourable trends in these countries.

The most commonly cited socioeconomic factors influencing crime include poverty, income inequality, unemployment, low levels of education, and limited access to social services. Poverty elevates the likelihood of involvement in property crimes, while income inequality fosters frustration and social conflict. Unemployment and inadequate education restrict access to lawful income opportunities, thereby increasing the risk of criminal behaviour. Enhanced social spending on education and healthcare can mitigate these risk factors, contributing to a reduction in crime rates (e.g. Vargas, 2023; Atrey, Singh, 2024).

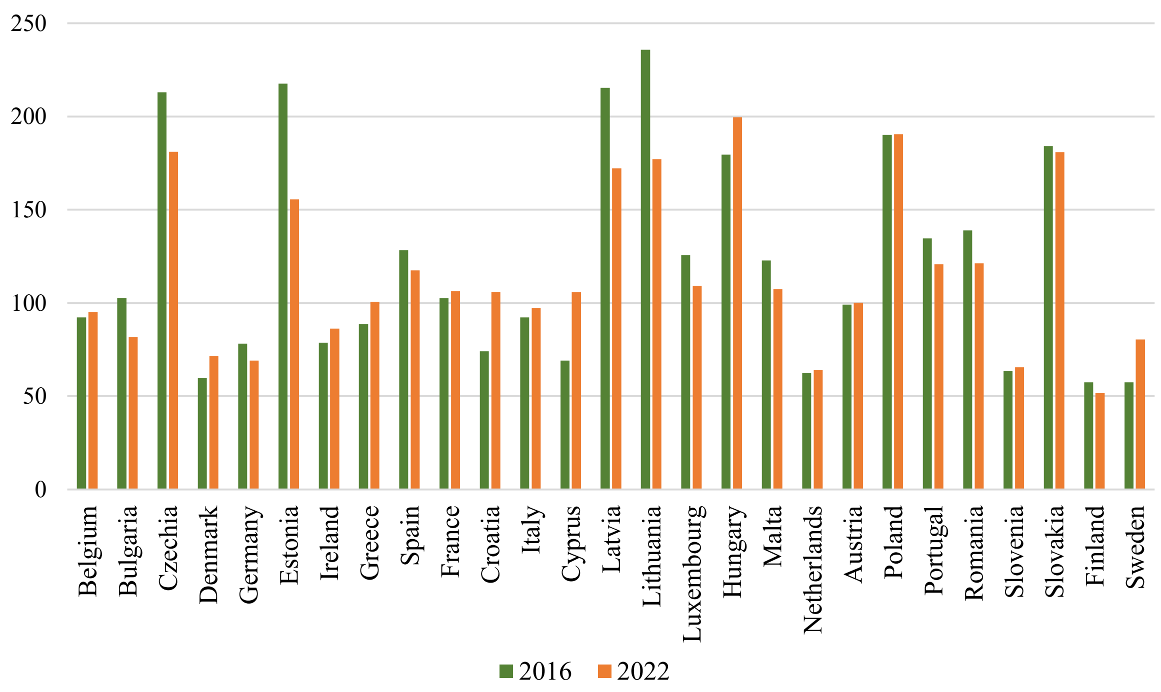

Figure 1. The number of prisoners per 100,000 population in the European Union countries.

Source: Own elaboration based on Eurostat (2024).

Significant differences in the levels of indicators influencing crime were observed across individual Member States of the European Union. The countries with the highest at-risk-of-poverty rates in both surveyed years (above 20%) were primarily post-communist nations, including Bulgaria, Estonia, Latvia, Lithuania, and Romania, as well as Spain (Table 2).

The indicator of severe material and social deprivation refers to individuals unable to afford specific goods, services, or social activities. As defined by Eurostat (2024), this metric represents the percentage of the population experiencing the enforced absence of at least seven out of thirteen factors – six pertaining to individuals and seven to households).

The list of factors at the household level includes:

- the ability to cover unexpected expenses,
- the capacity to afford a week's vacation away from home annually,
- the ability to manage arrears in payments (e.g., mortgage or rent instalments, utility bills, instalment purchases, or other loan repayments),
- the ability to purchase a meal containing meat, chicken, fish, or a vegetarian equivalent every other day,
- maintaining adequate heating at home,
- access to a car or van for personal use,
- the ability to replace worn-out furniture.

At the individual level, the factors include:

- having access to an internet connection,
- replacing worn-out clothes with new items,

- owning two pairs of properly fitted shoes, including a pair suitable for all weather conditions,
- allocating a small amount of money weekly for personal use,
- participating in regular recreational activities,
- meeting friends or family for drinks or meals at least once a month.

Among the EU-27 countries, the highest level of severe material and social deprivation was observed in Romania. However, this indicator showed a positive trend, decreasing by 45% in 2023 compared to 2016. Conversely, countries with the lowest levels of deprivation (less than 3%) included Sweden, Finland, the Netherlands, Luxembourg, and Estonia.

Unemployment rates across EU countries vary significantly. In 2016, Greece recorded the highest unemployment rate at 23.9%, while in 2023, Spain had the highest rate at 12.2%. Conversely, the lowest unemployment rates were observed in Germany (3.9% in 2016) and the Czech Republic (2.6% in 2023).

A positive trend was observed overall, with unemployment rates decreasing in 2023 compared to 2016 in all EU countries except Sweden. The most substantial reductions, exceeding 50%, were achieved in Poland, Cyprus, Greece, Slovenia, and Croatia.

Table 2.
Selected economic and social indicators in EU countries (in %)

Specification	Poverty risk index		Severe material and social deprivation index		Unemployment rate	
	2016	2023	2016	2023	2016	2023
Belgium	15.50	12.30	8.40	6.10	7.90	5.50
Bulgaria	22.90	20.60	33.50	18.00	8.60	4.30
Czechia	9.70	9.80	3.50	2.70	4.00	2.60
Denmark	11.90	11.80	2.60	4.90	6.00	5.10
Germany	16.50	14.40	4.70	6.90	3.90	3.10
Estonia	21.70	22.50	2.20	2.50	6.80	6.40
Ireland	16.80	12.00	8.00	6.00	8.40	4.30
Greece	21.20	18.90	18.40	13.50	23.90	11.10
Spain	22.30	20.20	8.50	9.00	19.60	12.20
France	13.60	15.40	6.70	6.60	10.10	7.30
Croatia	19.50	19.30	7.30	2.80	13.10	6.10
Italy	20.60	18.90	10.10	4.70	11.70	7.70
Cyprus	16.10	13.90	6.60	2.40	13.00	5.80
Latvia	21.80	22.50	12.60	6.20	9.70	6.50
Lithuania	21.90	20.60	15.40	6.10	7.90	6.90
Luxembourg	15.80	18.80	2.00	2.50	6.30	5.20
Hungary	14.50	13.10	20.60	10.40	5.00	4.10
Malta	16.50	16.60	5.20	4.10	4.70	3.50
Netherlands	12.70	13.00	2.60	2.70	7.00	3.60
Austria	14.10	14.90	3.30	3.70	6.50	5.10
Poland	17.30	14.00	5.40	3.00	6.30	2.80
Portugal	19.00	17.00	9.10	4.90	11.50	6.50
Romania	25.30	21.10	35.90	19.80	7.20	5.60
Slovenia	13.90	12.70	4.10	2.00	8.00	3.70
Slovakia	12.70	14.30	7.60	7.00	9.60	5.80
Finland	11.60	12.20	1.20	2.80	8.90	7.20
Sweden	16.20	16.10	0.70	2.50	7.10	7.70

Source: Own elaboration based on Eurostat (2024).

4. Social assistance in European Union countries

4.1. The characteristics of the statistical material

Crime is a multidimensional phenomenon characterised by numerous indicators, often referred to as diagnostic features. The study began with the selection of these diagnostic features, which include indicators of crimes recorded by the police, categorised by type, as well as socioeconomic factors that indirectly influence the propensity to break the law. These socioeconomic factors encompass indicators related to the financial condition of the population and the labour market. The empirical research relied on a database constructed from data provided by Eurostat (2024). The analysis primarily covered two years: 2016 and 2023. In instances where data for 2023 were unavailable, the most recent data – such as from 2022 or, in one case, 2021 – were utilised.

Table 3 outlines the indicators adopted for the study. It is important to note that all indicators used are classified as destimulants, indicating that higher values correspond to a worsening situation in the analysed area.

Table 3.
Indicators describing crime and selected descriptive parameters in 2016 and 2023

Symbol	Nazwa	2016			2023		
		$\bar{x}$	V_S (%)	*As*	$\bar{x}$	V_S (%)	*As*
X_{1D}	victims of human trafficking per 100,000 inhabitants	2.5	78.9	1.0	2.6	93.6	2.2
X_{2D}	prisoners per 100,000 inhabitants	120.9	45.2	0.7	115.4	36.0	0.7
X_{3D}	homicide rate per 100,000 inhabitants	1.1	86.1	2.5	0.9	73.5	2.5
X_{4D}	theft per 100,000 inhabitants	1277.1	75.1	1.3	1019.3	75.9	1.0
X_{5D}	sexual violence per 100,000 inhabitants	31.5	110.9	2.8	42.8	104.6	1.9
X_{6D}	premeditated homicides per 100,000 inhabitants	1.3	89.6	2.9	1.1	60.5	3.2
X_{7D}	people killed in road accidents per million inhabitants	57.3	30.2	0.7	48.1	30.3	0.7
X_{8D}	crime, violence, or vandalism in the area (%)	10.9	39.4	1.0	8.6	52.7	0.8
X_{9D}	threats of poverty (%)	17.1	22.9	0.2	16.2	21.9	0.2
X_{10D}	at-risk-of poverty rate for children (aged less than 18) (%)	20.1	30.6	0.7	18.2	29.9	0.4
X_{11D}	people living in households with very low work intensity (%)	9.5	34.1	0.9	6.8	30.5	0.0
X_{12D}	severe material and social deprivation index (%)	9.1	94.0	2.0	6.1	73.1	1.9
X_{13D}	people at risk of poverty or social exclusion (%)	23.5	31.5	1.4	20.5	22.2	0.6
X_{14D}	subjective poverty (%)	29.2	59.9	0.9	19.3	59.4	2.6
X_{15D}	unemployment rate (%)	9.0	47.8	2.0	5.8	37.8	1.2

Source: Own elaboration based on Eurostat (2024).

A preliminary analysis of the diagnostic features reveals significant disparities among the studied countries in terms of crime levels, as evidenced by high values of the coefficient of variation (Vs) and the asymmetry coefficient (A) for both analysed years. The X_{5D} index – sexual violence per 100,000 inhabitants – exhibited the highest level of variation. This considerable disparity is driven, in part, by the substantial differences between the maximum and minimum values. In 2023, Sweden recorded the highest value for this indicator at 200.34 (compared to 179.48 in 2016), while Greece had the lowest value at 3.93 (with Cyprus reporting 2.83 in 2016). Most of the indicators used in the study showed high or moderate right-hand asymmetry, indicating that, for most EU countries, their values were below the average. That signifies a favourable situation for indicators classified as destimulants, as lower values represent a better outcome. Notably, the X_{11D}, which measures the percentage of people living in households with very low work intensity, exhibited a distribution close to symmetry in 2023. The difference between the highest and lowest values for this index in that year was 6.9 percentage points.

4.2. Method

The article employs the TOPSIS method, a multivariate statistical analysis technique, to classify EU countries based on their crime rates. TOPSIS, or the Technique of Order Preference by Similarity to Ideal Solution, was proposed and described by Hwang and Yoon in 1981 and is widely recognised as a multi-criteria decision-making method (Roszkowska, 2011; Parida, Sahoo, 2013; Yoon, Kim, 2017; Ghose, 2021). The core concept of TOPSIS involves evaluating decision alternatives by measuring their distance from two reference points: the Positive Ideal Solution (PIS) and the Negative Ideal Solution (NIS). The optimal decision alternative is the one closest to the PIS and furthest from the NIS. This method is also suitable for creating rankings of objects, as demonstrated in this article.

The procedure for calculating a synthetic variable using the TOPSIS method is as follows:

Step 1. The starting point is to define the matrix:

$$X = [x_{ij}] \tag{1}$$

where:
i – object number (i = 1, 2, ..., n),
j – diagnostic feature number (j = 1, 2, ..., m),
x_{ij} – the value of j-th feature for i-th object.

Step 2. In order to ensure the comparability of variables, the initial values of diagnostic features are normalized based on the formula:

$$z_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{n} x_{ij}^2}} \tag{2}$$

where:
z_{ij} – the value of j-th standardized diagnostic feature for the i-th object.

Step 3. Values of normalized diagnostic features are weighted, which results in the matrix:

$$V = [v_{ij}] = [w_j z_{ij}] \tag{3}$$

for:

$$\sum_{j=1}^{m} w_j = 1 \tag{4}$$

where:

w_j – weight of *j*-th diagnostic feature.

Step 4. For each normalized weighted diagnostic feature from the matrix (3), two reference points are determined, which are determined by the Positive Ideal Solution and Negative Ideal Solution coordinates, respectively:

$$v_j^+ = \begin{cases} \max\limits_i v_{ij} & \text{for stimulant} \\ \min\limits_i v_{ij} & \text{for destimulant} \end{cases} \tag{5}$$

$$v_j^- = \begin{cases} \min\limits_i v_{ij} & \text{for stimulant} \\ \max\limits_i v_{ij} & \text{for destimulant} \end{cases} \tag{6}$$

where:

v_j^+ – *j*-th coordinate of Positive Ideal Solution,

v_j^- – *j*-th coordinate of Negative Ideal Solution.

Step 5. For all objects, their Euclidean distances from the positive and negative ideal value are calculated, respectively:

$$d_i^+ = \sqrt{\sum_{j=1}^{m} \left(v_{ij} - v_j^+\right)^2} \tag{7}$$

$$d_i^- = \sqrt{\sum_{j=1}^{m} \left(v_{ij} - v_j^-\right)^2} \tag{8}$$

where:

d_i^+ – Euclidean distance of the *i*-th object from Positive Ideal Solution,

d_i^- – Euclidean distance of the *i*-th object from Negative Ideal Solution.

Step 6. The value of the aggregate variable denoting the relative proximity of the i-th object to the Positive Ideal Solution is determined as the quotient:

$$R_i = \frac{d_i^-}{d_i^- + d_i^+} \tag{9}$$

where:
$0 \leq R_i \leq 1$.

The preferred object has the shortest distance from the positive ideal value and, at the same time, the most significant distance from the negative ideal value, i.e., it has the highest value of the coefficient R_i.

Step 7. Linear ordering of objects is performed due to the aggregate variable's non-increasing value (9).

Step 8. Using the three-median method to divide objects into typological groups with a similar level of the studied phenomenon according to formulas (Młodak, 2006):

Group I: $\mu_i > \mathrm{med}_1(\boldsymbol{\mu})$ – very low high risk of crime,

Group II: $\mathrm{med}(\boldsymbol{\mu}) < \mu_i \leq \mathrm{med}_1(\boldsymbol{\mu})$ – average threat of crime,

Group III: $\mathrm{med}_2(\boldsymbol{\mu}) < \mu_i \leq \mathrm{med}(\boldsymbol{\mu})$ – high crime risk,

Group IV: $\mu_i \leq \mathrm{med}_2(\boldsymbol{\mu})$ – very high crime risk.

5. Research results

Table 4 presents the classification and grouping of EU countries according to crime levels based on the synthetic measure calculated using the features listed in Table 3 for 2016 and 2023. In this ranking, a higher position indicates a lower crime rate in a given country.

Table 4.
Ordering and typological groups of European Union countries by crime level in 2016 and 2023

Country	2016			2023		
	R_i	rank	group	R_i	rank	group
Austria	0.7532	9	II	0.7475	11	II
Belgium	0.6935	20	III	0.6777	18	III
Bulgaria	0.5565	26	IV	0.6410	21	IV
Croatia	0.7560	7	II	0.7979	4	I
Cyprus	0.7094	16	III	0.7738	5	I
Czechia	0.7893	3	I	0.8070	2	I
Denmark	0.7011	17	III	0.6942	16	III
Estonia	0.6966	18	III	0.6589	19	III
Finland	0.7426	11	II	0.6555	20	III
France	0.7253	14	III	0.6051	23	IV

Cont. table 4.

Germany	0.7986	2	I	0.7611	7	II
Greece	0.6189	22	IV	0.5670	26	IV
Hungary	0.6751	21	IV	0.7229	14	III
Ireland	0.7438	10	II	0.7675	6	I
Italy	0.7281	13	II	0.7318	12	II
Latvia	0.5369	27	IV	0.5460	27	IV
Lithuania	0.5703	25	IV	0.7004	15	III
Luxembourg	0.7535	8	II	0.5685	25	IV
Malta	0.6964	19	III	0.7610	8	II
Netherlands	0.7379	12	II	0.7301	13	II
Poland	0.7878	4	I	0.8003	3	I
Portugal	0.7584	6	I	0.7499	10	II
Romania	0.5814	23	IV	0.6248	22	IV
Slovakia	0.7852	5	I	0.7517	9	II
Slovenia	0.8487	1	I	0.8660	1	I
Spain	0.7164	15	III	0.6884	17	III
Sweden	0.5795	24	IV	0.5903	24	IV

Source: Own elaboration.

Table 4 shows that Slovenia recorded the lowest crime rate in 2016. This ranking was attributed to the country's lowest values in the EU for the X_{6D} indicator (premeditated homicides per 100,000 inhabitants), as well as low values for the following indicators: X_{2D} (prisoners per 100,000 inhabitants), X_{3D} (homicide rate per 100,000 inhabitants), and X_{11D} (people living in households with very low work intensity). Germany also exhibited a low crime level in 2016, as reflected by the lowest values of indicators related to the income situation of residents (X_{14D}: subjective poverty) and the labour market (X_{15D}: unemployment rate) among EU countries. Additionally, Germany had low values for indicators such as X_{3D} (homicide rate per 100,000 inhabitants) and X_{7D} (people killed in road accidents per million inhabitants). The Czech Republic ranked third in 2016, owing to its lowest values among member countries for X_{1D} (victims of human trafficking per 100,000 inhabitants), X_{9D} (threats of poverty), and X_{13D} (people at risk of poverty or social exclusion). It also recorded low values for total homicides (X_{3D}) and premeditated homicides (X_{6D}).

Latvia recorded the highest level of crime among EU countries in 2016. It was predominantly driven by the highest values for the indicators X_{3D} (homicide rate per 100,000 inhabitants) and X_{6D} (premeditated homicides per 100,000 inhabitants), alongside elevated values for X_{2D} (prisoners per 100,000 inhabitants). Bulgaria ranked second to last, primarily due to the highest values in the EU for X_{7D} (people killed in road accidents per million inhabitants) and X_{8D} (crime, violence, or vandalism in the area). Additionally, Bulgaria exhibited high levels of poverty (X_{12D}) and social exclusion (X_{13D}).

In 2023, Slovenia maintained its position as the country with the lowest crime level. The Czech Republic moved up one place to second, attributed to maintaining the lowest values for three indicators from 2016 and adding X_{15D} (lowest unemployment rate in the EU) to this list. Poland ranked third, improving by one position, and was characterised by low values for indicators such as X_{1D} (human trafficking), X_{3D} (homicides), X_{5D} (sexual violence), X_{6D} (premeditated homicides), and X_{8D} (crime, violence, or vandalism). Poland also experienced reductions in most indicators compared to 2016, with significant decreases in theft (11.8 percentage points) and subjective poverty (9.7 percentage points). The highest crime rate in 2023 was again in Latvia and Greece, which fell by four positions in the ranking. In this country, there was an increase in theft and the number of prisoners.

In 2023, Luxembourg experienced the most significant decline in ranking, dropping 17 places, while Cyprus and Malta each fell by 11 places. Notably, Slovenia ranked first, and Latvia ranked last, and they maintained their positions from 2016.

The maps (Fig. 2-3) illustrate the division of EU member states into groups based on similarities in level of security, providing a visual representation of the taxonomic analysis. It should be noted that the best results in both years studied were achieved by countries located in the central-southern part of Europe, with this also applying to Portugal in 2016 and Ireland in 2023. Throughout the study period, Latvia consistently exhibited the worst situation concerning the analysed phenomena, followed by Bulgaria, Sweden, Romania, and Greece. In 2023, this group expanded to include France and Luxembourg. Hungary, however, showed improvement, advancing four places in the ranking to join the third typological group.

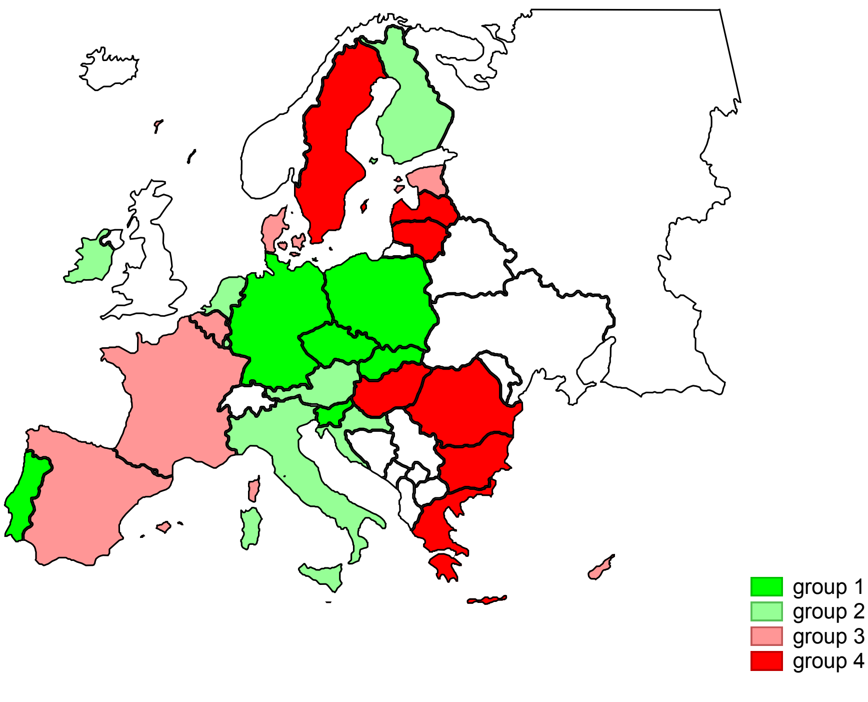

Figure 2. The division of EU countries into groups according to similarities in the level of security in 2016.

Source: Own elaboration.

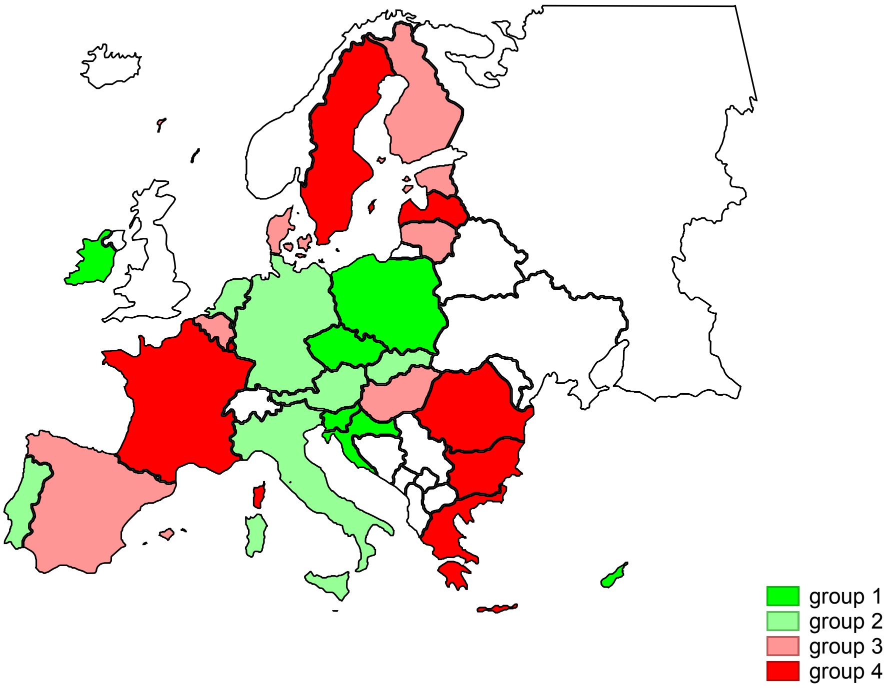

Figure 3. The division of EU countries into groups according to similarities in the level of security in 2023.

Source: Own elaboration.

6. Discussion and conclusions

This article addresses one of the most important issues that each of us faces, i.e. the problem of crime. The harmful impact of this phenomenon on the economy and the quality of life of the society has caused many countries to set combating crime as their paramount goal and new research is constantly being conducted in this regard (Gottschalk, 2024; Khalilia et al., 2024; Furger, 2024).

Analyzing the results of empirical research presented in this article, it can be seen that in most member states this phenomenon has been systematically decreasing. The number of crimes committed, such as murders and thefts, showed a decreasing trend. Jurgelewicz-Delegacz (2021) reached similar conclusions when examining selected categories of crime in EU countries in the years 2008-2018.

Taxonomic analysis based on the level of crime was carried out on 27 EU countries. The obtained results indicated the occurrence of differentiation of the phenomenon under study. It turned out that in 2023, residents of Slovenia, Czechia and Poland (top three places in the ranking) can feel the safest. Seven years earlier, instead of Poland, Germany was in this group. The worst situation in terms of crime level in both years studied was in Latvia.

However, the research presented in the article has certain limitations. Comparing crime statistics in different countries is still one of the most difficult methodological problems in criminological analyses. Countries differ in terms of penal systems and penal policies (Gruszczyńska, 2024). The main source of information in this study is statistics of the respective justice systems taken from international databases, including Eurostat, which contains only the number of crimes recorded by the police. It should be kept in mind that only a certain portion of all crimes are being reported and recorded by the law enforcement system.

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References

1. Abbas, S., Shouping, L., Sidra, F., Sharif, A. (2018). Impact of Crime on Socio-Economic Development: A Study of Karachi. *Malaysian Journal of Social Sciences and Humanities, Vol. 3, No. 3,* pp. 148-159, https://doi.org/10.47405/mjssh.v3i3.93
2. Anhyana, F., Bursa, N. (2019). Unemployment and Crime Nexus in European Union Countries: A Panel Data Analysis. *Journal of Administrative Sciences, Vol. 17, Iss. 34*, pp. 465-484, https://doi.org/10.35408/comuybd.574808
3. Atrey, I. Singh, B. (2024). Impact of Socio-Economic Factors on Juvenile Delinquency: An Explorative Study in Rajasthan. *European Economics Letters, Vol. 14, Iss. 2,* pp. 1449-1455, DOI: 10.52783/eel.v14i2.1502
4. Bąk, I. (2015). Struktura i typologia przestrzenna przestępczości w Polsce. *Ekonometria, Vol. 4, Iss. 50,* pp. 43-61, DOI: 10.15611/ekt.2015.4.03
5. Bąk, I., Cheba, K. (2018). Przestępczość w krajach członkowskich Unii Europejskiej – analiza statystyczna. *Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania Uniwersytetu Szczecińskiego, Vol. 54, Iss. 3,* pp. 57-69, DOI: 10.18276/sip.2018.54/3-04
6. Canter, D., Youngs, D. (2016). Crime and society. *Contemporary Social Science, Vol. 11, Iss. 4,* 283-288, https://doi.org/10.1080/21582041.2016.1259495
7. Carter, E., Ward, T., Strauss-Hughes, A. (2021). The classification of crime and its related problems: A pluralistic approach. *Aggression and Violent Behavior, Vol. 59,* 101440, https://doi.org/10.1016/j.avb.2020.101440

8. Durrant, R. (2021). Evolutionary theory and the classification of crime. *Aggression and Violent Behavior, Vol. 59,* 101449, https://doi.org/10.1016/j.avb.2020.101449
9. Eurostat (2024). *Database/General and regional statistics.* Retrieved from: https://ec.europa.eu/eurostat/web/main/data/database, 28.10.2024.
10. Eurostat (2024). *Severe material and social deprivation rate (SMSD).* Retrieved from: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Severe_material_and_social_deprivation_rate_(SMSD), 3.10.2024.
11. Furger, A. (2024). Can They Deliver? The Practice of Joint Investigation Teams (JITS) in Core International Crimes Investigations. *Journal of International Criminal Justice, Vol. 22, Iss. 1,* pp. 43-58, https://doi.org/10.1093/jicj/mqae005
12. Ghose, P.S. (2021). Selection of Plant Location for a Steel Project by TOPSIS. *World Journal Applied Chemistry, Vol. 6, Iss. 1,* pp. 1-5, DOI: 10.11648/j.wjac.20210601.11
13. Gokmenoglu, K.K., Yildiz, B.F. Kaakeh, M. (2022). Examining the Impact of Socioeconomic Factors on Crime Rates: A Panel Study. In: D. Prochazka (Ed.) *Regulation of Finance and Accounting* (pp. 409-420), Springer Proceedings in Business and Economics, Springer, https://doi.org/10.1007/978-3-030-99873-8_32
14. Gottschalk, P. (2024). Investigating and prosecuting white-collar and corporate crime: Challenges and barriers for national police agencies. *Journal of Economic Criminology, Vol. 3,* 100051, https://doi.org/10.1016/j.jeconc.2024.100051
15. Gruszczyńska, B. (2004). Crime in Central and Eastern European Countries in the Enlarged Europe. *European Journal on Criminal Policy and Research, Vol. 10, Iss. 2,* pp. 123-136, https://doi.org/10.1007/s10610-004-3784-2
16. Jonathan, O.E., Akinyede, J.O., Bernadin, T.C.A., Inoussa, T.M. (2021). Impacts of Crime on Socio-Economic Development. *Mediterranean Journal of Social Sciences, Vol. 12, Iss. 5,* pp. 71-81, https://doi.org/10.36941/mjss-2021-0045
17. Jurgelewicz-Delegacz, E. (2021). Wybrane kategorie przestępczości w krajach członkowskich Unii Europejskiej w świetle danych statystycznych Eurostatu. *Studia Prawnoustrojowe, Vol. 52,* pp. 145-163, https://doi.org/10.31648/sp.6635
18. Karpavicius, T., Stavytskyy, A., Giedraitis, V., Ulvidienė, E., Kharlamova, G., Kavaliauskaite, B. (2024). What Determines the Crime Rate? A Macroeconomic Case Study. *Economies, Vol. 12, Iss. 9*, 250, https://doi.org/10.3390/economies12090250
19. Khalilia, W.M., Ricard, S., Rabaia, A.A.L., Arès, M., Crispino, F. (2024). Challenges facing Palestinian crime scene investigators. *Egyptian Journal of Forensic Sciences, Vol. 14,* 13, https://doi.org/10.1186/s41935-024-00386-1
20. Khan, N., Ahmed, J., Nawaz, M., Zaman, K. (2015). The Socio-Economic Determinants of Crime in Pakistan: New Evidence on an Old Debate. *Arab Economic and Business Journal, Vol. 10, Iss. 2,* pp. 73-81, https://doi.org/10.1016/j.aebj.2015.01.001

21. Kim, B., Seo, C., Hong, Y-O. (2020). A Systematic Review and Meta-analysis of Income Inequality and Crime in Europe: Do Places Matter? *European Journal on Criminal Policy and Research, Vol. 28,* pp. 573-596, https://doi.org/10.1007/s10610-020-09450-7
22. Mamchii, O. (2023). *What Is Crime and Its Different Types. Best Diplomats*. Retrieved from: https://bestdiplomats.org/typesof-crime/, 10.10.2024.
23. Młodak A. (2006). *Analiza taksonomiczna w statystyce regionalnej.* Warszawa, Poland: Difin.
24. National Institute of Justice (2024). *Sources of Crime Data: Uniform Crime Reports and the National Incident-Based Reporting System*. Retrieved from: https://nij.ojp.gov/topics/articles/sources-crime-data-uniform-crime-reports-and-national-incident-based-reporting, 1.11.2024.
25. Okmi, M., Por, L.Y., Ang, T.F., Al-Hussein W., Ku C.S. (2023). A Systematic Review of Mobile Phone Data in Crime Applications: A Coherent Taxonomy Based on Data Types and Analysis Perspectives, Challenges, and Future Research Directions. *Sensors, Vol. 23, Iss. 9,* 4350, https://doi.org/10.3390/s23094350
26. ONZ (2010). *Twelfth United Nations Congress on Crime Prevention and Criminal Justice*. Salvador, Brazil. Retrieved from: https://www.un.org/en/conf/crimecongress2010/, 10.11.2024.
27. ONZ (2015). *Thirteenth United Nations Congress on Crime Prevention and Criminal Justice.* Doha, Qatar. Retrieved from: https://www.un.org/en/conf/crimecongress2010/, 10.11.2024.
28. ONZ (2021). *Fourteenth United Nations Congress on Crime Prevention and Criminal Justice.* Kyoto, Japan.
29. Parida, P., Sahoo, S.K. (2013). Multiple Atribute Decision Making Approach by TOPSIS Technique. *International Journal of Engineering Research & Technology, Vol. 2, Iss. 11,* pp. 907-912, DOI: 10.17577/IJERTV2IS110272
30. Roszkowska, E. (2011). Multi-criteria Decision Making Models by Applying the Topsis Method to Crisp and Interval Data. *Multiple Criteria Decision Making, Vol. 6,* pp. 200-230.
31. Sowmyya, T. (2014). Crime: A conceptual understanding. *Indian Journal of Applied Research, Vol. 4, Iss. 3*, 196-198, DOI: 10.15373/2249555X/MAR2014/58
32. Thotakura, S. (2014). Crime: A Conceptual Understanding. *Indian Journal of Applied Research, Vol. 4, Iss. 3*, pp. 196-198, https://doi.org/10.15373/2249555x/mar2014/58
33. Uddin, M. (2024). Causes of Increasing White-Collar Crime in Different Sectors of Bangladesh and its Impact on Society: A Feasible Reform. *Pakistan Journal of Criminology, Vol. 16, Iss. 4,* pp. 297-316, https://doi.org/10.62271/pjc.16.4.297.316
34. Van Dijk, J., Nieuwbeerta, P., Larsen, J.J. (2022). Global Crime Patterns: An Analysis of Survey Data from 166 Countries Around the World, 2006-2019. *Journal of Quantitative Criminology, Vol. 38*, pp. 793-827, https://doi.org/10.1007/s10940-021-09501-0

35. Vargas, J. (2023). The impact of socioeconomic factors on crime rates. *Perspective – Addiction & Criminology, Vol. 6, Iss. 4,* DOI: 10.35841/aara-6.4.161
36. Ward, T., Durrant, R., Dixon, L. (2021). The classification of crime: Towards pluralism. *Aggression and Violent Behavior, Vol. 59,* 101474, https://doi.org/10.1016/j.avb.2020.101474
37. Yoon, K.P., Kim, W.K. (2017). The behavioral TOPSIS. *Expert Systems with Applications, Vol. 89,* pp. 266-272, https://doi.org/10.1016/j.eswa.2017.07.045

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SERVICE EMPLOYEES' APPRAISALS TOWARD ARTIFICIAL INTELLIGENCE, ROBOTICS AND AUTOMATION IN THE WORKPLACE – RESULTS OF EXPLORATORY AND CONFIRMATORY FACTOR ANALYSES

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Purpose: In view of the rapid advancements in artificial intelligence, robotics, and automation (AIRA) within service industries, it is crucial to understand how these technologies are perceived by organizational members to ensure their effective implementation. Therefore, the purpose of this paper is to gain insights into employees' appraisals toward AIRA in the workplace in service settings.
Design/methodology/approach: A quantitative approach was adopted, with data being collected via a self-administered online survey from 369 service employees in Poland. The sample was randomly split into two subsamples. The first subsample was used for exploratory factor analysis (EFA), while the second subsample was used for confirmatory factor analysis (CFA).
Findings: The results of the EFA and CFA indicate that the AIRA appraisal scale is multidimensional and consists of three subscales: resource appraisal toward AIRA, challenge appraisal toward AIRA, and hindrance appraisal toward AIRA. AIRA in the workplace is perceived by service employees predominantly as a resource, then as a challenge, and lastly as a hindrance.
Research limitations/implications: The data collection was based on the non-random sampling technique and the questionnaire was disseminated among employees of selected service industries in Poland, which limits the generalizability of the findings beyond the specific context of this research.
Originality/value: Drawing upon the refined job demands-resources (JD-R) model, the study provides a comprehensive and nuanced perspective on employees' perceptions of AIRA integration into service delivery processes. The proposed perspective is better suited to explain employees' attitudinal and behavioral reactions to AIRA-driven changes in the work environment.
Keywords: artificial intelligence, robotics and automation (AIRA), workplace, appraisal, service employees, factor analysis.
Category of the paper: Research paper.

1. Introduction

In recent decades, the implementation of digital technologies, particularly artificial intelligence, robotics, and automation (AIRA), has profoundly transformed service workplaces and the nature of service jobs. A growing number of service organizations are opting to adopt AIRA with the objectives of reducing costs, enhancing operational efficiency, improving the customer experience, and optimizing the decision-making process (Buhalis et al., 2019; Borges et al., 2021). However, despite its increasing pervasiveness within service environments, research on service employees' attitudinal and behavioral reactions to AIRA adoption remains relatively scarce (Liang et al., 2022; Pereira et al., 2023; Hur, Shin, 2024). Furthermore, although some studies have highlighted the beneficial impacts of AIRA implementation on employees (e.g. Qiu et al., 2022; Li et al., 2024), the predominant focus of research has been on its detrimental consequences for work experiences and outcomes (e.g. Kong et al., 2021; Kang et al., 2024; Teng et al., 2024). A notable example of this approach is the concept of AIRA awareness, which – despite the neutrality of the term ”awareness” – has been widely used as a construct reflecting employees' concerns and commonly associated with job stress (e.g. Brougham, Haar, 2018; Zhou et al., 2024).

Researchers have posited that employees' perceptions of digital technologies exert a more substantial influence on predicting their work outcomes than the technology itself (Brougham, Haar, 2018; Ding, 2021). This assertion underscores the need to further explore AIRA appraisals in workplace context. Given the role of appraisals in shaping employees' attitudinal and behavioral responses, a comprehensive understanding of how intelligent technologies are perceived by organizational members is critical for developing effective strategies to facilitate AIRA adoption while concurrently mitigating risks and ensuring positive outcomes for employees. The purpose of the present paper is, therefore, to gain insights into employees' appraisals toward AIRA in the workplace in service settings.

To achieve the proposed purpose, the remainder of the paper is structured as follows. The next section delineates the job demands-resources (JD-R) model as the overarching framework for the study. Subsequent sections detail the methods employed and present the results obtained. Finally, the main findings are discussed, the limitations of the study are outlined and avenues for future research are suggested.

2. Theoretical grounding

A relevant framework to establish the theoretical foundation for AIRA appraisals in the workplace is the JD-R model (Demerouti et al., 2001; Bakker, Demerouti, 2017). The JD-R model is a unifying job design model that integrates various job stress and work motivation perspectives, elucidating the mechanisms through which individuals' workplace attitudes and behaviors are influenced by job characteristics (Bakker, Demerouti, 2017). These characteristics are properties of the work environment that can be classified into one of two broad categories: job demands and job resources. Job demands refer to the physical, psychological, social, or organizational aspects of the job that require sustained physical, cognitive, and/or emotional effort and are associated with certain physiological and/or psychological costs. Conversely, job resources refer to the physical, psychological, social, or organizational aspects of the job that are functional in achieving work-related goals, stimulate personal growth and development, and reduce job demands and the accompanying physiological and psychological costs (Demerouti et al., 2001).

Job demands and resources activate two distinct processes, namely a strain process and a motivation process. These processes give rise to divergent employees' attitudes and coping behaviors, yielding opposite effects on job performance. Specifically, job demands lead to work-related strain, as they deplete employees' physical, emotional, and cognitive resources; while job resources enhance work motivation, as they satisfy employees' basic psychological needs and foster dedication to work tasks by increasing the likelihood of successfully achieving one's work goals. Work-related strain has been shown to contribute to diminished job performance by diverting employees from work goals; in contrast, work motivation has been demonstrated to add to increased job performance by facilitating the adoption of goal-oriented behaviors. Finally, strain has been observed to perpetuate a loss cycle of maladaptive coping behaviors and job demands, which can further erode performance; meanwhile, motivation has been shown to initiate a gain cycle of proactive coping behaviors and job resources, thereby potentially enhancing performance (Bakker, Demerouti, 2017; Bakker et al., 2023).

An extension of the JD-R model (Crawford et al., 2010) posits that properties of the work environment falling under the job demand category are not homogeneous and can be further broken into two classes: threatening job demands (hindrances) and challenging job demands (challenges). Hindrances are defined as job demands that involve excessive or undesirable constraints that interfere with or inhibit an individual's ability to achieve valued goals. Conversely, challenges are defined as job demands that require effort but have the potential to engender feelings of fulfillment or achievement in an individual (Cavanaugh et al., 2000).

The proposed distinction is supported by cognitive appraisal theory (Lazarus, Folkman, 1984), which maintains that individuals, prior to implementing coping strategies, engage in primary and secondary appraisals when confronted with a novel situation. During a primary appraisal, individuals evaluate whether a particular encounter with the environment is relevant to their well-being and, if so, in what ways. When the encounter is deemed pertinent to the fulfillment of personal goals, values, or beliefs, a secondary appraisal ensues. At this stage, individuals assess their personal and situational resources, subsequently selecting actions that can be taken to overcome or prevent harm or to achieve benefit (Lazarus, Folkman, 1984). Encounters that are recognized to exceed one's resources are perceived as demands. Demands identified as thwarting goal attainment are appraised as threats (hindrances), whereas those identified as presenting an opportunity for gain are appraised as challenges (Crawford et al., 2010).

To summarize, according to the refined JD-R model, a strain process is initiated by all job demands, whether challenges or hindrances, because the increased effort associated with coping with demands results in resource depletion. A motivation process, however, is initiated both by job resources and challenging job demands, as they facilitate the achievement of valued goals and enhance the propensity to invest one's energy and abilities in the work task. In other words, while resources primarily impact job performance through a motivation pathway and hindrances primarily impact job performance through a strain pathway, challenges may contribute to job performance simultaneously through both pathways (Crawford et al., 2010; Van den Broeck et al., 2010).

It is important to note that employees' appraisals of specific work circumstances may not be uniform, as appraisals are subject to variation due to the unique characteristics of the individuals involved in this process. Furthermore, appraisal types are not inherently exclusive; a workplace situation may be, to varying degrees, interpreted in more than one way (Webster et al., 2011; Searle, Auton, 2015). Given this variability, using *a priori* categorizations of appraisals is deemed an invalid approach, as it does not accurately reflect employees' perceptions. Ultimately, it is the appraisals of situations, not the situations themselves, that explain employees' attitudinal and behavioral reactions.

In light of the aforementioned arguments, we posit that the implementation of AIRA in the workplace may be appraised by employees as a facilitating, challenging, or threatening work circumstance. Employees may perceive AIRA integration into service operations as a job resource because it can enhance their efficiency and effectiveness in work roles (Marinova et al., 2017) by eliminating some of the mundane and tedious tasks, thereby freeing up time to engage in more rewarding ones (Kassa, Worku, 2025), assisting in creative problem-solving (Jia et al., 2024), and reducing both physical and psychological workload and fatigue (Qiu et al., 2022). The adoption of AIRA in a service organization may be interpreted as a job challenge since employees may view the resulting pressure as an opportunity to adapt to the rapidly evolving work environment in the digital age (Liang et al., 2022), which positively affects their motivation to acquire new knowledge and skills (Ding, 2021) and fosters the satisfaction of their need for competence (Tan et al., 2024). Finally, AIRA implementation in service delivery processes may be viewed as a job hindrance due to its capacity to evoke fear of job replacement among employees (Brougham, Haar, 2018), which leads to an increased sense of job insecurity (Huang, Gursoy, 2024) and triggers workplace anxiety (Liu et al., 2024). Consequently, AIRA can be considered a double-edged sword, with the potential to result in a motivational and a taxing experience and, thereby, to enhance and impair employees' performance.

3. Methods

3.1. Instrument development

The AIRA appraisal scale was developed specifically for this study. To generate items that capture the specified domain of the construct under investigation, we conducted an extensive literature review on the effects of AIRA adoption on work outcomes at the individual level. This process was guided by the conceptual framework of the JD-R model proposed by Demerouti, Bakker, Nachreiner, and Schaufeli (2001) and later extended by Crawford, LePine, and Rich (2010). Based on the aforementioned review, we created a preliminary instrument consisting of 24 items. The item pool encompassed a range of consequences associated with the implementation of AIRA in the workplace, reflecting its appraisal as a resource, challenge, and hindrance.

A team of two researchers audited the initial list and evaluated each item based on its alignment with the conceptual interpretation of the construct. This procedure resulted in final list of 18 items that were subsequently included in the survey (Appendix). To ensure the relevance, clarity, and comprehensiveness of the questions and response options, we conducted a pre-test. Two experts in the field and five individuals representing the research population completed the questionnaire and provided feedback on its content. The pre-test revealed no significant issues related to wording or comprehension.

The final version of the survey instrument used in this study consisted of two sections. The first section gathered participants' opinions on the consequences of AIRA implementation in the workplace. All items were measured using a seven-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (7). The second section collected socio-demographic and job-related data. Additionally, to enhance data quality, an attention check was incorporated, prompting participants to select a specific response option from the provided scale.

3.2. Participants and procedure

The target population in the present study were individuals working in the service industry. Specifically, we recruited employees from the accommodation, food and beverages, recreation, entertainment, and arts sectors in Poland. For data collection, an online survey was administered by an external company, Ariadna, which is the largest independent nationwide research panel in Poland. This company is recognized for its commitment to the highest standards of scientific rigor and integrity in its survey methodology.

The data was collected over the course of one month, in August 2024, and the respondents were selected using a non-probability sampling technique, namely voluntary response sampling. A total of 524 individuals participated in the study; however, 155 questionnaires were excluded from the analysis. Of these, 98 were excluded due to incorrect responses to the attention check question, 23 due to an extremely short completion time (less than one minute), and 34 due to a lack of variability in responses to items measuring the key variable. Consequently, the final analysis included the opinions of 369 respondents.

The majority of participants were female (65%), with the predominant age group being between 21 and 30 years old (34%). Most of the sample reported holding a higher education degree (52%). The respondents primarily occupied non-managerial positions (68%), held permanent employment contracts (51%), and had between one and three years of experience at their current workplace (25%). The largest proportion of the surveyed individuals worked in organizations with 10 to 49 employees (41%) and were employed in accommodation, food and beverages sector (59%) (Table 1).

Table 1.
Respondent profile (N = 369)

Variable	Category	N	%
Gender	Female	241	65.3
	Male	128	34.7
Age	20 years old or younger	26	7.0
	21-30 years old	127	34.4
	31-40 years old	120	32.5
	41-50 years old	72	19.5
	Over 50 years old	24	6.5
Education	Tertiary	192	52.0
	Secondary	155	42.0
	Vocational	20	5.4
	Primary	2	0.5
Job position	Managerial	118	32.0
	Non-managerial	251	68.1
Employment contract	Permanent contract	188	50.9
	Fixed-term contract	63	17.1
	Self-employment	32	8.7
	Mandate contract/ contract for specific work	84	22.7
	Other	2	0.5
Job tenure in current workplace	Less than three months	38	10.3
	Over 3 months to 1 year	60	16.3
	Over 1 year to 3 years	91	24.7
	Over 3 years to 5 years	62	16.8
	Over 5 years to 10 years	65	17.6
	Over ten years	53	14.4
Workplace size	Less than 10 employees	93	25.2
	10–49 employees	150	40.7
	50-249 employees	88	23.8
	Over 249 employees	38	10.3
Type of economic activity	Accommodation, food and beverages sector	216	58.5
	Recreation, entertainment, and arts sector	153	41.5

3.3. Data analysis

Data analysis was conducted using SPSS 29.0 and AMOS 26.0 statistical software. We performed both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to ascertain the factorial structure that would best represent service employees' appraisals toward AIRA in the workplace. Following established guidelines (Costello, Osborne, 2005; Worthington, Whittaker, 2006), the sample of 369 employees was randomly split in half – the first half was used for EFA (N = 185), while the second half was used for CFA (N = 184). The subsample sizes in both cases satisfied the criterion of a 10:1 subject-per-item ratio (Hair et al., 2014). Prior to conducting factor analyses, we checked the items for skewness and kurtosis in both subsamples separately. Neither the skewness nor the kurtosis coefficients exceeded the absolute value of 1.0, suggesting that the assumptions of a normal distribution were not violated (Hair et al., 2014).

We evaluated the suitability of the data for EFA using Bartlett's test of sphericity, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy, and the single-variable measure of sampling adequacy (MSA). Statistical significance of Bartlett's test at a probability of 0.05 or less, a KMO value of 0.60 or higher, and MSA values of 0.50 or higher are indicative of sufficiently large relationships within the data set of interest, thereby justifying the implementation of factor analysis (Kaiser, Rice, 1974).

EFA was conducted employing the maximum likelihood extraction method followed by oblique rotation (Promax with Kaiser normalization). The decision regarding the number of factors to retain was made on the basis of eigenvalues, with factors exhibiting an initial eigenvalue of 1.0 or higher being kept. Additionally, we examined a scree plot to identify the inflection point in the curve connecting the eigenvalues of the factors, as well as percentage of variance explained, with solutions accounting for at least 60% of the total variance being deemed acceptable (Hair et al., 2014).

To evaluate scale items, we applied the following criteria: magnitude of item loadings, presence of cross loadings, and level of item communalities. For retaining an item, it is recommended that it load onto its primary factor above 0.40, load onto alternative factors below 0.30, and demonstrate a minimum difference of 0.20 between its primary and alternative factor loadings (Howard, 2016). Additionally, all items were assessed to ensure the deletion of those exhibiting communalities below 0.40 (Costello, Osbourne, 2005). To determine the reliability of the subscales, internal consistency was measured using Cronbach's alpha coefficient. The accepted standard for this index is 0.70 or above (Hair et al., 2014).

The factors extracted by EFA procedures were utilized as a base for creating the measurement model to be validated using CFA procedures. CFA was performed employing the maximum likelihood estimation method. The overall fit of the model was assessed with the following indices: the ratio of chi-square to degrees of freedom (χ^2/df), the comparative fit index (CFI), the Tucker–Lewis index (TLI), the incremental fit index (IFI), the standardized root mean square residual (SRMR), the root mean square error approximation (RMSEA), and the p-value for a close fit (PCLOSE). The model fit is considered to be good if χ^2/df falls below 2 (Tabachnick, Fidell, 2014), CFI, TLI and IFI exceed 0.95 (Hu, Bentler, 1999), SRMR is below 0.08 (Hu, Bentler, 1999), RMSEA is lower than 0.08 (MacCallum et al., 1996), and PCLOSE is greater than 0.05 (Schermelleh-Engel et al., 2003). In addition, the Akaike Information Criterion (AIC) and the Bayes Information Criterion (BIC) were employed to compare the alternative measurement models. For AIC and BIC, smaller values are indicative of better fitting models (Tabachnick, Fidell, 2014).

The next step involved assessing the scale's reliability and validity. To determine the reliability of the constructs, composite reliability (CR) scores were computed. The lower limit of acceptability for this index is 0.70 (Hair et al., 2014). In accordance with the recommendations by MacKenzie et al. (2011), the constructs' validity was ascertained through the content, convergent, and discriminant validity. The content validity was established based on a literature review that was used to create the items and on ratings of expert judges on the items' correspondence to the conceptually defined dimensions. Convergent validity was assessed by evaluating the magnitude and significance of loadings of indicators on their latent constructs, as well as by calculating the average variance extracted (AVE) in the indicators accounted for by the focal construct. A relationship with the latent construct that is significant and strong (above 0.60) (Bagozzi, Yi, 1988) and an AVE value greater than 0.50 (Fornell, Larcker, 1981) would suggest an adequate level of validity. Discriminant validity was determined by comparing the square root of AVE for each construct and the correlation coefficients between the focal construct and all the other constructs. Validity is established when the former exceeds the latter (Fornell, Larcker, 1981).

Based on the factor analyses results, we computed summated scores for each factor by averaging the included items. These scores were then utilized for the subsequent statistical analysis. Specifically, we employed a repeated measures analysis of variance and independent-samples t-tests to identify patterns of differences among the variables and among the subgroups of respondents.

4. Results

4.1. Exploratory factor analysis

Preliminary analysis showed that the data were suitable for EFA, as Bartlett's test of sphericity was significant ($\chi^2 = 2474.251$; df = 153; $p < 0.001$), a KMO value was greater than 0.60 (0.890), and the anti-image correlation matrix displayed MSA values above 0.50 for all items (0.710-0.951). We employed the maximum likelihood extraction method with Promax rotation (with Kaiser normalization), incorporating all 18 items of the AIRA appraisal scale.

The analysis indicated that the items reflected theoretically derived categories – one resource factor, one challenge factor, and one hindrance factor. All items demonstrated adequate loading on the intended construct (above 0.40), with the exception of one resource appraisal item and one challenge appraisal item, which exhibited substantial cross-loadings (above 0.30). Furthermore, an examination of item communalities revealed that one hindrance appraisal item had a communality coefficient of less than 0.40. Consequently, these three items were excluded from further analysis.

After scale purification, EFA was reiterated on the remaining 15 items. Once more, the factorability of the data was confirmed, as evidenced by a significant Bartlett's test of sphericity (χ^2 = 1902.274; df = 105; $p < 0.001$), a KMO value greater than 0.60 (0.869), and MSA values above 0.50 for all items (0.761-0.946). The maximum likelihood extraction method, followed by the Promax rotation with Kaiser normalization, was implemented, resulting in a three-factor solution. This solution was derived from initial eigenvalues (using Kaiser's criterion of 1), visual scree plot inspection, and amount of variance explained. Each of the three extracted factors comprised five items, collectively accounting for 64.34% of the total variance.

The communalities of all individual items ranged from 0.427 to 0.793, and the items exhibited adequate loading on the target factors (above 0.40) with no substantial cross-loadings. In particular, the loading values for the resource factor (F1) ranged from 0.589 to 0.935, for the challenge factor (F2) from 0.451 to 0.916, and for the hindrance factor (F3) from 0.649 to 0.822. Overall, the internal consistencies of the AIRA appraisal subscales were found to be high, with Cronbach's alpha coefficients consistently exceeding 0.70. Specifically, the alpha coefficients equaled 0.909 for the resource factor (F1), 0.881 for the challenge factor (F2), and 0.879 for the hindrance factor (F3). This finding substantiates the reliability of the constructs (Table 2).

Table 2.
Exploratory factor analysis results – development subsample (N = 185)

Item	Mean	Std Dev	Skewness	Kurtosis	Factor loading			Commu -nality
					F1	F2	F3	
AIRA2	4.58	1.545	-0.403	-0.177	0.674			0.611
AIRA3	4.36	1.396	-0.342	-0.043	0.786			0.739
AIRA4	4.26	1.500	-0.334	-0.200	0.935			0.772
AIRA5	3.95	1.475	-0.039	-0.226	0.772			0.653
AIRA6	4.30	1.473	-0.268	-0.013	0.589			0.652
AIRA7	4.23	1.296	-0.335	0.474		0.640		0.507
AIRA8	4.21	1.277	-0.234	0.478		0.848		0.733
AIRA9	4.18	1.393	-0.275	0.073		0.916		0.793
AIRA11	4.16	1.495	-0.133	-0.288		0.641		0.660
AIRA12	3.81	1.446	-0.091	-0.185		0.451		0.432
AIRA13	3.40	1.720	0.172	-0.850			0.770	0.610
AIRA14	3.25	1.586	0.392	-0.417			0.820	0.685
AIRA15	3.42	1.620	0.241	-0.568			0.822	0.709
AIRA16	3.39	1.672	0.309	-0.606			0.811	0.669
AIRA18	4.20	1.680	-0.202	-0.666			0.649	0.427
Cronbach's alpha					0.909	0.881	0.879	

Sum of squared loadings					5.863	3.087	0.702	
Variance explained (%)					39.083	20.580	4.677	

4.2. Confirmatory factor analysis

In order to determine whether the three-factor structure obtained on the development subsample using EFA could be confirmed on the validation subsample, we performed CFA. The goodness-of-fit statistics were evaluated based on the model in which all latent variables were correlated. An inspection of the goodness-of-fit indices for the proposed model suggests that it adequately represents the data, as χ^2 = 128.164, df = 72, χ^2/df = 1.780, CFI = 0.974, TLI = 0.961, IFI = 0.974, SRMR = 0.053, RMSEA = 0.065 (90% CI: 0.046-0.083), and PCLOSE = 0.087.

The standardized factor loading magnitudes for all 15 items were satisfactory (above 0.60), with all p-values below 0.001. Specifically, the loading values for the resource factor ranged from 0.766 to 0.928, for the challenge factor from 0.699 to 0.891, and for the hindrance factor from 0.602 to 0.847. The AVE exceeded 0.50 in all cases, corresponding to 0.722 for the resource factor, 0.703 for the challenge factor, and 0.598 for the hindrance factor. Convergent validity was thus ensured. Discriminant validity was confirmed as well, given that the square root of AVE for each construct was higher than the correlation coefficients between the focal factor and all the other factors (the correlation coefficients ranged from 0.040 to 0.731). The CR score for each of the AIRA appraisal subscale was greater than the threshold value of 0.70, attaining 0.928 for the resource factor, 0.922 for the challenge factor, and 0.880 for the hindrance factor, which indicate good construct reliability (Table 3).

Table 3.
Confirmatory factor analysis results – validation subsample (N = 184)

Factor/item	Mean	Std Dev	Skewness	Kurtosis	Factor loading	CR	AVE
AIRA-Resource						0.928	0.722
AIRA2	4.39	1.503	-0.319	-0.080	0.796		
AIRA3	4.18	1.454	-0.220	-0.220	0.836		
AIRA4	4.24	1.510	-0.423	-0.111	0.766		
AIRA5	3,92	1.592	-0.087	-0.428	0.912		
AIRA6	4.05	1.562	-0.291	-0.364	0.928		
AIRA-Challenge						0.922	0.703
AIRA7	3.99	1.441	-0.424	0.012	0.824		
AIRA8	3.99	1.519	-0.275	-0.278	0.877		
AIRA9	3.85	1.604	-0.175	-0.472	0.887		
AIRA11	3.91	1.583	-0.282	-0.550	0.891		
AIRA12	3.80	1.641	-0.177	-0.538	0.699		
AIRA-Hindrance						0.880	0.598
AIRA13	3.32	1.749	0.161	-0.998	0.798		
AIRA14	3.16	1.684	0.358	-0,751	0.801		
AIRA15	3.33	1.677	0.258	-0.663	0.847		
AIRA16	3.24	1.626	0.284	-0.631	0.796		
AIRA18	4.22	1.681	-0.334	-0.520	0.602		

Note: All factor loadings are significant at $p < 0.001$.

The goodness of fit of the proposed model was compared against three other models: model A, in which all 15 items loaded onto one factor; model B, in which 10 items loaded onto the resource-challenge factor and 5 items onto the hindrance factor; and model C, in which 5 items loaded onto the resource factor and 10 items onto the challenge-hindrance factor. The proposed model provided a better fit to the data than alternative ones, as indicated by lower values of χ^2/df, SRMR, RMSEA, AIC, and BIC, and higher values of CFI, TLI, IFI, and PCLOSE (Table 4).

Table 4.
Fit indices for the proposed model and alternative models – validation subsample (N = 184)

Model	χ^2/df	CFI	TLI	IFI	SRMR	RMSEA	PCLOSE	AIC	BIC
Base model – three factors	1.780	0.974	0.961	0.974	0.053	0.065	0.087	224.16	378.48
Model A – one factor	10.003	0.618	0.555	0.621	0.187	0.222	0,000	960.28	1056.73
Model B – two factors	4.721	0.844	0.816	0.845	0.075	0.143	0.000	428.21	581.87
Model C – two factors	7.985	0.707	0.655	0.709	0.180	0.195	0.000	772.67	872.33

Note: In model B resource and challenge appraisals were combined, in model C challenge and hindrance appraisals were combined.

In summary, the results of the EFA and CFA indicate that the AIRA appraisal scale presents an adequate fit with the observed data and demonstrates sufficient reliability and validity.

4.3. Variations in the AIRA appraisals

To examine whether the AIRA appraisals differ by dimension and employee subgroup, we analyzed the summated scales, which were created by averaging the scores of the items measuring each construct. The descriptive statistics indicate that AIRA in the workplace is primarily perceived by employees as a resource, followed by a challenge, and lastly as a hindrance (Table 5).

Table 5.
Descriptive statistics and correlations – full sample (N = 369)

Variable	Mean	Std Dev	Skewness	Kurtosis	Correlations		
					1	2	3
AIRA-Resource	4.22	1.305	-0.306	0.208	---		
AIRA-Challenge	4.01	1.255	-0.404	0.395	0.735***	---	
AIRA-Hindrance	3.49	1.373	0.124	-0.458	-0.008	0.073	---

Note: Significant at * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed).

A one-way repeated measures analysis of variance with a Greenhouse-Geisser correction showed a statistically significant difference among the employees' appraisals toward AIRA ($F(1.385,509.552) = 40.506$, $p < 0.001$, $\eta_p^2 = 0.099$). Post-hoc comparisons with Bonferroni corrections revealed significant pair-wise differences between resource and challenge appraisals, with a mean difference of 0.210 ($p < 0.001$), between resource and hindrance appraisals, with a mean difference of 0.729 ($p < 0.001$), and between challenge and hindrance appraisals, with a mean difference of 0.519 ($p < 0.001$).

The findings of a series of independent-samples t-tests demonstrate that the variations in how diverse subgroups of employees appraised AIRA in the workplace are predominantly attributable to the respondents' overall digital competences and AIRA knowledge. Individuals who self-identify as more tech-savvy and well-informed about AIRA tend to regard AIRA as both a resource and a challenge more frequently than their colleagues. Notably, ratings concerning the perception of AIRA as a hindrance remained unaffected by these features (Table 6).

Table 6.
Variations in the appraisals – full sample (N = 369)

Variable	AIRA-Resource	AIRA-Challenge	AIRA-Hindrance
Female	4.15 (1.248)	3.95 (1.197)	3.50 (1.387)
Male	4.36 (1.400)	4.13 (1.356)	3.49 (1.352)
t-value	-1.445	-1.244	0.022
30 years old or younger	4.26 (1.273)	4.00 (1.223)	3.57 (1.422)
Over 30 years old	4.20 (1.329)	4.03 (1.280)	3.44 (1.338)
t-value	0.472	-0.208	0.859
Tertiary	4.35 (1.231)	4.09 (1.163)	3.47 (1.356)
Secondary or lower	4.08 (1.370)	3.93 (1.347)	3.52 (1.395)
t-value	2.015^{*}	1.229	-0.326
Managerial	4.32 (1.405)	4.21 (1.391)	3.42 (1.423)
Non-managerial	4.18 (1.255)	3.92 (1.178)	3.53 (1.351)
t-value	0.997	2.090^{*}	-0.693
Permanent contract	4.15 (1.301)	4.00 (1.264)	3.63 (1.288)
Non-permanent contract	4.30 (1.308)	4.02 (1.250)	3.35 (1.446)
t-value	-1.084	-0.145	1.924
Less than 50 employees	4.21 (1.346)	3.98 (1.276)	3.46 (1.465)
50 employees or more	4.26 (1.227)	4.08 (1.217)	3.57 (1.177)
t-value	-0.341	-0.742	-0.780
Accommodation, food and beverages	4.19 (1.324)	4.01 (1.313)	3.52 (1.415)
Recreation, entertainment, arts	4.27 (1.280)	4.01 (1.173)	3.46 (1.315)
t-value	-0.553	-0.011	0.402
High AIRA knowledge	4.69 (1.422)	4.51 (1.246)	3.32 (1.399)
Low AIRA knowledge	4.04 (1.208)	3.82 (1.206)	3.56 (1.359)
t-value	4.156^{***}	4_926^{***}	-1.524
High digital competences	4.44 (1.301)	4.22 (1.250)	3.49 (1.444)
Low digital competences	3.84 (1.225)	3.64 (1.180)	3.50 (1.243)
t-value	4.366^{***}	4.352^{***}	-0.054

Note: Values in parentheses are standard deviations. Significant at * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (two-tailed).

5. Discussion

There is a broad consensus that intelligent technologies are increasingly reshaping service industries, causing a profound transformation in how organizations function (Huang, Rust, 2018). As AIRA becomes more pervasive in organizational operations, service employees, among other stakeholders, are directly influenced by its adoption. The present study was designed to provide insights into employees' appraisals toward AIRA in the workplace in service environments. To this end, we developed and validated the AIRA appraisal scale, which consists of three subscales: resource appraisal toward AIRA, challenge appraisal toward AIRA, and hindrance appraisal toward AIRA.

A key contribution of this work to the existing body of knowledge lies in offering of a more comprehensive and nuanced view of how employees perceive AIRA adoption into service organizations. First, our investigation lends further credence to the refined classification of job characteristics in the JD-R model proposed by Crawford, LePine, and Rich (2010). Specifically, the study's results provided support for the differentiation between the three appraisals categories. Both the explanatory and confirmatory stages of the analysis led to the conclusion that a tripartite solution presented an adequate fit with the observed data. Furthermore, confirmatory analysis revealed that the fit of an alternative two-factor structure, consistent with the original JD-R model, was inferior compared to the three-factor one.

Second, distinct from previous research grounded in the JD-R model, we refrained from making *a priori* categorizations of individuals' appraisals of workplace conditions. Instead, based on the premise that appraisals are functions of a specific set of environmental conditions and characteristics of the person engaged in the appraising process (Lazarus, Folkman, 1984), we opted to measure directly employees' appraisals of AIRA-driven work circumstances. In this regard, our position aligns with that of Webster, Beehr, and Love (2011) and Searle and Auton (2015), who argue that it is the appraisals that serve as the underlying mechanism linking workplace situations to outcomes and that situations may not be appraised consistently by different individuals and across different settings.

Third, unlike the majority of the prior empirical work that addressed AIRA's effects on work experiences and outcomes, our study does not ascertain that the implementation of AIRA is exclusively a job demand producing work stress. We propose that a scenario in which AIRA adoption is recognized as a circumstance exceeding employees' resources and requiring coping efforts is an option, not a certainty. In fact, our results indicated that employees perceive AIRA in the workplace mostly as a resource and least as a hindrance. This finding resonates to some extent with the theory of AI job replacement put forth by Huang and Rust (2018). This theory is based on the four intelligences framework (mechanical, analytical, intuitive, and empathetic) and asserts that AI job replacement occurs essentially at the task level, with mechanical tasks being replaced first, followed by analytical tasks, intuitive tasks, and empathetic tasks. Service jobs requiring frequent and extensive interactions with customers are less prone to the replacement by AIRA due to their heavy reliance on intuitive and empathetic intelligence. Tasks involving intuitive and empathetic skills are more difficult to be mimicked by intelligent technology because they require holistic and contextual understanding, along with a high level of social and emotional presence (Huang, Rust, 2018). In summary, when successful service provision demands a strong human touch, AIRA contributes predominantly to job augmentation rather than replacement, thereby being perceived as a facilitating rather than threatening work circumstance.

The findings of this study offer practical implications for service industry businesses. Given the multifaceted impact of AIRA on performance, with varying pathways in play, it is crucial for managers to understand employees' appraisals toward AIRA in the workplace. Indeed, the appraisals of work circumstances rather than work circumstances themselves have a critical implication for employees' attitudinal and behavioral responses. Depending on appraisals, AIRA integration into organizational operations has the potential to be a double-edged sword. On the one hand, it can be a motivational force, leading to favorable outcomes; on the other hand, it can be a strain-related experience, resulting in unfavorable outcomes. By understanding appraisals, managers can take targeted actions to enhance the motivation pathway and mitigate the strain pathway. These actions can assist service organizations in formulating and implementing effective strategies and practices for the adoption of intelligent technologies.

The study demonstrated that individuals who perceive themselves as more technologically adept and more knowledgeable about AIRA are more inclined to regard AIRA as a resource compared to their colleagues. Hence, a strongly recommended initiative employers could consider is investing in supporting their employees' digital competencies. Specifically, organizations should implement training programs designed to enhance employees' knowledge and skills on digital technologies in general and intelligent technologies in particular. Also, training programs focused on developing intuitive and empathetic skills are highly advised, as these skills are more difficult for intelligent technology to replicate. Such programs equip employees with personal resources that can be utilized to counteract the demands imposed by challenging or threatening work circumstances, thereby mitigating the potential negative effects of AIRA implementation.

The present study was conducted with meticulous attention to rigor; nevertheless, several limitations merit consideration. First, we relied on single-source data and the variable of interest was based on self-reported measures. Hence, there is a possibility for common method bias to occur, particularly the response consistency effect. In future studies, data collection should be expanded to include multiple sources to shed more light on the constructs under investigation. Second, we employed a non-probability sampling technique and an online survey to gather data, which may have resulted in a biased sample. Furthermore, the questionnaire was disseminated among employees of selected service industries in Poland. This restriction limits the generalizability of the findings beyond the specific context of this research. Therefore, replication studies are required to ascertain whether the results of the present research are industry- and country-specific or universally observed in service organizations. Finally, we focused exclusively on employees' appraisals toward AIRA, but did not account for the work-related antecedents and effects of these appraisals. Consequently, it is recommended that future studies investigate more complex linkages covering both driving and outcome variables. Particularly, it would be of value to examine organizational determinants of AIRA adoption perceptions and its impact on job performance, including the role of mediators along motivation and strain pathways. Such an examination could result in an enriched understanding of the mechanisms through which AIRA appraisals influence service employee performance.

6. Summary

Despite the growing body of research examining the links between AIRA adoption and work-related outcomes, studies that employ individual-level analysis remain underrepresented (Pereira et al., 2023). The present study aims to address this gap by enhancing the understanding of employees' appraisals toward AIRA in the workplace in service settings. The primary contribution of our investigation is to provide a comprehensive and nuanced perspective on employees' perceptions of AIRA integration into service delivery processes. The proposed perspective is better suited to explain employees' attitudinal and behavioral reactions to the changing work environment driven by AIRA, which is crucial for developing strategies to successfully integrate intelligent technologies within service organizations.

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References

1. Bagozzi, R.P., Yi, Y. (1988). On the evaluations of structural equation models. *Journal of the Academy of Marketing Science, Vol. 16, No. 1*, pp. 74-94. doi: 10.1007/978-3-319-16507-3
2. Bakker, A.B., Demerouti, E. (2017). Job demands–resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, Vol. 22, No. 3,* pp. 273-285. doi: 10.1037/ocp0000056
3. Bakker, A.B., Demerouti, E., Sanz-Vergel, A. (2023). Job demands–resources theory: Ten years later. *Annual Review of Organizational Psychology and Organizational Behavior, Vol. 10,* pp. 25-53. doi: 10.1146/annurev-orgpsych-120920-053933
4. Borges, A.F.S., Laurindo, F.J.B., Spínola, M.M., Gonçalves, R.F., Mattos, C.A. (2021). The strategic use of artificial intelligence in the digital era: Systematic literature review and future research directions. *International Journal of Information Management, Vol. 57,* Art. 2102225. doi: 10.1016/j.ijinfomgt.2020.102225
5. Brougham, D., Haar, J. (2018). Smart technology, artificial intelligence, robotics, and algorithms (STARA): Employees' perceptions of our future workplace. *Journal of Management and Organization, Vol. 24, No. 2,* pp. 239-257. doi: 10.1017/jmo.2016.55
6. Buhalis, D., Harwood, T., Bogicevic, V., Viglia, G., Beldona, S., Hofacker, C. (2019). Technological disruptions in services: Lessons from tourism and hospitality. *Journal of Service Management, Vol. 30, No. 4,* pp. 484-506. doi: 10.1108/JOSM-12-2018-0398
7. Cavanaugh, M.A., Boswell, W.R., Roehling, M.V., Boudreau, J.W. (2000). An empirical examination of self-reported work stress among U.S. managers. *Journal of Applied Psychology, Vol. 85, No. 1,* pp. 65-74. doi: 10.1037/0021-9010.85.1.65
8. Costello, A.B., Osbourne, J.W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research and Evaluation, Vol. 10, No. 7*, pp. 1-9. doi: 10.1.1.110.9154
9. Crawford, E.R., LePine, J.A., Rich, B.L. (2010). Linking job demands and resources to employee engagement and burnout: A theoretical extension and meta-analytic test. *Journal of Applied Psychology, Vol. 95, No. 5,* pp. 834-848. doi: 10.1037/a0019364
10. Demerouti, E., Bakker, A.B., Nachreiner, F., Schaufeli, W.B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology, Vol. 86, No. 3*, pp. 499-512. doi: 10.1037/0021-9010.86.3.499
11. Ding, L. (2021). Employees' challenge-hindrance appraisals toward STARA awareness and competitive productivity: A micro-level case. *International Journal of Contemporary Hospitality Management, Vol. 33, No. 9,* pp. 2950-2969. doi: 10.1108/IJCHM-09-2020-1038

12. Fornell, C., Larcker, D.F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research, Vol. 18, No. 1,* pp. 39-50. doi: 10.2307/3151312
13. Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E. (2014). *Multivariate data analysis* (7th ed.). Pearson Education.
14. Howard, M.C. (2016). A review of exploratory factor analysis decisions and overview of current practices: What we are doing and how can we improve? *International Journal of Human-Computer Interaction, Vol. 32,* pp. 51-62. doi: 10.1080/10447318.2015.1087664
15. Hu, L.T., Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, Vol. 6, No. 1,* pp. 1-55. doi: 10.1080/10705519909540118
16. Huang, M.H., Rust, R.T. (2018). Artificial intelligence in service. *Journal of Service Research, Vol. 21, No. 2*, pp. 155-172. doi: 10.1177/1094670517752459
17. Huang, Y., Gursoy, D. (2024). How does AI technology integration affect employees' proactive service behaviors? A transactional theory of stress perspective. *Journal of Retailing and Consumer Services, Vol. 77,* Art. 103700. doi: 10.1016/j.jretconser.2023.103700
18. Hur, W.-M., Shin, Y. (2024). Service employees' STARA awareness and proactive service performance. *Journal of Services Marketing, Vol. 38, No. 4,* pp. 426-442. doi: 10.1108/JSM-03-2023-0115
19. Jia, N., Luo, X., Zheng, F., Liao, C. (2024). When and how artificial intelligence augments employee creativity. *Academy of Management Journal, Vol. 67, No. 1,* pp. 5-32. doi: 10.5465/amj.2022.0426
20. Kaiser, H.F., Rice, J. (1974). Little Jiffy, Mark IV. *Educational and Psychological Measurement, Vol. 34, No. 1,* pp. 111-117. doi: 10.1177/001316447403400115
21. Kang, J., Shin, H., Kang, C. (2024). Hospitality labor leakage and dynamic turnover behaviors in the age of artificial intelligence and robotics. *Journal of Hospitality and Tourism Technology, Vol. 15, No. 5,* pp. 916-933. doi: 10.1108/JHTT-12-2023-0411
22. Kassa, B.Y., Worku, E.K. (2025). The impact of artificial intelligence on organizational performance: The mediating role of employee productivity. *Journal of Open Innovation: Technology, Market, and Complexity, Vol. 11, No. 1,* Art. 100474. doi: 10.1016/j.joitmc.2025.100474
23. Kong, H., Yuan, Y., Baruch, Y., Bu, N., Jiang, X., Wang, K. (2021). Influences of artificial intelligence (AI) awareness on career competency and job burnout. *International Journal of Contemporary Hospitality Management, Vol. 33, No. 2,* pp. 717-734. doi: 10.1108/IJCHM-07-2020-0789
24. Lazarus, R.S., Folkman, S. (1984). *Stress, appraisal and coping*. Springer.
25. Li, W., Qin, X., Yam, K.C., Deng, H., Chen, C., Dong, X., Jiang, L., Tang, W. (2024). Embracing artificial intelligence (AI) with job crafting: Exploring trickle-down effect and

employees' outcomes. *Tourism Management, Vol. 104,* Art. 104935. doi: 10.1016/j.tourman.2024.104935
26. Liang, X., Guo, G., Shu, L., Gong, Q., Luo, P. (2022). Investigating the double-edged sword effect of AI awareness on employee's service innovative behavior. *Tourism Management, Vol. 92,* Art. 104564. doi: 10.1016/j.tourman.2022.104564
27. Liu, Y., Li, Y., Song, K., Chu, F. (2024). The two faces of artificial intelligence (AI): Analyzing how AI usage shapes employee behaviors in the hospitality industry. *International Journal of Hospitality Management, Vol. 122,* Art. 103875. doi: 10.1016/j.ijhm.2024.103875
28. MacCallum, R.C., Browne, M.W., Sugawara, H.M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods, Vol. 1, No. 2,* pp. 130-149. doi: 10.1037/1082-989X.1.2.130
29. Mackenzie, S.B., Podsakoff, P.M., Podsakoff, N.P. (2011). Construct measurement and validation procedures in mis and behavioral research: Integrating new and existing techniques. *MIS Quarterly, Vol. 35, No. 2,* pp. 293-334. doi: 10.2307/23044045
30. Marinova, D., de Ruyter, K., Huang, M., Meuter, M. Challagalla, G. (2017). Getting smart: Learning from technology-empowered frontline interactions. *Journal of Service Research, Vol. 20, No. 1,* pp. 29-42. doi: 10.1177/1094670516679273
31. Pereira, V., Hadjielias, E., Christofi, M., Vrontis, D. (2023). A systematic literature review on the impact of artificial intelligence on workplace outcomes: A multi-process perspective. *Human Resource Management Review, Vol. 33, No. 1*, Art. 100857. doi: 10.1016/j.hrmr.2021.100857
32. Qiu, H., Li, M., Bai, B., Wang, N., Li, Y. (2022). The impact of AI-enabled service attributes on service hospitableness: The role of employee physical and psychological workload. *International Journal of Contemporary Hospitality Management, Vol. 34, No. 4,* pp. 1374-1398. doi: 10.1108/IJCHM-08-2021-0960
33. Schermelleh-Engel, K., Moosbrugger, H., Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, Vol. 8, No. 2,* pp. 23-74. doi: 10.23668/psycharchives.12784
34. Searle, B.J., Auton, J.C. (2015). The merits of measuring challenge and hindrance appraisals. *Anxiety, Stress and Coping, Vol. 28, No. 2,* pp. 121-143. doi: 10.1080/10615806.2014.931378
35. Tabachnick, B.G., Fidell, L.S. (2014). *Using multivariate statistics* (6th ed.). Pearson Education.
36. Tan, K.L., Gim, G.C.W., Hii, I.S.H., Zhu, W. (2024). STARA fight or flight: A two-wave time-lagged study of challenge and hindrance appraisal of STARA awareness on basic psychological needs and individual competitiveness productivity among hospitality

employees. *Current Issues in Tourism, Vol. 27, No. 13,* pp. 2151-2169. doi: 10.1080/13683500.2023.2224550

37. Teng, R., Zhou, S., Zheng, W., Ma, C. (2024). Artificial intelligence (AI) awareness and work withdrawal: Evaluating chained mediation through negative work-related rumination and emotional exhaustion. *International Journal of Contemporary Hospitality Management, Vol. 36, No. 7,* pp. 2311-2326. doi: 10.1108/IJCHM-02-2023-0240
38. Van den Broeck, A., De Cuyper, N., De Witte, H., Vansteenkiste, M. (2010). Not all job demands are equal: Differentiating job hindrances and job challenges in the job demands-resources model. *European Journal of Work and Organizational Psychology, Vol. 19, No. 6,* pp. 735-759. doi: 10.1080/13594320903223839
39. Webster, J.R., Beehr, T.A., Love, K. (2011). Extending the challenge-hindrance model of occupational stress: The role of appraisal. *Journal of Vocational Behavior, Vol. 79, No. 2,* pp. 505–516. doi: 10.1016/j.jvb.2011.02.001
40. Worthington, R.L., Whittaker, T.A. (2006). Scale development research: A content analysis and recommendations for best practices. *The Counseling Psychologist, Vol. 34, No. 6,* pp. 806-838. doi:10.1177/0011000006288127
41. Zhou, S., Yi, N., Rasiah, R., Zhao, H., Mo, Z. (2024). An empirical study on the dark side of service employees' AI awareness: Behavioral responses, emotional mechanisms, and mitigating factors. *Journal of Retailing and Consumer Services, Vol. 79,* Art. 103869. doi: 10.1016/j.jretconser.2024.103869

Appendix

Table 7.
Item symbols and item descriptions

Item symbol	Item
AIRA1*	AIRA will take over mundane tasks from me at work.
AIRA2	AIRA will eliminate a lot of repetitive and tedious work for me.
AIRA3	Thanks to AIRA, I will be able to focus on more rewarding tasks at work.
AIRA4	AIRA will reduce workload for me.
AIRA5	AIRA will give me more freedom to decide how to go about doing the work.
AIRA6	Thanks to AIRA, I will perform my job duties more efficiently.
AIRA7	The job challenges generated by AIRA will help me to learn a lot.
AIRA8	AIRA will exert pressure on me to develop my skills.
AIRA9	The job challenges generated by AIRA will allow me to use a broad set of skills and abilities at work.
AIRA10*	Despite challenges, AIRA will support my professional achievements.
AIRA11	AIRA will require me to focus on more complex tasks at work.
AIRA12	AIRA will increase my job responsibilities.
AIRA13	I am personally worried that what I do now in my job will be able to be replaced by AIRA.
AIRA14	I am quite pessimistic about my future in this industry because employees could be replaced with AIRA.
AIRA15	AIRA will hinder any professional achievements I might have.
AIRA16	AIRA will result in job demands that will be too much for me to handle.
AIRA17*	AIRA will worsen interpersonal relations at work.
AIRA18	AIRA will one day make human employees obsolete.

Note: Items with * were dropped during EFA.

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GENDER INFLUENCE IN ASSESSING SPORTS POTENTIAL IN SHAPING THE IMAGE OF THE LUBLIN BRAND

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Purpose: The primary objective of this study is to identify and evaluate the factors influencing the creation of Lublin's sports image that are significant for women and men. The study addresses two research questions: (1) Which factors contributing to Lublin's sports potential are crucial for shaping its image depending on gender? (2) What is the hierarchical importance of dimensions that constitute Lublin's sports image according to the opinions of women and men?
Design/methodology/approach: The study utilizes Anholt's Hexagon City Brands framework. Data necessary to determine the hierarchy of key factors affecting the creation of Lublin's sports image were collected through an online survey (CAWI) administered to 204 residents of Lublin. Opinions were gathered on the six dimensions of the city brand hexagon: *presence*, *place*, *potential*, *pulse*, *people*, and *conditions*. The study tests three hypotheses: (H1) The hierarchy of factors determining the sports image of the city differs by gender; (H2) The dimension of presence contributes most significantly to shaping Lublin's sports image among men; (H3) The dimension of pulse contributes most significantly to shaping Lublin's sports image among women. The second hypothesis is conditioned by considering the results of the sports teams in the presence dimension, while the third hypothesis is based on the consideration of residents' sports activities.
Findings: The study reveals minor differences in the hierarchy of factors determining the sports image of Lublin in the opinions of women and men. The most significant dimension for the city, as rated by both genders, is *pulse* (with an average score of 4.05; 4.09 for women and 4.01 for men). The second strongest dimension is *conditions* (with an average score of 4.01; 4.10 for women and 3.92 for men). Following dimensions are ranked in order of average ratings: *potential* (3.63; 3.71 for women and 3.56 for men), *presence* (3.42; 3.42 for women and 3.43 for men), *place* (3.14; 3.24 for women and 3.07 for men), and *people* (2.97; 2.94 for women and 3.01 for men). Thus, Hypothesis H1 is accepted as the hierarchy of factors shaping the sports image of Lublin differs significantly by gender, with *conditions* and *pulse* being the most important dimensions for women and men respectively. Hypothesis H2 is rejected, as the most critical dimension shaping the sports image of Lublin for men is not *presence* but *pulse*. Similarly, hypothesis H3 is also rejected, as the most important dimension shaping the sports image of Lublin for women is *conditions* rather than *pulse* as hypothesized. If hypothesis H3

were subjected to falsification, assuming that both *pulse* and *conditions* are important for women, it could be accepted in this revised form.
Practical Implications: The findings of this study provide a basis for formulating practical recommendations concerning the development of Lublin's sports infrastructure, as these factors are rated as the most important for the city. There is also a need to cautiously avoid promoting sports clubs exclusively as city landmarks, as their operational ratings heavily depend on the current situation in their respective leagues. Furthermore, the authorities of Lublin should focus on attracting high-ranking sports events, both national and international, as they enjoy high approval from both genders, bring visibility to the city, boost the local economy, and help distinguish Lublin among other Polish metropolises. There is also a need for greater involvement of city authorities in the creation and development of sports infrastructure and promotion of sports activities in the city.
Originality/Value: This article presents an original study concerning the potential use of sports in shaping a city's image. Its originality lies in the novel application of Anholt's City Brand Hexagon for a selected set of factors (representing city'się identity) perceived by respondents to contribute to the image of the city.
Keywords: City image, City brand hexagon, Sports, Women and men.
Category of the paper: Research article.

1. Introduction

The concept of city image is one of the most frequently discussed categories in territorial marketing (Govers, 2009; Florek, Kavaratzis, 2014; Daszkiewicz, 2017; Boisen et al., 2018). This is due to its ability to aggregate all characteristics of a place under a common marketing narrative, serving as an informational umbrella (Romanowski, 2013). Over time, city branding has gained recognition for its ability to promote tangible and intangible benefits to tourists, investors, and even local residents (Gilboa et al., 2015; Oshimi, Harada, 2019).

Publications concerning place image have evolved over the years. Initially, publications attempted to transfer solutions assigned to the image of products and firms to cities. Subsequently, a unique methodology for city branding research emerged, accounting for the creation of umbrella brands or sub-brands, considering diverse target groups. One of the current areas of exploration is the study of residents who represent internal stakeholders of marketing entities responsible for the space they operate in (Yu et al., 2023). Furthermore, various marketing actions influencing both the overall and specific images are analyzed (Anholt, 2007; Romanowski et al., 2024).

One of the areas where a city can influence its image is through sports. The objective of this paper is to identify and evaluate the factors influencing the creation of Lublin's sports image that are significant for women and men. This paper addresses two research questions: (1) Which factors contributing to Lublin's sports potential are crucial for shaping its image, depending on gender? (2) What is the hierarchy of importance of the dimensions that constitute Lublin's sports image according to the opinions of women and men?

2. Literature Review

The role of gender in evaluating sports potential and its implications for brand development is a critical area of study, particularly in the context of regional and municipal branding efforts. In the case of Lublin, a city with a rich cultural and sporting history, the intersection of gender dynamics and sports potential significantly impacts its brand image and marketing strategies.

Gender serves as a lens through which sports potential is often perceived, with societal expectations and stereotypes influencing the evaluation process. For instance, men's sports tend to receive greater visibility and investment, often shaping public perception of athletic excellence and regional pride (Elling, Knoppers, 2005). Conversely, women's sports, though increasingly recognized, often face challenges related to funding, media representation, and societal attitudes (Waśkowski, 2022), which can limit their contribution to the overall sports-driven branding of a city like Lublin (Fink, 2015).

The sports sector contributes to Lublin's brand identity by promoting values such as teamwork, perseverance, and community engagement. Gender-inclusive approaches in assessing sports potential can enhance the city's image, projecting it as progressive and equitable (Darnell, Sparks, 2005). For example, promoting women's sports alongside men's not only diversifies the city's brand but also aligns with contemporary values of gender equality, potentially attracting a broader demographic of tourists, investors, and residents (Bruce, 2016).

Moreover, gender-inclusive policies in sports branding can foster community cohesion. By celebrating achievements across all genders, Lublin can position itself as a leader in championing diversity and inclusion, thereby strengthening its regional and global identity. The integration of both male and female athletes in city-sponsored events and promotional campaigns underscores a balanced and comprehensive representation of sports potential (Cooky et al., 2015). A deliberate focus on gender equity in sports can amplify the city's reputation, foster inclusivity, and ensure that its brand resonates with diverse audiences. Future research and strategic initiatives should prioritize gender-aware frameworks to maximize the impact of sports in municipal branding efforts.

To evaluate the effectiveness of activities related to image building, appropriate methods and measurement tools must be employed. These methods allow for the identification of both strengths and weaknesses of a city across multiple dimensions, including its image (Nowacki, Zmyślony, 2011).

It is essential to remember that a city's image varies depending on the specific stakeholders involved such as tourists, investors, employees, consumers, residents, and students. This underscores the importance of measuring the image comprehensively (Malara, Sobol-Wojciechowska, 2011). Image measurement also enables comparative analysis with other cities, providing valuable insights for strategic positioning.

Two significant trends can be identified in discussions surrounding the relationship between sports and place branding. The first pertains to the preparation of a strategic set of information and imagery about a city, including potential shifts in perception, designed to attract world-class events—so-called mega-events—to the location (Hereźniak, Florek, 2018; Kim, Kim, Cho, Yim, 2019; Moon, Ko, Connaughton, Lee, 2013; Yu et al., 2023). The second trend focuses on stimulating sports tourism (Gilboa et al., 2015; Gonzalez, Gale, 2022; Preuss, Arne Solberg, 2015; Stylidis, Sit, Biran, 2016). These trends often overlap, as cities, regions, or nations without the requisite sports infrastructure rarely secure the rights to host mega-events.

However, there is a notable lack of publications addressing the perceptions of residents in the context of place branding aimed at fostering sports tourism. Since sporting events have been shown to impact both residents and tourists across economic, ecological, social, and cultural dimensions (Poczta, Dąbrowska, Kazimierczak, Gravelle, Malchrowicz-Mośko, 2020), they are frequently leveraged for city branding purposes (Oshimi, Harada, 2016).

The goal in such cases can be to create, alter, or refresh a city's image while simultaneously promoting sports or fostering societal engagement (Bosiacki, Śniadek, 2012). A city's sports image is shaped by strategies and initiatives in both sports marketing and territorial marketing. This image results from actions or the outcomes of strategies and plans that form perceptions of the city concerning its sports offerings (Dużyk-Dyna, 2016).

To evaluate the effectiveness of activities related to image building, appropriate methods and measurement tools must be employed. These methods allow for the identification of both strengths and weaknesses of a city across multiple dimensions, including its image (Nowacki, Zmyślony, 2011).

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In summarizing the issue of shaping a city's brand image, it is essential to emphasize that this is a long-term process influenced by numerous factors. The city's image serves multiple functions, bringing various tangible benefits to the municipality. For this reason, it should be subject to systematic management and control.

Moreover, the image of a place is not static; it can undergo transformations as a result of events occurring within the city and actions initiated by local governments. These dynamics highlight the need for proactive and adaptable strategies to maintain and enhance the city's brand image in response to changing circumstances and stakeholder expectations.

3. Objective and Methodology

The objective of this article is to identify and evaluate the factors influencing the creation of Lublin's sports image that are significant to both women and men. The study addresses two research questions: (1) Which factors contributing to Lublin's sports potential are crucial for shaping its image, depending on gender? (2) What is the hierarchy of importance of the dimensions that constitute Lublin's sports image according to the opinions of women and men?

The presented research continues the discussion initiated in the publication by Bloch, Romanowski, & Romanowski (2024). In this study, a decision was made to utilize holistic model that take into account many aspects of a city's functioning, such as Simon Anholt's Hexagon City Brands (2006) (Figure 1.).

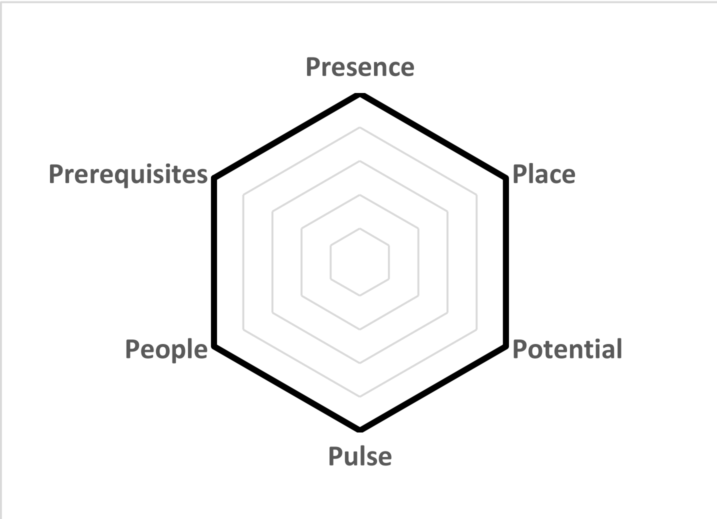

Figure 1. Anholt's City Brand Hexagon.

Source: Anholt, 2007, p. 85.

The model proposed by Simon Anholt consists of six dimensions that can be presented graphically in the form of a hexagon, and which is measured using an index - Anholt-Ipsos City Brand Index (2006). The index is estimated based on the average of the dimensions that make up the model. The first dimension is Presence, referring to the international status and position of the city. The second is the attractiveness or physical appearance of the place (Place), this means a favorable climate for living, the cleanliness of the natural environment or the attractiveness of buildings and public places. The third component is Prerequisites, which determine what features determine the choice of a city, such as: price attractiveness, standard of public facilities (e.g. hospitals or schools), public transport or sports facilities in the city. The People dimension refers to the characteristics and behavior of local residents. This aspect also refers to the sense of security in the city. Pulse describes the possibility of filling your free time with various types of additional activities. The indicated level also specifies the city's level of excitement about new places to discover. Potential measures educational and economic benefits in the city, the possibility of finding a job in line with expectations, and the degree of ease of doing business (Anholt, 2007).

The research tool used for the study is a survey questionnaire consisting of 11 questions. Each section of the questionnaire corresponds to a specific dimension that constitutes the Anholt City Brand Hexagon Model. Within each dimension, respondents are presented with several statements to evaluate on a scale from 0 to 5, where 0 indicates no influence on shaping the city's sports image, and 5 represents a very significant impact. The final section of the survey includes demographic questions that allow for respondent segmentation and the development of appropriate conclusions. The questionnaire was distributed on May 26, 2023, and the study was completed by June 9, 2023.

The primary purpose of this research was to understand the factors contributing to the sports image of Lublin and how they vary based on demographic variables. The survey was segmented into six dimensions:

1. *Presence*: this dimension concerns the city's position on a national or international scale. In the context of sports, factors such as sports clubs or infrastructure play a crucial role.
2. *Place*: this dimension describes the physical aspects of the city. It focuses on specific sports facilities and their impact on the city's sports image.
3. *Conditions*: this dimension examines societal expectations and the availability of factors that contribute to the city's sports potential. In the case of Lublin, it highlights the components that act as drivers for sports development in the city.
4. *People*: refers to the characteristics and behaviors of local residents, including aspects like security and social integration.
5. *Pulse*: evaluates the vibrancy of the city, including leisure activities and opportunities for social interaction.
6. *Potential*: measures the city's economic and educational benefits, job opportunities, and business conditions (Anholt, 2007).

The data collected allowed for a nuanced analysis of how these dimensions influence the sports image of Lublin, providing insights into gender-based differences that can guide targeted strategies for city branding (Table 1).

The study included 204 participants, all over the age of 18, and residents of the city of Lublin. The choice of city residents was based on the premise that those familiar with their city are more competent to evaluate the factors relating to Lublin's image.

The snowball method was used as the sampling method. The advantage of this method is its ability to reach specific individuals in cases of relatively narrow sample groups or significant numerical discrepancies, such as gender, education level, or age. Residents of the city were asked to further distribute the questionnaire to other potential respondents residing in Lublin. The method proved highly effective for individuals over the age of 40.

Table 1.
Dimensions of the city hexagon with assigned factors of Lublin brand related to sports

Presence	Place	Potential	Pulse	People	Prerequisites
Sport clubs Motor Lublin (speedway) MKS Lublin (handball women) Motor Lublin (football men) MKS Start Lublin (basketball men) AZS UMCS Lublin (athletics) LUK Lublin (volleyball men) AZS UMCS Lublin (basketball women) *Infrastructure* Stadium „Arena Lublin” Aquapark „Aqua Lublin” Sport hall „Globus”	Bicycle paths Swimming pools "Orlik" sports fields Tennis courts Climbing walls Skate parks	Possibility of organizing international sports events Possibility of earning money from sports Possibility of associating in sports institutions	Sports events Sports infrastructure in general Sports clubs Athletes Sports activity of residents Society activation programs Sports staff	Residents's willingness to engage in sports recreation in the city Other city residents' willingness to engage in sports recreation Residents' willingness to create a sports image of the city Residents' willingness to associate in sports institutions	Availability of sports infrastructure in the city Availability of attractive sports events in the city Availability of programs that activate society Availability of appropriately qualified sports staff

Source: own elaboration

Two research questions were addressed:

Which factors that make up the sports potential of the city of Lublin are key to creating its image depending on gender?

What is the hierarchy of importance of dimensions that make up the sports image of Lublin in the opinions of women and men?

Three hypotheses were formulated:

H1: The hierarchy of factors influencing the sports image of the city varies depending on gender.

H2: The presence dimension contributes most to the creation of the sports image of the city of Lublin among men.

H3: The pulse dimension contributes most to the creation of the sports image of the city of Lublin among women.

The second hypothesis considers the performance results of sports teams within the presence dimension, while the third hypothesis is based on the sport activities of residents.

4. Analysis of the Lublin brand Hexagon's Dimensions Based on Respondents' Opinions

A survey was conducted with 204 participants, consisting of 101 women (49.5%) and 103 men (50.5%). The majority of respondents had a higher education level (57.4%), followed by those with secondary education (24.5%), vocational education (12.7%), and primary education (5.4%) (see Figure 1).

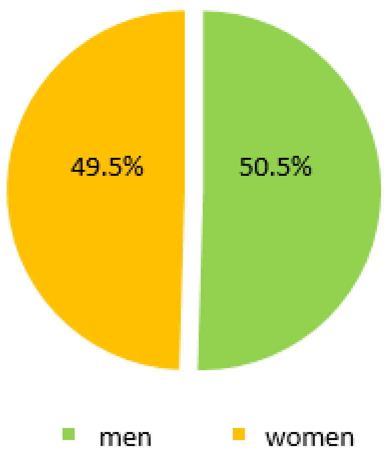

Figure 1. Distribution of respondents by gender.

Source: own elaboration.

The largest group of participants in the study consisted of individuals with higher education (57.4% of respondents). Smaller groups included participants with secondary education (24.5%), vocational education (12.7%), and primary education (5.4%). The high percentage of respondents with higher education can be attributed to the distribution of the questionnaire among peers of the researcher conducting the study (figure 2).

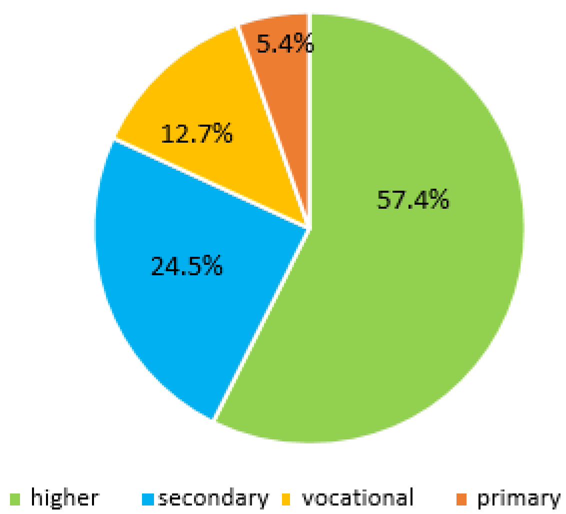

Figure 2. Distribution of respondents' educational background.

Source: own elaboration.

Analyzing age distribution (Figure 3), the largest group of respondents was aged 18-29 years (32.4%). This distribution reflects the distribution of the survey among a large number of peers of the researcher. Other age groups were as follows: 50-59 years (20.1%), 40-49 years (17.6%), 30-39 years (16.2%), and 60 years and older (13.7%).

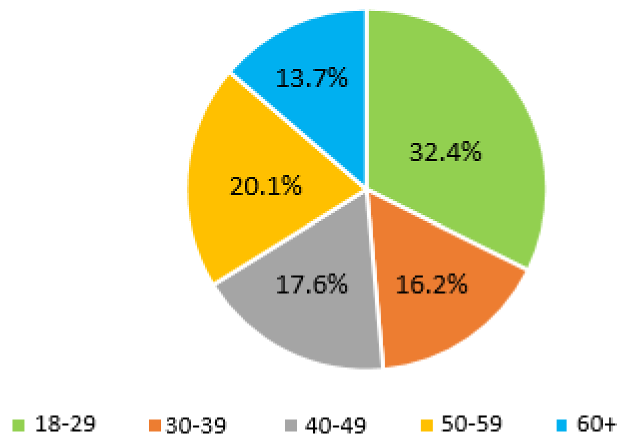

Figure 3. Distribution of respondents by age.

Source: own elaboration.

The first analyzed dimension was *presence* (Table 2). This issue was considered from the perspective of the impact of sports clubs and infrastructure on the sports image of the city of Lublin. Regarding sports clubs, residents indicated that the most significant impact on the sports image of the city is by the speedway club Motor Lublin (average rating – 4.41). This may be related to the club's very good performance. In 2021, the club won the national vice-championship, and as of June 10, 2022, the team is leading the speedway Ekstraliga. The second highest-rated team is the women's handball team MKS Lublin with an average rating of 3.99. The football team Motor Lublin follows with an average rating of 3.66, despite not having major achievements in recent years, competing in the 2nd League (third tier after Ekstraklasa and 1st League). Other clubs received much lower scores ranging from 2.24 to 2.63, despite competing at the highest levels.

Table 2.

Assessment of sports clubs by gender

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Motor Lublin (speedway)	4.42	4.41	4.41
MKS Lublin (handball women)	4.02	3.95	3.99
Motor Lublin (football men)	3.72	3.60	3.66
MKS Start Lublin (basketball men)	2.60	2.66	2.63
AZS UMCS Lublin (athletics)	2.44	2.68	2.57
LUK Lublin (volleyball men)	2.41	2.73	2.56
AZS UMCS Lublin (basketball women)	2.20	2.28	2.24

Source: own elaboration.

Regarding the impact of sports clubs by gender, women showed a more favorable view of high-average factors among the overall respondents. In contrast, the order of importance assigned to the clubs varied for men. For instance, the athletic club AZS UMCS Lublin occupied the fourth position for men but sixth for women, and the basketball team MKS Start Lublin took the sixth position for men but fourth for women.

The study explores significant disparities in respondents' opinions when evaluating aspects of the sports image of the city of Lublin from the perspective of educational background. The top three clubs maintained their order across each educational level group, but substantial differences emerged within other educational groups. Individuals with basic education ranked the volleyball club LUK Lublin (5th overall) fourth in influencing the city's sports image, while those with secondary education listed the athletic team AZS UMCS Lublin (6th overall) in the same position. Notably, substantial average differences were observed across various factors between groups with different educational backgrounds. For the athletic team (AZS UMCS Lublin), the difference between individuals with basic and higher education was 1.02. For the football club Motor Lublin, the difference between individuals with basic and secondary education was 0.90, while for the speedway club Motor Lublin, it was 0.78. Excluding volleyball and athletics, it can be concluded that individuals with basic education acknowledge the least influence of sports clubs on shaping the sports image of Lublin.

Regarding the influence of infrastructure facilities on shaping the sports image of the city, women rated the impact of each factor more favorably than men. These differences range from 0.02 in the case of Arena Lublin to 0.30 in the case of Globus Hall (Table 3).

Table 3.
Assessment of infrastructure facilities by gender

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Stadium „Arena Lublin”	4.36	4.34	4.35
Aquapark „Aqua Lublin”	4.07	3.93	4.00
Sport hall „Globus”	3.99	3.69	3.84

Source: own elaboration.

In evaluating the influence of infrastructure facilities on the development of Lublin’s sports image, respondents identified *Arena Lublin Stadium* as having the greatest impact, with an average rating of 4.35. This was followed by *Aqua Lublin* (4.00) and *Globus Hall* (3.84). Notably, all the infrastructure facilities received relatively high ratings, underscoring their significance as factors contributing to the creation of Lublin’s sports image.

The second analysed dimension was *place* (Table 4). Residents of Lublin identified bike paths (4.24) as the most significant urban infrastructure element affecting the city's sports image. The city continues to expand its infrastructure for cyclists, with 109.63 km of bike paths available, including the *Lubelski Rower Miejski* system. Pools (3.81) were the next most important factor, with facilities like *Aqua Lublin* and others at local schools and universities. Moderately influential were *Orlik* playgrounds (3.24), tennis courts (2.75), climbing walls

(2.54), and skateparks (2.34). Notably, climbing walls received relatively low influence ratings, despite being the birthplace of world record holder Aleksandra Mirosław in speed climbing.

Table 4.
Assessment of place *dimension by gender*

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Cycle paths	4.33	4.15	4.24
Swimming pools	4.04	3.59	3.81
"Orlik" sports fields	3.28	3.20	3.24
Tennis courts	2.89	2.61	2.75
Climbing walls	2.56	2.51	2.54
Skate parks	2.35	2.33	2.34

Source: own elaboration.

In every aspect, women rated the influence of various factors higher than men (table 5). Both sexes maintained the same hierarchy of importance. The most significant gender disparity was observed in the influence of pools, with a 0.45-point difference between the two groups.

The study related to *prerequisities* identifies the availability of infrastructure (4.45) and attractive sports events (4.35) as the most important factors in shaping the sports image (table 5). Moderate roles include programs that engage society (3.75) and the availability of qualified sports staff (3.49). When comparing genders, women consistently rated these aspects higher than men, maintaining the same hierarchy of importance.

Table 5.
Assessment of prerequisites *dimension by gender*

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Availability of sports infrastructure in the city	4.50	4.40	4.45
Availability of attractive sports events in the city	4.47	4.24	4.35
Availability of programs that activate society	3.82	3.67	3.75
Availability of appropriately qualified sports staff	3.61	3.36	3.49

Source: own elaboration.

Analyse of age differences shows significance in results, especially concerning the availability of sports programs (Table 6). The gap between the 30-39 age group and those 60 and older was 1.28, with older groups showing stronger preferences for available sports programs and events. The oldest group had an average rating higher than the overall respondent average (4.45).

Table 6.
Assessment of prerequisites *dimension by age*

The influence of factors on creating the sport image of Lublin	18-29	30-39	40-49	50-59	60+	Total
Availability of sports infrastructure in the city	4.08	4.48	4.64	4.73	4.61	4.45
Availability of attractive sports events in the city	3.12	3.09	3.53	3.90	4.14	4.35
Availability of programs that activate society	3.47	3.18	3.75	4.15	4.46	3.75
Availability of appropriately qualified sports staff	4.08	4.36	4.47	4.49	4.64	3.49

Source: own elaboration.

People dimension examines residents' proclivities towards pro-sport behaviours and their relation to shaping the city's sports image (Table 7). Respondents generally rate their own inclination towards recreational sports higher than other residents. The gender differences analysis indicates that men rate their personal inclination towards sports recreation in the city 0.56 points higher than others. This statement holds true for men but not universally for all respondents.

Table 7.
Assessment of people *dimension by gender*

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Residents's willingness to engage in sports recreation in the city	3.19	3.58	3.39
Other city residents' willingness to engage in sports recreation	3.19	3.02	3.10
Residents' willingness to create a sports image of the city	2.75	2.73	2.74
Residents' willingness to associate in sports institutions	2.61	2.70	2.66

Source: own elaboration.

Respondents were asked to evaluate the influence of the *pulse* factors on the creation of Lublin's sports image (Table 8). Residents identified *sporting events* as having the greatest impact, with an average rating of 4.52. These events, as previously mentioned, play a significant role in the city and often hold a high rank. The second most influential factor was *sports infrastructure* (4.40), which has been steadily developing through numerous modernizations and the construction of new facilities. This was followed by *sports clubs* (4.35), many of which compete in top-tier leagues, reflecting their strong performance as perceived by respondents.

Table 8.
Assessment of pulse *dimension by gender*

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Sports events	4.56	4.48	4.52
Sports infrastructure in general	4.40	4.40	4.40
Sports clubs	4.34	4.37	4.35
Athletes	4.24	4.17	4.20
Sports activity of residents	3.95	3.82	3.88
Society activation programs	3.64	3.47	3.55
Sports staff	3.53	3.36	3.45

Source: own elaboration.

The fourth factor in the hierarchy was *athletes* (4.20). Other factors, in descending order of importance, included: *residents' sports activity* (3.88), *community activation programs* (3.55), and *sports personnel* (3.45), which includes roles such as coaches and trainers. Notably, four of the assessed aspects received an average rating above 4 on a 0–5 scale, highlighting their high significance in shaping the city's sports image, according to respondents. Women rated five out of the seven factors higher than men. The *sports infrastructure* factor received the same average score (4.40) from both genders, while *sports clubs* were rated higher by men.

The *potential* dimension describes the opportunities that sport in the city provides and their impact on the creation of Lublin's sports image (Table 9). Residents of Lublin perceive the ability to host international sports events (4.21) as the most critical factor. Lublin hosts numerous high-ranking sports events, indicating a strong sports infrastructure. Moderately significant factors include earning potential from sports (3.48) and the ability to organize and join sports institutions (3.22).

Table 9.
Assessment of potential *dimension by gender*

The influence of factors on creating the sport image of Lublin	Women	Men	Total
Possibility of organizing international sports events	4.22	4.19	4.21
Possibility of earning money from sports	3.66	3.29	3.48
Possibility of associating in sports institutions	3.24	3.19	3.22

Source: own elaboration.

The *potential* dimension is also analyzed based on the respondent's gender (Table 10). While factors related to organizing international sports events and joining sports institutions were similarly rated, there is a noticeable difference regarding earning potential from sports (0.37 in favor of women).

Generally, women have a less favorable average attitude towards sports than men (Table 10). This trend extends to issues related to Lublin's city image based on sports and the use of sports in shaping the city's image. However, it is important to note that the average agreement score for each statement was above six on a seven-point scale, indicating a positive reception of these issues among both women and men.

Table 10.
Declaration of sport respondents' orientation by gender

Sport orientaion	Women	Men	Total
I have a positive attitude towards sports	6.14	6.46	6.30
I support creating the image of the city of Lublin based on sports	6.26	6.41	6.33
Sport can be used to create the image of the city of Lublin	6.36	6.49	6.42

Source: own elaboration.

It can be concluded that factors most influencing the creation of Lublin's sports image include: sports clubs (especially the speedway club *Motor Lublin*), *Arena Lublin Stadium*, sports events held in the city, and the city's sports infrastructure (especially cycle paths). Additionally, women tend to have a more favorable attitude towards many factors influencing the creation of the city's sports image compared to men. Furthermore, residents of the city have a positive attitude towards sports and support the creation of a Lublin brand based on sports.

5. Synthesis of the Lublin brand Hexagon's dimensions by gender

The next stage, involves calculating the average responses from each dimension and ranking them to determine which dimensions of the City Brand Hexagon for sports in Lublin are the most important for both genders (figure 4).

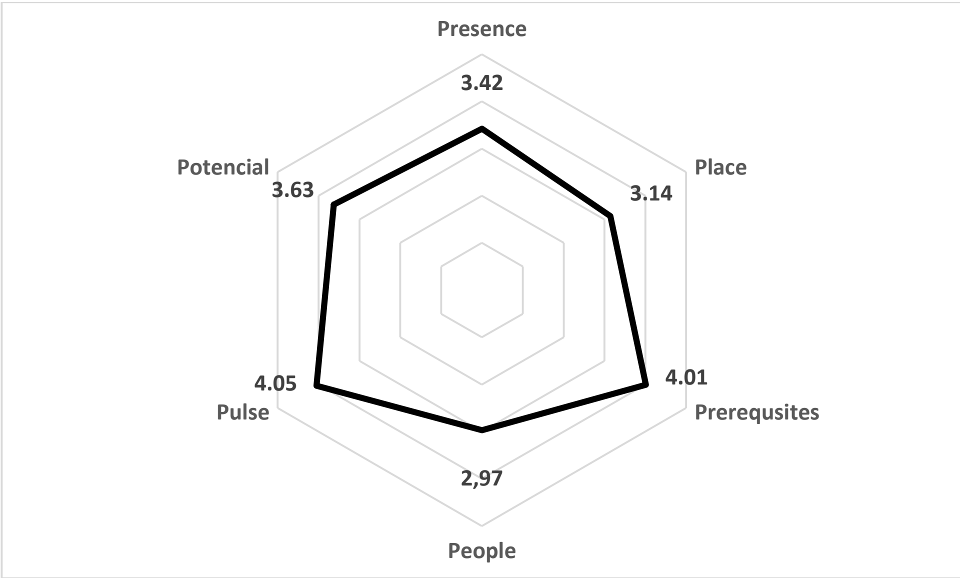

Figure 4. A hexagon for the sports image of Lublin – all respondents.

Source: own elaboration.

Analysing this from the perspective of all respondents, it can be noted that the strongest dimension of the city is the "Pulse" with an average of 4.05. This dimension includes aspects such as: sports events organized in the city, sports infrastructure, sports clubs, athletes associated with the city, residents' sports activity, sports activation programs, and sports staff. However, it is worth noting that just behind the *pulse* dimension, the second strongest dimension is *prerequisites* with an average of 4.01. The next dimensions in order of strength are: *potential* (3.63), *presence* (3.42), *place* (3.14), and *people* (2.97). The difference between the strongest and the weakest dimension in the study was 1.08.

Analysing the Hexagon dimensions by gender (Figure 5), it can be concluded that for women. the strongest dimension shaping the sports image of the city is "Conditions" (average – 4.10). However, there is a minimal difference (0.01) between this dimension and *pulse,* which turned out to be the strongest when considering the responses of both genders. The next Hexagon dimensions for women are: *potential* (3.71), *presence* (3.42), *place* (3.24), and *people* (2.94). For men, the strongest component of the Hexagon is *pulse* (similar to the overall respondents) with an average of 4.01. The next dimensions are: *prerequsites* (3.92), *potential* (3.56), *presence* (3.43), *place* (3.07), and *people* (3.01). Analyzing the results. It can be stated that there are no significant differences between the two genders that could suggest the reasons for significantly differing strengths of a particular dimension for a specific group.

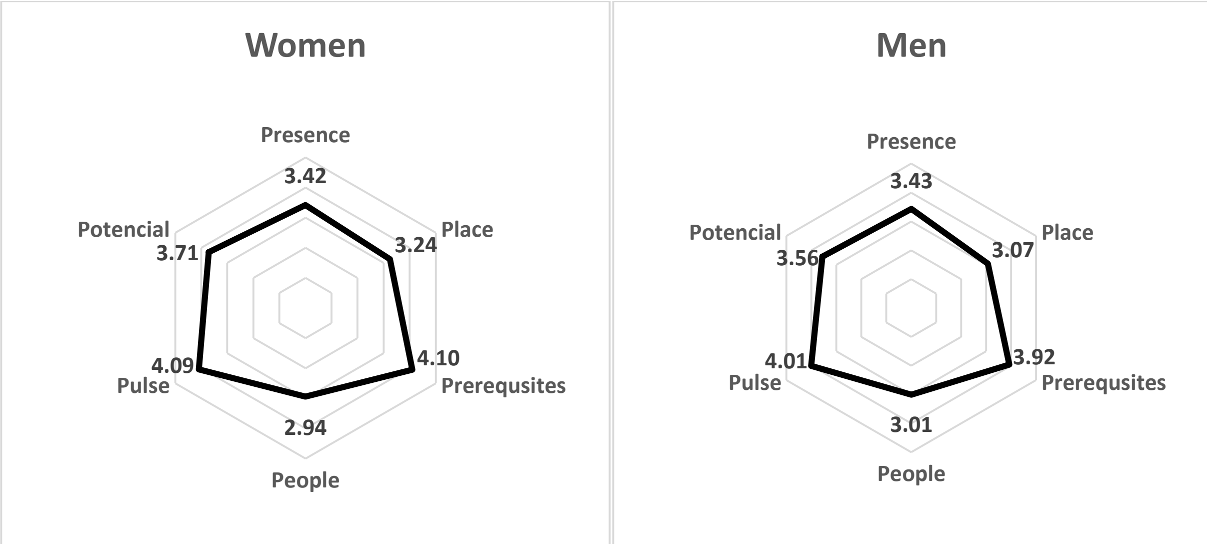

Figure 5. A hexagon for the sports image of Lublin by gender.

Source: own elaboration.

It is indicated that the strongest dimension of the City Brand Hexagon for sports in Lublin is *pulse.* This dimension concerns the impact of specific factors on creating the sports image of the city, including sports events, sports infrastructure, sports clubs, athletes, residents' sports activity, sports activation programs, and sports staff. As the respondent's age increases, this dimension is replaced by the *prerequsites* dimension, which relates to the impact of the availability of factors on creating the sports image of Lublin, such as the availability of sports infrastructure in the city, availability of attractive sports events, availability of programs to activate the community, and availability of properly qualified sports staff.

6. Conclusions and discussion

The research revealed minor differences in the hierarchy of factors shaping the sports image of Lublin, as perceived by women and men. The city's most prominent dimension, as rated by both genders, is pulse, with an average score of 4.05 for the entire population (4.09 for women and 4.01 for men). The second most significant dimension is conditions (overall average: 4.01; 4.10 for women and 3.92 for men). The subsequent dimensions, ranked by average scores, are: potential (3.63 overall; 3.71 for women and 3.56 for men), presence (3.42 overall; 3.42 for women and 3.43 for men), place (3.14 overall; 3.24 for women and 3.07 for men), and people (2.97 overall; 2.94 for women and 3.01 for men).

Consequently, Hypothesis H1 was confirmed, as conditions and pulse were identified as the most important factors influencing the sports image of Lublin among women, while pulse and conditions held the top positions for men. However, these differences are not substantial, as the rankings of the other dimensions within the hexagon remained unchanged regardless of gender.

Hypothesis H2 was rejected, as presence did not emerge as the most significant factor shaping Lublin's sports image among men, contrary to expectations; instead, pulse held this position. Similarly, Hypothesis H3 was rejected, as conditions were found to be the most important factor for women, rather than pulse as previously assumed. However, if hypothesis H3 were reformulated to suggest that pulse and conditions are equally important for women, it could be accepted in this revised form.

The study provided a basis for formulating practical recommendations for the development of Lublin's sports infrastructure. as these factors were identified as the most critical in shaping the city's sports image. The discussion surrounding the hypotheses highlights that gender plays an insignificant role in creating a city's image through sports. Separate campaigns targeting women or men should emphasize sports-related aspects rather than focusing on gender differences.

Furthermore, exclusive promotion of sports clubs as city representatives should be approached cautiously, as evaluations of their performance are heavily dependent on their current standing in respective leagues. Additionally, Lublin's authorities should prioritize attracting high-profile national and international sports events. Such events enjoy broad public support from both genders, enhance the city's reputation, stimulate local economic development, and help distinguish Lublin from other Polish metropolises. Emphasis should also be placed on increasing municipal involvement in the development of sports infrastructure and the promotion of physical activity within the city.

This article presents original research on the hierarchy of sports-related attributes in shaping a city's image, differentiated by gender. The study's novelty lies in the innovative application of the city brand hexagon to a selected set of sports-related factors (identity), which, according to respondents, contribute to the perception of the city (image).

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References

1. Bloch, M., Romanowski, R., Romanowski, B. (2024). *Using Sports In Shaping The Image Of The Lublin Brand*. In: R. Romanowski (ed.), *Place Marketing: Local Perspective*. Poznan: Uniwersytet Ekonomiczny w Poznaniu, Katedra Handlu i Marketingu, pp. 87-96.
2. Boisen, M., Terlouw, K., Groote, P., Couwenberg, O. (2018). Reframing place promotion, place marketing, and place branding-moving beyond conceptual confusion. *Cities, 80,* 4-11.
3. Bosiacki, S., Śniadek, J. (2012). Sport jako element strategii promocji miasta. *Przedsiębiorczość i Zarządzanie, 13*(10) Marketing sportowy wyzwaniem dla miast i regionów, 13-23.
4. Bruce, T. (2016). New rules for new times: Sportswomen and media representation in the third wave. *Sex Roles, 74(7-8)*, 361-376.
5. Cooky, C., Messner, M.A., Musto, M. (2015). "It's dude time!" A quarter century of excluding women's sports in televised news and highlight shows. *Communication & Sport*. *3*(3), 261-287.
6. Darnell, S.C., Sparks, R. (2005). Inside the promotional vortex: Examining the rhetoric of Nike's corporate social responsibility campaigns. *International Journal of Sport Communication, 2(1)*, 63-79.
7. Daszkiewicz, M. (2017). Country as a corporate brand. Developing a framework for place brand communication: A case study of Poland. *Handel Wewnętrzny, 371*(6), 56-65.
8. Dużyk-Dyna, P. (2016). Sportowy wizerunek Miasta Krakowa. *Marketing w sporcie, sport w marketingu, 50*.
9. Elling, A., Knoppers, A. (2005). Sport, gender and ethnicity: Practices of symbolic inclusion/exclusion. *Journal of Youth Studies, 8(1),* 51-69.
10. Fink, J.S. (2015). Female athletes, women's sport. and the sport media commercial complex: Have we really "come a long way, baby"? *Sport Management Review, 18(3),* 331-342.
11. Florek, M., Kavaratzis, M. (2014). From brand equity to place brand equity and from there to the place brand. *Place Branding and Public Diplomacy, 10,* 103-107.
12. Gilboa, S., Jaffe, E.D., Vianelli, D., Pastore, A., Herstein, R. (2015). A summated rating scale for measuring city image. *Cities, 44,* 50-59.
13. Gonzalez, L.R., Gale, F. (2022). Sustainable city branding narratives: a critical appraisal of processes and outcomes. *Journal of Place Management and Development, 16*(1), 20-44.
14. Govers, R. (2009). Place Branding: Glocal, Virtual and Physical Identities, Constructed, Imagined and Experienced.
15. Hereźniak, M., Florek, M. (2018). Citizen involvement. place branding and mega events: Insights from Expo host cities. *Place Branding and Public Diplomacy, 14,* 89-100.

16. Kim, Y., Kim, J., Cho, S., Yim, K. (2019). The impact of mega sporting events on host country's destination images: The cases of the 2014 Sochi Winter Olympics and 2015 Beijing IAAF World Championships. *Sport Marketing Quarterly, 28*(3), 148-164.
17. Moon, K.S., Ko, Y.J., Connaughton, D.P., Lee, J.H. (2013). A mediating role of destination image in the relationship between event quality. perceived value, and behavioral intention. *Journal of sport & tourism, 18*(1), 49-66.
18. Oshimi, D., Harada, M. (2019). Host residents' role in sporting events: The city image perspective. *Sport management review, 22*(2), 263-275.
19. Poczta, J., Dąbrowska, A., Kazimierczak, M., Gravelle, F., Malchrowicz-Mośko, E. (2020). Overtourism and medium scale sporting events organisations—The perception of negative externalities by host residents. *Sustainability, 12*(7), 2827.
20. Preuss, H., Solberg, H.A. (2015). FIFA World Cup 2006 in Germany. In: *Routledge Handbook of Sport and Legacy: Meeting the Challenge of Major Sports Events* (p. 202). Routledge.
21. Romanowski, R. (2013). *Relacyjne przesłanki tworzenia megaproduktu terytorialnego*. In: W. Ciechomski, R. Romanowski, *Marketing terytorialny oparty na wiedzy* (p. 63). Poznań: Wydawnictwo Uniwersytetu Ekonomicznego.
22. Romanowski, R. (ed.) (2024). *Place Marketing: Local Perspective*. Poznan: Uniwersytet Ekonomiczny w Poznaniu, Katedra Handlu i Marketingu. ISBN: 978-83-951573-8-7.
23. sport.pl (2013). *Katar kupił MŚ 2022? France Football" twierdzi, że tak.* http://www.sport.pl/pilka/1%2C64946%2C13313276%2CKatar_kupil_MS_2022__France_Football_twierdzi__ze.html, 22.11.2024.
24. Stylidis, D., Sit, J., Biran, A. (2016). An exploratory study of residents' perception of place image: The case of Kavala. *Journal of travel research, 55*(5), 659-674.
25. Waśkowski, Z. (2022). Women as leaders of organising running events teams. *Marketing of Scientific and Research Organizations, 45*(3), 17-26.
26. Yu, H.Y., Lee, D., Ahn, J., Lee, M., Foreman, J.J. (2023). City Branding's impact on cities hosting sporting events: Top-down and bottom-up effects in a pre-post study. *Tourism Management Perspectives, 46,* 101098.

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ARTIFICIAL INTELLIGENCE IN TERRITORIAL MARKETING

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Purpose: The purpose of this paper is to present a modern approach to the optimization of territorial marketing through discussing selected possibilities of applying artificial intelligence in the marketing management of territorial units such as regions, cities, districts, or municipalities.
Design/methodology/approach: The paper is based on a review of the literature and online sources – 51 bibliographic items in total. The time scope of the conducted analysis covers the years 2014-2024. Additionally, in order to present a comprehensive picture of the current trends, the method of desk research was used to analyse existing empirical data and professional literature on the subject. The analysis made use of inductive reasoning, which makes it possible to draw conclusions from the observed processes.
Findings: Artificial intelligence has enormous potential, capable of revolutionizing marketing management. Also, its potential and actual implementation in place marketing offers the possibility of obtaining a competitive advantage and extraordinary development opportunities. Combining creative economic ideas with the latest IT technologies makes it possible to achieve a synergistic effect in such areas as, for example, creating effective promotional campaigns for cities and regions.
Research limitations/implications: In the future it would certainly seem worthwhile to conduct representative empirical studies among managers involved in the promotion of cities to diagnose the actual implementation of selected artificial intelligence tools by the local government units responsible for the creation and implementation of promotional campaigns addressed to residents, tourists and investors. The content of this article can be helpful in developing the methodology for such research.
Practical implications: Effective management of the development strategy and promotion of territorial units plays a major role in the competition between cities for limited resources; which include funds from investors, tourists and local communities. Local government units which are managed in a modern way are open to new, innovative and creative ideas in their promotional media campaigns. Undoubtedly, the range of tools offered by artificial intelligence makes it easier to generate and implement original solutions that promote interactions with stakeholders as well as enabling effective monitoring of ongoing advertising campaigns.
Originality/value: The findings have cognitive value. The article describes the role of artificial intelligence in territorial marketing and the instruments used in this area.
Keywords: artificial intelligence (AI), territorial marketing.
Category of the paper: General review.

1. Introduction

The contemporary world of business and marketing is characterized by dynamic changes, driven by the development of technology and the growing importance of artificial intelligence. This does not only apply to companies, but also to institutions and non-profit organizations. Changing consumer behaviour, the fast development of IT technology and the globalization of markets create new challenges and requirements for organisations. One of the key areas undergoing dynamic change is marketing management. Advanced technologies such as artificial intelligence are increasingly used to efficiently manage marketing activities and to adjust to changing customer preferences. The implementation of artificial intelligence tools can significantly increase the effectiveness of marketing activities, make them more attractive for stakeholders, as well as helping to better understand and fulfil the needs of customers, who include primarily residents, tourists and investors.

2. History of artificial intelligence

The origins of artificial intelligence date back much earlier than the era of computers, starting from Aristotle and ancient Greece and continuing to the present day. As technology progressed, artificial intelligence evolved significantly, gradually finding practical applications in various areas of social and economic life. The Greek philosopher Aristotle (384-322 BC) wrote in his book *Politics* that if machines could independently perform the tasks assigned to them, one day they could replace humans at work. Although modern science has long since departed from Aristotle's methodology, his ideas still influence many areas of logic, mathematics, and artificial intelligence (Pickover, 2019).

In 1637, the philosopher René Descartes stated that machines would one day take significant initiatives, make decisions, and act in an "intelligent" manner. Although his vision was controversial, it later became the foundation for adopting the term Artificial Intelligence (Miernik, 2023).

In 1921, a Czech playwright Karel Čapek published a science fiction play that explored the concept of a factory-produced synthetic human being, which he called a robot. Thus, the concept of a "robot" used in research, art, and exploration was adopted more than 100 years ago (Vanjare, 2022).

In 1950, the British scientist Alan Turing stated that computers would eventually learn to think like humans. Turing believed that a machine could be considered intelligent if its responses could not be distinguished from those of a human. Modern chatbots are capable of misleading humans, but due to their limitations, this deception is usually quickly exposed.

Nevertheless, Alan Turing predicted that in the future, artificial intelligence would become indistinguishable from human intelligence (Heaven, Alison, 2017).

In 1951, the first artificial neural network was built. It was designed by Marvin Minsky and Dean Edmonds and called SNARC (Stochastic Neural Analogue Reinforced Computer). Back then, there were no microprocessors or transistors so 3000 vacuum tubes were used. The network's task was to help virtual rats go through a maze. The rats were given instructions to help them go through the maze, and each time the effect of the activity was recorded by the system. The machine learnt from each experience and was later able to make better decisions. Currently, neural networks use similar principles to classify objects visible in photographs (Górski, 2019).

In 1956, the first scientific conference on artificial intelligence was organized in Dartmouth. Among the guests were John McCarthy, Marvin Minsky, Nathaniel Rochester and Claude Shannon, as well as a number of scientists from various disciplines such as psychology, philosophy, mathematics, physics and linguistics. The aim of the conference was to define and direct research on machines that think, learn and in the future will replace humans in some jobs. The participants of the conference were divided into different working groups dealing with different aspects of artificial intelligence. These included speech recognition, natural language processing, planning, machine learning and other areas (bitcoin.pl, 2023).

The next important step in the development of artificial intelligence was the creation of a computer program called ELIZA by computer scientist Joseph Weizenbaum in 1964. This program became one of the first and most convincing virtual interlocutors (conversation simulators). ELIZA was programmed to respond to key words and phrases, creating the illusion of real human empathy. Today, virtual interlocutors (chat-bots) are often used in technical support systems and act as consultants for customers (Pickover, 2019).

Comparing the clumsy attempts of early computer engineering to the impressive robots being created today, enormous progress is evident. Moore's law, which states that the computational power of computers doubles every 24 months, shows how fast technological progress is. Raymond Kurzweil, an American scientist, on the basis of Moore's law calculated that by 2029 computers will achieve the same processing power as the human brain (Jastrzębska, Jastrzębska, 2010).

In 1981, the Japanese Ministry of International Trade and Industry allocated USD 850 million for a fifth-generation computer project, the aim of which was to develop a computer capable of speech, language translation, image interpretation, and human-like reasoning (biuroreklama.pl, 2023).

Increasing technological advances led to the development of the Mercedes Dickmans van in 1986, which became the first autonomous vehicle. It took eight years to build and had a top speed of 96 km/h, limited only by engine power. The vehicle was equipped with sensors that allowed it to recognize objects, drive in a convoy and change lanes autonomously (Skuza, 2023). Today, autonomous vehicles are only legally allowed on the road in a few countries.

The next important date on the timeline was the year 1988, when IBM published a groundbreaking paper that introduced probability principles into the process of automatic translation from French to English. This approach was quickly replaced by a method based on calculating the probability of outcomes, which more closely resembled the cognitive processes of the human brain. This change became the foundation for modern machine learning technologies (Zalewska-Bochenko, 2024).

The development of artificial intelligence has been characterized by periods of ups and downs. The boom, which occurred between 1956 and 1974, was the result of fascination with the new possibilities the field offered. Intriguing assumptions that it was possible to create intelligent machines that would replace humans fascinated the scientific world. Various organizations, most notably the U.S. government, funded extremely expensive research. But then came the "lean years" of 1974-1993, as scientists struggled with the limited capabilities of computers, the vast amount of information that a rational machine must process, a lack of money, criticism from ethicists and philosophers, as well as a host of other problems that caused research to be curtailed and its results to be negligible.

The 1990s saw a new phase in the development of artificial intelligence with the transition from physical robots to digital programs. This decade saw the emergence of Sojourner, NASA's first autonomous robotic system, and the defeat of chess grandmaster Garry Kasparov by Deep Blue (Adamyan, 2023).

In the 21st century, artificial intelligence has undergone further intensive development, transforming from a research area into a driving force of innovation in many fields. Computing power and data storage capacity have increased significantly. Access to Big Data and the development of processors have enabled more sophisticated applications of artificial intelligence. A key event for AI was the development of machine learning. Neural networks, especially multi-layer ones (so-called deep neural networks), have enabled machines to learn with unprecedented efficiency. As a result, a period of commercial implementation of many applications has begun, from product recommendations in online stores to autonomous cars and personal assistants. The introduction of Midjourney and ChatGPT tools has made AI functions available to a wide range of users. In addition, global corporations, striving for a technological advantage, have begun to invest significant financial resources in the development of artificial intelligence and other innovations (cebrf.knf.gov.pl, 2024).

In June 2023, the European Parliament adopted the world's first comprehensive legislation on AI, the so-called Artificial Intelligence Act. As part of the adopted digital transformation strategy, an attempt was made to regulate activities connected with implementing artificial intelligence. A programme called "Europe's Digital Decade" was developed. It formulated goals for technological transformation by 2030 in areas such as secure and sustainable digital infrastructure, digital public services, digital transformation of businesses, and digital skills. The document was preceded by the signing of the Declaration of Digital Rights and Principles on 15 December 2022, which regulates the processes of safe and sustainable digital transformation, as well as pointing out the need to protect human rights (Jaskuła, 2023). EU regulations on the misuse of artificial intelligence are also included (Greser, Dymitruk, 2022).

3. Applications, benefits and drawbacks of artificial intelligence

Artificial intelligence can be defined as a system that enables the performance of tasks that require a learning process as well as taking into account new circumstances when solving a given problem, and which can, to a varying extent depending on the configuration, act autonomously and interact with the environment (Zalewski, 2020). According to the OECD recommendations, artificial intelligence is a system based on machine concepts that can predict, recommend and make decisions affecting the real or virtual environment (Mrożek, 2023).

Stuart Russell and Peter Norvig, in their book *Artificial Intelligence: A Modern Approach*, which is one of the best-known textbooks in the field of artificial intelligence, defined artificial intelligence as “a field of computer science that deals with the creation of computer programs capable of performing tasks that, if performed by a human, would require intelligence. This field encompasses many different areas, such as machine learning, natural language processing, pattern recognition, planning or reasoning” (Russell, Norvig, 2021). This definition highlights the fact that artificial intelligence encompasses a variety of systemic approaches and operational techniques, and its goal is creating computer programs that are capable of imitating selected aspects of human intelligence.

Artificial intelligence-assisted work and work automation rely on high computing power, improved sensors, big data sets, the use of algorithms, output technologies such as 3D printers, robots and “cobots” – collaborative robots that work with humans, as well as interactive online platforms that act as intermediaries between job providers and job seekers (Kremer et al., 2021).

Artificial intelligence is an interdisciplinary field of science that draws not only on the exact sciences (mathematics, cybernetics, computer engineering) and natural sciences (neurobiology), but also social sciences (economics, psychology), and the humanities (philosophy, linguistics). Artificial intelligence is a term that takes on different meanings depending on the context, being a subject of research, debate and interpretation by many scholars. The definitions of AI are as diverse as its applications. Today, artificial intelligence can be found almost everywhere, from smartphone cameras to video games, e-commerce, education, healthcare, cybersecurity, product recommendations, search engines, and advertising (Portal Fintech, 2022). The authors of the report “Applications of Artificial Intelligence in the Economy. Overview of Selected Initiatives and Technologies with Recommendations for Entrepreneurs” list and describe the following main areas of AI implementation: healthy society, modern agriculture, sustainable (bio)products, (bio)processes and environment, sustainable energy, zero-emission smart buildings, environmentally friendly transportation, closed-loop economy, advanced materials and nanotechnology, electronics and photonics, creative industries, and marine technologies (Rzeźnik et al., 2023; Davenport, 2023).

A selection of arbitrary examples of AI application fields are listed below:

1. Biometrics – a field in which data relating to the human body is collected, such as the appearance of the iris, fingerprints, face, ear shape, as well as a person's actions, such as making gestures with a finger on a touchscreen or with a gloved hand. This data is used to train the system to recognize users, for example for the purpose of authentication in a phone's operating system or in a bank, or in the judiciary in analysing evidence.
2. Material recognition using laser induced breakdown spectroscopy (LIBS) – machine learning in which data in the form of a recorded spectrum of light produced after a laser strike is used to train a system to recognize materials.
3. Speech recognition – this field includes applications that learn the sound of the voice, responding to a spoken name or keyword.
4. Radiology – a field in which CT scans, MRIs and X-rays are used to detect abnormalities caused by, for example, disease or degeneration.
5. Object detection – systems that learn the appearance of particular classes, such as specific shapes, animals or objects. A trained system can search for elements belonging to specific classes in other images. A good example of this is the Google search engine, which can classify images and which uses captcha data to create a training data set.
6. Cybersecurity – security systems (IPS – intrusion prevention system) and traffic analysis (NTA – network traffic analysis) that learn to recognize attacks (for example recognizing counterfeit credit cards, fighting terrorism) or direct traffic based on collected and tagged data. Spam detection email systems are also intelligent solutions that learn as they analyse new messages (Baran, 2022).

Artificial intelligence has found applications in many fields, including medicine, computer science, law, scientific research, the military, as well as the design and production of goods. As regards economics and management, it is applied in forecasting, such as estimating a country's economic cycle. Neural networks help model non-linear phenomena, simulate numerical series with respect to time and draw conclusions, formulate cyclical relationships, perform regression analysis, and approximate very complex functions. Genetic algorithms, in turn, are used to optimize managerial solutions.

Expert systems are used in management accounting, controlling, human resource management, production process engineering, stock market gaming, as well as corporate and household credit systems. The implementation of expert systems for decision making in an enterprise makes it possible to reduce personnel costs and improve the company's operations, for instance processing loan applications by a bank.

4. Artificial intelligence and marketing

As regards marketing, artificial intelligence helps to find solutions in line with the assumption that the highest priority for companies is to reduce the costs connected with customer acquisition and retention, as well as increasing the efficiency of sales activities (Rutkowski, 2020; Szpringer, 2024). Creative solutions and applications that serve this purpose include the following: customer identification and contact monitoring on websites; real-time content personalization; marketing automation; email marketing and newsletters as well as separation of spam from regular emails; mobile marketing automation; live chat; database search and mining (Big Data Marketing); automatic sales chat; inbound marketing; customer lifecycle management; customer recommendation systems; the creation and management of advertising campaigns; social media posts, and many others. The above activities and tools are used to intelligently automate processes, based on permanent interaction with the recipients of marketing activities and optimization of customer service. For example, Amazon uses AI to optimize inventory management and logistics, predicting product demand and automating warehouse management; Netflix uses an advanced movie recommendation system; and Spotify uses AI to provide personalized playlist suggestions for its users. Some of the most popular AI tools used in marketing include ChatGPT, Canva, Grammarly, NeuronWriter and Intercom (Podgórski, 2024). Interesting classifications and characterizations of the functionalities of AI instruments are also included in the study "Małe firmy w erze AI. Innowacyjne narzędzia marketingowe i sprzedażowe" [Small businesses in the age of AI. Innovative marketing and sales tools] (www.ifirma.pl, 2023) and in the book *Przewodnik po sztucznej inteligencji* [A guide to artificial intelligence] (Zdobylak, 2024). These include the following:

- creative text editing tools (ChatGPT, Google Bard, Copy AI, Jasper, Rytr),
- image generation tools (Midjourney, Stable diffusion, DALL·E2, ideogram.ai, Microsoft Designer),
- social media tools (Cortex, Buffer, Lately),
- AI video and audio generators (Colossyan, Synthesia, Creative Reality™ Studio, kaiber.ai, Adobe Podcast).

The main benefit of using AI is reducing human error and risk. Everyone makes mistakes. Using AI to perform tasks, especially repetitive tasks, can prevent damage to products and services due to human error. Using AI can help avoid health risks, for example by using robots instead of people in highly radioactive locations (tableau.com, 2024).

Another benefit is the 24/7 availability of AI. The average person works about 6 hours a day, and the human body is designed in such a way that it needs breaks to rest, prepare for new jobs, and maintain a work-life balance. Meanwhile, AI means that machines can work 24/7 without a break (Kumar, 2019).

Unlike machines, humans are guided by emotions when making decisions. Thus, the use of artificial intelligence can contribute to more pragmatic and rational decision-making. An example of this can be a recruitment system that uses objective artificial intelligence to verify job candidates based on their skills and qualifications, which helps eliminate subjective biases (Duggal, 2024). In addition, artificial intelligence can be used to effectively delegate monotonous tasks, allowing employees to focus on tasks that require more creativity. An example of this can be the use of robots on production lines, where repetitive tasks are performed with high precision and speed, significantly reducing labour costs and the failure rate of manufactured components.

Although AI has many advantages, its disadvantages also need be considered. The most important one is the fear of job losses and rising unemployment. According to a study conducted by the McKinsey Global Institute, automation and AI could replace 400 to 800 million jobs worldwide by 2030 (Nesirat, 2023). Although the fear of job losses is understandable, it is worth emphasizing that AI can create new jobs. According to the World Economic Forum, automation and AI could create 97 million new jobs in sectors such as data analysis, AI implementation, and content creation. According to a report by investment bank Goldman Sachs, although generative artificial intelligence could increase global GDP by 7% within 10 years, at the same time it poses a “threat” to about two-thirds of the jobs in Europe and the US, which could become automated. Analysts predict that AI could replace up to 300 million jobs (Matolicz, 2023).

Another challenge is the existential threat, as some fear that if AI becomes more intelligent than humans, it may decide to take action against them, trying to destroy humanity (analyticsvidhya.com, 2023). The controversial thing is that if a strong AI exists, humans will undoubtedly pass on to it their own weaknesses and flaws. It will be used to destroy humans, because this is what they do. Generally, conquering the world and subordinating others is an attribute of many humans, but an intelligent machine does not need such features.

The real threats are technical issues. AI systems are not perfect, and as with any advanced tool, failures can occur. Over reliance on AI creates long-term dependence on the technology (Avelino, 2023). In addition, concerns have been raised about the security of personal data that may be collected during interactions with AI systems and then used in an unauthorized manner. Processing personal data by AI algorithms may lead to the unintended disclosure or misuse of this information (Noss, 2023).

The use of AI systems by businesses towards consumers raises a number of ethical and legal concerns. These include growing information asymmetries between businesses and consumers; risks associated with exploiting consumer vulnerabilities through profiling and targeting; or risks associated with algorithmic decision-making due to the lack of transparency of automated decisions, which can lead to biased or discriminatory outcomes (Ebres, 2021). Also, the issues of liability for artificial intelligence errors are extremely significant. This issue is discussed in more detail in the report “Rozwiązania generatywnej sztucznej inteligencji –

zagrożenia i aspekty prawne" [Generative artificial intelligence solutions – risks and legal aspects"] (Lampart, 2023).

In summary, artificial intelligence is a dynamic interdisciplinary field, the importance of which is constantly growing. The development of AI brings with it new innovations, which leads to its economic expansion. Understanding the enormous impact of artificial intelligence on the global economy encourages many countries to invest money in the development of this field of science. The leaders are the USA and China, but other countries such as Canada, Japan, South Korea and European countries are also increasingly investing in the development of AI technology. According to the report "Unlocking Europe's AI Potential", the state of AI in Poland looks quite good compared to other European countries. The number of companies dealing with artificial intelligence is impressive, and 15,000 people employed in the AI sector in Poland constitute 40% of all AI specialists in the CEE region. In addition, over 300 Polish companies, of which 200 are start-ups, offer solutions based on artificial intelligence; and these companies operate in various sectors, from finance and healthcare to e-commerce and the energy industry. The benefits of implementing AI in Poland are significant: 94% of companies investing in artificial intelligence record an increase in revenue, 88% an increase in innovation, and 81% an improvement in business processes (aioai.pl, 2024).

5. Implications of artificial intelligence in place branding

Modern territorial marketing is based on the use of technological and communication tools. According to Andrzej Szromnik, the process of managing a settlement unit based on the marketing concept is characterized by progressive thinking about achieving successes, while at the same time treating the local government as a market (territorial) product, covered by the "philosophy of achieving set goals by spatial settlement units under conditions of competition for limited resources, which is based on the belief that the results are determined by the proper orientation towards customers-partners" (Widera, Widera, 2023).

However, the rapid and dynamic development of modern technologies raises many concerns in society. A number of opinions voiced in the media indicate that people are afraid of unemployment caused by automation and robotization, excessive surveillance, and loss of their personal data. Many threats are posed by the difficulty in recognizing false information on the Internet, so-called fake news, which can be misleading and encourage actions with dangerous consequences. The challenges related to counteracting disinformation are of primary importance. This issue is discussed in more detail in (Cymanow-Sosin, Tenerowicz, Cymanow, 2024).

It also seems important to point out that technologies whose operation we do not fully understand – such as autonomous cars – arouse the greatest anxiety (Rudnicka et al., 2020). This is a classic example of resistance to change, i.e. a subconscious reaction triggered in the human brain by a stimulus associated with threat and fear for safety.

Artificial intelligence is a technology that offers tremendous opportunities. However, its development is associated with ethical dilemmas, which will require additional legislation at some point. Its impact on our lives, economy and society is becoming increasingly apparent, and AI specialists are already in great demand on the job market. A number of legal aspects in the use of AI, for example the issue of what a robot is under European Union law and who bears responsibility for its work, are discussed in the monograph "Inteligentne miasta i sztuczna inteligencja" [Smart cities and artificial intelligence] by Jolanta Blicharz (Blicharz, 2023) and by Dominika Wcisło in a report entitled "Ebook o prawnych aspektach Gen AI" [Ebook on the legal aspects of Gen AI] (Wcisło, 2024). Interesting comments on legal provisions relating to the protection of consumers from unfair practices in the application of AI systems can also be found in the book "Prawne aspekty działalności marketingowej" [Legal aspects of marketing activities] (Blicharz, Szalonka, 2024).

Place branding has undergone a significant evolution over the past two decades, both in terms of understanding the essence of the process and its theoretical foundations, and the role of different stakeholder groups. This evolution has coincided with global transformations in the macro-environment, such as the global economic crisis; rapid technological development (social media, artificial intelligence, augmented reality); declining trust in political, economic and intellectual elites; the rise of populist movements and related changes in the sphere of axiology; the migration crisis; and many others (Hereźniak, 2020). These phenomena have affected the direction of both academic research and the actions of experts and managers of territorial brands.

The key AI functionalities in territorial marketing include the following:

1. Personalization of marketing content: analysis of recipient data for better ad matching, e.g. the use of AI algorithms in the process of selecting and displaying potentially interesting content in Meta Ads (www.markaterytorialna.pl). It is estimated that personalization can increase the effectiveness of marketing expenses by up to 30% and that 60% of customers whose shopping experience is personalized will repeat purchases from the same retailer (Jeleśniański, 2024).
2. Optimization of advertising campaigns: facilitating campaign management thanks to the predictive capabilities of artificial intelligence, e.g. predicting trends based on previous results, testing different variants of ad creation, using Meta Advantage products.
3. Customer service: chatbots help to quickly provide answers to typical consumer questions. They can be successfully used as virtual assistants to city residents on the websites of various institutions (e.g. a bot that presents the provisions of the landscape law). Currently, chatbots are often a source of frustration, but they will continue to

improve and provide effective customer support 24/7. They will not only answer simple questions, but also solve problems and even conduct transactions. In the near future we will also see a rise in the popularity of voice assistants such as Amazon Alexa and Google Assistant, which will have an impact on SEO and content marketing strategies.

4. Sentiment analysis: monitoring opinions about a brand based on mentions collected from various sources on the web. Tools such as SentiOne or Brand24 have a built-in function for the automatic recognition and assessment of the emotional tone of statements, which makes it much easier to monitor the moods of recipients.
5. Creating new content as part of content marketing: writing blog posts, creating descriptions for newsletters, preliminary verification of texts for substantive correctness (e.g. ChatGPT, Jasper). Artificial intelligence enables the creation of tailored content for customers by analysing large data sets and providing recommendations. AI analyses the history of purchases, behaviour on websites, interactions on social media and other data to identify customers' preferences and needs. On this basis, it automatically generates personalized recommendations for products and services (e.g. tourist destinations to visit) and adjusts marketing messages, which not only increases the effectiveness of advertising campaigns, but also significantly improves the shopping experience of the campaign's recipients (Kornaś, 2024). Additionally, two-way interaction can turn the tourist into a prosumer, that is a co-creator of the tourist offer (Chaber, 2023).
6. Generating graphics, presentations, videos, logos and processing text into specific visual creations (e.g. Craiyon, Canva AI, Midjourney).

An important role of artificial intelligence relates to the processes of communication with the local community. AI can collect and analyse data about the territorial unit, the behaviour of its residents as well as their preferences and needs. It can help segment them, which makes it easier to adjust the services provided, sometimes in real time. In turn, the residents, through the use of digital communication channels, can influence local government decisions through public consultation (Noworól, 2024). In addition, AI can support spatial policy as it can help with land-use planning and the implementation of optimal solutions, combining social, economic and spatial requirements. For example, on the basis of typological analyses of local buildings it can create functional and spatial models for the design of the urban fabric. However, it must be remembered that AI is not a substitute for strategic thinking but rather a tool that can support this thinking (Przegalińska, Jemielniak, 2023).

6. Conclusions

Territorial marketing that uses the potential of AI is not only the future – it already is a source of competitive advantage for many entities. Thanks to AI, city authorities are able to offer their customers better tailored products and services, and consequently experiences that translate into their commercial success. As AI technology continues to develop, place marketing specialists will be able to implement increasingly innovative and engaging promotional campaigns. Research conducted by Boston Consulting Group and Harvard shows that ChatGPT improves marketers' efficiency by 40% (Jeleśniański, 2024). The future of spatial marketing is associated not only with greater personalization of the offer and its promotion, but also with more interactive methods and tools of communicating with customers, who are primarily residents, tourists and investors.

The use of AI is pivotal to effectively promoting a city or region. Social media platforms such as Facebook, Instagram or Twitter make it possible to reach a wide audience in a very short time. What is more, the advanced analytical tools of these platforms enable precise targeting of recipient groups and measuring the effectiveness of conducted campaigns. As a result, it is possible to quickly adapt the promotional strategy of a municipality, city, county, region or country to changing market conditions and recipient preferences.

References

1. Adamyan, L. (2023). *The early history and future of artificial intelligence*. Retrieved from: https://www.ai-bees.io/post/artificial-intelligences-early-history-and-future, 14.12.2024.
2. Aioai.pl. (2024). *Polska liderem w Europie w zakresie sztucznej inteligencji*. Retrieved from: https://aioai.pl/polska-liderem-w-europie-w-zakresie-sztucznej-inteligencji/, 18.12.2024.
3. Analyticsvidhya.com (2024). *Top 7 Advantages and Disadvantages of Artificial Intelligence*. Available online: https://www.analyticsvidhya.com/blog/2023/05/advantages-and-disadvantages-of-ai/, 18.12. 2024.
4. Avelino, J. (2023). *The advantages and disadvantages of AI: A guide for trainers.* Retrieved from: https://training.safetyculture.com/blog/advantages-and-disadvantages-of-ai/,18.12.2024.
5. Baran, M. et al. (2022). Metody i zastosowania sztucznej inteligencji. *Nauka - Technika – Technologia, Tom 4.* Akademia Górniczo-Hutnicza w Krakowie, p. 91.
6. Bitcoin.pl (2023). *Krótka historia AI – od Turinga do IoT*. Available online: https://bitcoin.pl/historia-ai, 12.12.2024.

7. Biuroreklama.pl (2023). *Historia sztucznej inteligencji*. Available online: https://biuroreklama.pl/blog/ai/2023/historia-sztucznej-inteligencji/, 12.12.2024.
8. Blicharz, J. (2023). Inteligentne miasta i sztuczna inteligencja, Wybrane aspekty teoretycznoprawne. *Prace Naukowe Wydziału Prawa, Administracji i Ekonomii Uniwersytetu Wrocławskiego, Seria: e-Monografie, No. 211,* p. 80.
9. Blichtarz, M., Szalonka, K. (2024). Prawne aspekty działalności marketingowej. *Prace Naukowe Wydziału Prawa, Administracji i Ekonomii Uniwersytetu Wrocławskiego, seria: e-Monografie, No. 220*, p. 98 et seq.
10. Cebrf.knf.gov.pl (2024). *Wprowadzenie do sztucznej inteligencji*. Available online: https://cebrf.knf.gov.pl/komunikaty/artykuly-csirt-knf/362-ostrzezenia/887-wprowadzenie-do-sztucznej-inteligencji, 14.12.2024.
11. Chaber, P. (2023). *Nowe technologie w turystyce i marketingu terytorialnym.* https://cwd.info.pl/wp-content/uploads/2023/05/Nowe-technologie-w-turystyce_Pawel-Chaber-1.pdf, 17.12.2024.
12. Cymanow-Sosin, K., Tenerowicz, K., Cymanow, P. (2024). *Media przyszłości – wybrane aspekty komunikacyjne, ekonomiczne i edukacyjne*. Kraków: Homini, p. 129 et seq.
13. Davenport, T., Mittal, N. (2024). *Sztuczna inteligencja w biznesie. Jak zdobywać rynkową przewagę dzięki AI?* Warszawa: MT Biznes.
14. Duggal, N. (2024). *Advantages and Disadvantages of Artificial Intelligence*. Retrieved from: https://www.simplilearn.com/advantages-and-disadvantages-of-artificial-intelligence-article, 17.12.2024.
15. Ebers, M. (2021). Liability for Artificial Intelligence and EU Consumer Law. *Journal of Intellectual Property Law, Information Technology and Electronic Commerce, vol. 12, no. 2,* p. 204.
16. Górski, S. (2019). *Najważniejsze momenty w historii rozwoju SI. Od Turinga do pierwszej zimy*. Retrieved from: https://www.sztucznainteligencja.org.pl/najwazniejsze-momenty-w-historii-rozwoju-si-1-od-turinga-do-pierwszej-zimy/, 12.12.2024.
17. Greser, J., Dymitruk, M. (2022). Unijny projekt regulacji sztucznej inteligencji, a przeciwdziałanie próbom autorytarnego jej wykorzystywania przez władze publiczne. *Problemy współczesnego prawa międzynarodowego, europejskiego i porównawczego, vol. XX.* Uniwersytet Jagielloński w Krakowie, pp. 135-160.
18. Heaven, D., Alison, J. (2017). *Sztuczna inteligencja. Co warto wiedzieć o nadchodzącej epoce inteligentnych maszyn,* pp. 12-14.
19. Hereźniak, M. (2020). *Marka miasta – między teorią a praktyką*, w: *Strategie budowania marki i rozwoju handlu. Nowe trendy i wyzwania dla marketingu.* T. Domański (ed.). Łódź/Warszawa: Uniwersytet Łódzki/PWE, p. 59.
20. https://markaterytorialna.pl/blog/jak-wykorzystac-sztuczna-inteligencje-ai-w-marketingu-terytorialnym, 17.12.2024.

21. Jaskuła, S. (2023). Sztuczna inteligencja w edukacji we współczesnej rzeczywistości hybrydalnej. *Perspektywy Kultury, No. 42(3),* pp. 13-26.
22. Jastrzębska, W., Jastrzębska, A. (2010). *Nierówności społeczne a wzrost gospodarczy, Vol. 17,* p. 173.
23. Jeleśniański, M. (2024). *AI w marketingu, czyli nowa normalność.* Retrieved from: https://jelesnianski.pl/sztuczna-inteligencja/ai-w-marketingu-czyli-nowa-normalnosc/, 18.12.2024.
24. Kornaś, W. (2024). *Sztuczna inteligencja w marketing.* Retrieved from: https://www.wsb.net.pl/ marketing/sztuczna-inteligencja-w-marketingu/, 17.12.2024.
25. Kremer, M., Went, R., Engbersen, G. (2021). *Better Work: The Impact of Automation, Flexibilization and Intensification of Work.* Springer Nature, p. 204.
26. Kumar, S. (2019). *Advantages and Disadvantages of Artificial Intelligence*. Retrieved from: https://towardsdatascience.com/advantages-and-disadvantages-of-artificial-intelligence, 18.12.2024.
27. Lampart, M. (2023). *Rozwiązania generatywnej sztucznej inteligencji – zagrożenia i aspekty prawne.* Warszawa: Polska Agencja Rozwoju Przedsiębiorczości, pp. 39-45.
28. Matolicz, K. (2023). *Sztuczna inteligencja w komunikacji*. Warszawa: Raport Lighthouse, p. 5.
29. Miernik, A. (2023). *Sztuczna inteligencja – czym jest? Czy AI wpłynie na sytuację na rynku pracy w Polsce?* Retrieved from: https://www.ey.com/pl_pl/workforce/sztuczna-inteligencja-ai-i-rynek-pracy-w-polsce, 18.12.2024.
30. Mrożek, J. (2023). *Chat GPT i sztuczna inteligencja, a przepisy o ochronie danych osobowych*. Retrieved from: https://rodoradar.pl/chat-gpt-i-sztuczna-inteligencja-a-przepisy-o-ochronie-danych-osobowych/, 14.12.2024.
31. Nesirat, Y. (2023). *800 million jobs could be lost to AI and Automation by 2030*. Retrieved from: https://medium.com/leadership-by-design/800-million-jobs-could-be-lost-to-ai-and-automation-by-2030, 18.12.2024.
32. Noss, S. (2023). *Generative AI and Its Impact on Privacy Issues*. Retrieved from: https://www.datagrail.io/blog/data-privacy/generative-ai-privacy-issues/, 18.12.2024.
33. Noworól, A. (2024). Strategia rozwoju lokalnego w warunkach globalnej niepewności oraz zmian prawnych i technologicznych. In: *Rozwój regionalny i polityka regionalna* (p. 21). Uniwersytet Ekonomiczny w Krakowie.
34. Pickover, C. (2019). *Artificial Intelligence: An Illustrated History: From Medieval Robots to Neural Networks.* New York City: Sterling, pp. 23-24, 213-214.
35. Podgórski, D. (2024). *Pięć popularnych narzędzi AI wykorzystywanych w marketingu.* Retrieved from: https://www.talem.eu/blog/5-popularnych-narzedzi-ai-wykorzystywanych-w-marketingu, 17.12.2024.
36. Portal Fintech (2022). *Sztuczna inteligencja (AI). Zalety, wady i przyszłość.* Retrieved from: www.fintechportal.pl/sztuczna-inteligencja-zalety-wady-i-przyszlosc, 18.12.2024.

37. Przegalińska, A., Jemielniak, D. (2023). *AI w strategii marketingowej. Rewolucja sztucznej inteligencji w zarządzaniu*. Warszawa: MT Biznes, p. 81.
38. Rudnicka, A., Kaczorowska-Spychalska, D., Kulik, M., Reichel, J. (2020). *Digital ethics – polscy konsumenci wobec wyzwań etycznych związanych z rozwojem technologii*. I Ogólnopolski Raport. Łódź: Uniwersytet Łódzki.
39. Russell, S.J., Norvig, P. (2021). *Artificial Intelligence. A Modern Approach.* London: Pearson Education, p. 19.
40. Rutkowski, I. (2020). Inteligentne technologie w marketingu i sprzedaży — zastosowania, obszary i kierunki badań. *Marketing i Rynek, No. 6*, p. 6.
41. Rzeźnik, G. (2023). *Zastosowania sztucznej inteligencji w gospodarce. Przegląd wybranych inicjatyw i technologii z rekomendacjami dla przedsiębiorców.* Warszawa: Polska Agencja Rozwoju Przedsiębiorczości, pp. 14-37.
42. Skuza, A. (2023). *Tesla is not the first. Mercedes was the first autonomous car*. Retrieved from: https://arekskuza.com/the-innovation-blog/tesla-is-not-the-first/, 14.12.2024.
43. Szpringer, W. (2024). *Sztuczna inteligencja w zarządzaniu. Regulacja a konkurencja.* Warszawa: Poltex.
44. Tableau.com (2024). *What are the advantages and disadvantages of artificial intelligence (AI)*. Available online: https://www.tableau.com/data-insights/ai/advantages-disadvantages#advantages, 18.12.2024.
45. Vanjare, V. (2022). *Historical events in artificial intelligence*. Retrieved from: https://www.linkedin.com/pulse/historical-events-artificial-intelligence-vrunda-vanjare/, 12.12.2024.
46. Wcisło, D. (2024). *Ebook o prawnych aspektach Gen AI.* Warszawa: LAWMORE, pp. 1-80.
47. Widera, Z., Widera, W. (2023). Wykorzystanie technologii informacyjno-komunikacyjnych w partycypacyjnym zarządzaniu samorządami terytorialnymi w koncepcji smart city. *Zeszyty Naukowe Akademii Górnośląskiej, No. 10*, p. 94.
48. www.ifirma.pl (2023). *Małe firmy w erze AI Innowacyjne narzędzia marketingowe i sprzedażowe.* Available online: www.ifirma.pl/wp-content/uploads/2023/11/Male-firmy-w-erze-AI-ebook-ifirma.pdf, 17.12.2024.
49. Zalewska-Bochenko, A. (2024). Sztuczna inteligencja w procesie edukacji. *Optimum. Economic studies, no. 2(116).* Uniwersytet w Białymstoku.
50. Zalewski, T. (2020). Definicja sztucznej inteligencji. In: L. Lai, M. Świerczyński (eds.), *Prawo sztucznej inteligencji* (p. 14). Warszawa: C.H. Beck.
51. Zdobylak, J. (2024). *Przewodnik po sztucznej inteligencji.* Retrieved from: https://www.iab.org.pl/baza-wiedzy/typ-dokumentu/poradniki/przewodnik-po-sztucznej-inteligencji-2024/, 17.12.2024.

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BEHIND-THE-SCENES MARKETING AS A TOOL FOR COMMUNICATING THE MEDICAL FACILITY WITH THE PATIENT ON SOCIAL MEDIA

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Purpose: to present issues related to behind-the-scenes marketing in the context of its relevance to the medical establishment as a social media communication channel.
Design/methodology/approach: A literature analysis and critique was applied. A non-systematic literature review was conducted using scientific databases: Google Scholar, Taylor and Francis Online, PubMed and ScienceDirect. The scientific items were supplemented with industry literature and online sources on the issues addressed.
Findings: Behind-the-scenes marketing on social media allows for better outreach to patients, building trust and loyalty to the medical facility. An authentic representation of the organisation's activities and values translates to greater service satisfaction. In addition, behind-the-scenes marketing enables better communication with patients and promotion of the quality of medical services, and the diverse content and its forms contribute to the organisation's online visibility.
Research limitations/implications: The literature review was based only on selected scientific databases. The literature search used a specific combination of keywords using logical operators, which may have omitted other scientific items from the database.
Practical implications: Medical facilities should create compelling and diverse behind-the-scenes content on various social media and share the values and mission of the facility. Such activities attract patients' attention and humanise the brand. Medical staff should be trained to communicate with patients to understand their needs better, which improves satisfaction with medical services and influences loyalty.
Social implications: Facilities should use behind-the-scenes marketing to communicate relevant information about health, prevention and available services. In this way, patients will be better informed and can make more informed decisions about their health. In addition, the authenticity presented in behind-the-scenes marketing can help strengthen the perception of healthcare facilities as entities focused on the health and well-being of patients.
Originality/value: The coverage of issues treating behind-the-scenes marketing is based exclusively on foreign literature, enriching the previous scientific output concerning marketing in the enterprise and medical industry, signalling the author's contribution to developing the discipline of management and quality sciences. There is not much research in the analysed sources in this area, especially in the Polish literature, which provides excellent opportunities for further exploration of the issues raised. The article primarily addresses researchers and scientists dealing with behind-the-scenes marketing in the medical industry. In addition,

the article is valuable for managers of medical institutions dealing with communication with stakeholders, mainly patients.
Keywords: behind-the-scenes marketing, patient, medical facility, social media, communication.
Category of the paper: General review.

1. Introduction

Behind-the-scenes marketing in healthcare facilities is vital for communicating with patients on social media. To effectively use this form of marketing in healthcare facilities, it is essential to focus on staff empathy, a friendly facility interior and online visibility. It is necessary to highlight that behind-the-scenes marketing attracts new patients and influences the loyalty and satisfaction of existing patients. The role of social media in exposing behind-the-scenes marketing activities is vast, as more and more patients are seeing the activities of their healthcare facility in these very places, which can translate into building their brand and maintaining good relationships with their healthcare audience.

The study aims to present issues related to behind-the-scenes marketing in the context of its relevance to the medical institution as a communication channel in social media. To achieve the stated objective, the following research questions were formulated:

1. What are the benefits of behind-the-scenes marketing for companies and their audiences?
2. What is the importance of behind-the-scenes marketing used on social media for the growth of a medical facility?

2. Research Methodology

The research method used in this study was literature analysis and critique. For this purpose, a non-systematic literature review was conducted based on an established condition with keywords and Boolean operators: ("behind-the-scenes marketing" OR "BTS marketing") AND (healthcare OR "healthcare provider" OR "medical facility") AND "social media", on which the search for relevant literature was based in databases (the search results in brackets are the number of items): Google Scholar (6), Taylor and Francis Online (0), PubMed (0) and ScienceDirect (0). No time limitation was applied to avoid missing items of value. The listed databases were chosen because the Author of the study has an account in these databases. As the search query yielded only 6 results, and none of these items were ultimately taken for analysis, it was decided to continue the literature collection process through the Bing search engine, analysing industry articles, blogs, and company websites, among others. In the end, 24 sources were analysed, among which there were academic articles (10), chapters from monographs (1), online industry articles (6), blogs (5), and online dictionaries (2).

3. Behind-the-Scenes Marketing - Essence, Application and Benefits for Companies and Audiences

With modern audiences craving authenticity and transparency, they are more likely than ever to identify with brands they feel connected to, and companies can further build this connection by using behind-the-scenes content to humanise their image (Unlimited, 2019). Behind-the-scenes (BTS) marketing has become a powerful tool for brands to communicate with their customers; from films, fashion shows or software development to culinary art, BTS content offers an insight into the process behind a polished end product (Townsley, 2024). However, what exactly is behind-the-scenes marketing, and what are its uses?

Behind-the-scenes marketing (BTS) is partially uncut content that provides an unedited view of what is happening inside the company (Mara, 2022). This content shows audiences the culture, management and day-to-day operations of the company, and promoting this type of behind-the-scenes content helps cultivate a personal connection with consumers, increase engagement (O'Brien, 2018), and create authenticity as well as increase its perception, given that this content is similar to that generated by users (Richards et al., 2021). This authenticity breeds connections, as behind-the-scenes content peels away the layer of perfection often associated with finished products and instead shows the messy, imperfect and human side of creation. Audiences resonate with this authenticity, creating a deeper emotional connection with the brand (Townsley, 2024).

Behind-the-scenes marketing thus involves the selective management of information, pointing out that what is not communicated is just as important as what is shared, emphasising the importance of secrecy in marketing strategies (Berthon et al., 2021). Such covert activities aim to connect with audiences, revealing the internal workings of the organisation and development processes (Geretsegger, 2021).

Behind-the-scenes marketing also refers to the hidden processes and algorithms used by search engines, influencing users' perception and understanding of information searched online (Cortázar, 2014). This enables companies to analyse vast amounts of data to identify patterns and trends that may not be apparent at first glance, allowing companies to make informed decisions, optimise marketing campaigns and improve overall business performance. Behind-the-scenes marketing also enables companies to stay ahead of the competition by anticipating market trends and proactively adjusting strategies, as by harnessing the power of data mining, companies can identify emerging opportunities and potential threats, giving them a competitive advantage in the marketplace. Furthermore, behind-the-scenes marketing helps companies streamline their operations and improve efficiency by automating targeted advertising, customer segmentation and predictive analytics (John, 1999).

Behind-the-scenes marketing is also applied in fashion, focusing on the processes and connections that shape the history of contemporary fashion (Eide, 2023). In addition, one can also identify another application of behind-the-scenes marketing relating to the publication process of the Thesaurus Antiquitatum et Historiarum Italiae by Pieter van der Aa, in which he played a crucial role in overcoming obstacles and successfully promoting the work in academic circles (Piccoli, 2013).

Behind-the-scenes marketing can include movie bloopers, an interview with a favourite actor on the set of his next film, and memes after the film. This type of behind-the-scenes content gives an insight into the people behind your favourite products, services and social content. Behind-the-scenes content humanises brands, strengthens their online presence, and nurtures relationships with customers (Kenan, 2023), i.e. they benefit both media creators and consumers. This type of content can show a different side of the brand and build trust among audiences ('Behind the Scenes (BTS) | Glossary', n.d.). Furthermore, by using behind-the-scenes marketing strategies, companies can gain valuable insights into customer needs and tailor their products or services accordingly. This personalised approach can increase customer satisfaction and loyalty, ultimately driving business growth (John, 1999).

4. Behind-the-Scenes Marketing in Social Media - Examples and Relevance to the Healthcare Facility

Changing consumer behaviour, ever-increasing competition between brands and technological advances determine the landscape of social media marketing. Today, it is about social media presence and communicating content effectively and efficiently to the audience. What matters most to users is transparency and authenticity on the part of brands, which have become essential elements of any successful social media marketing strategy, and behind-the-scenes content plays a vital role in this dynamic (Big Deal Marketing, 2024).

BTS is widely used on social media, being a great way to share a more intimate and unfiltered view of different activities or creations ('What Does "BTS" Mean?', 2023). An example of behind-the-scenes marketing activities on social media is when a company reveals the inner workings of a campaign to engage and inform its audience (Basra, 2014).

Medical facilities can also expose various content and behind-the-scenes activities on social media, such as a series of meetings with medical staff or a video showing a specific medical procedure. In this case, social media is an ideal channel for BTS content, as it can include videos, photos, blogs, and other content formats that highlight the staff, procedures, and treatments that bring a healthcare provider to life.

In the case of a medical facility, relevant and engaging social media content can be shown in various ways. Firstly, it is possible to showcase the medical professionals working at the medical facility daily who are the faces behind the entity. Such employee recognitions related to the staff's skills, knowledge and commitment build the facility's brand as an authority in the medical industry. Photos, videos or blog articles can be used when healthcare providers share their daily tasks. In this way, you can present and discuss the structure of the medical and administrative staff, as well as how the facility's management manages its team. In addition, the specific methods and tools the team uses can be presented while adding storytelling elements.

Secondly, the facility's interior can be presented creatively while highlighting the building layout, rooms, and atmosphere. This content is visually engaging and shows patients what they can expect when they visit a particular facility. In addition, it is great for promoting special events such as White Saturdays. Such initiatives aim to improve public health by facilitating access to medical specialists and consultations and providing preventive screenings at no cost to local communities. White Saturdays offer considerable convenience, especially for people involved in professional activities who find it difficult to make regular appointments with their family doctors. On-site, medical professionals encourage individuals to examine themselves, provide critical details about diseases and potential risks, impart knowledge about the dangers of various lifestyle diseases, and offer guidance on self-care. Through White Saturdays, residents of a specific area or city are offered mobile screening services, often performed via specialised vehicles such as hearing buses, osteobuses, mammobuses or specially equipped screening tents (*White Saturdays | Poznan.pl*, n.d.).

Thirdly, if a medical facility hosts or participates in a health-related event, conference or congress, it can report on the entire stay, showing the audience's emotions surrounding the event. For example, an Instagram Reel showing how the facility interacted with TikTok during the conference session can be created. In addition, you can post the findings of a session in real time to encourage participants to attend the next session. Finally, on social media, you can spark the curiosity of those watching a particular healthcare provider around upcoming events with announcements (static and video). An example would be a carousel post on Instagram, where the first slide could show a conversation between team members working on an event, and the next slide could show a video clip relating to the topic of discussion. In doing so, you could encourage your audience to interact through a call-to-action in the form of a question, a request for comment or an incentive to share the post. In summary, engaging your audience with videos on social media is now critical to the success of the healthcare industry. Social media platforms such as Facebook, Instagram, LinkedIn and Twitter have become major hubs for video content. Each platform offers unique video features such as Instagram's Reels, LinkedIn's native videos and Twitter's short video snippets. These platforms provide a space for more informal and creative video content, allowing medical brands to connect personally with their audiences (Gadless, 2023).

Increasingly, healthcare providers are providing videos of specific treatments or medical interventions or 'before and after' photos to provide an exclusive insight into the performance of a particular procedure to generate buzz among patient-clients and give them a behind-the-scenes look at the entire procedure. Additionally, viewers can be encouraged to dig deeper and sign up for a consultation before the procedure. What is added to the behind-the-scenes video depends on what the facility wants viewers to know or learn. This is an excellent opportunity to share ideas, concepts and values that may not be detailed in standard marketing materials and on the entity's website. In addition, behind-the-scenes videos can be styled to give viewers a better insight into what happens before, during and after the camera run while also allowing them to become aware of specific stages of the service (Farber, n.d.). In summary, the benefits of using behind-the-scenes videos for businesses, including medical facilities, can be identified (Townsley, 2024; Watts, 2017): humanising the company, demonstrating the quality of their products and services, sharing their "why?", educating and inspiring, cultivating a sense of exclusivity, building trust.

To summarise the discussion so far, it is essential to emphasise that social media makes it easier for medical facilities to share compelling content behind the scenes. Combining videos and photos with written captions, blog or email marketing to add depth and a human side to your brand story is a good idea. Exciting forms of behind-the-scenes content include video previews (trailers), blooper videos (compilations of funny and awkward moments), photo previews, and photo carousels (Zaleski, n.d.). This type of content enables providers to share valuable health information, promote services and effectively connect with patients (Kumar, Dhyani, 2023), and by using platforms such as Facebook, Telegram and YouTube, medical professionals can reach a wider audience, increase brand awareness and increase the number of potential customers, ultimately improving the overall patient experience and healthcare delivery (Atsbeha, Wodaje, 2024a, 2024b).

The following are some examples of Polish medical facilities that use behind-the-scenes marketing on social media.

1. Enel-Med Medical Center: Its Facebook profile regularly shares photos and information about opening new branches, such as the facility in Warsaw Spire and the React office building in Lodz. The posts show a behind-the-scenes look at the network's growth and commitment to expanding the availability of medical services (enel-med, 2022a, 2022b).
2. Salve Medica: This facility actively maintains social media profiles, such as Facebook and Instagram, where it regularly publishes content showing the daily work of the medical team, preparations for procedures, and coverage of educational events. This lets patients get to know the clinic's staff and facilities better, building trust and a positive image (Cieślik, 2023).

3. Klinika Skórna.pl: Publishes photos and videos showing the results of procedures, such as labioplasty, on its Facebook and Instagram profiles, along with patient stories (Skórna.Pl, n.d.; Skórna.pl | **Medycyna Estetyczna** | **Chirurgia** | **KATOWICE** (@skorna.pl) • Zdjęcia i filmy na Instagramie, n.d.).
4. Piotr Skupin Plastic Surgery Clinic: Shares "before and after" photos of procedures such as breast augmentation and nose correction, showing the results of their work (*Piotr Skupin (@skupinklinika) • Zdjęcia i filmy na Instagramie*, n.d.).
5. Klinika Kolasiński: Documents the results of procedures through photography, allowing objective evaluation of the results and presenting them on social media (*Klinika Kolasiński*, n.d.; *Klinika Kolasiński (@klinikakolasinski) • Zdjęcia i filmy na Instagramie*, n.d.).

Polish medical facilities on social media increasingly use behind-the-scenes marketing to build trust and patient engagement. An example of such activities is Enel-Med Medical Center, which presents a behind-the-scenes look at the development of its facilities, highlighting its commitment to making services more accessible. Salve Medica uses social media to show the daily work of its staff, preparations for procedures, and coverage of educational events, enhancing the clinic's positive image. Clinics specialising in aesthetic medicine, such as Klinika Skórna.pl, Piotr Skupin Plastic Surgery Clinic and Klinika Kolasiński use behind-the-scenes marketing, publishing photos and videos of the "before and after" effect of procedures performed. This content is often supplemented with patient stories, which allows a better understanding of medical procedures and builds authentic trust in the facilities. All these activities demonstrate how behind-the-scenes marketing can be effectively used on social media to bring patients the behind-the-scenes of facilities' operations, promote professionalism and increase transparency in communication with the public.

5. Limitations

This article contains limitations. Firstly, the literature review was based only on selected scientific databases: Google Scholar, Taylor and Francis Online, PubMed and ScienceDirect, which did not result in any relevant publications anyway, thus limiting the number and value of search results for applicable items. When writing the article on behind-the-scenes marketing in the medical industry, one may focus on other scientific databases omitted from this study: Web of Science and Scopus. Secondly, the literature search used a specific combination of keywords using logical operators, which may have omitted other scientific items from the database. Industry literature and electronic sources were used to supplement the analysis.

6. Conclusions and Practical Implications

The conclusions of the literature review are as follows about the research questions posed. Firstly, behind-the-scenes marketing contributes to brands' humanisation, allowing them to reach their audiences better. By portraying activities and values authentically, companies can build trust and loyalty with their audiences, resulting in greater satisfaction with service quality. Additionally, effective use of this type of marketing can attract new audiences through engaging and authentic content. Secondly, behind-the-scenes marketing on social media is essential in creating a positive image for medical facilities. It enables better communication with patients and promotes the availability and quality of services. Behind-the-scenes content, such as videos and photos, contributes to the facility's online visibility and improves community perception.

The practical implications of behind-the-scenes marketing in the context of medical facilities include several vital aspects: increasing visibility on social media, interacting with patients, humanising the brand, building trust and relationships with patients, and being creative in communication.

Firstly, medical facilities should focus on creating compelling behind-the-scenes content on social media that can capture patients' attention. It is worth experimenting with various engaging content formats, such as videos, photos, blogs, posts, event previews, behind-the-scenes videos or compilations of funny staff moments. In addition, medical facilities should take full advantage of various social media outlets such as Facebook, Instagram, LinkedIn and TikTok, tailoring content to the specifics of each platform and actively engaging audiences to participate in discussions (e.g. through questions, requests for comments or interactive call-to-action posts). Secondly, it is worth sharing the values and mission of the organisation in the form of content that shows the organisation's human side. Recipients want to know who is behind the medical services, which can build trust and a bond with patients. Thirdly, medical staff should be trained to communicate with patients to show empathy and understanding of their needs. Placing more importance on interaction with patients improves patient satisfaction and influences loyalty.

Despite the identified limitations, this article may form the basis for a more extensive analysis in the future, which could include additional or utterly different research bases. In addition, this paper may initiate a series of articles addressing behind-the-scenes marketing in the medical industry on selected social media, revealing differences in community building, professionalism, communication process, and content used - including its length and forms.

7. Summary

Behind-the-scenes marketing in social media is an innovative communication tool, particularly relevant in the medical industry, where transparency, authenticity and relationship-building with patients play a key role. An analysis of examples of Polish medical institutions, such as Enel-Med Medical Center, Salve Medica and aesthetic medicine clinics, shows that the appropriate use of behind-the-scenes content can effectively humanise a brand, increase audience engagement and build trust and loyalty among patients.

Publishing content showing the behind-the-scenes of daily operations and the effects of treatments or educational events allows the facility to increase its visibility in the online space and reinforce its image of professionalism and accessibility. BTS content in the form of photos, videos or posts from the backstage of a medical facility's operations can attract new patients while maintaining a bond with existing customers.

The practical benefits identified in the article, such as humanising the brand, promoting service quality and building trust, show that behind-the-scenes marketing should become an integral part of any medical facility's communication strategy. Further research in this area may provide additional information on the effectiveness of such activities and their impact on the development of medical facilities in a rapidly changing digital environment.

References

1. Atsbeha, B.W., Wodaje, M.N. (2024a). *Examining Social Media Usage Patterns among Health Care Providers in Gondar Town: A Cross-Sectional Survey*. https://doi.org/10.21203/rs.3.rs-3872002/v1
2. Atsbeha, B.W., Wodaje, M.N. (2024b). Exploring social media adoption for marketing purpose among healthcare professionals in Gondar town, central Gondar zone: A facility-based cross-sectional survey. *Digital Health*, *10*, 20552076241259872. https://doi.org/10.1177/20552076241259872
3. Basra, K. (2014). Behind the scenes of the 'Be a flu hero' social media campaign. *British Journal of School Nursing*, *9*(9), 452-453. https://doi.org/10.12968/bjsn.2014.9.9.452
4. Behind the scenes (BTS) | Glossary (n.d.). In: *Digital Marketing Institute*. Retrieved from: https://digitalmarketinginstitute.com/resources/glossary/behind-the-scenes-bts, 20 July 2024.
5. Berthon, P., Lord Ferguson, S., Hannah, D., Parent, M. (2021). Towards a conceptualization of secrecy in marketing. *Journal of Strategic Marketing*, 1-16. https://doi.org/10.1080/0965254X.2020.1853200

6. *Białe Soboty | Poznan.pl*. (n.d.). Retrieved from: https://www.poznan.pl/mim/main/-,p,46235,47619,47620.html, 19 July 2024.
7. Big Deal Marketing (2024, March 20). *Transparency, Authenticity, and Behind-the-Scenes Content*. https://bdmarketing.com/transparency-authenticity-and-behind-the-scenes-content/
8. Cieślik, A. (2023, March 29). *Social media w komunikacji placówki: Na przykładzie Salve Medica*. ZnanyLekarz. https://pro.znanylekarz.pl/blog/placowki/salve-medica-social-media
9. Cortázar, C. (2014). *Search behind the scenes*. Proceedings of the 11th Conference on Advances in Computer Entertainment Technology, 1-4. https://doi.org/10.1145/2663806.2663815
10. Eide, H. (2023). Swedish Splendor Behind the Scenes. In: *The Routledge History of Fashion and Dress, 1800 to the Present* (pp. 99-111). Routledge.
11. enel-med (2022a, March 21). *Otworzyliśmy nowy oddział enel-med w ścisłym centrum Łodzi!* Facebook. https://www.facebook.com/enelmed/posts/2028743167303659/
12. enel-med (2022b, November 3). *Otwieramy nowy oddział!* Facebook. https://www.facebook.com/enelmed/posts/otwieramy-nowy-oddzia%25C5%2582-mowa-o-centrum-medycznym-enel-med-oddzia%25C5%2582-warsaw-spire-kt/2210006152510692/
13. Farber, B. (n.d.). *Behind-the-Scenes Marketing Videos | Video Marketing and Production*. Retrieved from: https://thoughtcastmedia.tv/resources/video-marketing/behind-the-scenes-videos/, 20 July 2024.
14. Gadless, B. (2023, June 22). *Video Marketing in Healthcare & Pharma: Comprehensive Guide*. emagineHealth. https://www.emaginehealth.com/blog/video-healthcare-pharma-marketing/
15. Geretsegger, M. (2021). Behind the scenes: About hidden support to reach one's audience. *Nordic Journal of Music Therapy*, *30*(2), 103-105. https://doi.org/10.1080/08098131.2021.1877390
16. John, G.H. (1999). Behind-the-scenes data mining: A report on the KDD-98 panel. *SIGKDD Explor. Newsl.*, *1*(1), 6-8. https://doi.org/10.1145/846170.846176
17. Kenan, J. (2023, November 1). *10 behind-the-scenes content ideas for your next campaign*. Sprout Social. https://sproutsocial.com/insights/behind-the-scenes-content/
18. *Klinika Kolasiński* (n.d.). Facebook. Retrieved from: https://www.facebook.com/KlinikaKolasinski, 10 January 2025.
19. *Klinika Kolasiński (@klinikakolasinski) • Zdjęcia i filmy na Instagramie* (n.d.). Instagram. Retrieved from: https://www.instagram.com/klinikakolasinski/, 10 January 2025.
20. Kumar, H., Dhyani, B. (2023). Role of Social Media Marketing in Changing Healthcare Perception: An Empirical study. *Journal of Informatics Education and Research*, *3*(1), *Article 1*. https://doi.org/10.52783/jier.v3i1.37

21. Mara, C. (2022, February 24). *Behind-the-scenes Content Is Authentic Storytelling*. Practical Ecommerce. https://www.practicalecommerce.com/behind-the-scenes-content-is-authentic-storytelling
22. O'Brien, M. (2018, April 5). *The Value of Behind-the-Scenes Content in Marketing*. NextPage. https://gonextpage.com/2018/04/05/the-value-of-behind-the-scenes-content-in-marketing/
23. Piccoli, C. (2013). Publishing in the Republic of Letters: Behind the Scenes of Pieter van der Aa's Thesaurus antiquitatum et historiarum Italiae (Leiden, 1704-25)*. *Quaerendo*, *43*(1), 61-82. https://doi.org/10.1163/15700690-12341263
24. *Piotr Skupin (@skupinklinika) • Zdjęcia i filmy na Instagramie* (n.d.). Instagram. Retrieved from: https://www.instagram.com/skupinklinika/, 10 January 2025.
25. Richards, O., Janét, K., Eris, S., Landrum, A.R. (2021). Engaging Audiences with Behind-the-Scenes Science Media. *Journal of Broadcasting & Electronic Media*, *65*(4), 525-548. https://doi.org/10.1080/08838151.2021.1984489
26. *Skórna.pl* (n.d.). Facebook. Retrieved from: https://www.facebook.com/skornapl, 10 January 2025.
27. *Skórna.pl | **Medycyna Estetyczna** | **Chirurgia** | **KATOWICE** (@skorna.pl) • Zdjęcia i filmy na Instagramie* (n.d.). Instagram. Retrieved from: https://www.instagram.com/skorna.pl/, 10 January 2025.
28. Townsley, D. (2024, April 17). *Why Behind-The-Scenes Content is So Engaging*. https://www.planoly.com/blog/behind-the-scenes-content-engaging
29. Unlimited, M. (2019, November 19). A Sneak Peek at Behind-the-Scenes Marketing. *Speaking Human*. https://thinkmonsters.com/speakinghuman/media/a-sneak-peek-at-behind-the-scenes-marketing/
30. Watts, S. (2017, July 10). *Humanise your brand with behind the scenes videos*. DS Videos. https://www.dsvideos.co.uk/behind-the-scenes-videos/
31. What Does 'BTS' Mean? Social Media Dictionary by NapoleonCat (2023). In: *NapoleonCat*. https://napoleoncat.com/dictionary/bts/
32. Zaleski, A. (n.d.). Behind-the-Scenes Social Media Post Ideas. *Squarespace*. Retrieved from: https://www.squarespace.com/blog/behind-the-scenes-social-media-posts, 20 July 2024.

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BRIDGING GENERATIONS – LEVERAGING INTERGENERATIONAL INITIATIVES IN CITY MARKETING

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Purpose: The article aims to identify the importance of cities' practices in bridging generations and to identify approaches cities can leverage when implementing intergenerational marketing initiatives.
Design/methodology/approach: The research was conducted using desk research and a case study using an exploratory qualitative approach. Content analysis of official documents and published materials was used to describe intergenerational initiatives and identify applied marketing approaches.
Findings: The research identifies the significance of intergenerational interactions for cities and their communities, explores strategies applicable to intergenerational marketing, and examines approaches cities employ to lead and support intergenerational initiatives.
Research limitations/implications: The case study is limited to Barcelona and Wroclaw. The content analyses and information synthesis consider the qualitative data collected in the case studies. Triangulation of methods and data in further research would allow for broadening the research material and deeper analysis.
Practical implications: Research indicates the rationale of using multifaceted approaches to intergenerational marketing, combining initiatives based on age-inclusive, pro-ageing, cross-generational and age-agnostic strategies.
Originality/value: The research contributes to understanding intergenerational marketing approaches and determining their importance and applicability in cities' practice. Recognising the importance of bridging generations in city communities and exploring possible approaches to implementing intergenerational marketing can foster developing city practices in this area.
Keywords: intergenerational marketing, city marketing, intergenerational strategy, age-inclusive marketing, pro-ageing marketing, cross-generational marketing, age-agnostic marketing, age-friendly city, intergenerational city.
Category of the paper: research paper.

1. Introduction

Population ageing is a global demographic trend that has led to many economic, social, medical and public health challenges (Zhong et al., 2022). A phenomenon accompanying this trend is ageism, which refers to stereotyping, prejudice and discrimination against people based on their age. Ageism, which can be institutional, interpersonal or self-directed, has serious and far-reaching consequences for the well-being and quality of life of individuals and entire communities (World Health Organization, 2021). Therefore, multifaceted efforts to bridge generations, enhance mutual understanding, build relationships, strengthen bonds and take joint action are becoming increasingly important. New intergenerational programmes that foster relationships between young people and older adults are constantly developed for the mutual benefit of all age participants (Jarrott, 2019; Jarrott et al., 2021).

European Economic and Social Committee highlights the importance of promoting intergenerational solidarity, which is the key to sustainable development, overcoming ageism and including the perspective of young people in relevant policies and initiatives. The right of representatives of all generations to realise basic values and needs is highly recognised. There are also areas where young and older people's interests are complementary. Therefore European Union Youth Strategy and a new European Strategy for Older Persons (proposed) focus on the needs and contributions of all generations, especially on the unique challenges and opportunities facing older people and youth. Intergenerational dialogue and cooperation can contribute to policies considering trends and future scenarios.

The need for investment and action to promote intergenerational interactions to reduce ageism towards older and younger generations is highlighted by international organisations, including the World Health Organization (World Health Organization, 2021). The WHO's Global Network for Age-Friendly Cities and Communities inspires and supports cities and communities worldwide to become increasingly friendly for all age groups (World Health Organization, n.d.-a). Implementing this vision requires integrating the cities' structures and public policies with the lives of cities' communities (Santana et al., 2022).

The last decade has witnessed increasing initiatives in many cities worldwide to create and support age-friendly and intergenerational communities. They have become an important part of many cities' policies aimed at improving the quality of life for older people and developing an age-friendly environment, affecting the quality of life and creating opportunities for people of different ages (Buffel et al., 2020; Lee, Zhong, 2019; Zhong et al., 2022). Cities also increasingly lead and support programs, services, integrative environments, and marketing initiatives to promote social interactions across generations.

The article aims to identify the significance of cities' practices in bridging generations and to explore approaches cities can leverage when implementing intergenerational marketing initiatives. Based on a literature review and a case study, the considerations address the following questions: What is the importance of intergenerational interactions for cities and their communities? What marketing approaches may be used in intergenerational initiatives? How do cities lead and support intergenerational initiatives?

The case study concerns Barcelona and Wroclaw, European cities with active intergenerational marketing initiatives and members of the Global Network of Age-Friendly Cities and Communities. Content analysis of official documents and publicised materials was used to describe intergenerational initiatives developed in each city's communities. As a result of the research procedure used, the following were described: city population and the age structure of inhabitants, strategic policies and organisational support for intergenerational initiatives, intergenerational projects developed or supported by cities' authorities, and grassroots intergenerational initiatives, approaches of intergenerational marketing applied in the cities' practices. The synthesis of information led to conclusions about the role of intergenerational initiatives and the approaches of intergenerational marketing applied in city practices.

The research contributes to the discussion on using intergenerational initiatives in city marketing. Recognising the importance of bridging generations in city communities and exploring possible approaches to implementing intergenerational marketing can foster developing city practices in this area.

2. Importance of intergenerational interactions for cities and their communities

The importance of intergenerational interactions is increasingly recognised in the well-being of individuals and entire communities. Due to demographic changes and ageing populations, the benefits of intergenerational interaction are most often referred to the situation of seniors. Developing age-friendly cities and communities become important to many cities' policies. which often focuses on improving the quality of life for older people (Buffel et al., 2020). In this context, age-friendly cities create accessible, affordable, usable, and inclusive environments for older adults, enhancing their mobility and well-being. Emphasis is also placed on the importance of urban projects, structures and services supporting active ageing and reducing the isolation of older members of city communities (Garrocho, Vilchis Mata, 2021).

Lee & Zhong (2019) highlight the importance of community environments encouraging intergenerational interactions, which are essential for diverse members of communities and cities. Building intergenerational and age-friendly communities is based on social and physical environments that support social interaction, exchange and cooperation between different generations (Zhong et al., 2020). Simultaneously, fostering intergenerational interactions influences the creation of dynamic environments where common experiences, values and perspectives can be shared, shaping and strengthening the identity and cohesion of city communities. A strong sense of belonging and togetherness can influence residents' contact quality and increase their engagement in joint city initiatives.

Intergenerational interactions contribute to social capital and influence the development of inclusive environments, promoting equity and solidarity in diverse communities (Andina, Corvino, 2023; Mega, 2013). Considering the perceived barriers to integration due to generational differences and other sociocultural factors, intergenerational interventions and initiatives are essential to foster meaningful connections and social cohesion (Lau, 2024). Creating age-friendly communities stimulates positive social interaction between generations (Lee, Zhong, 2019) and reduces intergenerational conflicts (Zhong et al., 2022).

Intergenerational interactions enrich city communities by fostering mutual learning (Manchester, Facer, 2017), which is facilitated by supporting intergenerational training and mentoring initiatives in cities (Somers, 2024). As the research shows, intergenerational learning benefits both younger and older people, increasing their knowledge and skills, improving their learning experience, strengthening relationships and fostering social contribution (Qianhexin, 2023).

Developing conditions that bridge diverse age groups in city environments enhances intergenerational understanding, community engagement and collaboration (Somers, 2024). Promoting inclusiveness and reducing age exclusion is linked to increasing the capacity to utilise the potential of all members of urban communities (Mega, 2013). Therefore, creating inclusive public spaces fostering cross-generational relationships that meet youth and older adults' needs and developing initiatives that support and create intergenerational cooperation is important.

3. Essence and strategies of intergenerational marketing

Intergenerational marketing applies to marketing strategies and initiatives based on the shared values and experiences of representatives of different generations. The intergenerational approach involves promoting and ensuring equal opportunities, fostering a sense of belonging and recognising the value of people of different ages, and combating prejudice, exclusion or age discrimination (Marabini, Henkens, 2023; Oxford Review, 2024). Bridging generations implies creating conditions that encourage people of different ages to engage in dialogue, seek mutual understanding and undertake joint intergenerational initiatives.

Based on observing different marketing practices, it is possible to distinguish strategies used by both commercial and non-commercial entities. A considerable part of activities in line with the idea of intergenerational marketing are those based on **age-inclusive strategies**. They support age-inclusivity by targeting age-diverse audiences, multi-generational offerings meeting the needs of various ages, supporting positive attitudes and respect for people of various ages, running projects involving different generations, and running projects to challenge and combat age-related exclusions.

Intergenerational marketing practices also incorporate **pro-ageing strategies**, which may be labelled **age-positive** or **age-friendly**. They focus on encouraging self-acceptance and celebrating self-beauty at any age. Although a pro-ageing strategy, in broad terms, can apply to people of different ages, in marketing practice, it is most often related to promoting a positive image of people who, because of their age, belong to the category of seniors. Marketing practices of this kind are usually aimed at seniors, influencing their positive self-perception and self-esteem and encouraging them to get involved in various activities. However, such marketing activities can also be directed at other community members to influence positive attitudes towards and respect for older people.

Cross-generational strategies can also be applied in marketing activities that bridge generations. Leveraging this strategy fosters intergenerational connections by emphasising shared values, interests and experiences. Marketing efforts can also focus on helping to repair and strengthen ties between younger and older generations. Intergenerational connectivity is promoted by creating platforms for experience sharing and intergenerational cooperation, which can lead to synergies and greater value creation. Bringing generations together can also be about shared entertainment and leisure activities.

The following is worth considering in your marketing efforts: transferring knowledge and exchanging experience in intergenerational contacts is multidirectional. Seniors can act as so-called gran-influencers when their image is linked to wisdom and life experience (Guillén, 2023). Young people can be guides and assist older people in discovering and exploiting opportunities arising from the development of technology and social media communication. Marketing activities can benefit from older people's knowledge and experience and the younger generations' technological skills. Further, in marketing practice, we can increasingly observe cross-generational influencers who run joint projects and channels in social media.

Intergenerational marketing can also leverage **age-agnostic strategies** focusing on creating offers and experiences that appeal to consumers regardless of age (Walker, 2011). They can also be described as age-neutral, ageless and age-independent marketing because they are based on the assumption that age characteristics should not determine the marketing strategy adopted, as they do not define attitudes, interests, or behaviour (Guillén, 2024). Implementing age-neutral approaches challenges marketers to explore and understand characteristics beyond demographics - values and interests among them (Stroud, 2005). However, with the increasing usage of real-time data and personalisation, consumer insights are moving beyond demographics and are based on detailed data about consumer preferences and online behaviour. Focusing on consumer relationships allows for the building of richer customer profiles, more precise insights and the creation of well-tailored marketing activities (Rawat, 2024; Robbins, 2022).

4. Intergenerational initiatives in city marketing – case studies

4.1. Research methodology

The research was conducted using a case study with an exploratory qualitative approach. The case study is one of the frequently used and valuable methods in the field of marketing that allows for an understanding of phenomena by presenting them in a concrete and real-life context (Alsayel et al., 2022; Bonoma, 1985; Gustafsson, 2017; Yin, 2014).

The case study concerns two European cities, Barcelona and Wroclaw. and their intergenerational initiatives conducted or supported by the municipal authorities and institutions operating in the cities. These are cities located in different countries, varying in population and international standing. The cities' policies and marketing activities have been in line with the ideas of age-inclusiveness and age-friendliness in recent years. Barcelona and Wroclaw are members of the WHO Global Network of Age-Friendly Cities.

The research examined how Barcelona and Wroclaw incorporate and support intergenerational initiatives into the city marketing practice. The case study used desk research based on public sources and the content analysis of official documents and publicised materials on intergenerational initiatives. In each case, the following were identified:

- Brief information about the population and the age structure of inhabitants.
- Strategic policies and organisational support for intergenerational initiatives.
- Intergenerational projects developed or supported by cities' authorities, and grassroots intergenerational initiatives.
- Approaches to intergenerational marketing - synthesis of case studies.

The synthesis of information led to conclusions about the approaches of intergenerational marketing applied in the cities' practices. Research synthesis applies to summarise, integrate, combine, and compare the findings of different studies on specific issues. The synthesis of case studies considers the flexible nature of the case studies and the qualitative characteristics of the data (Cruzes et al., 2011).

4.2. Barcelona

4.2.1. Brief information about the city population and the age structure of inhabitants

Barcelona is a Spanish city with a population of nearly 1.7 million people registered as living in Barcelona in 2023, according to the data from the Municipal Data Office (Barcelona City Council, 2024b). The urban agglomeration's population, including Barcelona's population and adjacent suburban areas, is estimated at more than 5.7 million in 2024, making it one of the most populous metropolitan areas in the European Union (World Population Review, 2024a).

The average age of people in the city is 44.4, which remains largely unchanged compared to previous years (Barcelona City Council, 2024b). The ageing population is one of the main challenges facing Barcelona society. In 2023, inhabitants 65 and over in Barcelona represented

27.1% of the city population (City Population, 2023a). According to forecasts, by 2030, almost one in three residents in Barcelona will be 60 years old or older. Notably, in Barcelona, two out of three residents aged 80 or over are women (ESPON, 2020). In addition, nearly a third. Barcelona's homes are occupied by people living alone (Barcelona City Council, 2024b). Therefore, the challenges of an ageing society will also be linked to the problem of loneliness.

Table 1.
Age distribution and percentage share in the city population of Barcelona [as of 2023]

Age Group	Population	Percentage Share (%)
0-9 years	124,007	7.48
10-19 years	144,086	8.69
20-29 years	208,395	12.58
30-39 years	255,330	15.41
40-49 years	251,861	15.20
50-59 years	223,320	13.48
60-69 years	183,111	11.05
70-79 years	148,334	8.96
80+ years	117,512	7.09
Total	1,655,956	100

Source: Adapted from (City Population, 2023a).

Demographic data from 2023 (Table 1) shows that, overall, the largest age groups in Barcelona are between 30-30 and 40-49 years old (respectively 15,41% and 15.20%). There is also a significant proportion of young people, fed in recent years by immigrants, which increases the population in the 20-29 age group (12,58%). Collectively, the younger population (0-29 years) accounts for approximately 28.75%, while the older population (60+ years) represents about 27.10%. Barcelona's age structure significantly affects the challenges of intergenerational activities in the city. Due to its age-diverse population, Barcelona implements various initiatives to meet the needs and encourage cooperation and mutual support among various age groups. By implementing intergenerational programs, Barcelona can bridge the generational divide, fostering a more cohesive, inclusive and resilient community.

4.2.2. Strategic policies and organisational support for intergenerational initiatives

In broad terms, an important document guiding the city's inclusive activities is the Barcelona Interculturality Plan 2021-2030. The policy aims to promote interaction and social cohesion between the different groups and individuals that make up the city's community. It includes strategic actions to ensure that all city policies take into account an intercultural perspective, the starting point of which is a commitment to the defence of human rights and needs and equal treatment and equal rights for all, regardless of cultural background and other key factors of inequality such as age, gender, gender identity, social class. The plan emphasises the importance of equity, recognition of diversity and positive interactions (Barcelona City Council, 2021).

In response to the challenges of making Barcelona a truly senior citizen-friendly city, the plan ‘Barcelona: a senior citizen-friendly city 2022-2030’ was developed. The plan focuses on accessibility, autonomy, and reducing loneliness among older citizens. It includes 26 initiatives addressing the following areas (Ajuntament de Barcelona, 2023):

- empowerment, respect and good treatment,
- combating loneliness,
- intergenerational relations,
- civic and social participation,
- spaces, facilities and services.

Strategic policies highlight Barcelona's commitment to addressing intergenerational challenges and supporting a more inclusive and resilient community. The city involves residents of all ages in decision-making processes related to city planning and community development. This participatory approach ensures that the voices and needs of different age groups are considered in planning and implementing the city's policies (Barcelona City Council, 2021). For many years, Barcelona City Council has encouraged the active participation and engagement of older people. Such involvement is important for the healthy ageing of older people and for improving the well-being of those older people who are vulnerable due to dependency, isolation or very low income levels (Barcelona City Council, 2011).

Participatory city planning is conducted using the Decidim Barcelona platform, which enables citizens to co-design local solutions, including policies that support intergenerational integration (Ajuntament de Barcelona, 2024a). The city incorporates the needs and experiences of older residents in its planning, integrating their voices through the Barcelona Elderly Advisory Council (Barcelona City Council, 2024a). Initiatives such as the ‘Voices of Barcelona's Elderly’ convenings bring together different groups to share input and support inclusive urban policies (Barcelona City Council, 2023).

In 2009, the Barcelona City Council began the Barcelona Age-Friendly City project, an initiative that the World Health Organisation (WHO) promoted in the Age-Friendly Cities programme. In 2011, when the World Health Organisation awarded Barcelona accreditation recognising it as a member of the Global Network of Age-Friendly Cities, which stems from its commitment to improve by continuing to build a city for all ages, enabling greater participation and a better quality of life for older people (Barcelona City Council, 2011).

4.2.3. Intergenerational projects developed or supported by cities' authorities, and grassroots intergenerational initiatives

Intergenerational marketing to improve the city's accessibility and promote Barcelona as an age-friendly and welcoming place for all ages is part of wider city initiatives. Barcelona is implementing various initiatives to address the needs of different age groups. The city has developed many intergenerational programs encouraging collaboration between younger and older residents. These programs include urban and community projects, educational workshops, and social events to promote mutual understanding and support.

An important part of age-friendly initiatives concerns the promotion of social inclusion of older residents and covers urban accessibility, housing and mobility. Efforts focus on practical improvements such as better public transport systems, accessible public spaces and programs to support intergenerational links. Barcelona introduces and promotes a range of products that allow seniors to be more active. An example is the Pink Card (Targeta Rosa) associated with the City Council's subsidy programme, aimed at people over 60 and people with disabilities who have limited resources. The card provides access to the city's public transport network and offers free entry or reduced rates at city facilities, establishments and associations (Ajuntament de Barcelona, n.d.-b).

Because of low age-related self-esteem, people often put restrictions on themselves and fail to recognise their skills, values, and development opportunities. Besides, positive-aging attitudes are linked to commitment and citizenship, which can be one of the conditions for ensuring respect among the community (Barcelona City Council, 2011). Therefore, the city supports initiatives and offers online resources to improve senior residents' mental and emotional health. The reference website 'El Cabàs emocional' has been created to support this, bringing together activities and online resources to improve citizens' mental and emotional health (Ajuntament de Barcelona, n.d.-a). Barcelona also supports Lifelong learning programmes that offer a broad range of courses to study. Older people are also encouraged to participate in various activities (courses, lectures, walks and memory training workshops) organised in the senior citizens' centres and city facilities (Barcelona City Council, 2024a). The initiatives described are promoted on the city council's official website, dedicated websites and social media.

Barcelona supports intergenerational initiatives, creating programmes and spaces that foster mutual understanding and cooperation between residents. An important part of intergenerational initiatives is city projects focusing on bridging the digital divide between generations. The marketing campaigns that support them emphasise solidarity and knowledge sharing between generations. An example of such a project is 'Barcelona Metròpolis', which concerns the development of digital competencies. Intergenerational learning fosters the digital and social inclusion of older people and promotes better communication, support, understanding and intergenerational solidarity. Therefore, the benefits of such initiatives come not only from digital training and knowledge but also from strengthening relationships between young and old, breaking down barriers and dispelling negative stereotypes between generations (Barcelona City Council, 2022).

The important initiative is the "Vincles BCN" project designed to combat social isolation and encourage intergenerational connections through digital tools. The project's expected outcomes are to strengthen the social bonds of older people experiencing loneliness and improve their wellbeing through new technologies. The 'Vincles BCN' project has introduced an accessible and highly intuitive application that allows users to communicate via calls and video or voice messages, designed specifically for older people. Users can interact with two groups: friends and family, and the ‘Vincles’ user group, which connects with other older people in their area who share their interests. Other initiatives such as the ‘Open Neighbourhood Network’ and ‘Connectem Barcelona’ are linked to the project (Barcelona City Council, n.d.).

In response to the problem of loneliness in Barcelona, the idea is to foster co-housing communities where flats are shared by families, single people, and senior citizens. They share spaces such as kitchens and gardens, which promote mutual help and bonding. The idea of cooperative housing is for families, single people, and senior citizens to share spaces (such as kitchens and gardens). Promoting communal forms of coexistence contributes to mutual support and enhances the interrelationship between the people who live in buildings and neighbourhoods (Sostre Cívic, n.d.).

An example of a wider initiative with an intergenerational context is the Superblocks project, aimed at improving the quality of life for residents by reducing car traffic and increasing space for pedestrians and cyclists. The streets are thus safer for older residents, and the younger generations have more space for physical and social activities. These are traffic-calmed streets, with priority for pedestrians, with more greenery, and spaces for interaction, play and recreation. The superblocks are at the heart of a sustainable mobility concept, serving other social objectives, responding to the needs of different generations and creating spaces for intergenerational integration (Barcelona City Council, 2020; Eggimann, 2022).

Barcelona is a hub for grassroots initiatives, particularly in intergenerational collaboration and community-building, selected examples of which will be presented in the paper. Barcelona boosts community allotments under the Municipal Allotment Network of over 360 urban gardens, including those dedicated to elderly residents. The functioning of these gardens promotes ecological farming and serves as spaces for intergenerational interaction (Ajuntament de Barcelona, 2024b). The initiative promotes intergenerational exchange and enhances social cohesion, as representatives of younger generations often join the initiative to learn sustainable practices from older residents.

Barcelona also fosters the development of intergenerational communities by promoting bottom-up cohousing projects that bring together people of different ages to co-manage shared living spaces. These intergenerational initiatives combat isolation among seniors while providing affordable housing for younger participants and opportunities for knowledge exchange and integration (Ribbons, 2023).

The intergenerational programs in Barcelona foster collaboration and mutual support across age groups. The city's initiatives and support for grassroots efforts can develop inclusive and sustainable communities by encouraging intergenerational dialogue and cooperation. Barcelona also organises campaigns, events, workshops and community forums to engage residents of all ages in creating solutions and undertaking age-friendly initiatives. Such marketing initiatives promote awareness of ageing issues and support wider participation in the planning and development of the city.

The city's intergenerational initiatives are actively highlighted through marketing activities, Barcelona's official websites and social media platforms, promotional materials from various institutions and organisations, media outlets and events.

4.3. Wroclaw

4.3.1. Brief information about the city population and the age structure of inhabitants

Wroclaw is the capital of the Lower Silesian Voivodship and one of the largest Polish cities. According to data from the Statistical Office in Wroclaw published in 2023, the city has over 674 thousand inhabitants (Statistical Office in Wroclaw. Dolnośląski Centre for Regional Surveys, 2023). According to the latest version of the UN World Urbanisation Prospects, which includes population estimates and projections, the population of Wroclaw in 2024 is assessed at 642,357 (World Population Review, 2024b). The census data do not consider immigrants or people who are not registered, therefore, according to a study commissioned by the Municipal Council by a team of researchers from the University of Wroclaw, the estimated real number of inhabitants of Wroclaw is more than 893 thousand (Wroclaw University, 2023).

For several years, the population of the capital of Lower Silesia has been increasing, mainly due to the positive balance of migration. According to the Central Statistical Office, the number of inhabitants of Wroclaw will slowly but steadily decline over the next several years, and in 2060, there will be about 623 thousand people (Statistics Poland, 2023).

Demographic changes in the age structure of the city population mean that the average age of the inhabitants of Wroclaw grows. It reached an average of 43.2 years in 2023 and will probably continue to grow (Portal samorządowy, 2023). In 2023, inhabitants 60 and over in Wroclaw represented 25,25 % of the city population (City Population, 2023b). Data on the age structure of the city population is presented in Table 2. According to demographic forecasts, in 2050, seniors aged 60+ may account for around one-third of the population of Wroclaw (Sutryk, 2018). The ageing of city society is a challenge that will deepen over time and requires planned and multidimensional efforts.

Table 2.
Age distribution and percentage share in the city population of Wroclaw [as of 2023]

Age Group	Population	Percentage Share (%)
0-9 years	63852	9.48
10-19 years	52943	7.86
20-29 years	79096	11.74
30-39 years	133225	19.77
40-49 years	109275	16.22
50-59 years	65233	9.68
60-69 years	73752	10.95
70-79 years	63473	9.42
80+ years	32894	4.88
Total	799743	100.0

Source: Adapted from (City Population, 2023b).

Statistical data on the demographic structure of Wroclaw's population presented in Table 2 provides information on the age distribution in the city. The largest age group is the 30-39 age group, accounting for 19.77% of the total population, followed by the 40-49 age group with 16.22%. The younger population (0-29 years) accounts for around 29.08%, while the older population (60+ years) accounts for around 25.25%.

Given this diverse age structure, it is imperative for Wroclaw to implement intergenerational initiatives that promote cooperation and mutual support between different age groups. Such activities will increase social cohesion and ensure that all age groups' needs and contributions are recognised and valued. Intergenerational initiatives can bridge the gap between young and old, promoting a more inclusive and resilient community.

4.3.2. Strategic policies and organisational support for intergenerational initiatives

The key document addressing intergenerational challenges and goals is the Wroclaw Strategy 2030. The idea of integration is expressed in the city's mission statement: "Wroclaw as a meeting place - a city that unites". The document addresses social inclusion and building a city that is friendly to all age groups in its specific objectives. This includes supporting and promoting initiatives that unite younger and older generations, emphasising the importance of transferring knowledge, experience and culture. The strategy emphasises the importance of interpersonal ties, including intergenerational relations, in creating a city's social capital based on mutual trust, cooperation and solidarity. Therefore, the priorities of the city's strategy include support for initiatives to strengthen intergenerational solidarity and search for opportunities for cooperation, partnerships and integrated projects (Wydział Partycypacji Społecznej, 2021).

The Wroclaw Senior Policy aims to include older people in the city through activation and intergenerational cooperation programmes, such as 'Local Activity Centres' and educational workshops run jointly by senior citizens and young people. Organisational support is provided by the operation of the Wroclaw Senior Citizens' Centre, Wroclaw Council of Senior Citizens, Wroclaw Senior Ombudsman and Guardian and the Wroclaw Senior Fund (Polityka Senioralna, 2021; Wroclawskie Centrum Seniora, n.d.).

The city strategic policies addressing intergenerational challenges also include Wroclaw’s Mobility Policy, Wroclaw’s Educational Strategy, Cycling Policy of Wroclaw Strategy of Recreation in Wroclaw, Principles of Ecological Policy of Wroclaw (World Health Organization, n.d.-b).

From 2018, Wroclaw has been a member of the WHO Global Network of Age-Friendly Cities. The network member city should implement planning procedures in which participatory mechanisms should be established to involve residents, especially older citizens, throughout the process. Plans should include a comprehensive ‘age-friendliness’ assessment. Network member cities are subject to a progress evaluation, which includes submitting a report to WHO on achieving the goals set out in the planning phase. Network membership requires prior demonstration of improvement and continued commitment (Membership to the Global Network - Age-Friendly World, n.d.).

Wroclaw implements intergenerational projects within the framework of government grants through public institutions, NGOs, associations, informal urban movements and senior citizens' organisations (World Health Organization, n.d.-b). Particularly apparent age-friendly initiatives are projects focusing on improvements and support for older people.

4.3.3. Intergenerational projects developed or supported by cities' authorities and grassroots intergenerational initiatives

In Wroclaw, intergenerational projects are initiated by the city authorities or are grass-roots initiatives. Many initiatives are carried out in collaboration with multiple stakeholders - city authorities, institutions, service providers, community members, and their organisations.

The Wroclaw Senior Centre coordinates many Wroclaw projects aimed at senior citizens. One of the initiatives is Senior Cards, which has a special service and recreational offer divided into individual age groups of seniors. The Senior Cards, issued at several points in the city, offer free entry to cultural, educational and intergenerational events, discounts on sports and recreational activities, rehabilitation holidays, excursion programmes and field trips. The wide range of discounts also includes the products of participating partners, offering discounts on special products in shops and health-promoting services and medical consultations (Wrocławskie Centrum Seniora, n.d.-a).

Wroclaw also launches projects to increase the activity and mobility of senior citizens. From 2022, senior citizens aged 65 and over can use Wroclaw's public transport free of charge. In other cities in Poland, free public transport is provided from the age of 70, so Wrocław is a pioneer in Poland here. Wroclaw also introduced the TAXI75+ programme, under which the cardholder is entitled to two free rides twice a month to offices, hospitals and clinics (Darmowa taksówka dla seniora!, 2024). In Wroclaw, the Senior Travel Fund operates, which, through the support of senior NGOs and Neighbourhood Councils, made it possible to organise and finance trips and excursions for seniors (Wrocławskie Osiedla, 2024).

Encouraging seniors to become active in the form of volunteering in NGOs in the Municipality of Wroclaw is carried out as part of the 'Professional Senior - Volunteer in a Non-Governmental Organisation' project. It aims to improve the organisation's selection process to find volunteers with unique competencies that can enhance the efficiency of NGOs. The Academy of Active Senior Volunteers also pursues keeping seniors active and preventing social exclusion. Related to it is the 'Active Seniors' Foundation, which offers seniors various educational and sporting activities. These projects have developed a volunteer base that creates and participates in new NGO initiatives (World Health Organization, n.d.-b).

Many of Wroclaw's projects aim to improve the quality of life of the elderly, and they have an intergenerational character. A good example is "City of Generations", a social education programme on older people and the ageing process implemented by the Wroclaw Social Development Centre - Wroclaw Senior Citizens' Centre. Pedagogues of educational institutions, in cooperation with senior citizens, undertake educational activities focused on changing the attitudes of children and adolescents towards seniors and the perception of old age by the younger generation as a natural phase of life (Wrocławskie et al., n.d.-b).

The important city program is the School of Leaders, coordinated by the Wroclaw Senior Citizens' Centre, which was created to encourage senior citizens to participate in citizenship. The idea was to train people who want to act for seniors in local communities: senior citizens' clubs, Third Age Universities, community activity centres, etc. The initiative has an intergenerational character, as the leaders act together - younger people with older ones. Younger people have skills in preparing documentation and handling computers and the Internet, while seniors 65+ have better contacts and interpersonal competencies within the senior citizens' organisations and communities. In subsequent editions of this project, marketing activities have focused on supporting young people who are active or intend to lead initiatives for senior citizens (Wrocławskie Centrum Seniora, n.d.-c, 2024).

Wroclaw has projects focused on sports and recreational activities for senior citizens. These include the Wroclaw Senior Coach programme, launched in 2020. Qualified coaches conduct sports and recreational activities with Wroclaw's senior citizens as part of the project. An extension of this initiative is organising additional activities such as excursions, festivals, or outdoor picnics (Wroclaw.pl, 2020). The 'Wroclaw Senior Coach' social media profile provides the project's marketing support, presenting the offer and reporting on activities (Wrocławski Trener Senioralny, n.d.).

The Toys and Play Laboratory is another initiative that aims to prevent alienation and isolation among senior citizens and bring generations together. As part of the project, senior citizens tell children about the games they remember from childhood and bring various objects from their youth. This initiative enables intergenerational dialogue and consolidating the collective memory of that part of personal life and individual experience that is being forgotten. The programme was implemented in the real world and virtual space (Polityka Senioralna, 2021).

Wroclaw also performs initiatives to strengthen existing grassroots organisations, including support for Senior Citizens' Clubs and Spaces for the Third Age (Polityka Senioralna, 2021). Intergenerational initiatives are implemented by the city's social welfare centres, such as the "Pogodna connects generations" project. This initiative aims to strengthen intergenerational bonds by organising joint activities in art, cooking, music, relaxation, theatre, etc. Participants include senior citizens from the Day Care Centre, preschool and school children, and students from the cooperating educational institutions (MOPS we Wrocławiu, n.d.).

Through public and grassroots initiatives and co-creation, neighbourhood meeting places are being created in Wroclaw's housing estates. Such projects are particularly important from the point of view of activating and improving the quality of life of senior citizens. However, they also have an integrating effect on representatives of different age groups. According to research carried out in the context of one such Wroclaw project, increased public participation and involvement in the co-creation process is achieved by ensuring that the process includes options for multiple and flexible participation (Miśniakiewicz, 2024).

Numerous organisations in Wroclaw base their activities on the idea of intergenerationalism. One example is the Future of Generations Foundation, which cooperates with leading business, science and politics representatives to propose and implement concrete solutions. It organises training and information campaigns that educate and activate the public, carries out analyses and expert reports, and runs support programmes such as the Digital Consultation Point and the Legal Aid Point free of charge (Fundacja Przyszłość Pokoleń, n.d.).

Many intergenerational initiatives are implemented as part of the Wroclaw Civic Budget, allowing residents to directly influence the selection of projects supporting intergenerational solidarity (Wrocławski Budżet Obywatelski, 2024). Projects include the creation or upgrading of intergenerational centres (places that can act as integration centres, offering space for developing interests and passions, workshops, physical activities and meetings), intergenerational recreation areas (playgrounds with elements of outdoor gyms, sensory paths or gazebos that serve children, young people and seniors alike) and garden social spaces (where residents of different age groups can grow plants together, relax or hold workshops).

Intergenerational initiatives implemented in Wroclaw are promoted in marketing campaigns, the city's official websites and social media profiles, communication channels and promotional materials of institutions and organisations, and other media publications and special events.

4.4. Approaches to intergenerational marketing - synthesis of case studies

Despite the contextual differences and specificities of the individual initiatives, common aspects can be observed in the approaches of both cities. Both cities present strategic alignment in their intergenerational approaches, developing comprehensive policies that combine intergenerational goals with city planning. As members of the WHO Global Network for Age-Friendly Cities, both cities exemplify how their policies can integrate intergenerational dimensions into broader city development goals. The participation of stakeholders and members of the city community in both the planning and implementation of intergenerational activities is worth emphasising.

Barcelona and Wroclaw implement intergenerational marketing, combining different approaches and initiatives. A large part of the age-inclusive initiatives of both cities relates to supporting the activity and mobility of senior citizens. These initiatives are often initiated by municipal authorities and supported by funds linked to broader programs addressing social challenges arising from an ageing society. Some of these initiatives are based on an age-inclusive strategy. Increasing the inclusivity of seniors is facilitated by the cities' programmes to increase the mobility and activity of seniors, including the cards introduced by both cities offering a range of age-group-specific benefits. The initiatives of both cities increase accessibility to social programmes and encourage seniors to participate in cultural events and recreational activities.

However, senior citizenship policy's objectives are increasingly combined with a cross-generational approach, incorporating integration, cooperation and intergenerational exchange. As part of city initiatives, age-inclusive public spaces and spaces for intergenerational cooperation emerge and are promoted. Cities' authorities initiate and support efforts to transform urban environments to promote accessibility and interaction among age groups.

The cities also implement initiatives based on a pro-ageing strategy, referring to positive ageing. They aim to ensure that age-related self-esteem does not restrict people from being active by underestimating their skills, values and potential for development. In addition, by fostering engagement and citizenship, these programs can ensure respect for people of different ages in the community. Both cities have programs for mental health support, self-acceptance, and a positive mindset, as well as support opportunities for self-development and self-education through life-long learning.

Efforts leveraging cross-generational strategies bring generations together using common interests and cooperative initiatives. To connect the generations and bridge the generation gap, cities use intergenerational learning and experience exchange. One platform for this exchange is technology, with digital competence programs as implementation examples. In cross-generational programs, younger and older people share their experiences, interests and passions, which provides a basis for mutual understanding and respect. Therefore, transferring knowledge and exchanging experience in intergenerational contacts is multidirectional. Both cities also create cultural and recreational opportunities for bridging generations, developing and supporting projects of cross-generational exchange and bringing generations together.

Given the need to meet cities' strategic objectives of proactive measures for older people, intergenerational well-being, integration and social cohesion, age-agnostic approaches can arguably have lower communication exposure within cities' marketing initiatives. However, this does not diminish their importance in achieving intergenerational goals. The city authorities of Barcelona and Wroclaw recognise the value of age-neutral initiatives, developing urban projects (recreational areas, garden spaces etc.) and cultural and leisure projects for all ages, addressing the needs of the population and collective involvement regardless of age. Such urban spaces, platforms and programs serve as neutral grounds for interaction, fostering collaborative community environments.

Barcelona and Wroclaw represent multi-faceted approaches to intergenerational marketing that combine initiatives based on age-inclusive, pro-ageing, cross-generational and age-agnostic strategies. In the marketing communication of intergenerational initiatives, the objectives of support for older people and age-positivity are often emphasised. Beyond the specific aims and scope of the efforts conducted, marketing messages are more often based on positive messages than negative ones, highlighting the fight against social and age exclusions.

5. Conclusions

Research findings highlight the importance of using intergenerational marketing approaches to strengthen social capital and foster inclusive, cohesive and integrated communities. Based on case studies, it is possible to identify guidelines for other cities to replicate or follow their intergenerational practices. The cities' intergenerational initiatives are based on clear pathways within city policies and insist on cooperation between city authorities, institutions, organisations and community members.

The cities represent multi-faceted approaches to intergenerational marketing, combining initiatives based on age-inclusive, pro-ageing, cross-generational, and age-agnostic strategies. Leveraging these diverse and intergenerational approaches strategically aligns these efforts with broader city development and social goals. By combining diverse intergenerational strategies, cities demonstrate a comprehensive approach to intergenerational well-being, integration, and social cohesion.

However, responding to the challenges of an ageing population, ageism, loneliness, and other related issues does not mean basing marketing on negative messages. Therefore, intergenerational marketing often focuses on age-positive ideas, positive motivations and values that can unite the generations and provide a platform for mutual understanding, respect and cooperation.

Moreover, intergenerational initiatives also have marketing value because of their potential to create the image of cities. Through positive messages and descriptions of the cities' activities, they foster marketing content generation and dissemination through formal and informal communication.

References

1. Ajuntament de Barcelona (n.d.-a). *Cabàs emocional*. Sanidad y Salud. Retrieved from: https://ajuntament.barcelona.cat/sanitatisalut/es/canal/cabas-emociona, 14.09.2024.
2. Ajuntament de Barcelona. (n.d.-b). *¿Qué es la T-metropolitana tarjeta rosa?* Persones Grans. Retrieved from: https://ajuntament.barcelona.cat/personesgrans/es/que-es-la-t-metropolitana-tarjeta-rosa, 14.09.2024.
3. Ajuntament de Barcelona (2023). *Barcelona: Friendly towards the elderly*. Info Barcelona. Retrieved from: https://www.barcelona.cat/infobarcelona/en/tema/senior-citizens/barcelona-friendly-towards-the-elderly_1241075.html, 14.09.2024.
4. Ajuntament de Barcelona (2024a). *Decidim.barcelona*. Retrieved from: https://www.decidim.barcelona/, 14.09.2024.

5. Ajuntament de Barcelona (2024b). *Municipal Allotment Network | Espais Verds*. Retrieved from: https://ajuntament.barcelona.cat/espaisverds/en/participate/get-green/municipal-allotment-network, 23.09.2024.
6. Alsayel, A., de Jong, M., Fransen, J. (2022). Can creative cities be inclusive too? How do Dubai, Amsterdam and Toronto navigate the tensions between creativity and inclusiveness in their adoption of city brands and policy initiatives? *Cities*, *128*, 103786. https://doi.org/10.1016/j.cities.2022.103786
7. Andina, T., Corvino, F. (2023). Transgenerational Social Structures and Fictional Actors: Community-Based Responsibility for Future Generations. *The Monist*, *106*(2), 150-164.
8. Barcelona City Council (n.d.). *Vincles BCN*. Barcelona Digital City. Retrieved from: , from https://ajuntament.barcelona.cat/digital/en/technology-accessible-everyone/fight-against-digital-inequality/fight-against-digital-inequality-4, 3.11.2024.
9. Barcelona City Council (2011). *Barcelona age-friendly city*. Retrieved from: https://extranet.who.int/agefriendlyworld/wp-content/uploads/2014/05/Barcelona-Age-friendly-city-Together-we-build-a-city-for-all-ages.compressed.pdf, 12.10.2024.
10. Barcelona City Council (2020). *Towards Superblock Barcelona*. Retrieved from: https://ajuntament.barcelona.cat/premsa/wp-content/uploads/2020/11/201111-DOSSIER-Superilla-Barcelona-EN.pdf, 12.09.2024.
11. Barcelona City Council (2021). *Barcelona Interculturality Plan 2021-2030*. Retrieved from: https://ajuntament.barcelona.cat/bcnacciointercultural/sites/default/files/documentos/barcelona_interculturality_plan_2021-2030.pdf, 1.09.2024.
12. Barcelona City Council (2022). *Barcelona Metròpolis. Digital partners: Benefits of intergenerational learning*. Barcelona Metropolis. Retrieved from: https://www.barcelona.cat/metropolis/en/contents/digital-partners-benefits-intergenerational-learning, 11.09.2024.
13. Barcelona City Council (2023). *Elderly people make themselves heard again*. Info Barcelona. Retrieved from: https://www.barcelona.cat/infobarcelona/en/tema/senior-citizens/elderly-people-make-themselves-heard-again_1209930.html, 11.09.2024.
14. Barcelona City Council (2024a). *Elderly People*. Barcelona Website. Retrieved from: https://www.barcelona.cat/en/living-in-bcn/with-elderly-people, 12.09.2024.
15. Barcelona City Council (2024b). *The city's population continues to grow and reaches 1.7 million*. Retrieved from: https://www.barcelona.cat/infobarcelona/en/tema/city-council/the-citys-population-continues-to-grow-and-reaches-1-7-million_1405179.html, 3.11.2024.
16. Bonoma, T.V. (1985). Case Research in Marketing: Opportunities, Problems, and a Process. *Journal of Marketing Research*, *22*(2), 199-208.
17. Buffel, T., Rémillard-Boilard, S., Walsh, K., McDonald, B., Smetcoren, A.-S., De Donder, L. (2020). Age-Friendly Approaches and Old-Age Exclusion: A Cross-City Analysis. *International Journal of Ageing and Later Life*, 1-29.

18. City Population (2023a). *Barcelona*. Retrieved from: https://www.citypopulation.de/en/spain/cataluna/barcelona/08019__barcelona/, 11.09.2024.
19. City Population (2023b). *Wrocław*. Retrieved from: https://www.citypopulation.de/en/poland/dolnoslaskie/admin/powiat_wrocław/0264011__wrocław/, 12.09.2024.
20. Cruzes, D. S., Dyba, T., Runeson, P., Host, M. (2011). Case Studies Synthesis: Brief Experience and Challenges for the Future. *2011 International Symposium on Empirical Software Engineering and Measurement*, 343-346.
21. *Darmowa taksówka dla seniora!* (2024, November 23). Wroclaw.pl. Retrieved from: https://www.wroclaw.pl/dla-mieszkanca/darmowa-taksowka-dla-seniorow, 11.09.2024.
22. Eggimann, S. (2022). The potential of implementing superblocks for multifunctional street use in cities. *Nature Sustainability*, *5*(5), 406-414.
23. ESPON (2020). *ACPA – Adapting European Cities to Population Ageing: Policy challenges and best practice*. Retrieved from: https://archive.espon.eu/sites/default/files/attachments/7.%20ACPA_city%20report_Barcelona_1.pdf, 12.09.2024.
24. *Fundacja Przyszłość Pokoleń* (n.d.). Retrieved from: https://przyszloscpokolen.pl/, 25.10.2024.
25. Garrocho, C., Vilchis Mata, I. (2021). Las Age-Friendly cities facilitan la movilidad de los adultos mayores. *Korpus, 21*, 295-316.
26. Guillén, M.F. (2023). *The Perennials: The Megatrends Creating a Postgenerational Society*. St. Martin's Press.
27. Guillén, M.F. (2024, February 16). The Future of Marketing Is Intergenerational. *Harvard Business Review*. Retrieved from: https://hbr.org/2024/02/the-future-of-marketing-is-intergenerational, 12.05.2024.
28. Gustafsson, J. (2017). Single case studies vs. Multiple case studies: A comparative study. *Academy of Business, Engineering and Science Halmstad University, Sweden*, 1-15.
29. Jarrott, S.E. (2019). *Brief: Survey of shared site intergenerational programs.* Retrieved from: https://www.gu.org/app/uploads/2019/01/Intergenerational-Brief-Shared-Site-Survey-Report.pdf, 12.10.2024.
30. Jarrott, S.E., Scrivano, R.M., Park, C., Mendoza, A.N. (2021). Implementation of Evidence-Based Practices in Intergenerational Programming: A Scoping Review. *Research on Aging*, *43*(7-8), 283-293.
31. Lau, M.H.M. (2024). Fostering intergenerational interactions in high-rise residential neighbourhoods: Towards culturally-informed interventions? *Housing Studies*, *39*(10), 2606-2625.
32. Lee, C., Zhong, S. (2019). Age-friendly communities: Community environments to promote active ageing in place. In: *Urban Environments for Healthy Ageing* (pp. 147-172). Routledge.

33. Manchester, H., Facer, K. (2017). (Re)-Learning the City for Intergenerational Exchange. In: H. Sacré, S. De Visscher (Eds.), *Learning the City* (pp. 83-98). Springer International Publishing.
34. Marabini, C., Henkens, K. (2023). *Age-inclusive HR Policies and Organizational Climate: Are Older Workers and Employers on the Same Page?* Netspar, Network for Studies on Pensions, Aging and Retirement.
35. Mega, V. (2013). Intergenerational Cities Embracing Diversity and Social Justice. In: V. Mega, *Quintessential Cities, Accountable to the Future* (pp. 127-145). New York: Springer.
36. *Membership to the Global Network—Age-Friendly World* (n.d.). Retrieved from: https://extranet.who.int/agefriendlyworld/membership/, 25.10.2024.
37. Miśniakiewicz, A. (2024). Co-Creating a Seniors' Meeting Place: A Prototype Pop-Up Installation on a Popowice Housing Estate in Wrocław, Poland. *Buildings*, *14*(5), 1400. https://doi.org/10.3390/buildings14051400.
38. MOPS we Wrocławiu (n.d.). *Pogodna łączy pokolenia*. Retrieved from: https://mops.wroclaw.pl/projekty-i-programy/pogodna-laczy-pokolenia, 25.10.2024.
39. Oxford Review (2024). Age-Inclusive Policies—Definition and Explanation. *The Oxford Review - OR Briefings*. Retrieved from: https://oxford-review.com/the-oxford-review-dei-diversity-equity-and-inclusion-dictionary/age-inclusive-policies-definition-and-explanation/, 12.10.2024.
40. Polityka Senioralna (2021). *Polityka senioralna we Wrocławiu*. Retrieved from: https://polityka-senioralna.pl/polityka-senioralna-we-wroclawiu/, 25.10.2024.
41. Portal samorządowy (2023). *Średnia weieku mieszkańców miast wojewódzkich*. Retrieved from: https://www.portalsamorzadowy.pl/polityka-i-spoleczenstwo/te-miasta-maja-najstarszych-i-najmlodszych-mieszkancow,440495.html, 12.10.2024.
42. Qianhexin, L. (2023). Intergenerational Learning and the Elderly-friendly Learning Society. *Lecture Notes in Education Psychology and Public Media*, *11*(1), 243-249.
43. Rawat, J. (2024, June 27). Beyond One-Size-Fits-All: Hyper-Personalization In Loyalty Programs. *Forbes*. Retrieved from: https://www.forbes.com/sites/forbesbusinesscouncil/2024/06/27/beyond-one-size-fits-all-hyper-personalization-in-loyalty-programs/, 12.10,2024.
44. Ribbons, A. (2023). Learning from Barcelona's grassroots housing struggles: Towards a transformational Degrowth agenda. *Radical Housing Journal*, *5*(1), 125-148.
45. Robbins, D. (2022, May 5). Why Marketers Should Go Beyond Demographics—And How To Do So Effectively. *Forbes*. Retrieved from: https://www.forbes.com/sites/forbescommunicationscouncil/2022/05/05/why-marketers-should-go-beyond-demographics-and-how-to-do-so-effectively/, 12.10.2024.

46. Santana, F.M. de M., Magagnin, R.C., Fontes, M.S.G. de C., Azambuja, M. dos A. (2022). Age-Friendly Cities: A Systematic Review. *Revista Nacional de Gerenciamento de Cidades*, *10*(80), 135-148.
47. Somers, A. (2024). Intergenerational Engagement and Generational Identity. In: *Studying Generations: Multidisciplinary Perspectives* (pp. 123-136). Bristol University Press.
48. Sostre Cívic (n.d.). *La Balma: Cooperative housing in Poblenou*. Retrieved from: https://sostrecivic.coop/en/projectes/la-balma/, 24.10.2024.
49. Statistical Office in Wrocław. Dolnośląski Centre for Regional Surveys. (2023). *Wroclaw in figures*. Retrieved from: wroclaw.stat.gov.pl, 24.10.2024.
50. Statistics Poland (2023). *Population projection 2023-2060*. Retrieved from: https://stat.gov.pl/en/topics/population/population-projection/population-projection-20232060,4,1.html, 24.10.2024.
51. Stroud, D. (2005). *The 50-Plus Market: Why the Future Is Age Neutral When It Comes to Marketing and Branding Strategies*. London/Sterling, Va.: Kogan Page.
52. Sutryk, J. (2018). *Wroclaw Mayors letter*. WHO The Age Friendly Cities Network. Retrieved from: https://extranet.who.int/agefriendlyworld/wp-content/uploads/2018/12/Wroclaw-Mayors-letter.pdf, 24.10.2024.
53. Walker, K. (2011). The Age-Neutral Customer Journey. In: F. Kohlbacher, C. Herstatt (Eds.), *The Silver Market Phenomenon: Marketing and Innovation in the Aging Society* (pp. 295-308). Berlin/Heidelberg: Springer.
54. World Health Organization (n.d.-a). *About the Global Network for Age-friendly Cities and Communities—Age-Friendly World*. Retrieved from: https://extranet.who.int/agefriendlyworld/who-network/, 10.09.2024.
55. World Health Organization (n.d.-b). *Wroclaw—Age-Friendly World*. Retrieved from: https://extranet.who.int/agefriendlyworld/network/wroclaw, 10.09.2024.
56. World Health Organization (2021). *Global Report on Ageism* (1st ed). World Health Organization. Retrieved from: https://iris.who.int/bitstream/handle/10665/340208/9789240016866-eng.pdf?sequence=1, 10.09.2024.
57. World Population Review (2024a). *Barcelona, Spain Population 2024*. Retrieved from: https://worldpopulationreview.com/cities/spain/barcelona, 24.10.2024.
58. World Population Review (2024b). *Wroclaw, Poland Population 2024*. Retrieved from:https://worldpopulationreview.com/cities/poland/wroclaw, 25.10.2024.
59. Wroclaw University (2023). *Our scientists counted all the residents of Wrocław*. Retrieved from: https://uwr.edu.pl/en/our-scientists-counted-all-the-residents-of-wroclaw/, 24.10.2024.
60. Wroclaw.pl (2020). *Seniorzy chcą się ruszać*. Retrieved from: https://www.wroclaw.pl/dla-mieszkanca/program-wroclawski-trener-senioralny-ze-sportowa-rodzina, 12.09.2024.
61. *Wrocławski Budżet Obywatelski* (2024). Wroclaw.pl. https://www.wroclaw.pl/rozmawia/wroclawski-budzet-obywatelski, 11.11.2024.

62. *Wrocławski Trener Senioralny* (n.d.). Retrieved from:, from https://www.facebook.com/p/Wroc%C5%82awski-Trener-Senioralny-100063698730785/?_rdr, 25.10.2024.
63. Wrocławskie Centrum Seniora (n.d.-a). *Karta Seniora*. Retrieved from: https://www.seniorzy.wroclaw.pl/informacje-ogolne, 20.10.2024.
64. Wrocławskie Centrum Seniora (n.d.-b). *Miasto pokoleń*. Retrieved from: https://seniorzy.wroclaw.pl/node/422, 20.10.2024.
65. Wrocławskie Centrum Seniora (n.d.-c). *Szkoła liderów dla animatorów środowisk senioralnych*. Retrieved from: https://www.seniorzy.wroclaw.pl/Szkola-liderow, 20.10.2024.
66. *Wrocławskie Centrum Seniora* (n.d.-d). Retrieved from: https://www.seniorzy.wroclaw.pl/, 20.10.2024.
67. Wrocławskie Centrum Seniora (2024). *Startuje VIII edycja Szkoły Liderów!* Retrieved from: https://www.seniorzy.wroclaw.pl/VIII-szkola-liderow-startuje, 20.10.2024.
68. Wrocławskie Osiedla (2024). *Senioralny Fundusz Wyjazdowy 2024*. Wrocławskie Osiedla. Retrieved from: https://osiedle.wroc.pl/index.php/6748-senioralny-fundusz-wyjazdowy-2024, 20.10.2024.
69. Wydział Partycypacji Społecznej (2021). *Strategia Wrocław 2030*. Retrieved from: https://www.wroclaw.pl/rozmawia/strategia-rozwoju-wroclaw-2030, 2.09.2024.
70. Yin, R. (2014). *Case Study Research: Design and Methods*. Sage Publications, Inc.
71. Zhong, S., Lee, C., Foster, M.J., Bian, J. (2020). Intergenerational communities: A systematic literature review of intergenerational interactions and older adults' health-related outcomes. *Social Science & Medicine*, *264*, 113374.
72. Zhong, S., Lee, C., Lee, H. (2022). The role of community environments in older adults' intergenerational and peer social interactions. *Cities*, *129*, 103785.

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INNOVATIONS IN DISTRIBUTION LOGISTICS SUPPORTING THE ADAPTATION OF LOGISTICS OPERATORS TO CHANGING MARKET CHALLENGES

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Purpose: The purpose of this article is to present innovations in distribution logistics as a key factor supporting the adaptation of logistics operators to dynamically changing market conditions.
Methodology: The article uses an analytical approach, based on a literature review and empirical research. The study was based on an electronic CAWI survey conducted among respondents representing various segments of the logistics industry.
Findings: The analysis of the results allowed for the identification of trends and barriers in the implementation of innovations in logistics.
Research limitations and implications: The study was cross-sectional and covered a selected group of respondents, which may influence the generalization of the results. In the future, it would be beneficial to expand the analysis to include data from different markets and to study the long-term effects of implementing innovations in distribution logistics.
Practical implications: The research results indicate the need for investment in digital technologies, automation, and employee skills development in the logistics sector. Companies should also consider collaboration with technology entities and suppliers of innovative solutions, which could allow for faster implementation of modern distribution models.
Social implications: The use of modern technologies in distribution logistics could contribute to reducing CO_2 emissions, improving working conditions in the sector, and increasing the accessibility of logistics services. The impact of innovations on the labor market, however, requires further analysis, especially in the context of replacing traditional positions with automated systems.
Originality/Value: The article contributes to the literature on distribution logistics by presenting current trends and challenges associated with the implementation of innovations in this sector.
Keywords: Logistics innovations, distribution logistics, process automation, supply chain optimization, technologies.
Category of the paper: Research paper.

1. Introduction

Innovations in distribution logistics are a key element supporting the development of logistics operators in the face of continuously changing market conditions. Globalization, the development of new technologies, changing consumer needs, and the increasing pressure for sustainable development require logistics companies to adapt their strategies, processes, and tools to meet new challenges. In light of these dynamic changes, innovations not only respond to market expectations but also serve as the foundation for maintaining competitiveness and operational efficiency.

Contemporary challenges in distribution logistics include, among others, the increased complexity of supply chains, the need for faster and more flexible customer service, and minimizing costs while maintaining high service quality. Innovations in logistics processes, such as route optimization, the introduction of new transportation methods, warehouse automation, and the development of parcel tracking technologies, are becoming essential. Logistics operators must not only invest in new technologies but also adapt them in a way that allows for effective integration with existing processes.

It is also important to note that innovations in distribution logistics extend beyond technology to include organizational and process changes. An example of this is the development of last-mile logistics, which is becoming increasingly critical in response to growing consumer expectations for fast and convenient delivery. Logistics operators are changing their approach to managing distribution networks, focusing on greater flexibility, proximity to customers, and cost reduction. Innovative approaches to organizing distribution processes allow for better alignment of services with the evolving needs of the market and customer expectations.

The aim of this article is to present innovations in distribution logistics as a key factor supporting the adaptation of logistics operators to dynamically changing market conditions.

2. Specifics of Service Provision in Logistics Companies

Recent practice has solidified the assumption that a company's success and prosperity require focusing on areas where it has an advantage over competitors and those that are crucial for its operations. Therefore, as much as possible, it is necessary to refrain from performing tasks in-house that can be outsourced to other entities that can perform them more cheaply, including logistics processes. According to Rydzkowski, tasks that external companies can handle according to our needs and quality requirements, and generally at a lower cost, should be outsourced to them (Rydzkowski, 2007).

Christopher M. defines a logistics service as the process of managing the flow of goods and information (Christopher, 1998). Ciesielski M. emphasizes the importance of the function and quality of logistics services (Ciesielski, 2005). Harrison A. and van Hoek R. focus on the complexity of logistics services (Harrison, Van Hoek, 2011), while Mentzer J.T., Flint D.J., Hult G.T.M. highlight customer perception and service quality (Mentzer 2001). On the other hand, Krawczyk S. defines a logistics service in the context of outsourcing and logistics operators (Krawczyk, 2012). Rydzkowski W., Wojewódzka-Król K. emphasize the integrative elements of logistics services (Rydzkowski, 2007).

Knowledge of the life cycle of a logistics service provides the basis for making decisions regarding the supply strategy of this service on the market and allows a company to guide its behavior depending on changes in demand or the actions of competing enterprises (Archutowska, 2009). Regarding the life cycle and the time required for each phase of the cycle (seen as stages of service sales), factors such as service price, demand for the service, and the level of its complementarity determine it. The main goals of providing logistics services are:

- Constantly balancing the effects of seasonality in demand for logistics products by entering into contracts with manufacturers regarding the collection and handling of stocks in regional warehouses with unused storage capacity.
- Improving the distribution of logistics infrastructure by diversifying warehouse base locations.
- Reducing transport costs through the use of multimodal, intermodal, or bimodal transport.
- Introducing new products to the market through demand testing by quickly delivering small batches of products simultaneously to multiple sales points in a short time. This form of logistics services is an alternative to large, capital-intensive advertising campaigns organized by producers (Gołębska, 2009).

Logistics services have wide application in the distribution process. Christopher M. (2011) defines distribution as a key element of logistics: "Distribution is the management of goods flow from the producer to the final customer, including transport, warehousing, order fulfillment, and customer service" (Christopher, 2011). Skowronek C., Sarjusz-Wolski Z. (2012) describe distribution in the context of the logistics system (Skowronek 2012), while Gudehus T., Kotzab H. (2012) place distribution in the broader context of supply chain management (Gudehus 2012). Ciesielski M., Długosz J. (2010) emphasize its integrative nature (Ciesielski 2010).

The increasing complexity of logistics systems encourages or sometimes forces companies to outsource logistics services to specialized logistics companies in the TSL (transport, forwarding, logistics) sector. A logistics service provider (operator) can be defined as an external supplier that performs all or part of the logistics functions for the contracting company. This broad definition includes entities providing transport, warehousing, distribution, customs services, etc. Companies are inclined to outsource these processes due to the desire to reduce costs, focus on their core business activities, and also because of the burdens associated with maintaining their own transport fleet, which involves investment in vehicles, technical facilities, qualified staff, and ensuring constant transport volume, among other things.

Depending on the logistics service provider and its position in the industry, the term "third-party logistics" (3PL) is sometimes replaced by terms like "contract logistics" and "outsourcing". There are attempts to distinguish between these terms, but all refer to the use of external logistics service providers. In the case of contract logistics, such cooperation is typically long-term and involves a formal agreement defining the scope of services, the duration of cooperation, responsibility for performed tasks, and any penalties for non-compliance. The term "logistics outsourcing" is also used, meaning outsourcing logistics services to external parties. Skjoett-Larsen T. emphasizes the role of long-term cooperation in contract logistics (Skjoett-Larsen, 2000). Bolumole Y.A. points out the difference between contract logistics and traditional transport services, highlighting the comprehensive management of logistics processes and the integration of the operator's activities with the client's supply chain management system (Bolumole, 2001). Kisperska-Moroń D., Krzyżaniak S. define contract logistics as an advanced form of outsourcing (Kisperska, 2009), while Bowersox D.J., Closs D.J., Cooper M.B. emphasize the strategic importance of contract logistics (Bowersox, 1996), and Lieb R.C., Randall H.L. focus on the value-added elements (Lieb, 1996). Ciesielski M. points out the impact of contract logistics on supply chain efficiency (Ciesielski, 2011), while Langley C.J. Jr., Allen G.R. define contract logistics as a long-term partnership (Langley, 2005).

The concept of contract logistics defines a business model based on cooperation between a company (manufacturer, importer) and a logistics service provider, which involves dividing functions between the two parties. The manufacturing company focuses on its core activities (production, trade, services) and passes on most functions to the logistics company, which are not crucial for its operations but unnecessarily engage its resources. Contract logistics leads to significant cost reduction, for example, by limiting the need to maintain warehouses that are used only part of the year. The entrepreneur does not need to maintain an expensive transport fleet, while the logistics service provider can optimize its processes and efficiently use its fleet through agreements with multiple companies. Many logistics operators collaborate with companies that provide only transport services, ensuring them regular orders, while focusing on the overall organization of goods and services flow for their client.

Logistics service providers vary, from simple freight carriers and operators offering service packages based on customer needs, to those who act as coordinators of supply chains, performing planning, coordinating, and controlling tasks through the use of information systems and their experience based on highly specialized logistics knowledge.

The decision to use logistics operators for distribution can be motivated by strategic reasons, in the sense that the organization acknowledges the need for one or more aspects of the chain to be changed. This decision may also be made for more tactical reasons; for instance, the organization may have an inefficient distribution network or insufficient warehousing capacity. Regardless of whether the decision is strategic or tactical, using logistics service providers (3PL) is fundamentally due to the organization's awareness of its insufficient potential in the aforementioned areas (Brooks Bentz, 2006).

Outsourcing logistics services can improve both the efficiency and effectiveness of the distribution process; however, it is important to note that cooperation with an operator may easily end in failure (i.e., the inability to meet one party's requirements by the other). One of the most common causes of failure lies in unreasonable or unrealistic expectations, often from the party using the operator's services. For example, if an operator is required to reduce transport costs by half, this should be considered an unrealistic demand. Another cause of failure could be a lack of flexibility in the actions of both parties involved. Regardless of the diligence in cooperation, one always has to anticipate unexpected problems and challenges (Tompkins, 2006).

3. Innovative Solutions in Distribution Logistics Management

In the field of logistics services, the area of distribution and so-called "last mile logistics" (Last Mile for e-commerce) has gained significant importance. In these areas, innovation is primarily understood as the reduction of costs and delivery time. Both of these factors impact the level of customer service. The growing importance of environmental aspects and sustainable development is also crucial. Logistics operators must meet these expectations, constantly searching for new solutions, often ahead of current needs. Another reason for introducing changes and an innovative approach are the circumstances that force them (staffing issues, the desire to obtain external financial support). One of the first definitions of innovation was formulated by Joseph Schumpeter, who defined innovation as the introduction of a new solution into practice (Schumpeter, 1934). Peter F. Drucker defines innovation as the practical implementation of new ideas in an organization (Drucker, 1985). Everett Rogers focuses on the diffusion of innovation in society (Rogers, 1962). Philip Kotler defines innovation in the context of marketing and management: Innovation is any successful implementation of a creative idea that generates value for the customer (Kotler, 2009). The Oslo Manual 2018, which is of great importance for logistics and transport, contains definitions of innovation because innovations in these sectors (e.g., new parcel tracking technologies, route optimization, warehouse automation) are key to increasing efficiency and sustainable development. According to the definition in the Oslo Manual (OECD), innovation is a new or improved product or process (or a combination of both) that differs significantly from previous products or processes of the entity and that has been made available to potential users (product) or put into use by the entity (process). The term "innovation" can therefore refer both to the action and the result of the action. Innovative activity includes all developmental, financial, and commercial actions undertaken by the company aimed at the creation of innovations for the company. Business innovation is a new or improved product or business process (or a combination of both) that differs significantly from previous products or business processes of the company and has been introduced to the market or put into use by the company.

Compared to the previous edition of the manual, the main change in the definition of business innovation is the reduction of the previous definition to four types of innovation (product, process, organizational, and marketing innovations) and narrowing it to two main types: product innovation and business process innovation. In the revised definition, the ambiguity of the requirement for a "significant" change has also been reduced by comparing both new and improved innovations with the previous products or business processes of the company. The basic definitions of product innovation and business process innovation are as follows: Product innovation is a new or improved product or service that differs significantly from the company's previous products or services and has been introduced to the market. Business process innovation is a new or improved business process for one or more business functions that differs significantly from the company's previous business processes and has been put into use by the company.

The updated classification of innovation according to the OECD can also be applied to innovations introduced by logistics operators in the field of distribution (both those already in use and those still in the testing phase).

Table 1.
Types of Innovations in Distribution Logistics (Own Study)

Category of innovation	Examples in distribution logistics
Product Innovations	**Autonomous delivery systems** – the use of autonomous vehicles, drones, and robots in the distribution process (e.g., Amazon Prime Air, Starship Technologies). **Advanced packaging technologies** – the use of intelligent RFID labels and IoT sensors that allow for monitoring transport conditions (e.g., temperature, humidity). **New delivery models** – the implementation of innovative logistics concepts, such as delivery to the customer's vehicle trunk (e.g., Amazon Key, Amazon Key in Car) or dynamic pick-up points (smart lockers). **Ultra-fast distribution technologies** – the development of systems like Hyperport Cargo, which can significantly reduce delivery times in global supply chains.
Business Process Innovations	**The use of advanced data analytics and artificial intelligence (AI)** – route optimization, demand forecasting, and predictive inventory management using machine learning algorithms (e.g., DHL and Resilience360, UPS ORION, Emapa). **Warehouse process automation** – the implementation of robotics in distribution centers, such as the use of goods-to-person systems (Amazon Robotics, Ocado Smart Platform).

From the perspective of businesses, however, the effectiveness of implementing an innovation is more important than its proper classification. When companies entrust the distribution of their products to logistics service providers, they expect it to be carried out better (in a shorter time, at a lower cost) than if they were to manage these processes themselves.

The introduction of innovation in distribution logistics results from the synergy between external factors, such as market, regulatory, and technological changes, and internal factors, such as organizational culture, resources, and competencies. Logistics operators who effectively identify these factors and respond appropriately can gain a competitive advantage in a dynamically changing environment.

Table 2.
External and Internal Factors Influencing Innovation in Distribution Logistics (Own Study)

External Factors Affecting Distribution Innovation	Internal Factors Affecting Distribution Innovation
1. Intensification of Market Competition	1. Organizational Culture Supporting Innovation
Increased competition in the logistics market creates pressure on operators, forcing them to implement new technologies and processes to maintain competitiveness and operational efficiency.	An organizational culture that promotes openness to change supports innovation, thus enabling the implementation of modern logistics solutions.
2. Legal Regulations and Changes in Government Policies	2. Technological Potential of the Organization
Changes in legal regulations, such as environmental protection laws, transport safety standards, or quality standards, may force the implementation of innovations in logistics operations, including distribution.	The technological capabilities of the enterprise, including access to modern IT systems and infrastructure, are crucial for the effective introduction of innovations in distribution.
3. Changing Consumer Needs and Expectations	3. Allocation of Financial and Investment Resources
Increased consumer expectations, such as shorter delivery times, flexibility in product access, and transparency of processes, pose a challenge for logistics operators to implement innovative solutions in distribution.	Allocating appropriate financial resources for technological innovations and the development of logistics infrastructure allows for the effective implementation of new solutions in distribution processes.
4. Technological Advancements and Digitization	4. Change Management and Adaptation Capabilities
The development of digital technologies (IoT, Big Data, artificial intelligence) promotes the introduction of innovative solutions in distribution processes, enabling route optimization, warehouse automation, and real-time shipment tracking.	The organization's ability to effectively manage the change process and adapt to new technologies and market needs is decisive for the success of innovation implementation.
5.Globalization of Markets and Increasing Complexity of Supply Chains	5. Organizational Strategy and Innovation Focus
Globalization and the increasing complexity of supply chains force logistics operators to invest in innovative solutions that enable effective management of distribution processes at the international level.	Organizations that include innovation as a key element of their strategy are more likely to implement modern solutions in distribution, ensuring their competitiveness in the market.
6. Pressure for Sustainable Development and Minimizing Carbon Footprint	6. Competence and Quality of Management Personnel
The growing emphasis on sustainable development, including minimizing environmental impact, forces operators to implement ecological innovations in distribution processes, such as electric vehicles or CO_2 emission optimization in routes.	A highly qualified management team, capable of making strategic decisions and effectively implementing technological innovations, is crucial for the success of innovation implementation in distribution.
7. Impact of Changing Business Models and E-commerce	7. Organizational Structure Efficiency
The dynamic growth of e-commerce and the changing business models, such as online sales, force logistics operators to adapt to new market needs, including improving the efficiency of distribution processes.	An organizational structure that enables quick decision-making and effective internal communication supports the implementation of innovations in distribution, fostering adaptation to changing market conditions.

4. Evaluation of innovation implementation in the logistics sector based on empirical data

The study was conducted in January and February 2025. The entities selected for the research vary in size and scope of operation, with the common denominator being active participation in logistics processes either as a provider of these solutions or as a user of them. The research tool used to verify the questions and hypotheses was a questionnaire. It was decided to use the electronic CAWI (Computer-Assisted Web Interviewing) survey method, which allowed for the analysis of the studied issues from various perspectives, while also addressing multiple topics and providing the opportunity to reach a broad group of individuals from the surveyed population. A virtual version of the survey was created using Google Forms, containing 14 questions (4 demographic questions and 18 closed-ended substantive questions). As a result of the conducted study, responses were obtained from 100 respondents. The largest group of respondents (35.3%) are companies operating for more than 20 years. This may suggest that the industry being studied is dominated by stable, experienced enterprises that have survived various market challenges and have an established position. Companies operating for less than 5 years account for 30.4% of those surveyed. This indicates that there are many new entities in the market, which may suggest favorable conditions for starting a business but also high competition. Companies operating for 5-10 years account for 19.6%, and those operating for 10-20 years represent 14.7%, which is a relatively low result. This may suggest that some companies do not survive the first 10 years of operation or that the market is dominated by either young startups or long-established leaders. In the analyzed group, as many as 46.1% of companies declared activity in transportation. Warehousing (21.6%) and distribution (19.6%) are the next dominant areas of operation. Half of the surveyed companies (50%) employ fewer than 50 people, which may suggest that there are many small enterprises in the industry that do not require a large workforce. However, it should be noted that 21.6% of companies employ more than 1000 people, indicating that large organizations also play a key role. This may point to the presence of global or national logistics, manufacturing, or distribution leaders. The relatively low share of companies employing between 50-1000 people suggests that it is more difficult to grow in the category of medium-sized businesses in the studied sector. This may mean that smaller firms either remain small or are taken over by larger corporations. The transportation and logistics sector is highly diverse, ranging from small transport companies providing only transport services to large cross-border corporations offering a full range of contract logistics services.

One-third (33%) of the surveyed companies systematically introduce innovations in logistics processes. This indicates the innovative maturity of this group of enterprises and their constant pursuit of optimizing distribution logistics. The largest group of respondents (43.1%) indicates that nearly half of the companies see the need for innovation but do so sporadically.

This may be due to various reasons, such as lack of resources, technological knowledge, or the need for prior operational preparation. More than 15% of surveyed companies do not implement innovations systematically but have plans for such actions. This could mean that these companies are experimenting with modern solutions but do not consider them a key element of their strategy. The smallest group of companies declares that they do not implement innovations and have no such plans. This could indicate a conservative approach to distribution logistics or a lack of need for changes in the current system.

The most commonly used technologies are transport management systems (59.8%, 61 responses) – the most popular innovation, highlighting the importance of transport optimization in logistics, artificial intelligence and data analysis (41.2%, 42 responses) – technologies related to processing and analyzing large datasets are gaining increasing popularity, and warehouse automation (29.4%, 30 responses) – used by almost one-third of companies, indicating a growing trend of automation in logistics processes. Other technologies mentioned by respondents include: Internet of Things (IoT) – 21.6% (22 responses), which helps in monitoring resources and optimizing processes, autonomous vehicles/drones – 13.7% (14 responses), indicating slow adoption of these technologies, which may still be costly or experimental, and Blockchain – 8.8% (9 responses), a less commonly used technology but potentially applied in supply chain tracking. Companies primarily focus on optimizing transport, data analysis, and warehouse automation, which points to key areas of logistical transformation. The Internet of Things (IoT) and autonomous vehicles are less popular but still significant for the future of logistics. Blockchain is relatively rarely implemented, which may result from a lack of full understanding of its applications in the industry. Only 1% of respondents declare a lack of innovation, suggesting that almost all companies are taking steps towards technological development. The logistics sector is gradually adopting innovative technologies, but not all solutions are yet widely implemented. It can also be stated that the term "artificial intelligence" is not entirely understood – the solutions applied in the industry should rather be classified under the term "machine learning".

Rising operational costs represent the biggest challenge for companies, indicated by almost half of the respondents. This could be influenced by rising fuel, energy, labor costs, and inflation. A shortage of skilled workers (22.5%) is the second major issue, which may stem from recruitment difficulties and the need to invest in process automation. Issues related to global supply chains (10.8%), which may be impacted by disruptions in the delivery of raw materials and goods, delays, and rising transport costs, also pose a significant challenge for companies. Another factor influencing logistics problems is the rapidly changing customer preferences, highlighting the need for businesses to dynamically adjust their strategies to meet the changing market demands. The chart shows that companies must simultaneously deal with multiple challenges, with operational costs and the lack of skilled workers being the most pressing issues.

The study revealed that companies are responding to changing market challenges. The highest percentage of companies (45.1%) indicated that they have implemented process optimization actions. This suggests that, in the face of changing conditions, businesses are focusing on improving internal procedures to increase efficiency and reduce costs. The next two most commonly selected approaches (20.6% and 21.6%) show that companies are increasingly investing in modern solutions and collaborating with other entities to maintain competitiveness. A smaller emphasis is placed on the development of logistics services—only 10.8% of respondents identified logistics services development as a key adaptive strategy. This may suggest that companies consider other actions, such as process optimization and technology, to be more prioritized. A very small percentage of companies could not identify a specific strategy, which suggests that most organizations have a clear direction for adaptation. Also, only a small portion of respondents indicated that actions are being taken in all areas, which may mean that most companies are focusing on selected priorities. In summary, the survey results show that businesses are focusing on improving internal processes and technological innovations to meet market challenges.

87.3% of respondents (the sum of "very important" and "important" categories) consider logistics innovations an important element of competitiveness, which indicates the growing role of technology and process optimization in distribution. A small number of people regard this aspect as neutral or of little importance, suggesting that most companies recognize the need for changes and investments in this area. The lack of significant responses in the "insignificant" categories suggests that logistics innovations are seen as essential in today's business environment. In conclusion, the majority of respondents agree that innovations in distribution logistics play a key role in maintaining competitiveness in the market.

Only 26.5% of companies already have a dedicated logistics innovation department, indicating that most organizations do not yet have a formally separated unit focused on this issue. Over 43% of companies plan to create such a team, suggesting a growing awareness of the need for innovations in logistics. 30.4% of respondents believe it is not necessary, which may indicate that their companies either do not see the need for a dedicated department or manage logistics innovations in another way. The results show that although most companies recognize the importance of innovations in logistics (as indicated in previous charts), only a portion of them already have a dedicated team for this area. However, a large group of companies plans to establish one, indicating a trend toward greater specialization and investment in the logistics of the future.

Respondents also answered a question regarding the assessment of government or regional support for implementing innovations in the logistics sector. Respondents rated the support on a scale from 1 to 5, where 1 means no support and 5 means very high support. The most frequent response was a rating of 3 (neutral support), indicating a moderate perception of the level of support. A significant portion of respondents rated the support as 2 or 1, suggesting that many perceive it as insufficient. Only 6.9% rated the support as very high. Therefore, it should be recognized that the expectations of the logistics industry are quite high, and most respondents assess the support for innovations in logistics as average or insufficient. Implementing innovations (especially technological ones) is, unfortunately, a process that requires significant financial investment as well as knowledge capital.

Technological innovations play a crucial role (also in terms of image) in enhancing the innovation of distribution logistics in organizations. The respondents indicated that technological innovations are of great importance (43.1%), although they are not a key factor. Meanwhile, 17.6% of respondents believe they are essential for efficiency. Only a small percentage (about 5%) stated that they have no impact. Analyzing the survey results, it can be observed that most respondents (60.7%, the sum of "Very important" and "Important" answers) consider technological innovations an important element for improving the efficiency of distribution logistics. This indicates a growing awareness of the role of modern technologies in optimizing logistics processes, reducing costs, and increasing productivity. Meanwhile, 25.5% of respondents attribute moderate importance to innovations, which may suggest that in their organizations, technologies do not yet play a central role, or their impact is limited to specific aspects of operations. A low percentage of respondents (8.8% - low importance, about 5% - no importance) suggests that only a few organizations fail to recognize or implement modern technological solutions in distribution logistics. This could be due to various factors such as industry specifics, budget constraints, or lack of access to advanced tools. These results show that technological innovations play an increasingly important role in distribution logistics, and organizations recognize their potential to improve efficiency. This trend may indicate a growing need for investments in modern solutions, such as automation, artificial intelligence, or supply chain management systems.

The most frequently chosen innovation resulting from changing market conditions is warehouse process automation (44.1%). This demonstrates that organizations are striving to increase efficiency and reduce operating costs through automation, Warehouse Management Systems (WMS), and AI-based solutions in warehouse management. Digitalization and the use of Big Data (41.2%) are also significant, suggesting that companies are focusing on better collecting, analyzing, and utilizing data to optimize the supply chain and predict trends. Technologies supporting sustainable development (43.1%) are an important element of many companies' strategies, which may be linked to ESG (Environmental, Social, and Governance) regulations, reducing CO_2 emissions, and more eco-friendly transportation methods. Similarly, solutions in supply chain management (42.2%) indicate that organizations aim to increase the resilience of their supply chains, reduce the risk of delays, and improve logistical predictability. The implementation of resource-sharing platforms (13.7%) received significantly fewer responses. This may suggest that organizations are not yet ready for open collaboration models or do not see direct benefits in them. Only 1% of respondents indicated that innovation in logistics does not concern them. This means that virtually all companies recognize the need for change and modernization, even though the pace of implementing new technologies may differ between organizations. The analysis of results shows that companies are primarily investing in warehouse automation, digitalization, and supply chain optimization, which allows for greater flexibility and resilience to market changes. The increasing interest in sustainable development reflects adaptation to global ecological trends and regulations. At the same time, resource sharing is an area that is not yet highly popular. In the long term, it can be expected that further digitalization and automation will be key areas for the development of logistics, and organizations will increasingly implement solutions based on data analysis and AI to enhance their competitiveness in the market.

Most respondents also considered innovations to have a significant or very high impact on the organization's ability to respond to disruptions (a total of 62.7%). However, 32.4% rated the impact as moderate, and a small number of people indicated low or no impact. The results suggest that innovations in distribution logistics are an important factor in increasing the resilience of the supply chain, but they do not completely eliminate challenges related to disruptions.

As mentioned, innovations in distribution logistics increase an organization's competitiveness in the market, but their implementation is usually costly and involves necessary investments. The largest number of organizations declare moderate investments (40.2%), which suggests that although companies are investing in innovations, they are often constrained by budget or other priorities. A total of 39.2% of respondents (18.6% + 20.6%) indicated large or very large investments, which shows that for a significant group of companies, innovations are an essential element of their competitiveness strategy. 16.7% of companies invest little, which may indicate a focus on traditional logistics management methods. The lack of investment was not indicated by a significant number of respondents, suggesting that almost every organization allocates at least some resources to innovations. As many as 63.7% of respondents indicated the high cost of implementing technologies as the biggest obstacle. This shows that for many organizations, investing in logistics innovations is a costly venture, which may limit the pace of their implementation. 34.3% of companies struggle with a lack of qualified personnel, suggesting that the development of new technologies is outpacing the availability of specialists in the labor market. 30.4% pointed to a limited awareness of the benefits of innovations, meaning that some companies may not fully recognize the potential of modern solutions. 26.5% of companies lack adequate technological infrastructure, suggesting that a lack of modernization in other areas of the organization hinders the implementation of innovations. 22.5% of organizations face resistance from employees to change, which may stem from concerns about job losses or the need to learn new technologies. 17.6% pointed to a lack of support from management or company owners, indicating that not all organizations have a clear innovation strategy.

He most commonly identified innovation critical for distribution logistics is the automation of processes. This involves the implementation of modern technologies such as warehouse robots, automatic sorting systems, and autonomous transport vehicles. The goal of automation is to increase operational efficiency, reduce human errors, and lower costs. Advanced data analytics includes the use of Big Data, predictive algorithms, and machine learning to optimize logistics processes. It helps predict demand, better manage inventory, and streamline the supply chain. IoT in logistics refers to the use of smart sensors, real-time tracking systems, and intelligent RFID labels. It allows for monitoring transport conditions, cargo location, and optimization of resource management. Artificial intelligence supports decision automation, demand forecasting, delivery route optimization, and customer service chatbots. It can also increase warehouse efficiency by smartly managing space and resources. Digital platforms enable the integration of various supply chain participants (suppliers, carriers, distributors) on a single shared platform. They allow for better collaboration, order automation, and improved visibility of logistics processes. Supply chain optimization (26.5%) includes improvements in transportation management, warehousing, operational cost reduction, and increased delivery efficiency through better synchronization of processes.

The introduction of innovations is an obvious response to changes in the company's environment. The majority of organizations (44.1%) believe that market changes influence their decisions but do not lead to radical changes in strategy. At the same time, there is a division between companies that accelerate the implementation of innovations in response to changes (22.5%) and those that, due to difficult market conditions, limit investments in innovations (22.5%). Only a small part of organizations (8.8%) adjusts only in the case of significant changes, and only 2% of companies are completely resistant to market changes. These results indicate that most organizations maintain moderate flexibility regarding innovations, and only a part of them treats changing market conditions as the main factor determining their actions.

5. Summary

Innovations in distribution logistics are an inevitable development direction for the sector, driven by technological progress and changing market expectations. The research results confirm that investments in automation, digitization, and optimization of logistics processes contribute to increased efficiency and competitiveness of companies.

Distribution logistics has undergone dynamic transformations in recent years, due to both technological evolution and changes in consumer behavior. Modern solutions such as artificial intelligence, the Internet of Things, and blockchain are beginning to play an increasingly important role in optimizing logistics processes. Warehouse process automation and the implementation of intelligent transportation management systems enable more efficient and flexible delivery execution. The conducted research confirms that logistics operators recognize the importance of innovation, but face barriers to their implementation, such as high costs, lack of access to qualified workers, and limited institutional support.

One of the key conclusions from the analysis is the growing need to adapt operational models to the realities of digitization and automation. Logistics companies that effectively implement innovative technologies can not only increase their efficiency but also gain a competitive advantage in the face of increasing market pressure. On the other hand, failure to adapt to new realities may result in the loss of market position and limited expansion opportunities.

Further research in the field of logistics innovations should focus on analyzing the long-term effects of implementing modern solutions, as well as finding strategies to minimize implementation barriers. Special attention should be given to the impact of innovation on the social aspect, including changes in the labor market, the need for upskilling employees, and the impact on sustainable development and the reduction of CO_2 emissions.

In conclusion, innovations in distribution logistics are a key element of the transformation of modern supply chains. Companies that actively invest in modern technologies and adapt their operational strategies to changing conditions have the opportunity to achieve long-term success and build a competitive advantage in the logistics sector.

References

1. *Amazon Key, Amazon in garage,* https://www.amazon.com/Amazon-Key-In-Garage-Delivery/b?ie=UTF8&node=21222091011, January 5.2025.
2. *Amazon Prime Air*, https://www.aboutamazon.com/news/tag/prime-air
3. Archutowska, A., Żbikowska, E. (2009). Rozwój rynku usług logistycznych w Polsce. In: D. Kisperska-Moroń, S. Krzyżniak (eds.), *Logistyka.* Poznań: Biblioteka Logistyka.
4. Bolumole, Y.A. (2001). The Supply Chain Role of Third-Party Logistics Providers. *The International Journal of Logistics Management*.
5. Bowersox, D.J., Closs, D.J., Cooper, M.B. (2013). *Supply Chain Logistics Management.* McGraw-Hill.
6. Brooks Bentz (2006). So You Think You Want to Outsource? *Logistics Today, May 9,* pp. 24-27, https://www.mhlnews.com/transportation-amp-distribution/so-you-think-you-want-outsource, December 12.2024.
7. Christopher, M. (2011). *Logistics & Supply Chain Management.* Pearson Education.
8. Ciesielski, M., Długosz, J. (2010). *Strategie logistyczne*. PWE.
9. Ciesielski, M. (2011). *Logistyka w biznesie.* PWE.
10. CSCMP, https://cscmp.org/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms/CSCMP/Educate/SCM_Definitions_and_Glossary_of_Terms.aspx?hkey=60879588-f65f-4ab5-8c4b-6878815ef921, December 12.2024.

11. *DHL and Resilience 360*, https://tapcrowdstatic-ie.s3-euwest1.amazonaws.com/5544/confbagfiles/event/10890/CSI_DHL_Resilience360_1474895712_1507195876.pdf, January 05.2025.
12. Drucker, P.F. (1985). *Innovation and Entrepreneurship: Practice and Principles*. Harper & Row.
13. Emapa, https://emapa.pl/rozwiazania/#optymalizacja-tras, January 10.2025.
14. Gołębska, E. (2009). Kompedium wiedzy o logistyce. In: D. Kisperska-Moroń, S. Krzyżniak (eds.), *Logistyka.* Biblioteka Logistyka.
15. Gudehus, T., Kotzab, H. (2012). *Comprehensive Logistic*. Springer.
16. Harrison, A., van Hoek, R. (2011). *Logistics Management and Strategy: Competing through the Supply Chain.* Pearson Education.
17. Hyperport, https://www.hyperlooptt.com/projects/hyperport/, January 05.2025.
18. Kisperska-Moroń, D., Krzyżaniak, S. (2009). *Logistyka.* ILiM.
19. Kotler, P. (2009). *Marketing Management*. Pearson Education.
20. Krawczyk, S. (2012). *Outsourcing usług logistycznych.* Difin.
21. Langley, C.J. Jr., Allen, G.R. (2005). *Third-Party Logistics Study: Results and Findings of the 2005 TPL Study.* Georgia Institute of Technology.
22. Lieb, R.C., Randall, H.L. (1991, 1994, 1995, 1996). A Comparison of the Use of Third-Party Logistics Services by Large American Manufacturers. *Journal of Business Logistics*.
23. Mentzer, J.T., Flint, D.J., Hult, G.T.M. (2001). Logistics Service Quality as a Segment-Customized Process. *Journal of Marketing*.
24. *Ostatnia Mila dla E-commerce – Raport Polski Instytut Transportowy* (2023). Otimo, Last Mile experts.
25. Reporting and Using Data on Innovation, 4th Edition. The Measurement of Scientific, Technological and Innovation Activities, by OECD/Eurostat: https://www.oecd.org/content/dam/oecd/en/publications/reports/2018/10/oslo-manual-2018_g1g9373b/9789264304604-en.pdf, January 20.2025.
26. Rogers, E.M. (1962). *Diffusion of Innovations.* Free Press.
27. Rydzkowski, W. (ed.) (2007). *Usługi logistyczne*. Poznań: ILiM.
28. Rydzkowski, W., Wojewódzka-Król, K. (2007). *Transport. Logistyka. Ekonomia.* PWN.
29. Schumpeter, J.A. (1934). *The Theory of Economic Development*. Harvard University Press.
30. Skjoett-Larsen, T. (2000). Third Party Logistics – From an Interorganizational Point of View. *International Journal of Physical Distribution & Logistics Management*.
31. Skowronek, C., Sarjusz-Wolski, Z. (2012). *Logistyka w przedsiębiorstwie.* PWE.
32. *Starship Technologies,* https://www.starship.xyz/, January 05.2025.
33. Tompkins, J.A. (2006). The Business Imperative of Outsourcing. *Industrial Management, styczeń-luty*, pp. 8-12.
34. *UPS Orion*, https://www.supplychaindive.com/news/ups-orion-route-planning-analytics-data-logistics/601673/, January 05.2025.

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DEVELOPMENT OF HUMAN CAPITAL IN MODERN ENTERPRISES IN THE ERA OF CHANGING ECONOMY

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Purpose: The main aim of this paper is to present the importance of human capital and the areas of investment that determine its development. This is followed by the presentation of empirical research results that attempt to answer the following questions: Do the surveyed companies engage in human capital development? Are internal employee development programs adapted to employees' expectations, interests and needs? What areas are companies investing in to increase the value of human capital?
Design/methodology/approach: Analysis of literature and website reports related to the topic under study, Conducted empirical research targeting managers of large and medium-sized enterprises in Lubusz Voivodeship. The survey was conducted in 2024 during the months of August-September. The research method was a diagnostic survey, the tool was an electronic survey questionnaire.
Findings: Human capital in the era of changing economy is a key element that affects the competitiveness of modern companies, and therefore there should be continuous investment in the areas which determine its development in order to achieve market success.
Most of the companies surveyed are involved in human capital development, but not all internal programs are adapted to employees' expectations, interests or needs. The most important areas affecting human capital development in the surveyed companies are: education and training, talent-based management and modern technology.
Research limitations/implications: Research will be conducted to verify the rate of change in the area of future competencies in modern companies.
Practical implications: The presented results constitute a valuable source that shows whether the surveyed companies are following the right direction in human capital investment.
Originality/value: The paper can contribute to increasing managers' awareness of how to effectively develop and use of employees' potential.
Keywords: human capital, development, areas of investment, competencies of the future.
Category of the paper: Research paper, literature review.

1. Introduction

In recent years, thanks to the knowledge-based economy, the importance of intangible resources, which have a significant impact on the functioning of modern companies, has been greatly emphasized. One such resource is human capital, which through effective management, based, among others, on continuous development, becomes the most valuable asset, affecting the competitive position of enterprises. In the era of changing economy, where in terms of technology or socio-economics the pace of change is rapid, companies need to be more flexible in responding to new challenges. One such challenge is a different view about the management of people, who play a special role these days. Therefore, the main purpose of this paper is to present the importance of human capital and the areas of investment that determine its development. This is followed by the presentation of the results of an empirical study aimed at senior managers of medium and large enterprises in Lubusz Voivodeship. The study attempts to answer the following questions:

1. Do the surveyed companies engage in human capital development?
2. Are internal employee development programs adapted to employees' expectations, interests and needs?
3. What areas are companies investing in to increase the value of human capital?

2. The importance of human capital in modern companies

The development of human capital dates back to the 1960s. Its creators were T.W. Schultz and G.S. Becker (Niklewicz-Pjaczyńska, Wachowska, 2012). In the subject literature, we can see many definitions of this issue, which are considered in a broader or narrower sense. According to T.W. Schultz and G.S. Becker, human capital is a person's innate qualities, educated skills, knowledge and professed values and attitudes. In a slightly broader sense, the authors also included the health of employees and their vital energy (Niklewicz-Pjaczyńska, Wachowska, 2012).

Human capital is the values hidden in employees that are reflected in their abilities to perform their work. It is a key element of intellectual capital, a stimulant of the formation and functioning of its other components (Gawron, Myjak, 2019). It is a set of human qualities in formal terms, which can include various learning activities, and informal terms, i.e. skills, talent or competencies, which form the bottom line of the enterprise (Francik, Kot-Radojewska, 2020).

According to E. Skrzypek, human capital consists of knowledge, practical skills, entrepreneurship, ability to make improvements, aspirations and motivation (Skrzypek, 2009). On the other hand, A. Mazurkiewicz points to an additional composition of qualities, such as a person's energy, commitment, loyalty, active learning and sharing of knowledge and information resources, and the ability to respond and adapt to new situations (Mazurkiewicz, 2010).

Human capital is the psychophysical attributes of an individual, which include: innate abilities, competencies, active attitude in the economic and social spheres, and culture (Grzybowska, 2015).

According to B. Kaczmarek and W. Walczak, human capital is a set of knowledge and skills owned by employees. If they have valuable knowledge, they can become a stimulator of innovation processes that affect the attractiveness of modern enterprises, but only if organizations provide employees with the right environment to use their individual potential (Kaczmarek, Walczak, 2009, p. 239).

Human capital is a mobile resource. It is difficult to measure due to its intangible nature and its inability to be copied by competitors. It has the capacity for accumulation, where used knowledge multiplies its value, while unused knowledge weakens (Grzybowska, 2015). Human capital "is the driving force behind the creation and distribution of knowledge" (Brzeziński, 2018, p. 22).

In summary, human capital is a key resource, consisting of knowledge, skills, experience, creativity and abilities of employees. They are the property of an individual, not the company, but by effectively using the potential of employees in cooperation and continuously investing in their development, it becomes a shared value (Kaczmarek, Walczak, 2009).

3. Areas of investment in human capital

Modern enterprises faced a very volatile and unstable environment, which forces continuous investment in employee development.

The development of human capital is in other words a process aimed at all activities, affecting the enrichment of knowledge, development of skills, creativity or innovation, which should lead to an increase in its potential. C.A. Coleman stresses that the development of human capital should be in line with the personnel development strategy and takes into account: the importance of human capital in the company, valuing the activities of employees, considering their diversity, awareness of the importance of investing in development and in the talents of employees. In addition, adaptation of development projects to the employee's individual interests and needs (Żukowska, Wardzińska, 2020).

In order to adapt to new challenges, modern companies should place great emphasis on areas that support the development of human capital, such as (Francik, Kot-Radojewska, 2020; Pocztowski, 2016):

- creation of a personnel strategy, which is an important component of the company's overall strategy. It indicates the areas of involvement in the development of human capital;
- education and training, i.e., investing in various forms of education, such as external and internal training, degree programs, conferences, webinars and e-learning training, which become an important element in the era of digital transformation;
- talent-based management focused on attracting talent, retaining and developing employees with unique competencies;
- flexible employment models, i.e. changes in the way work is organized. Remote or hybrid work requires new skills in team management, effective communication and self-reliance;
- organizational culture that shapes a friendly atmosphere in the workplace and is based on respect, trust and openness;
- workplace sustainability – comfortable and safe working conditions, fair treatment of all employees, and attention to physical and mental health,
- measures to increase employee involvement – appreciation, praise, support, etc.;
- modern technologies, such as artificial intelligence, the Internet of Things and robotics, which change the nature of current work;
- appropriate system of motivating employees, encouraging development;
- coaching and mentoring program;
- work-life balance – or work-life balance;
- knowledge management, which facilitates the collection, dissemination and use of knowledge and the development of acquired competencies or the creation of new ones (Bednarczyk, 2022);
- diversity management – having a diverse team in the company, influences to increase creativity, ingenuity and approach on a larger scale to problems and ways of solving them (Gross-Gołacka, 2018).

Orientation to the above-mentioned areas promotes the formation of an appropriate working environment for the development of human capital (Francik, Kot-Radojewska, 2020). Conscious investment in people is an integral part of the effective functioning of any modern enterprise (Chojnacka, 2021).

4. Competencies of the future – new challenges

Nowadays, the range of knowledge and information absolutely needed to perform specific tasks in specific positions is constantly expanding. In the decision-making process, a much larger number of data sources and quantities of information must be analyzed. The pace of change in information processing also continues to increase. Technological evolution has resulted in the computerization of processes in modern companies in many areas, which forces the adaptation of employees' competencies to the new conditions in which companies have been and will be operating in the era of changing economy (Graczyk-Kucharska, 2020). Today, digital competencies are even required for proper functioning, "they are defined as a set of skills, knowledge and attitudes that enable critical and responsible use of digital technologies" (Motylińska, 2020, p. 203). Digital innovations such as big data, artificial intelligence, the Internet of Things, data analytics, neural networks, robotics or machine learning cause a revolution in the market (Graczyk-Kucharska, 2020). Automation and digitalization reshape the nature of current work. Gradually, the role of employees will change toward collaboration with robots. This correlation will amplify productivity through effective decision-making by the employee with the precision of robots. These changes will not only apply to manufacturing processes, but also to managerial or administrative-office processes. Employees alone will be required to have greater soft skills, i.e. creativity and innovation, or effective communication with the use of modern technologies, high activity in the organization of their own work and ingenuity (Graczyk-Kucharska, 2020). According to the *Infuture Hatalska Foresight Institute* report, the so-called STEM (*science, technology, engineering, math*) sciences will also be important, stimulating mathematical abilities and analytical thinking skills. According to the report, worldwide we have and will continue to have a shortage of skilled employees in this field. These skills lead to a noticeable 24.4% increase in employment of people with such skills in the US, while other industries recorded an increase of only 4.0%. According to the report, such specialists as programmers are and will continue to be in high demand in the labor market in Poland as well. It should be remembered that such skills, according to the report, should be supported by the so-called soft competencies mentioned earlier, which will distinguish us from artificial intelligence and machines. Key competencies of the future, according to the *Infuture Hatalska Foresight Institute* are: active education, critical thinking, creativity and innovation, communication skills, ability to share knowledge and information, problem-solving skills, teamwork skills, design thinking, entrepreneurship, emotional intelligence and empathy (Infuture Hatalska Foresight Institute Report*,* 2019).

In summary, companies will need to invest in upskilling and reskilling to allow faster adaptation. However, it is necessary to first identify the gap in the company between the competencies it has and those required in the future, then focus on the fundamental areas that determine the development of the most important competencies of the future.

5. Development of human capital in the surveyed companies

Part of the survey, the results of which are presented below, was conducted in medium and large enterprises in Lubusz Voivodeship. The sample selection was random in order to provide each enterprise with a chance to participate in the survey. The survey was conducted in 2024 during the months of August-September. The research method was a diagnostic survey, and the tool was a survey questionnaire, which was addressed to senior managers. The survey included 96 respondents, 76 men (75.84%) and 20 women (20.16%). The survey attempted to answer the following questions:

1. Do the surveyed companies engage in human capital development?
2. Are internal employee development programs adapted to employees' expectations, interests and needs?
3. What areas are companies investing in to increase the value of human capital?

The results are shown in Tables 1, 2 and 3 below.

Table 1.
Enterprise involvement in employee development

Does the company engage in human capital development?	**Quantity (in pcs.) N = 96**	**Percentage of responses**
Definitely yes. Continuous employee development is a key element in the company's strategy	51	53,1
Yes, but these are irregular activities	35	36,5
No	10	10,4
Total	96	100

Source: own elaboration based on surveys conducted.

According to the survey, 53.1% of managers indicated that the company engages in human capital development and it is a key element of the company's strategy, 36.5% believe that these activities are occasional, while 10.4% believe that the company does not engage in employee development. Unfortunately, the results are not very optimistic, because in modern times, the continuous development of human capital should become a priority for companies that want to succeed in the market in the future.

Table 2.
Employee development programs

Are employee development programs adapted to employees' individual expectations, interests and needs?	**Quantity (in pcs.) N = 96**	**Percentage of responses**
Yes	40	41,7
Not always	56	58,3
No	–	–
Total	96	100

Source: own elaboration based on surveys conducted.

The survey showed that 41.7% of managers indicated that internal employee development programs are adapted to the individual expectations and needs of employees, which will certainly affect their effectiveness, commitment and job satisfaction. In contrast, 58.3% of managers felt that they are not always. This means that some decisions are ill-considered and may lead to a decrease in employee motivation, which may be associated with weaker commitment and a decrease in work efficiency.

Table 3.
Investment in human capital

What areas are companies investing in to increase the value of human capital? N=96	Variable with multiple responses	
	Quantity	Percentage of cases
Education and training	82	85,4
Talent-based management	58	60,4
Knowledge management	51	53,1
New flexible work models – remote, hybrid work	35	36,5
Organizational culture conducive to learning	48	50,0
Sustainability in the workplace	46	47,9
Diversity management	46	47,9
Modern technologies	63	65,6
Appropriate system of motivating employees	40	41,7
Other, which ones?	–	–

Source: own elaboration based on surveys conducted.

The surveyed companies invest the most in training and education – 85.4%, which are conducted by internal specialists or external trainers. Training in the form of e-learning is also popular. Another area is modern technology 65.6%, which develops digital competencies that are so important in an ever-changing economy, and talent-based management 60.4%, which allows to effectively attract, develop and retain employees with special competencies. Other areas identified by the managers are knowledge management – 51%, which allows to develop and use the acquired knowledge, and organizational culture, which should shape an environment of trust, loyalty, openness and encourage employees to learn. The surveyed companies are least invested in an incentive system that stimulates employees to develop, and flexible work models that require and at the same time teach new skills in team management, effective communication and self-reliance.

The presented research results indicate that the majority of companies are consciously involved in the development of human capital. This investment will certainly affect the efficiency and innovation of the surveyed enterprises, which will translate into a sustainable competitive advantage in the future. Unfortunately, there is a group of enterprises that do not recognize the need for continuous human capital development, and their activities are irregular or nonexistent. The research also shows that employee development programs are not always adapted to their individual needs and expectations, which can certainly affect the reduction of employee engagement, lack of willingness to learn and assimilate the acquired knowledge. The most important areas affecting the development of human capital in the surveyed companies are: education and training, modern technology and talent-based management. The surveyed companies should invest more in diversity and creating an inclusive environment that increases the creativity of teams and the attractiveness of companies.

6. Conclusions

The development of human capital in a changing economy is one of the key challenges for modern companies. Development process is a long-term activity that requires the commitment of managers and employees. Adaptation of programs to the employees' individual needs, interests or goals allows the development of key competencies in a rapidly changing economy. Areas such as training, education, organizational culture, incentive system, talent management programs, knowledge management processes, workplace sustainability, diversity or new technologies determine the development of human capital, which becomes a recipe for success of an individual as well as a company. The results of this research indicate that not all surveyed companies appreciate the presented areas of investment in human capital. Selected ones follow the right direction in the development of employees, while others need to change this direction or adapt to the prevailing realities. Adequate management and development of human capital in the era of changing economy is a key factor affecting the competitiveness of modern companies and prepares them for the upcoming changes and challenges of the competencies of the future.

Reference

1. Bednarczyk, M. (2022). Knowledge management in an innovative organization. In: A. Majzel, A. Wala, *Innovation from idea to use. Theory and application in practice. Volume I. So that innovation would be of value.* Gorzów Wielkopolski: The Jacob of Paradies University Publishing House.
2. Brzeziński, M. (2018). *Integrated knowledge-based organizations.* Warsaw: Difin, p. 22.
3. Chojnacka, M. (2021). *Organization of the future.* Gorzów Wielkopolski: The Jacob of Paradies University Publishing House.
4. Francik, A., Kot-Radojewska, M. (2020). *Human capital in knowledge-based organization.* Warsaw: Difin.
5. Gawron, J., Myjak, T. (2019). *Management of human capital in theory and practice*. Nowy Sącz: State Higher Vocational School Publishing House.

6. Gołaszewska, U. (2014). Measures to raise the level of human capital in the new financial perspective 2014-2020. *Opitmum Economic Studies, No. 6(72).*
7. Graczyk-Kucharska, M. (2020). Planning human resources and competencies of the future. In: M. Graczyk-Kucharska, M. Spychała, M. Goliński, M. Szfrański, *Challenges of modern human resource management.* Radom: IN-W "Spatium".
8. Gross-Gołacka, E. (2018). *Management of diversity. Towards differentiated human resources in the organization.* Warsaw: Difin.
9. Grzybowska, A. (2011). Human capital management in the enterprise. *Scientific Journals of the Ostroleka Scientific Society, 25*.
10. Infuture Hatalska Foresight Institute (2019). *Employee of the Future Report*, pp. 24-28, https://infuture.institute/raporty/pracownik-przyszlosci/#:~:text=Zapraszamy%20na%20 warsztaty,%20sk%C5%82adaj%C4%85ce%20si%C4%99%20z%202%20modu%C5%82 %C3%B3w:%20Mo, October 5, 2024.
11. Kaczmarek, B., Walczak, W. (2009). *Knowledge management in modern enterprises.* Łódź: University of Łódź Publishing House.
12. Motylińska P. (2020). Prevention and formation of awareness of information security in environments of information overproduction. In: H. Batorowska, P. Motylińska, *Information and media security in times of information overproduction* (p. 203). Warsaw: Scientific and Educational Publishing House of the Polish Librarians Association.
13. Niklewicz-Pjaczyńska M., Wachowska M. (2012). *Knowledge-human capital-innovation.* Wrocław: Labour and Economic Digital Library Publishing House, http://www.bibliotekacyfrowa.pl/publication/36265, October 3, 2024.
14. Pocztowski, A. (2016). *Talent management in organizations.* Warsaw: Wolters Kluwer.
15. Przygocki, Z. (2018). *Knowledge and human capital in entrepreneurial environments. A territorial approach.* Łódź: University of Łódź Publishing House.
16. Skrzypek, E. (2009). Creativity of knowledge employees and their impact on the innovativeness of enterprises. In: E. Okoń-Horodyńska, R. Wisła, *Intellectual capital and its protection.* Warsaw: Institute of Knowledge and Innovation.
17. Żukowska, J., Wardzińska, K. (2020). Challenges of the area of learning and development of employees in the organization. In: J. Cewińska, A. Krejner-Nowecka, S. Winch, *Management of human capital – challenges*. Warsaw: SGH.

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MANAGING THE DEVELOPMENT OF TOURISM IN BORDER AREAS ON THE EXAMPLE OF THE CIESZYN SILESIA EUROREGION

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Purpose: The aim of this article is to present Cieszyn Silesia as a modernly managed Euroregion. The paper highlights the advantages of this tourist destination as well as the importance of efficient tourism development management in border areas, including the creation of good neighbourly relations based on mutual respect for national differences as well as undertaking mutually beneficial cooperation based on partnership.
Design/methodology/approach: The research included studies of specialist literature in the field of territorial marketing, devoted to both Euroregional cooperation and instruments supporting the development of tourism in border regions. A total of 24 publications in the form of monographs and scientific articles were used, as well as source materials obtained from the Cross-Border Tourist Information Centre in Cieszyn. An important source of information on the cooperation of the authorities of Polish Cieszyn and Czech Těšín was also an individual in-depth interview (IDI) conducted with the Chairman of the Silesian Railway Association in Cieszyn, Mr. Ladislav Antalc.
Findings: The article emphasizes the need to ensure managerial responsibility and sustainable development of local tourism, which involves taking into account the economic, social and aesthetic needs of various stakeholder groups on both sides of the border. In addition, selected tourist attractions of the Cieszyn Silesia Euroregion are described.
Research limitations/implications: In the future it would certainly seem worthwhile to carry out representative marketing research, among both actual and potential tourists mainly from Poland and the Czech Republic, in order to identify those elements of the tourist offering of the Cieszyn Region that can be modified and further optimized.
Practical implications: Effective management of tourism development in the border Euroregion of Cieszyn Silesia brings many benefits to local governments, residents, tourists, investors, travel agencies, hotels, guesthouses and restaurants. The article also discusses the main elements of the tourist offering and the advantages of Euroregional cooperation.
Originality/value: The results of the conducted analysis have both cognitive and utilitarian value, especially in the context of developing and implementing a strategy for promoting the tourist offering of the Cieszyn Silesia Euroregion.
Keywords: Polish-Czech cross-border cooperation, Polish-Czech borderland, Cieszyn Silesia Euroregion.
Category of the paper: General review.

1. Introduction

Nowadays, tourism is considered to be an activity that is important for people's health, for the functioning of regions with tourist attractions and appropriate infrastructure, as well as for the economy of a given country due to its share in the creation of GDP. In the European Union, tourism generates almost 10% of GDP and creates about 25 million jobs (Rapacz, 2020). It should also be noted that tourism, despite its spatial dispersion, is linked with almost all sectors of the economy and constitutes its "flywheel". The tourist attractiveness of individual regions and the intensity of tourist traffic have a significant impact on the development of the tourism industry. In some border regions, tourism plays a leading role in socio-economic development.

Scientific research often addresses the issue of the tourist attractiveness of specific areas. Although previously it was believed that the attractiveness of a region is determined by its tourist attractions and the existing tourist facilities, currently it is assumed that an important element influencing the tourist attractiveness of a region is the way in which tourist traffic is organized, and especially the promotion and the service offered to tourists (Kruczek, Walas, 2012). In addition, more and more emphasis is currently being placed on the aspects of sustainable tourism (Reformat, Pabian, 2020). Sustainable tourism is based on such a method of management that the economic, social and aesthetic needs of various stakeholder groups are met while preserving natural processes, biodiversity and the cultural and economic integrity of a given Euroregion. Therefore, the conditions necessary for the development of tourism in border areas include, among others, an abundance of tourist sights, natural attractions, a clean natural environment, protection of natural resources, as well as providing tourists with the infrastructure they expect, including accommodation and catering facilities.

The main segments of tourists in border regions include the following:

- inhabitants of border regions, i.e. neighbours from across the border,
- people travelling through a given Euroregion in transit,
- domestic tourists interested in active tourism and contact with nature,
- foreign tourists seeking unique landscape attractions,
- school youth and students (Kuśmierski, Dudkiewicz, 2002).

Moreover, it is estimated that by 2030, approximately 29% of tourists will be people aged 60+, making it one of the largest market segments (Rapacz, 2020).

International tourism serves to accelerate and deepen European integration (Merski, 2002). State and local government authorities, entrepreneurs, associations, foundations and other non-governmental organizations become involved in the development of tourism. The creation of Euroregions would not be possible without the activity of local communities living in the borderlands. Sometimes cooperation is sparked by unfavourable phenomena and the need to tackle them, such as illegal immigration; fires caused by reckless tourists; trampling of paths;

littering of forests and waters; noise; air pollution from cars; destruction of vegetation; disturbance of wildlife, etc. Politics often plays a significant role in the development of tourism, e.g. with regard to public transport and spatial management (Gaworecki, 2002). The patterns of behaviour of the residents and tourists in terms of spending leisure time also have a significant impact.

2. Tourism marketing in border areas

The focus of broadly understood territorial marketing is on both the material and non-material values of specific places, i.e. the infrastructure, people, tourist and natural attractions, economic and cultural potential, place brand, image and other attributes (Raftowicz-Filipkiewicz, 2013). Marketing is one of the basic instruments for stimulating demand in economic activity in a competitive market, including the tourism market. Awareness of customer behaviour and needs is the basis for the business decisions of tour operators, travel agencies, hotels, restaurants, ski lift operators, etc.

Another challenge for territorial marketing is virtual marketing, often referred to as e-marketing or "territorial marketing 2.0". This kind of marketing is an inexpensive way of reaching millions of potential recipients who are interested in conducting business in a given territorial unit, purchasing local products or services, or participating in local events. Studies have shown that in recent years the Internet has become a key tool in territorial marketing (Avraham, Ketter, 2008). This tool has enormous potential in reaching the recipients of the entire spectrum of activities in the field of territorial marketing and can certainly be used much more extensively (Gregor, Gotwald, 2011).

The implementation of artificial intelligence (AI) in territorial marketing also offers great opportunities. AI is an interdisciplinary field of science that deals with the creation of computer programs capable of performing tasks that, if performed by humans, would require intelligence (Russell, Norvig, 2021). Artificial intelligence helps in finding solutions that minimize the costs associated with customer acquisition and retention, as well as increasing the effectiveness of promotional activities (Szpringer, 2024). This is achieved through creative solutions and applications, such as real-time content personalization; marketing automation; email marketing and newsletters; mobile marketing automation; live chat; database search and mining (Big Data Marketing); automatic sales chat; inbound marketing; customer lifecycle management; customer recommendation systems; the creation of advertising campaigns; social media posts, and many others. The primary goal of these tools is to obtain and maintain a competitive advantage over other territorial units, which can be regions, cities, districts and municipalities. These activities are addressed to residents, tourists, investors and other internal and external stakeholders. AI means that city authorities are able to offer their customers better tailored products and services, and consequently experiences that translate into their commercial success.

The key factor in building the competitiveness of tourist areas and enterprises is information technology. Their communication capabilities cannot be overestimated. Apart from being a communication platform, their important attributes include assistance in completing transactions and building relationships (Bednarczyk, 2011). The effectiveness of promotional activities implemented in border regions depends on a range of factors, but the most important role in the process of providing tourist services is played by direct customer service, which includes the staff, their professional preparation and genuine commitment (Wiatrak, 2017).

3. Euroregional cooperation

Euroregional cooperation as a specific institutionalized form of cross-border cooperation has a relatively long history. Much has been done within its framework to improve neighbourly relations based on mutual respect for differences and partnership cooperation. In addition, the European Union has made it an instrument for stimulating peripheral and lagging regions.

The borderland phenomenon becomes particularly visible when such an area starts to experience a new pace of development caused by the ongoing changes (Hojny, 2006).

A Euroregion is not only a geographically separated area characterized by a certain level of economic development, which determines its inhabitants' standard of living. It is also the customs, views, manners and lifestyle of its inhabitants that distinguish them from their neighbours (Nemčok, 2002). In this context, it is very important to prepare tourist guides for intercultural communication. It is necessary to remember that this type of communication is based on empathy and on understanding representatives of foreign nations, and at the same time on striving to be understood by them during a conversation in a foreign language (Staniewska-Ziętek, Wołoszyn, 2013). And it is not only about the grammatical correctness of statements, but also about understanding the context, metaphors, etc.

The border region is, by definition, directly connected with the state border. Thus, in such areas there may be social problems related to historical events and there is a mixing of cultures, folk customs, national languages and local dialects, which can result in both genuine interest and friendship as well as hostility. There is no denying that in Cieszyn Silesia there were also some antagonisms and mutual hostility between Poles and Czechs. These were primarily related to the Polish-Czechoslovak war over Cieszyn Silesia in January 1919, the annexation of Zaolzie by Poland in October 1938, or the dispute over the areas around the cities of Kłodzko and Racibórz in June 1945. Fortunately, all the above examples occurred in the fairly distant past.

A region is understood as a separate, relatively homogeneous area, distinguished from adjacent areas by natural features. A Euroregion is a separate unit including the area of two or more countries, which is a form of cross-border cooperation structure between regions of EU member states and also EU neighbouring countries. A Euroregion is therefore a form of cooperation and connection, the opposite of dispersion and atomisation (O'Dowd, 2003).

The creation of a Euroregion involves the representatives of local and regional self-government units, and sometimes also other social and economic stakeholders of border areas. Euroregions prove to be advantageous as a form of cooperation and activation of peripheral border regions (Greta, 2013).

The specificity of several Eurogions located on the Polish and Czech sides of the border was comprehensively discussed in the monograph "Funkcjonowanie euroregionów na pograniczu południowym Polski" [The Functioning of Euroregions on the Southern Border of Poland] (Santera-Półgrabi, 2015). Additionally, an interesting description of the implementation of territorial marketing tools and strategies in the Czech Republic based on the example of the Kingdom of Wallachia, located next to Cieszyn Silesia, can be found in the following work (Rumpel, Siwek, 2006).

4. Cieszyn Silesia as a Euroregion

There are 16 Euroregions within Poland's borders. These include the following (in order of creation):

1. Neisse-Nisa-Nysa Euroregion (1991, Poland/Germany/Czechia),
2. Carpathian Euroregion (1993, Poland/Slovakia/Ukraine/Hungary/Romania),
3. Spree-Neisse-Bober Euroregion (1993, Poland/Germany),
4. Pro Europa Viadrina Euroregion (1993, Poland/Germany),
5. Tatra Euroregion (1994, Poland/Slovakia),
6. Bug Euroregion (1995, Poland/Ukraine/Belarus),
7. Pomerania Euroregion (1995, Poland/Germany/Sweden),
8. Glacensis Euroregion (1996, Poland/Czechia),
9. Neman Euroregion (1997, Poland/Lithuania/Belarus),
10. Pradziad Euroregion (1997, Poland/Czechia),
11. Baltic Euroregion (1998, Poland/Russia/Lithuania/Sweden/Denmark),
12. Cieszyn Silesia Euroregion (1998, Poland/Czechia),
13. Silesia Euroregion (1998, Poland/Czechia),
14. Beskidy Euroregion (2000, Poland/Czechia/Slovakia),
15. Białowieża Forest Euroregion (2002, Poland/Belarus),
16. Łyna-Ława Euroregion (2003, Poland/Russia).

The socio-political changes in Central Europe after 1989 made it possible to start developing cross-border cooperation between Poland and neighbouring countries. The Czech Republic became one of the most important cooperation partners for Polish local governments. Currently, the Polish-Czech borderland, alongside the Polish-German and Polish-Slovak borderlands, is a model example of innovative cross-border cooperation (Lewkowicz, 2019).

From the perspective of tourism, the most attractive part of the Silesian Foothills is the Cieszyn Silesia Euroregion. It is a region characterized by cultural and regional distinctiveness. Its inhabitants have a strong sense of identity, which is certainly connected with the fact that this land used to be part of the Duchy of Cieszyn, located around the city of Cieszyn and the Olza River. Today, Cieszyn Silesia is divided by the state border into two parts, one belonging to Poland and the other belonging to the Czech Republic (Těšinské Slezsko). The territorial location of Cieszyn Silesia is shown in Figure 1.

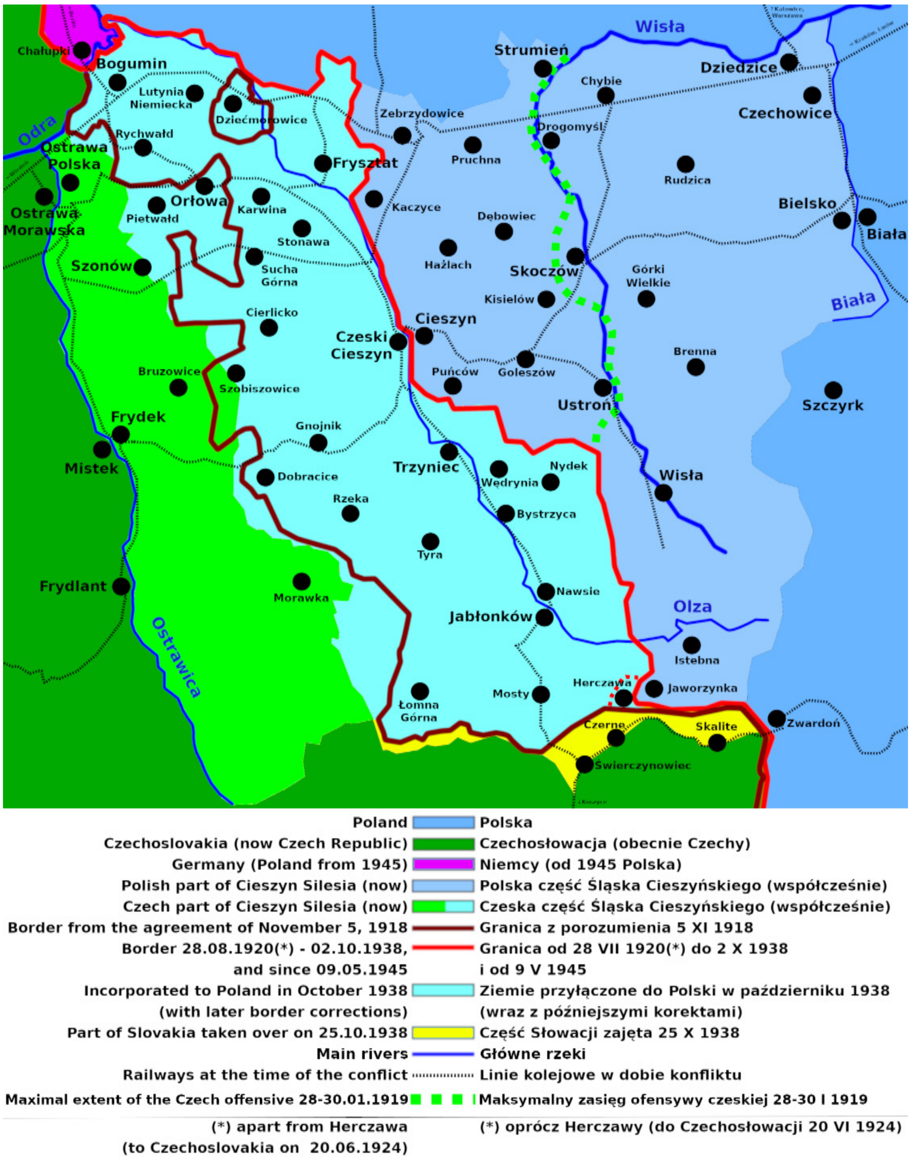

Figure 1. Cieszyn Silesia.

Source: www.euroregion.olza.pl/index2/index.php

Cieszyn Silesia is a historical region in Poland and the Czech Republic in the southeastern part of Silesia, around the city of Cieszyn and the Olza River. It covers an area of approximately 2,280 km². These lands are inhabited by over 800,000 people (approximately 460,000 on the Czech side and 350,000 on the Polish side). The main cities in the Czech part are Ostrava, Karviná, Frydek-Mistek, Havišov, Český Těšín, Jablánkov, Třinec and Bohumín; and in the Polish part Cieszyn, Bielsko-Biała Czechowice-Dziedzice, Skoczów, Ustroń and Wisła.

Regardless of the potential benefits and normative solutions regulating the framework of cross-border cooperation, Euroregions, having decades of experience behind them, have developed a number of principles on which exemplary Euroregional cooperation should be based. The following eight principles are the most important:

1. good neighbourliness of borderland residents,
2. maintaining identity (national, state, regional and local) by cooperating territorial units and local communities,
3. voluntary participation in the Euroregion, which is reflected in the procedures for joining and leaving the Euroregional structures,
4. striving for symmetry and parity, which means that each party has the same number of seats (votes) in the different bodies of the Euroregion and has the same right to represent that Euroregion. This principle also applies to the issue of financing Euroregional structures,
5. pragmatism and cost-benefit analysis,
6. being guided by friendship and trust when engaging in joint ventures,
7. consensus, which consists in a continuous search for a common position through talks, negotiations, agreements,
8. rotation, which means cyclically changing the places where various initiatives are organised and chairing of various cross-border bodies and institutions (Lewkowicz, 2013).

The borders of the Cieszyn Silesia Euroregion are not the same as the historical borders of Cieszyn Silesia. The Euroregion consists of 16 Polish and 43 Czech municipalities. The geographical borders of Cieszyn Silesia go through the cities of Bielsko-Biała, Frydlant nad Ostravicí, Frydek-Mistek and Ostrava. Cieszyn Silesia also includes Beskid spa resorts, such as Wisła, Ustroń, Brenna and Trójwieś. On the Czech side of the Olza River, apart from Český Těšín, there are also Chotěbuz, Jablunkov and Návsí. The Cieszyn Silesia Euroregion includes not only the former Duchy of Cieszyn, but also Jastrzębie-Zdrój and Godów. Cross-border cooperation has connected two different historical regions here.

The city authorities of Cieszyn and Český Těšín, the management of the Euroregion Cieszyn Silesia, the Olza Association for the Development of Regional Cooperation, the "Person on the Border" Association, the Polish Tourist and Sightseeing Society and the Silesia Travel agency have joined forces to make the most of the extraordinary wealth of sacral and secular monuments, the unique natural environment as well as cultural and sporting events organized for tourists. Some tourist products or events are prepared jointly, others are offered independently by individual organizations.

The Cross-Border Tourist Information Centre has been established and run by Cieszyn Castle. It is located right next to the border bridge, and the tourists who visit it receive comprehensive information about Cieszyn Castle, the city of Cieszyn, the Cieszyn Silesia region, the Cieszyn tram route as well as the most important events. Since the Tourist Information Centre is located right next to the border with the Czech Republic, the visitors can also receive some tips on what is worth seeing on the Czech side of the Olza, in Moravia and Bohemia. Tourists can also obtain information about places in Europe that are historically related to Cieszyn Silesia. Organized groups can book a guided tour of the Castle Hill.

In the immediate vicinity of the Cross-Border Tourist Information Centre there is a replica of the Cieszyn tram, which used to run regularly, connecting the two parts of Cieszyn on the opposite banks of the Olza River. The Cross-Border Tourist Information Centre is financed from the budgets of the City of Cieszyn and the City of Český Těšín.

5. The main tourist attractions of the Cieszyn Silesia Euroregion

A comprehensive description of the management of tourism development and the characteristics of the tourist offering of the Cieszyn Silesia Euroregion is not possible within the framework of this article due to publishing limitations. The wealth of material is due to the fact that the first traces of settlement in Cieszyn date back to the 6th century BC, and the number of unique sights and monuments is measured in hundreds (Panic, 2012). Therefore, only some of the tourist attractions of the Cieszyn Land have been selected and described below. These include the following:

1. Thematic walks.
2. The Street of Cieszyn Women.
3. Rides on historic trains:
   - A cross-border trip to Ostrava Zoo.
   - Event trains.
   - Food trains.
   - Mining express trains.
   - Saint Nicholas trains.
   - Christmas trains.
   - Special occasion trains.
4. Hiking and cycling in Cieszyn Silesia.
5. Attractions for skiers.
6. Cultural events.

An example of **thematic walks** is the event “Discover Cieszyn”. These are summer holiday walks organized by guides from Cieszyn Castle, the Czech Tourist Club and the Cross-Border Tourist Information Centre. The trips take place on Saturdays. They are free for Polish and Czech walkers. Generally, the walks are thematically diverse and the participants can choose one according to their preferences. In addition, trips to the Polish and Czech parts of Cieszyn are organized throughout the year by various travel agencies and the Polish Tourist and Sightseeing Society (PTTK). The programme of last year’s summer holiday walks is presented in Table 1.

Table 1.
Thematic walks programme in 2024

Date	Theme of the walk	Organizer
July 6, 2024	A walk with PTTK	PTTK
July 13, 2024	Kolem Olzy tam a zpět	Czech Tourists Club
July 20, 2024	Building bridges – a walk along the Olza river	Cross-border Tourist Information Centre
July 27, 2024	Exkurze hasičské stanice s ukázkou techniky	IZS, Hasičská stanice
August 3, 2024	Meeting with the Cat Gang	Orangery of Cieszyn Castle
August 10, 2024	Exkurze čistírny odpadních vod	Čistírna vod Chotěbuz
August 17, 2024	A few words about Cieszyn crafts	Cieszyn Castle,
August 24, 2024	Na procházku s Prochaskou	Muzeum Těšínska
August 31, 2024	From field to settlement	Volunteer Fire Department Bobrek

Source: Own study based on www.cieszyn.pl/aktualnosci/7807/lato-2024-w-cieszynie

Cieszyn Women's Street is an unusual street on Castle Hill in Cieszyn, dedicated to exceptional women. It was created to mark the role and place of women who created the ordinary and extraordinary life of Cieszyn. It is one of very few, and perhaps even the only such street in Poland. In this street there are latern-shaped park lamps with the names of 18 outstanding women. They were installed in such a way that the entire attention of the tourist is focused on the names of these women. When it is dark, they shine and also show the way, both literally and figuratively.

The street honours women who have made outstanding contributions to Cieszyn Silesia. The idea was implemented in 2010 thanks to the Creative Women’s Club Association with the support of Cieszyn Castle. It is a unique project of this kind in Poland. In 2015, the second part was completed, and in 2018 two new lamps dedicated to members of the National Council of the Duchy of Cieszyn – the first local government in Poland – were added. In 2019, the street gained two new patrons, in whose honour magnolias were planted. These patrons were Olga Havlová (wife of the President of the Czech Republic Václav Havel, a legend of the Czechoslovak democratic opposition and founder of the Committee of Good Will), and the second patron was Danuta Wałęsa.

Rides on historic trains are organized by the Slezský železniční spolek (Silesian Railway Association). The Association was founded in 2016, and its goal is to popularize rail transport among the public. It organizes trips on excursion and sightseeing trains to places that are often inaccessible on a daily basis, thus showing interesting places not only in the Cieszyn Silesia region. As emphasized by the chairman Ladislav Antalec of the Silesian Railway Association, who was interviewed directly, the Cieszyn Silesia region has a wide range of interesting cultural and industrial monuments and sights, and the aim of the association is to connect these places using rail transport. The main motto of the association is to bring together people and ideas using trains. Plans for the future also include the renovation and operation of historical buildings, historical vehicles and cultural monuments in the North Moravia region. In addition to developing the potential of railways as such, the association also educates young people, teaching them how to travel efficiently. The conversation with the chairman made it patently clear that excursion and sightseeing trains are not just a business, but "trains created with passion", as evidenced by the abundant and original offering.

The cross-border trip to Ostrava Zoo has been organized since 2022 at weekends during summer holidays. The train departs from the Polish part of Cieszyn, stops in Český Těšín, and then travels along non-public coal sidings to the Josefova jáma-Ostrava stop, right next to the gates of Ostrava Zoo. On the way back, it takes a different route: Ostrava Střed, Havířov, Český Těšín. During the journey, tourists can enjoy expert commentary from a guide. Trips to Ostrava Zoo are very popular due to the significant investments that have been made there in recent years. In the 2024 season, around 7,000 people went on the cross-border trip to the Zoo, of whom around 6,500 were from Poland.

Event trains are also very popular with tourists. Various occasions and events are used to organize a ride on a special train. One example are trips to the annual grape harvest in Valtice (South Moravia). The trips are organized by the Silesian Railway Association, Chateau Kończyce Wielkie, the Cieszyn Wine Trail, the Cieszyn Silesia Euroregion and the City of Cieszyn. Trips to Valtice are organized mainly for Poles. The train is ten carriages long and an average of 800 people use it every year. Participants can buy a ticket for the train and enjoy the free part of the programme in Valtice, or they can buy the train ride and a ticket for the grape harvest. Both Polish złoty and Czech crowns are accepted on the train, and passengers can take advantage of some refreshments during the journey. The Burčák express train to Mutěnice has a similar purpose, but enjoys less popularity. In Mutěnice, annual celebrations of young partially fermented wine (Burčák) are held. In addition to organizing trips, the association fulfils the mission of reviving the tradition of wine-growing in Cieszyn Silesia, which is surprisingly rich here. For this purpose, wine tourism is being developed and cooperation is being established with winemakers from both Southern Moravia and neighbouring Austria.

The offer also includes **food trains**, such as the “Schnitzel” express train to Malá Morávka, where a traditional “schnitzel festival” takes place, involving most of the local restaurants. One can eat veal, turkey, deer steaks, fried frog legs, kangaroo, ostrich or shark steaks, as well as various other specialities. Those who want to do something more beneficial for their health can take a walk in the beautiful countryside with the cleanest air in the Czech Republic, visit a mountain spa in Karlovy Studánka or take a hiking trip along the white Opava trail.

Another food train is the “Blueberry Express”, which also goes to Malá Morávka during the ripening season of forest blueberries. The local restaurants prepare not only many blueberry dishes for tourists, but also a range of other delicacies, such as flambéed (i.e. doused with high-proof alcohol and set on fire) shark fin, kangaroo steak or wild boar on blueberries. There is also traditional blueberry beer, various liqueurs and lemonades, and blueberry cakes. However, the most popular product is blueberry dumplings, tonnes of which are sold every year.

Mining express trains travel along the routes in the Ostrava-Karviná coal mining region. In cooperation with PKP Cargo International, guided tours on these extraordinary passenger trains are organised every year. The trains run on Saturdays and Sundays along non-public coal sidings in the Ostrava-Karviná coal district. The route leads to places that passenger trains usually do not reach and which the residents are strictly prohibited from entering on a daily basis.

St. Nicholas Trains are an offering that is aimed at families with children. Among the passengers there are also children from orphanages and seniors, for whom a certain number of places are always reserved. St. Nicholas visits all the train carriages and his team rewards the young passengers with small prizes for reciting a poem or singing a song. St. Nicholas Trains run on the last weekend of November and travel along a circular route of the railway stations in Ostrava.

Christmas trains are trains consisting of carriages and locomotives decorated with festive lights that run through Silesian cities such as Ostrava, Karviná, Frydek-Místek and Český Těšín. Light refreshments are served on the train, and the communal singing of Christmas carols accompanied by accordionists creates a wonderful Christmas atmosphere on board this extraordinary means of transport.

Special occasion trains are offered at the request of customers. For example, one can order a “birthday train”. A special train full of amazing experiences is then prepared for the birthday girl or the birthday boy. On the association’s website the customers can find the following information: “We operate in the field of excursion and nostalgic rail transport and have extensive experience in organizing adventure trains. Upon request, we are able to send a special train practically anywhere where there are railway tracks. We always fulfil the customer’s wishes and tailor the events strictly to their requirements”. Rides on special, historic trains are popular with both Czechs and Poles, and Polish is very often heard on these as well as in the top tourist attraction, which is Ostrava Zoo.

Hiking and cycling in Cieszyn Silesia combines history, tradition and modernity. Every hiker will find an activity for themselves here, from gentle walks in the Silesian Foothills, through gentle Beskid walks to mountain glades, to truly steep routes in the highest parts of the Silesian Beskids. The lovers of hiking and cycling trips will find a range of well-prepared and interesting trails and paths leading to picturesque areas, historic churches, former nobility residences, palaces and castles.

Cieszyn Silesia is a region that for years has been recommended as one of the best cycling destinations in Poland. The trails run from popular tourist resorts and lesser-known corners. Road signs will lead the cyclist to gentle ridges, quiet forest gravel roads, and typical mountain sections. Road cycling enthusiasts know the wonderful routes to Trójwieś Beskidzka and to mountain passes (Kubalonka, Biały Krzyż). One can ride on one's own or take part in numerous competitions. Tourism related to downhill cycling, enduro and cross-country has also developed. The ski lifts in Wisła and Ustroń have organized so-called bike parks with excellent routes of varying degrees of difficulty. Fans of extreme mountain biking love downhill (DH), which involves an individual bike ride down steep, natural slopes against the clock. Downhill paths are often very narrow, rocky and intersected with protruding roots. They also have a number of drops of various heights, which are the most spectacular but also the most hazardous features, often causing dangerous accidents and injuries.

In the Polish-Czech borderland there is a special framework for cycling tourism, the so-called Euroregional cycling loop, which has 9 designated cycling routes, each with several sub-routes. Cross-border cycling routes, which partly go through the neighbouring Upper Oder Land and the Czech side of the Silesian Beskids turned out to be not only a hit among cyclists but also an investment and commercial success.

Attractions for skiers are another element of the tourist offering of the Cieszyn Silesia Euroregion. With the beautiful Beskids, this part of Cieszyn Silesia is a favourite holiday destination for winter sports enthusiasts. Skiers and snowboarders find their "promised land" here. For the fans of ski jumping, the World Cup competition held annually in Wisła is a must-see event.

The next important point on the winter sports map of the region is the Kubalonka Pass located between Wisła and Istebna. It is a cross-country skiing centre and generally a thriving sports centre, which has some of the most modern cross-country trails in the whole of Europe. The Silesian Beskids are a favourite place for weekends around nature not only for the residents of the Katowice agglomeration. Its natural charm is often enjoyed by the residents of Zaolzie and some more distant towns in Czechia.

The Cieszyn Silesia Euroregion has cross-border potential, which contributes to strengthening the region's assets and expands and strengthens its offering. On both sides of the border, tourists can enjoy diverse, interesting and valuable attractions of the Polish and Czech parts of Cieszyn Silesia. In Cieszyn Silesia, a number of **cultural events** are organized during the summer, which certainly make the stay more attractive for tourists. The most famous and popular events include “The Three Brothers’ Festival”, “Cinema on the Border”, the theatre festival “Without Borders”, the opera festival “Viva il Canto”, “Cieszyn Jazz Autumn” and “A Decade of Organ, Choral and Chamber Music”, which are organized on both sides of the border, in Cieszyn and Český Těšín.

In turn, the most popular cultural events in the Beskid part of Cieszyn Silesia include “The Traditional Sheep Run” (Koniaków), “A Run for New Life” (Wisła), “Midsummer’s Night” (Brenna), “The Lamb Festival” (Ustroń), “The Days of Koniaków Lace” (Koniaków), “The Romantic Pair Run” (Ustroń) and many, many others. Undoubtedly, the largest folklore event is the August Beskid Culture Week, which every year attracts the best folk bands from all over the world.

The Traditional Sheep Run (in Polish *Tradycyjne Miyszani Owiec*) is when small herds of animals belonging to different farmers are combined into one huge herd, then grazed together until St. Michael’s Day (September 29). The celebration involves collecting the sheep from the farmers and escorting them with music to a special enclosure. It is the most important festival in the shepherding calendar. In Koniaków, after a long winter, on the first weekend in May, several dozen farmers combine their sheep into one large herd so that they can start the traditional grazing. The farmers wear their festive costumes, the trumbita sounds, shepherds’ bells can be heard in the distance, and the shepherds light special fires in their huts.

Among other cultural events, the so-called “Cinema on the Border” is an event worth mentioning. It is the largest festival of films from Poland, the Czech Republic and Slovakia, and the only film event that for over two decades has been held in one city, Cieszyn, but on both sides of the border – Polish and Czech. Divided by the Olza River, the city is connected by the Friendship Bridge, which symbolizes the idea of the festival. From the very beginning, i.e. since 1999, the aim of the “Cinema on the Border” has been to mutually promote Central European cinema on both sides of the border. Film screenings are accompanied by concerts, exhibitions, discussions and meetings with artists, as well as workshops. The rich and original programme of “Cinema on the Border” and the unique atmosphere of the festival have won the hearts of thousands of fans and have been appreciated by the film community with numerous awards.

The “Cinema on the Border/Cinema on Hranici” Film Festival project was born in the Polish-Czech-Slovak Solidarity community from a heartfelt need to learn about the culture of our neighbours. In the 25 years, the number of films shown has been growing steadily, reaching a round hundred in the twelfth edition in 2010.

Figure 2. Film screening on the banks of the Olza River.

Source: https://borderfestival.eu/pl

Currently, the festival has the following structure: 6 days of showing films, with at least 4 screening locations in the double city; always over 100 films in total; 5 concerts; and a number of accompanying events. The idea of this film festival is invariably the consistent promotion of the close neighbours' culture.

6. Conclusions

The Cieszyn Silesia Euroregion was established on 22 April 1998 to support cross-border cooperation on the Olza River. The Polish and Czech sides jointly collect, process and share with each other economic, tourist, cultural and sports information. The information is collected by the municipalities, and their activities are coordinated by two Border Information Agencies. The information is made available in about 300 information points and on the Internet. The Euroregion's strategic goals are as follows:

- broadly understood development of the region,
- exchange of experiences and information,
- supporting the culture, education and sports in the region,
- joint development of transport, communication and connectivity in the region, including improving the safety of the residents,
- development of tourism, including improving the flow of tourists across the border,
- cooperation between schools, including joint ecological care (Kaszper, Małysz, 2009).

Over the 25 years of its existence, the Euroregion has proved that genuine, and not just superficial, cross-border cooperation between local governments on the Polish and Czech sides of the border, based, among other things, on the professional management of tourism development, is possible.

References

1. Avraham, E., Ketter, E. (2008). *Media Strategies for Marketing Places in Crisis: Improving the Image of Cities, Countries, and Tourist Destinations*. Amsterdam: Butterworth Heinemann, p. 63.
2. Bednarczyk, M. (ed.) (2011). *Zarządzanie konkurencyjnością biznesu turystycznego w regionach.* Warszawa: CEDEWU, p. 126.
3. Gaworecki, W. (2002). Kierunki i możliwości wykorzystania turystyki w regionach przygranicznych. In: J. Merski (ed.), *Turystyka w regionach przygranicznych czynnikiem integracji europejskiej.* Białowieża: Druk-Tur, p. 121.
4. Gregor, B., Gotwald, B. (2011). Potencjał e-marketingu w kreowaniu wizerunku regionu. In: W. Deluga, J. Dyczkowska (ed.), *Marketing terytorialny: konkurencyjność regionów, przedsiębiorstw a ochrona środowiska* (p. 59). Koszalin: Wydawnictwo Politechniki Koszalińskiej.
5. Greta, M. (2013). *Euroregiony polskie w procesie integracji europejskiej oraz przezwyciężaniu peryferyjności i dysproporcji regionalnych.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego, p. 10.
6. Hojny, P. (2006). *Pogranicze polsko-czesko-niemieckie z perspektywy organizacji pozarządowych.* Wrocław: Atut, p. 11.
7. https://borderfestival.eu/pl, 15.11.2024.
8. https://euregio-teschinensis.eu/pl/ts_pl/, 17.11.2024.
9. https://olza.pl/pl/turystyka/produkty-i-atrakcje/inne, 15.11.2024.
10. https://slezskyzeleznicnispolek.cz/, 15.11.2024.
11. Interview with the Chairman of the Silesian Railway Association in Cieszyn, Mr. Ladislav Antalec.
12. Kaszper, R., Małysz, B. (2009). *Poláci na Těšínsku. Studijní material*. Vydal Kongres Poláků v České republice. Český Těšín, p. 98.
13. Kruczek, Z., Walas, B. (2012). Miasto jako podmiot promocji. Ocena działań promocyjnych Krakowa jako destynacji turystycznej. *Studia Ekonomiczne, no. 119*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, p. 125.

14. Kuśmierski, S., Dudkiewicz, D. (2002). Marketing jako czynnik intensyfikujący turystykę w regionach przygranicznych. In: J. Merski (ed.), *Turystyka w regionach przygranicznych czynnikiem integracji europejskiej* (p. 184). Białowieża: Druk-Tur.
15. Lewkowicz, Ł. (2013). *Euroregiony na pograniczu polsko-słowackim. Geneza i funkcjonowanie.* Lublin: Wydawnictwo UMCS, p. 38.
16. Lewkowicz, Ł. (2019). Uwarunkowania i formy instytucjonalnej polsko-czeskiej współpracy transgranicznej. *Przegląd Geograficzny, vol. 91, iss. 4*, p. 511.
17. Merski, J. (ed.) (2002). *Turystyka w regionach przygranicznych czynnikiem integracji europejskiej.* Białowieża: Druk-Tur, p. 25.
18. Nemčok, O, (2002). Polityka regionalna i jej wpływ na poziom i perspektyy rozwoju współpracy transgranicznej. In: J. Merski (ed.), *Turystyka w regionach przygranicznych czynnikiem integracji europejskiej* (p. 153). Białowieża: Druk-Tur.
19. O'Dowd, L. (2003). The changing significance of European Borders. In: J. Anderson, L. O'Dowd, T. Wilson (eds.), *New borders for a changing Europe. Cross-border cooperation and governance* (p. 22). London.
20. Panic, I. (2012). *Dzieje Śląska Cieszyńskiego od zarania do czasów współczesnych, vol. IV.* Starostwo Powiatowe w Cieszynie, pp. 1-463.
21. Promotional materials obtained from the Cross-Border Tourist Information Center in Cieszyn, operated by Cieszyn Castle.
22. Raftowicz-Filipkiewicz, M. (2013). Marketing terytorialny jako narzędzie budowania przewagi konkurencyjnej gmin Doliny Baryczy. *Nauki o Zarządzaniu [Management Sciences], no. 1(14).* Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, p. 58.
23. Rapacz, A. (ed.) (2020). *Społeczno-ekonomiczne i przestrzenne aspekty rozwoju turystyki w regionie.* Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, pp. 9-11.
24. Reformat, B., Pabian, B. (ed.) (2020). *Zarządzanie w turystyce zrównoważonej. Zarys problematyki.* Wydawnictwo Uniwersytetu ekonomicznego w Katowicach, pp. 1-163.
25. Rumpel, P., Siwek, T. (2006). Marketing terytorialny a kreowanie regionów - przykład czeski. *Przegląd Geograficzny, t. 78, z. 2*, pp. 197-205.
26. Russell, S.J., Norvig, P. (2021). *Artificial Intelligence. A Modern Approach*. London: Pearson Education, p. 19.
27. Sanetra-Półgrabi, S. (2015). *Funkcjonowanie euroregionów na pograniczu południowym Polski.* Toruń: Adam Marszałek, pp. 92-177.
28. Staniewska-Ziętek, W., Wołoszyn, A. (2013). *Uwarunkowania rozwoju turystyki i rekreacji w regionie transgranicznym.* Wydawnictwo Naukowe PWSZ im. Jakuba z Paradyża w Gorzowie Wielkopolskim, p. 263.
29. Szpringer, W. (2024). *Sztuczna inteligencja w zarządzaniu. Regulacja a konkurencja.* Warszawa: Poltex, p. 223.
30. Wiatrak, A. (2017). *Marketing terytorialny w komunikowaniu i partnerstwie regionalnym i lokalnym. Handel Wewnętrzny, nr 4, t. 1,* p. 247.

31. www.academia.edu/42309768/Euroregiony_na_pograniczu_polsko_slowackim Geneza_i_funkcjonowanie_Lublin_2013, 14.11.2024.
32. www.cieszyn.pl/aktualnosci/7807/lato-2024-w-cieszynie, 14.11.2024.
33. www.euroregion.olza.pl/index2/index.php, 14.11.2024.

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WORKAHOLISM – CONDITIONS, CONSEQUENCES, COUNTERACTION IN THE CONTEXT OF ORGANIZATIONAL MANAGEMENT

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Purpose: The purpose of this article is to present the phenomenon of workaholism as one of the many risks associated with organizational management policies. The paper assesses the consequences of the phenomenon in organizational, family, health and interpersonal aspects.
Design/methodology/approach: The article is a theoretical analysis of the phenomenon of workaholism in the context of organizational management. Workaholism is analyzed both through the prism of the causes and mechanism of formation, as well as the possible health, social and family consequences. The study uses secondary data taken from public statistics, thematic reports and scientific research. Available domestic data were used to illustrate the phenomenon, and foreign data were also referenced for comparative purposes.
Findings: the phenomenon of workaholism, posing a major threat to the effectiveness and efficiency of the activities undertaken, should be one of the main determinants of the organization's management policy.
Practical implications: the negative consequences of workaholism and the danger associated with social approval of increasing working hours, implies the need for research into the scale of the phenomenon and the identification and implementation of countermeasures in organizations. Difficulties in defining the phenomenon and contentious issues regarding the classification of workaholism should not be a reason for limiting research in this area.
Social implications: To draw attention to the problem of workaholism in organizations, especially corporations, and to point out the need to take specific measures to prevent it.
Originality/value: The article evaluates workaholism in the context of its consequences for the individual and the oraganization, and identifies examples of preventive measures. The article is aimed at employees of the organization to raise awareness of the risk of work addiction and managers to improve the work environment to protect the organization from the consequences, including the costs of workaholism.
Keywords: workaholism, psychosocial risk, organizational management.
Category of the paper: point of view, concept article.

1. Introduction

Work in many cultures is equated with prestige and social success, and industriousness in a common assessment is a trait viewed positively. It is treated as a sign of social maturity. To quote Golińska (2008), "a mature person is one who undertakes labor activity and, as a result, confirms and develops his resources, skills, abilities". So it should come as no surprise that the time devoted to work is lengthening, and other forms of activity are being neglected.

With people under increasing pressure and the boundaries between family and work life blurring, excessive work is becoming commonplace. This phenomenon, in the context of the scale of the problem, as well as the negative consequences in various areas of life, is gaining more and more scientific attention.

A workaholic devotes a significant part of his time to work, giving it special importance in the hierarchy of life goals and values. This is due, among other things, to the fact that this phenomenon is socially accepted and desirable (Ogińska-Bulik, 2010). A workaholic, therefore, can be evaluated as an employee who represents a valuable potential of the organization that employs him.

Observations of the problem in question in relation to the American experience, however, lead to the conclusion that the presence of a workaholic in a team contributes to unfavorable changes in the work environment and negatively affects performance (Mieścicka, 2002). The reason may be the workaholics' high expectations of themselves and their co-workers, as well as functioning in the face of demands for perfection and in constant fear of criticism.

Methods

The subject of the article is the phenomenon of workaholism in the context of organizational management. Workaholism is analyzed through the prism of both its causes and the mechanism of its emergence, stages of development, and anticipated health, social and economic consequences. The article presents statistics relating to the phenomenon in question.

The individual, social and economic effects of workaholism are described. The article uses secondary data from public statistics, thematic reports and scientific studies. Available domestic data were used to illustrate the phenomenon, and foreign data were also referred to for comparative purposes.

2. The essence of workaholism – an overview of definitions

Workaholism is a multidimensional concept, and there is no unanimity among researchers on how to unify and measure the phenomenon in question. This results in the lack of a uniform and widely accepted definition of workaholism. Reviewing the literature, three approaches to workaholism can be distinguished (Golińska, 2010). The first group refers to viewing workaholism in the category of addiction, which is identical in symptoms and consequences to physiological addiction. W.E. Oates, a psychiatrist and pastor, introduced this concept in his article "On Being a Workaholic" of the year and in his book "Confessions of a Workaholic". He defined workaholism as some kind of compulsion or uncontrollable need to work constantly (Oates, 1971, after Antroszko, 2010; Paluchowski, Hornowska, 2021). This definition is identical to that of Schaufeli and his colleagues (Schaufeli, Shimazu, Taris, 2009), who defined workaholism as a tendency to work excessively hard (behavioral component) and an obsession with work (cognitive component) that manifests itself in compulsive work. In a later discussion of the term, Spence and Robbins (1992) emphasized the addictive nature of workaholism. They noted that workaholics feel a compulsion to work, and failure to satisfy this need results in the appearance of guilt and depression. Spence and Robbins (1992) recognized that workaholism is a multifaceted phenomenon. They identified three dimensions of the so-called "triad of workaholism" - work involvement (work involvement), work compulsion (drive to work) and work enjoyment (work satisfaction). Work compulsion represents the internal pressure that forces an employee to work, while work enjoyment is the pleasure derived from the work activity itself. The commitment dimension refers to employees' involvement in work and the time invested in it (Spence, Robbins, 1992).

A different conception of understanding workaholism is promoted by Mudrack and Nughton (2001). In their view, workaholism is a learned and established behavioral tendency. Based on their research, they observed that workaholics tend to devote a significant amount of time and energy to work activities that are not required of them. These activities primarily referred to thinking about work, even when workaholics remained in another role. They also noted a strong need to control other employees and exert influence, which resulted in the emergence of conflicts.

In turn, still other researchers emphasize the importance of personality traits that accompany workaholism (Wojdyło, 2007; Clark et al., 2016). The results of research on personality determinants form a consistent picture of a workaholic. This is a person with low self-esteem who seeks to confirm his or her own worth through achievements and successes. She tries at all costs to avoid situations in which she might reveal a lack of competence or any weakness. The workaholic derives his motivation from anxiety, which results in obsessive and compulsive behavior aimed at lowering the tension associated with possible failure (Atroszko, 2010).

In conclusion, it should be noted that the vast majority of definitions of workaholism emphasize its negative impact on the functioning of the individual. However, there are also definitions whose authors draw attention to the positive aspects of this phenomenon. Thus, in the literature one can find both definitions, which show the dysfunctional side of workaholism, and those which see workaholism in terms of the norm. Definitions that emphasize the positive links between workaholism and the functioning of the subject, however, are few.

2.1. Workaholism – the scale of the phenomenon

The "Addiction in Poland" Report (2023) shows that in 2019 nearly one-tenth of Poles over the age of 15 (9.1%) had an addiction problem. Both addiction and the risk of addiction primarily affect young adults under the age of 35, particularly those aged 25-34, with similar rates for women and men. Various aspects of work activity are an important risk factor. Workaholism risk is fostered in particular by running a business, while a risk factor in the context of work addiction is holding leadership positions, being responsible for the work of others, or managing projects.

Although, in light of research on work addiction, the amount of time spent at work is not a necessary criterion for diagnosing workaholism (Poelmans, Buelens, 2004; Burke, Matthiesen, 2004), there is, however, a tendency among work addicts to devote more hours to work activities (Burke, 1999). Taris, Geurts, Schaufeli, Blonk and Lagerveld (2008), in their work, emphasize the temporal aspect of workaholism, defining work addiction as a phenomenon consisting of two components: the temporary commitment to work and the inability to stop it, i.e. the compulsion to perform the activity.

The latest research release, "Poles' gainful employment and satisfaction with it" (2023), shows that slightly more than half of gainfully employed Poles (51%) declare that their professional work takes them 40 hours a week, i.e. according to the current basic working hours. Working less is declared by 14% of respondents, and 28% indicate that they are gainfully employed more than 40 hours a week. The arithmetic average of the declared time devoted to gainful employment is 42 hours of work per week, which, given previous measurements, indicates a continuation of the downward trend. Employment conditions are clearly changing over the years, with the percentage of people working more than 40 hours a week steadily declining.

This is confirmed by the data in Table 1. Analyzing them, it can be seen that the percentage of employed people who typically work 49 or more hours per week is decreasing over the period under review. Despite this, as many as 7.5% of those employed in 2023 worked more than the accepted norms (Table 1). The reason for this may be that an increase in working hours can affect career opportunities, which, however, requires keeping up with the competition, either through a faster pace of work or greater availability (Golińska, 2014).

Table 1.
Long working hours at the main job (%)

Countries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Belgium	10,1	10	9,8	10,1	9,3	9,5	9,5	9,3	9,3	8,6
Bulgaria	2,3	1,9	1,9	1,4	1,3	1,1	1	1,2	0,7	0,4
Czech Republic	12,1	12,2	11,8	11,5	11,4	11	9,4	6,3	8,1	7,4
Dishes	5,2	5,4	5,1	5,1	4,7	4,1	4,2	6	5,6	5,1
Germany	8,9	8,6	8,2	7,7	7,2	6,9	6	6,4	6	5,3
Estonia	4,2	4	3,7	3,6	3,6	3,6	2,9	2,9	2,2	1,9
Ireland	7,3	8,2	8,2	9,3	9,8	10	9,4	8,6	9,2	7,8
Greece	18,5	18,6	19,4	18,2	17,2	16,6	16,1	14,3	12,6	11,6
Spain	10,5	9,8	9,1	8,4	8	7,2	6,4	7	7,3	6,7
France	12,2	12	12,3	11,9	11,9	12	11,7	10	10,2	9,9
Croatia	4,7	6	5,8	5,5	6,2	6,3	5,8	4,6	4,5	3,7
Italy	10,3	10,5	10,3	10,6	10,6	10,1	8,9	9,7	9,4	9,6
Cyprus	12,1	12,6	12,5	11,7	10,7	9,9	9,1	9,4	9,7	9,9
Latvia	3,2	3,4	3,3	2,5	2,3	2,1	2,2	1,6	1,3	1,1
Lithuania	0,6	0,9	0,8	0,9	0,7	0,7	0,9	0,8	0,8	1,1
Luxembourg	6,2	5,4	5,4	5,3	4,1	4,2	3,9	7,6	6,6	6
Hungary	4,6	4,7	3,7	3,8	3,2	2,9	1,9	3	2,6	2,2
Malta	7,3	7,8	7,1	7,2	8,3	9,9	8,8	5,5	4,5	4,6
Netherlands	4,9	4,8	4,8	4,6	4,6	4,5	3,8	5,9	5,8	5,5
Austria	12,1	11,7	11,4	11,3	11	10,4	9,7	8,4	8,1	7,9
Poland	14	13,2	12,7	11,8	11	10,5	9,1	7,8	7,8	7,5
Portugal	12,9	11,4	10,8	11	10,4	10,4	8,7	9,7	9,2	9
Romania	3,2	2,7	2,6	2,3	2	2,2	2,1	2,6	2,2	1,8
Slovenia	9,2	8,6	7,4	7,3	7,2	7,1	6,6	6,3	5,7	5,5
Slovakia	11	10,5	9,9	9	9	9,4	8	5,6	6,1	6,1
Finland	7,8	7,8	7,8	7,4	7,5	7,5	7	6,4	6	5,6
Sweden	4,6	4,6	4,4	4,2	4,1	4,1	3,6	7,6	7,5	7,3

Source: Długie godziny pracy w głównej pracy. (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfsa_qoe_3a2/default/table?lang=en

Data included in the "How's life" report (OECD, 2020) indicate that Poles' long working hours do not translate into high levels of life satisfaction. In this aspect, we are below average, behind the French and the British. Moreover, long working hours are not conducive to work-life balance. The average rest time in OECD countries is 15 hours a day, in Poland only 14.4 hours.

Eurostat data shows that for years Poland has been in the lead among EU countries with the highest percentage of workers taking up additional employment, behind Germany, France. However, analyzing the data from 2014 to 2023, one can see a downward trend (Table 2). The reason for this situation may be the inability to secure the desired level of income from a single source.

Table 2.
Employees with a second job (thousands)

Countries	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Belgium	193	184,4	201,2	177,9	179,1	206,7	204,7	215,8	257,3	256,3
Bulgaria	16,8	13,3	14,5	13,2	11,4	12,4	11,7	10,6	11,3	12,6
Czech Republic	106,7	113,4	117,5	133,9	133,5	133,7	127,5	133,8	142,4	136,1
Dishes	199,3	189,3	248,3	229,9	199,7	225,1	209,4	219,8	228,9	228,7
Germany	1956,4	1996,7	2180,4	2203,4	2173,3	2262,7	1927,1	1784,2	1889,8	1903,2
Estonia	28,2	28,8	31,9	32,9	37,7	39	34,9	39,1	45,1	45
Ireland	47,2	46,4	46	55,7	59,9	66,6	60,1	76,5	86,7	93,3
Greece	58,6	58,1	65,4	76,2	79,3	78,6	71,2	66,4	63,2	55,7
Spain	380,6	401,2	422,4	444,2	437	463,1	417,6	498,1	525,9	562,8
France	1393	1341,4	1309,9	1312,5	1410,1	1385,3	1345,3	1202,1	1206	1234,8
Croatia	37,4	38,2	17	15,9	19,9	15,9	15,7	32,7	24,6	30,3
Italy	288,2	298,7	322,5	334,2	317,5	332,3	312,8	338	279,3	279,2
Cyprus	13	10,1	12,8	12,5	10	10,3	9	11,2	10,6	9,8
Latvia	39,2	47,4	49,2	36,5	37,3	40	33,6	33	34,9	42,5
Lithuania	83,8	67,4	66,7	64,4	63,7	64,6	62,8	67,6	78,1	82
Luxembourg	7,6	9,9	9,8	9,8	10,1	9,6	7,9	14,2	11,3	14,1
Hungary	68,3	46,1	54,5	65,9	62,4	62,5	53,3	55,7	59,6	59,7
Malta	9	8,7	7,4	6,8	8	8,4	9,6	11,9	12,5	13,7
Netherlands	670,1	705,5	686,9	685	704,6	704,6	699,4	884,9	943,3	972,6
Austria	182,4	183,1	198,4	199,6	183,8	186,9	184,5	222,5	231,6	246
Poland	999,1	907,9	888,5	883,5	865	846,2	784,4	787,1	708,4	705,5
Portugal	195,6	189,6	191,6	192	199,3	220,1	179,1	215	230,8	246,1
Romania	165	135,2	130,2	128,3	129,9	147,8	128,8	50,3	43,8	42,9
Slovenia	36,6	31,3	24	34	34	21,8	20,5	35,2	44,1	41
Slovakia	24,2	21,9	29,9	32	31,5	29,2	22,7	25,6	36,2	32,7
Finland	125,8	140,1	143,6	147,3	156,1	164,7	155,6	183,3	190,5	194,2
Sweden	419,5	415	413,3	418,6	420,7	441,9	384,7	261,9	299,6	318,6

Source: Procent osób pracujących mających drugą pracę (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfst_hh2jty/default/table?lang=en.

The more optimistic data are for weekend work. Analyzing the data in Table 3, there is a downward trend for Poland. Employees are paying more and more attention to work-life balance. Employers, in turn, are increasingly trying to create appropriate environments in which employees experience this balance. This is related to the increase in competition between companies, which translates into the need to be innovative. In the face of these challenges, the role of employees is becoming increasingly important. Employees must maintain high performance and contribute to the success of the company (Wolor et al., 2020). To ensure the productivity of employees, companies, in turn, must consistently consider their needs (Larasati, Hasanati, 2019).

Table 3.
Weekend work (%)

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Belgium	22,6	22,5	22,6	22,3	22,3	23	20,3	21,6	bd	21,4
Bulgaria	19,6	20	18,4	20,1	17,9	19	17,8	13,8	bd	9,9
Czech Republic	19,3	19,7	18,7	17,8	16,9	16,5	14	13,4	bd	14,4
Dishes	21,5	20,3	22,4	18,3	16,8	16,6	17,5	17	bd	15,1
Germany	26,6	26,6	26,2	26,2	25,6	25,1	20,1	19,6	bd	18,6
Estonia	22,9	21,6	23,6	22,8	21,9	20,5	19	13,4	bd	11,9
Ireland	32,9	32,3	32,4	33,2	34	32,8	27,4	29,1	bd	28,5
Greece	43,3	44	43,9	43,2	42,5	41,4	40,2	40,3	bd	41,3
Spain	31,5	31,9	31,4	31,5	30,8	31	26,7	29	bd	28,8
France	30,8	30,9	30,7	30,7	30,5	30,9	27,3	29,2	bd	29,3
Croatia	16,6	19,1	17,5	14,9	14	15,2	14	15,8	bd	16,6
Italy	35,5	35,6	35,9	36,5	36	36,1	31,4	34,5	bd	35,2
Cyprus	33,3	33,2	31,2	32,4	31,3	32,5	28,9	26,3	bd	26,7
Latvia	20,4	22,5	23,2	19,5	19,2	19,7	16,4	16,1	bd	16,6
Lithuania	20	18,7	20,2	18,3	17	16,8	15,7	6,9	bd	3,9
Luxembourg	17	18,2	17,4	16,4	17,2	16,5	15,2	12,9	bd	14,3
Hungary	10,3	9,8	10,3	9,3	8,8	8,7	7,5	7,6	bd	7
Malta	29,4	29,3	27,5	26	27	31,6	31	27,7	bd	28,5
Netherlands	31,1	31,4	31,9	32	31,7	31	29,8	18,2	bd	17
Austria	30,5	29,8	29,8	29,2	28,7	28,1	25,1	24,7	bd	24,3
Poland	15,9	15,1	14,2	13,5	12,4	11,7	10,2	9,5	bd	8,5
Portugal	10,5	10	10,4	10,9	10,6	10,7	10,4	20,8	bd	23,8
Romania	33,4	29,2	28,6	28,3	26,9	25,7	22,2	18,3	bd	18,1
Slovenia	23,7	22,1	20,1	20,2	19,4	18,8	17,6	13,6	bd	14,8
Slovakia	24,3	24,5	23,9	22,2	20,9	20,6	16,3	14,1	bd	15,9
Finland	24,9	24,9	25,9	25,3	25,7	24,9	23,8	18,6	bd	17,4
Sweden	17,1	17	16,6	16,1	15,8	16,6	15,7	18,9	bd	20,1

Source: Praca w weekendy (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfsa_qoe_3b3/default/table?lang=en.

2.2. Causes of workaholism

When discussing the causes of workaholism, one should first refer to the three most important theories explaining workaholic behavior - trait theory, learning theory and addiction theory (McMillan et al., 2001). It is worth noting that workaholism is determined by various factors, both individual, organizational and cultural. Understanding these factors is essential for developing effective strategies to prevent it.

When analyzing individual factors that sensitize people to the occurrence of workaholism, it is important to consider personality trait theory. It emphasizes the habitual patterns of behavior, thoughts and emotions underlying workaholism (Jackson et al., 2016). It suggests that workaholism is a characteristic of an individual's personality (Sharma, Sharma, 2011). Workaholics exhibit traits such as obsession, compulsion, perfectionism, achievement orientation, conscientiousness and self-imposed demands to meet the demands of work. Their addictive relationship with work leads them to prioritize work over other aspects of life, potentially harming their physical and mental well-being (Innanen et al., 2014). According to trait theory, workaholism is an individual trait that applies to people from different communities. It is therefore independent of the workplace and remains relatively constant throughout life (Retowski, 2003).

When analyzing factors on the side of the organization, one should refer to learning theory, which views workaholism as a learned behavior (McMillan et al., 2003). It includes classical conditioning, social learning theory and causal conditioning. Bandura's social learning theory suggests that individuals acquire workaholic behavior by observing and imitating others in their social environment. In contrast, causal conditioning, based on Skinner's theory, indicates that external reinforcements, such as work incentives, can motivate workaholic behavior. Thus, it can be surmised that the most vulnerable group to workaholism are workers with high salaries and professional status, while lacking satisfaction with non-work activities (Retowski, 2003).

When discussing the causes of workaholism, one should also consider the theory of addiction. It depicts workaholism as a form of addiction in which individuals engage in excessive work-related behavior that is difficult to control without external support. It includes medical and psychological addiction models, with the latter emphasizing the perceived benefits that individuals derive from work despite the negative consequences (Merkx, Nawijn, 2021).

It should be noted that workaholism includes factors beyond the individual level that these theories focus on. It takes into account organizational and external influences beyond the individual's control (Adongo, Dayour, Bukari, Akotoye, Amissah, 2024).

2.3. Consequences of workaholism

Authors of studies on workaholism emphasize its negative impact on the well-being, relationships and overall quality of life of individuals, and point out its causes and consequences.

Workaholism can lead to negative changes in both subjective and social functioning. The development of addiction carries the risk of mental as well as physical health disorders. It causes dysfunction in the family system, whose members try in different ways to find their way in the face of the workaholic's disturbed behavior. The consequences of workaholism are also experienced by acquaintances, friends and especially co-workers. The negative impact is then realized through his tendency to exaggerate control, exorbitant demands, subjective treatment of employees and unwillingness to delegate tasks to others (Chrapek, 2014).

Table 4.
Consequences of workaholism

Area	Consequences	Study authors
Family	Conflicts in family relationships. Conflicts in the marriage/partnership relationship. Lack of ability and/or willingness to engage in intimacy. Deprivation of family needs. Problems in the functioning of children of workaholics. Physical absence from family life. Lack of commitment to the family. Lack of or weakened ties with children.	Robinson, 2000; Golińska, 2008, 2010, 2021; Bakker et al., 2008; Maslach, 1986
Work	Deterioration of work quality. Less creativity and innovation. Lack of job satisfaction. Professional burnout. Deterioration of work ralations with co-workers superiors, which may affect the achievement of organizational goals. Deterioration of efficiency and productivity at work. Avoiding participation in work-related social functions. Resistance to working with other employees. Avoiding the delging of tasks carried out by yourself. Disparity between work efficiency and amount of time spent on work.	Schaufeli et al., 2009; Mazzetti et al., 2016; Spence, Robbins, 1992; Kanai, Wakabayashi, 2001; Maslach, 1986; Golińska, 2010, 2011
Private and professional interpersonal relations	Deterioration of relationships at work. Control and lack of trust in colleagues. Deterioration/loss of intrapersonal relationships outside of work. Social isolation. Conflicts on and off the job.	Bakker, Demerouti, Burke, 2009; Golińska, 2010, 2011
Health	Increased exhaustion due to long working hours. Increased stress levels. Professional burnout. Sleep problems, anxiety before sleep, insomnia. Cardiovascular diseases. Negative health effects of co-morbid addiction to workaholism. Death from overwork. Mental problems - panic attacks, depression, anxiety, anger, anhedonia.	Schaufeli et al., 2009; Salanova et al., 2016; Spagnoli et al., 2018; Andreassen et al., 2011; Kanai, Wakabayaschi, 2001; Killinger, 2007; Spence, Robins, 1992; Golińska, 2010, 2011
Personal	Low satisfaction with life. Insecurity. Deterioration of sense of well-being. Development of addiction.	Taris, Schaufeli, Verhoeven, 2005; Killinger, 2007; Golińska, 2010, 2011

Source: own compilation based on: Golińska, 2011, pp. 17-18; Borkowska, 2010, pp. 5-44. Bakker, Demerouti, Burke, 2009, pp. 23-33; Maslach, 1986, pp. 53-75; Mazzetti, Biolcati, Guglielmi, Vallesi, Schaufeli, 2016, pp. 567-587; Schaufeli, Bakker, Van der Heijden, Prins, 2009, pp. 249-272; Taris, Schaufeli, Verhoeven, 2005, pp. 37-60; Salanova, Lopez-Gonzalez, Llorens, del Líbano, Vicente-Herrero, Tomas-Salv´a, 2016, pp. 228-242.

In conclusion, it is worth noting that the phenomenon of workaholism poses a threat to maintaining work-life balance. A conflict arises regarding the time spent on work and non-work commitments, and because work time is a very important factor in reconciling work and private life, this conflict can contribute to imbalances between these spheres (Szydlik-Leszczyńska, 2017).

3. The role of organizations in countering workaholism among employees

3.1. Diagnosis and recognition of workaholism in the organization

There are many tools for diagnosing workaholism that accentuate its various dimensions. A well-known and widely used scale is the Questionnaire for Measuring Work Addiction Risk Test (WART), by Robinson and Philips (1995). The author of the scale distinguishes between 5 symptoms of workaholism (after Wojdyło, 2005):

- work overload,
- control/perfectionism,
- employment,
- neglect of close relationships,
- self-esteem.

A great deal of research has been conducted using this tool, primarily on the effects of workaholism, but it is worth adding that the method also has its opponents. Among the methods widespread in many countries, one should mention the Work-BAT (Workaholism Battery), whose authors are Spence and Robbins (1992). The questionnaire consists of scales examining feelings of work compulsion, job satisfaction and preoccupation with work. Another well-known tool for measuring workaholism is the Scales of Workaholism as Behavioral Tendencies (Mudrack, Naughton, 2001). The authors start from the premise that workaholism is a behavioral tendency, manifested by unrequired activity and excessive control of people's activities. In contrast, the DUWAS (Dutch Work Addition Scale), developed by Schaufeli and colleagues, emphasizes two dimensions of workaholism - excessive work and compulsive work.

Various attempts to adapt scales for studying workaholism can be found in Polish studies: Work- BAT - Golińska, 2014; WART – Wojdyło, 2005, 2010. It is also worth noting the Scale of Work Absorption (SZAP) by Golinska (2005).

The above questionnaires are used to study workaholism, but it is not always possible to use them in an organization. Therefore, it is important to know how to recognize workaholism. It is worth recalling that it is a heterogeneous phenomenon, and thus multidimensional, which can introduce uncertainty in assessing worrying symptoms. When assessing the symptoms of workaholism, it is worth addressing three perspectives: workaholic functioning, behavior, and emotional experience (Hu, 2018). The most easily discernible signs of workaholism are behavioral aspects. Behaviors such as increasing work hours, working during the weekend, limiting time for other activities outside of work, performing tasks beyond the organization's expectations, and doing work despite the lack of difficulty in meeting economic needs should draw the attention of managers. Referring to the cognitive aspect, it is worth noting, among other things, the compulsion to work, which is a symptom of addiction. A workaholic feels a constant, internal need to do work, unrelated to external demands (Spence, Robbins, 1992).

In addition to this symptom, constant thinking about work, and the inability to absitively, i.e. stop working, are often mentioned. Emotional components include positive emotions and moods related to work (joy, happiness, satisfaction) and negative ones when work is stopped (sadness, frustration, anger). It is noteworthy, however, that in some accounts of workaholism, the emotional component is overlooked (Malinowska et al., 2015).

In conclusion, it should be emphasized that the diagnosis of workaholism should be handled by a qualified person. However, the observation of certain disturbing symptoms should draw the attention of management and be the basis for taking an interest in the employee's situation.

3.2. The role of HR in preventing workaholism, including education and training for managers

As mentioned earlier, workaholism is a phenomenon that causes many negative consequences, such as psychological problems (psychosomatic complaints, affective disorders, anxiety disorders), problems in interpersonal relations and family problems. It is worth noting that the consequences of workaholism affect not only the person affected, but also those around him. An important issue in the concept of pro-coholism is the negative effects on oragnization. While in the case of the workaholic himself and his family the phenomenon of workaholism has a negative impact, in the case of organizations the problem is more complex due to the organizational climate conducive to workaholism that prevails in many companies. This is why the measures taken by organizations that can influence the occurrence of this phenomenon in enterprises are so important.

An important role in reducing the risk of workaholism and its negative consequences is the ways in which supervisors motivate employees. Excessive control, motivation by fear promotes the development of this addiction and its negative consequences (Schulz, 2017). Therefore, being attentive to the needs of employees, but also treating them subjectively and acccpeting certain imperfections can counteract the negative consequences of this phenomenon.

There are three main job demands that can affect workaholics: 1) role overload, referring to the multiplicity of work roles, resulting in a lack of time to perform related tasks, 2) role ambiguity, referring to the responsibilities assigned to the role, and 3) conflict at work, caused by the employee's inadequacy and pressure at work (Hu, 2018). The results of research published in the report "Professional work of Poles and satisfaction with it" (2023) show the dependence of the role performed and the amount of time spent on work. On average, people in leadership roles at work, responsible for the work of others, or in charge of projects spend significantly more time on paid work than those who do not perform such tasks (an average of 44.2 hours per week versus 41.1 hours). Clear differences can also be seen when we compare the declarations of the two groups of respondents in relevant time frames. The majority (56%) of those not involved in managerial tasks declare that paid work takes them an average of 40 hours a week, which is the standard norm for full-time work, and only one in four of this group (25%) generally work longer hours. Among respondents in managerial roles, responsible for the work of others or managing projects, nearly two-fifths (37%) work more than 40 hours a week, and those declaring a 40-hour workweek make up just over two-fifths (44%) among them.

In view of the above, organizational support relating to work planning and transparency of tasks and responsibilities assigned to specific oragnization roles becomes important. Shaef and Fassel (1988, after Gilliss, 1993), on the other hand, recommend organizing management training that would relate to identifying the problem in employees and creating a favorable working environment. Also important is organizational culture, which plays a large role in promoting and reinforcing workaholism (Keller et al., 2016). A competitive work atmosphere, pressure, fear of failure and task orientation can promote workaholism. In contrast, a supportive work environment that pays attention to the employee's workload, shows respect for the employee's private life, and introduces stress-reducing solutions and teaches ways to cope with stress can influence employee satisfaction (while also benefiting the organization) and not eliminate the causes of workaholism (Szydlik-Leszczyńska, 2017).

Guerreschi (2005), on the other hand, indicates that outreach efforts should also involve schoolchildren. This would result, according to the author, in reducing the transmission of addiction to the next generation and prevent other mental health problems, such as other behavioral and substance addictions, mood and anxiety disorders.

4. Summary

New phenomena peculiar to the times we live in, such as globalization, socio-economic crisis, can generate pressure on employees and organizational management. Work ethic and organizational culture encourage work and indirectly work dependence. Support from family and friends, maintaining a balance between family and work life, and setting priorities can reduce the degree of work dependency. Moreover, effective organizational management can minimize the risk of addiction and help increase productivity and quality of work. Modern organizations are facing new challenges that management must deal with accordingly. In view of the above, human resource management should pay attention:

1. Introduce changes in work organization, which should take into account: working time for individual employees, defining professional roles, appropriate organization of own work.
2. Promoting health-oriented attitudes by emphasizing the importance of maintaining a work-life balance.
3. Promoting and creating conditions for teamwork.
4. Training managers to recognize the symptoms of work addiction.

5. Education of executives in terms of understanding the phenomenon of workaholism and the negative consequences for the organization.
6. Creating a work environment conducive to physical and mental health.
7. Individualized help for work addiction.

The above catalog of activities certainly does not exhaust the possibilities of organizations to counteract workaholism. Undoubtedly, it is worth paying attention to the system of work in organizations that can strengthen and perpetuate the described phenomenon.

References

1. Adongo, C.A., Dayour, F., Bukari, S., Akotoye, E.A., Amissah, E.F. (2024). Workaholism among young people in the ride-hailing travel economy. *Annals of Tourism Research Empirical Insights*, *Vol. 5, Iss. 1, 100117*. Retrieved from: https://www.sciencedirect.com/science/article/pii/S2666957923000320.
2. Andreassen, C.S., Hetland, J., Molde, H., Pallesen, S. (2011). Workaholism and potential outcomes in wellbeing and health in a cross-occupational sample. *Stress Health*, *Vol. 27(3),* pp. 209–214. http://dx.doi.org/10.1002/smi.1366.
3. Atroszko, P. (2010). Uzależnienie od pracy – wynik „słabej woli" czy potrzeba doskonałości?. *Studia Psychologica*, *Vol. 10*, pp. 179-201.
4. Bakker, A.B., Demerouti, E., Burke, R. (2009). Workaholism and relationship quality: A spillover–crossover perspective. *Journal of Occupational Health Psychology*, *Vol. 14(1),* pp. 23-33. doi: 10.1037/a0013290.
5. Bakker, A.B., Demerouti, E., Dollard, M.F. (2008). How job demands affect partners' experience ofexhaustion: integrating work–family conflict and crossover theory. *Journal of Applied Psychology, Vol. 93*(4), pp. 901-911. https://doi.org/10.1037/0021-9010.93.4.901.
6. Borkowska, S. (2010). Równowaga między pracą a życiem pozazawodowym. *Acta Universitatis Lodziensis, Folia Oeconomica*, *Vol. 240*, pp. 5-44. Retrieved from: http://hdl.handle.net/11089/434.
7. Burke, R.J. (1999). Workaholism in organizations: Gender differences. *Sex Roles*, *Vol. 41(5/6),* pp. 333-345. https://doi.org/10.1023/A:1018818731922.
8. Burke, R.J., Matthiesen, S.B. (2004). Workaholism among Norwegian joumalists: Antecedents and conseąuences. *Stress and Health, Vol. 20*, pp. 301-308. doi:10.1002/smi.1025.
9. Chrapek, E. (2014). Charakterystyka konsekwencji uzaleznienia od pracy z uwzględnieniem perspektywy indywidualnej oraz społecznej. *Zeszyty Naukowe Politechniki Częstochowskiej Zarządzanie, Vol. 15,* pp. 57-64. Retrieved from: http://www.zim.pcz.pl/znwz.

10. Clark, M.A., Michel, J.S., Zhdanova, L., Pui, S.Y., Baltes, B.B. (2016). All work and no play? A meta-analytic examination of the correlates and outcomes of workaholism. *Journal of Management, Vol. 42(7),* pp. 1836-1873. https://doi.org/10.1177/0149206314522301.
11. *Długie godziny pracy w głównej pracy* (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfsa_qoe_3a2/default/table?lang=en
12. Gilliss, B.E.EdD. (1993). Organizations of the Future: An Analysis of Current Literature and a New Model. *Dissertations, 582*. Retrieved from: https://digital.sandiego.edu/dissertations/582.
13. Golińska, L. (2011). *Pracoholik a pracoholik entuzjastyczny – dwa światy?* Łódź: Wydawnictwo Uniwersytetu Łódzkiego, pp. 17-18.
14. Golińska, L. (2005). Skala do badania zaabsorbowania pracą (SZAP). *Acta Universitatis Lodziensis. Folia Psychologica, Vol.* 9, pp. 17-29. Retrieved from: https://cejsh.icm.edu.pl/cejsh/element/bwmeta1.element.hdl_11089_3932
15. Golińska, L. (2008). *Pracoholizm, uzależnienie czy pasja.* Warszawa: Difin, pp. 10, 54-67.
16. Golińska, L. (2010). Pracoholizm – istota, konsekwencje i uwarunkowania. *Acta Universitatis Lodziensis. Folia Psychologica*, *Vol. 14*, pp. 97-107. https://doi.org/10.18778/1427-969X.14.07.
17. Golińska, L. (2011). Pracoholizm, stres a zdrowie. In: B. Dudek (ed.), *Społeczne, psychologiczne i zdrowotne skutki pracoholizmu.* Łódź: Wydawnictwo Uniwersytetu Łódzkiego, pp. 47-72.
18. Golińska, L. (2014). *Pracoholizm inaczej*. Warszawa: Difin.
19. Guerreschi, C. (2005). *Nowe uzależnienia*. Kraków: Salwator, p. 147.
20. Hu, L. (2018). A Review of Workaholism and Prospects. *Open Journal of Social Sciences, Vol. 6*, pp. 318-334. https://doi.org/10.4236/jss.2018.611024
21. Innanen, H., Tolvanen, A., Salmela-Aro, K. (2014). Burnout, work engagement and workaholism among highly educated employees: Profiles, antecedents and outcomes. *Burnout Research*, *Vol. 1(1),* pp. 38-49. https://doi.org/10.1016/j.burn.2014.04.001
22. Jackson, S.S., Fung, M.C., Moore, M.A. C., Jackson, C.J. (2016). Personality and workaholism. *Personality and Individual Differences*, *Vol. 95,* pp. 114-120. https://doi.org/10.1016/j.paid.2016.02.020
23. Kanai, A., Wakabayashi, M. (2001). Workaholism among Japanese Blue – Collar employees. *International Journal of Stress Management*, *Vol. 8(2*), pp. 129-164. doi: 10.1023/A:1009529314121
24. Keller, A.C., Spurk, D., Baumeler, F., Hirschi, A. (2016). Competitive Climate and Workaholism: Negative Sides of Future Orientation and Calling. *Personality and Individual Differences*, *Vol. 96*, pp. 122-126. https://doi.org/10.1016/j.paid.2016.02.061
25. Killinger, B. (2007). *Pracoholicy. Szkoła przetrwania.* Poznań: Dom Wydawniczy Rebis.

26. Komunikat z badań Praca zarobkowa Polaków i zadowolenie z niej. Centrum Badania Opinii Społecznej, nr 152/2023.
27. Larasati, D.P., Hasanati, N. (2019). The effects of work-life balance towards employee engagement in millennial generation. *Advances in Social Science, Education and Humanities Research (ASSEHR), Vol. 304*, pp. 390-394. https://doi.org/10.2991/acpch-18.2019.93
28. Malinowska, D., Staszczyk, S., Tokarz, A. (2015). Pracoholizm – wskazania dotyczące diagnozy oraz przegląd działań interwencyjnych. *Medycyna Pracy*, *Vol. 66(1),* pp. 71-83. doi: 10.13075/mp.5893.00046
29. Maslach, Ch. (1986). Stress, Burnout and Workaholism. In: R. Kilburg, P. Nathan, R. Thoreson (Eds.), *Professionals in Distress: Issues, Syndroms and Solutions in Psychology* (pp. 53-75). Washington: American Psychological Assotiation.
30. Mazzetti, G., Biolcati, R., Guglielmi, D., Vallesi, C., Schaufeli, W.B. (2016). Individual characteristics influencing physicians' perceptions of job demands and control: The role of affectivity, work engagement and workaholism. *International Journal of Environmental Research and Public Health, Vol. 13*, pp. 567-587. https://doi.org/10.3390/ijerph13060567
31. McMillan, L.H., O'Driscoll, M., Marsh, N.V., Brady, E.C. (2001). Understanding Workaholism: Data Synthesis, Theoretical Critique, and Future Design Strategies. *International Journal of Stress Management, Vol. 8(2),* pp. 69-91. doi: 10.1023/A:1009573129142
32. McMillan, L.H., O'Driscoll, M., Burke, R.J. (2003). Workaholism: A Review of Theory, Research, and Future Directions. *International Review of Industrial and Organizational Psychology*, *Vol. 18*, pp. 167-189. doi: 10.1002/0470013346.ch5
33. Merkx, C., Nawijn, J. (2021). Virtual reality tourism experiences: Addiction and isolation. *Tourism Management*, *Vol. 87*. doi.org/10.1016/j.tourman.2021.104394
34. Mieścicka, L. (2002). *Pracoholizm*. Warszawa: Instytut Psychologii Zdrowia, pp. 20-40.
35. Mudrack, P.E., Naughton, T.J. (2001). The assessment of workaholism as behavioral tendencies: Scale development and preliminary empirical testing. *International Journal of Stress Management, Vol. 8, No. 2,* pp. 93-111, http://dx.doi.org/10.1023/A:1009525213213
36. OECD (2020). How's life? 2020: Measuring well-being, Paris: OECD Publishing. Retrieved from: https://www.oecd.org/content/dam/oecd/en/publications/reports/2020/03/how-s-life-2020_b547d82c/9870c393-en.pdf
37. Ogińska-Bulik, N. (2010). *Uzależnienie od czynności. Mit czy rzeczywistość?* Warszawa: Difin, p. 35.
38. Paluchowski, W.J., Hornowska, E. (2021). *O pojęciu pracoholizmu.* Poznań: Rys, pp. 8, 15-16. doi: 10.48226/978-83-66666-54-2
39. Poelmans, S., Buelens, M. (2004). Enriching the Spence and Robbins' typology of workaholism. Demographic, motivational and organizational correlates. *Journal of*

Organizational Change Management, Vol. 17(5), pp. 440-458. doi: 10.1108/09534810410554470.
40. *Praca w weekendy* (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfsa_qoe_3b3/default/table?lang=en
41. *Procent osób pracujących mających drugą pracę* (2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023). Zbiór danych. Komisja Europejska, Eurostat. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/lfst_hh2jty/default/table?lang=en
42. Raport 2023, Uzależnienia w Polsce (2023). Warszawa: Krajowe Centrum Przeciwdziałania Uzależnieniom, pp. 29-32. Retrieved from: https://kcpu.gov.pl/wp-content/uploads/2024/03/Raport-2023-wersja-Internetowa.pdf
43. Retowski, S. (2003). Pracoholizm – próba teoretycznego zdefiniowania zjawiska. In: B. Wojciszke, M. Plopa (Eds.), *Osobowość a procesy psychiczne i zachowania.* Kraków: Oficyna Wydawnicza Impuls, pp. 334-335.
44. Robinson, B.E. (1998).The workaholic family: a clinical perspective, *American Journal Family Therapy*, *Vol. 26(1),* pp. 65-75. https://doi.org/10.1080/01926189808251087
45. Robinson, B.E. (2000). A Typology of Workaholics With Implications for Counselors. *Journal of Addictions & Offender Counseling, Vol. 21*, pp. 34-48. https://doi.org/10.1002/j.2161-1874.2000.tb00150.x
46. Salanova, M., Lopez-Gonzalez, A.A., Llorens, S., del Líbano, M., Vicente-Herrero, M.T., Tomas-Salv´a, M. (2016). Your work may be killing you! Workaholism, sleep problems and cardiovascular risk. *Work Stress*, *Vol. 30(3),* pp. 228-242. https://doi.org/10.1080/02678373.2016.1203373
47. Schaufeli, W.B., Bakker, A.B., Van der Heijden, F., Prins, J.T. (2009). Workaholism among medical residents: It is the combination of working excessively and compulsively that counts. *International Journal of Stress Management*, *Vol. 16(4),* pp. 249-272. https://doi.org/10.1037/a0017537
48. Schaufeli, W.B., Shimazu, A., Taris, T.W. (2009). Being driven to work excessively hard: The evaluation of a two-factor measure of workaholism in the Netherlands and Japan. *Cross-Cultural Research, Vol. 43(4),* pp. 320-348. doi.org/10.1177/ 1069397109337239
49. Schulz, A. (2017). Pracoholizm – znamieniem współczesności? *Zeszyty Naukowe PWSZ w Płocku, Nauki Ekonomiczne, t. 26,* pp. 417-434. doi: 10.19251/ne/2017.26(28)
50. Sharma, J., Sharma, P. (2011). Workaholism and its correlates: A study of academicians. *International Journal of Management and Business Research*, *Vol. 1(3),* pp. 151-160.
51. Spagnoli, P., Balducci, C., Kovalchuk, L.S., Maiorano, F., Buono, C. (2018). Are engaged workaholics protected against job-related negative affect and anxiety before sleep? A study of the moderating role of gender. *International Journal Research and Public Health*, *Vol. 15(9)*. https://doi.org/10.3390/ijerph15091996

52. Spence, J.T., Robbins, A.S. (1992). Workaholism: Definition, measurement, and preliminary results. *Journal of Personality Assessment*, *Vol. 58*, pp. 160-178. https://doi.org/10.1207/s15327752jpa5801_15
53. Szydlik-Leszczyńska, A. (2017). Zagrożenia dla równowagi życie zawodowe a prywatne w kontekście wymagań stawianych współczesnym pracownikom. *Roczniki Ekonomii i Zarządzania, t. 9(45), Vol. 7,* pp. 77-88. doi: http://dx.doi.org/10.18290/reiz.2017.9.3-6
54. Taris, T.W., Geurts, S.A.E., Schaufeli, W.B., Blonk, R.W.B., Lagerveld, S.E. (2008). All day and all of the night: The relative contribution of two dimensions of workaholism to well-beingin self-employed workers. *Work & Stress*, *Vol. 22*, pp. 153-165.
55. Taris, T.W., Schaufeli, W.B., Verhoeven, L.C. (2005). Workaholism in the Netherlands: Measurement and implications for job strain and non-work conflict. *The Journal of Applied Psychology*, *Vol. 54*, pp. 37-60. Retrieved from: http://www.mpopa.ro/statistica master/workaholism fact an.pdf
56. Wojdyło, K. (2005). Kwestionariusz Pracoholizmu (WART) – adaptacja narzędzia i wstępna analiza własności psychometrycznych. *Nowiny Psychologiczne*, *Vol. 4*, pp. 71-84.
57. Wojdyło, K. (2007). Koncepcja osobowościowych wyznaczników pracoholizmu. Weryfikacja hipotez w korelacyjnym modelu. *Studia Psychologiczne, Vol. 45*, pp. 53-67.
58. Wojdyło, K., Buczny, J. (2010). Kwestionariusz do pomiaru pracoholizmu: WART-R. Analiza trafności teoretycznej i rzetelności narzędzia. *Studia Psychologiczne*, *Vol. 49*, pp. 67-80.
59. Wolor, C.W., Kurnianti, D., Zahra, S.F., Martono, S. (2020). The Importance of work-life balance on employee performance milennial generation in Indonesia. *Journal of Critical Reviews*, *Vol. 7(9),* pp. 1103-1109. doi: 10.31838/jcr.07.09.203

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ERGONOMICS IN ORGANIZATIONAL MANAGEMENT: A KEY FACTOR FOR PRODUCTIVITY GROWTH IN A 5.0 SOCIETY

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Purpose: The purpose of the study is to analyze the role of ergonomics as a key factor for productivity growth in organizational management in the context of society 5.0. The work aims to understand how the application of ergonomic principles contributes to better use of human and technological resources, improving the efficiency, health and well-being of employees and, as a result, the productivity of the entire organization.
Design/methodology/approach: The study used a research and analysis approach, based on a literature review of ergonomics, management and the concept of society 5.0. Employee and manager surveys were conducted to assess the impact of ergonomic innovations on their work comfort and efficiency.
Findings: The results of the analysis show that implementing ergonomic solutions increases productivity, reduces stress and fatigue, and minimizes health risks for employees. An ergonomic approach in management enables technology to better adapt to people's needs, which promotes productivity and quality of work. Society 5.0, which puts people at the center of technology, offers tremendous opportunities for ergonomics in creating healthy and effective workplaces.
Research limitations/implications: The main limitations of the study stem from the diversity of industries, where standardized ergonomic standards are hard to come by.
Practical implications: Implementing ergonomic practices in organizations increases efficiency and comfort at work. Organizations that incorporate ergonomic principles into workplace design can gain greater productivity, reduce employee absenteeism and increase employee engagement.
Social implications: Ergonomics supports not only employee health, but also work-life balance, which is important in a 5.0 society. Promoting ergonomic work standards can contribute to an overall increase in quality of life and social well-being.
Originality/value: The work provides a unique perspective on ergonomics as a central element of management in modern society 5.0. It shows how ergonomic management can support harmonious cooperation between humans and technology, contributing to the sustainable development of organizations and society as a whole.
Keywords: ergonomics, organizational management, efficiency, society 5.0.
Category of the paper: research paper.

1. Introduction

Ergonomics in organizational management is a field that is playing an increasingly important role in building effective, healthy and sustainable work environments. The goal of ergonomics is to adapt working conditions to the needs and capabilities of employees, which translates not only into their comfort and health, but also into increased efficiency and motivation in the workplace. In the context of organizational management, ergonomics encompasses both the design of workstations and the proper planning of processes and organizational structures to minimize stress, fatigue and the risk of work-related injuries.

It should be noted that ergonomics also plays a key role in the development of the concept of society 5.0, which emphasizes the harmonious integration of technology and human life. In this society, advanced technologies such as artificial intelligence, robotics and big data coexist with humans to support their needs and improve their quality of life. Ergonomics, the science of adapting working conditions to human capabilities and limitations, is therefore becoming an important factor in increasing productivity, health and well-being. With an ergonomic approach to the design of workstations, tools, as well as digital environments, it is possible to increase employee efficiency and satisfaction, which in turn translates into innovation and development of entire organizations.

Despite the growing awareness of the importance of ergonomics, there is a lack of comprehensive research on its integration with modern organizational management strategies in Society 5.0. Existing research focuses mainly on physical and cognitive ergonomics, while the aspect of organizational ergonomics, which takes into account psychosocial factors, still needs to be studied in depth (Wilson, 2014).

The purpose of this work is to analyze the role of ergonomics as a key factor in productivity growth in organizational management in the context of society 5.0. The work aims to understand how the application of ergonomic principles contributes to better utilization of human and technological resources, improving the productivity, health and well-being of employees, and ultimately the productivity of the entire organization.

This article is scientific, based on research and analysis, including methodology and research results. It will present the key principles of ergonomics and the benefits it brings to employees and the organization as a whole, as well as practical solutions that can be implemented in different types of organizations to improve the quality of the work environment. While the second part of the article will address the issues of key principles of ergonomics, its impact on productivity and the benefits it brings in the context of a 5.0 society, in which technologies support people, not replace them.

2. The role of ergonomics in organizational management

Ergonomics is a term derived from the Greek words “ergon” (activity, work) and “nomos” (custom, law, knowledge), i.e. knowledge of human work (Kotowski, 2008). The creator of the term ergonomics, is the Pole W. Jastrzębowski, who introduced the term for the first time in the world in his texts, which appeared in the journal Nature and Industry in 1857. In an article titled “A Drawing of Ergonomics, or the Science of Work Based on the Laws Drawn from the Science of Nature”. Jastrzębowski introduced the concept of ergonomics, defining it as follows: “by the name of ergonomics we denote the science of work, that is, the use of the powers and abilities given to man from the Creator.”

The origins of ergonomics can be traced back to the beginning of human life on Earth, since even then work was the foundation of human development, both on an individual and social level. Analyzing the course of technological progress and organizational structure, one can conclude that mankind naturally sought to maintain harmony between the technical world and the sphere of organic life (Bartnicka, Kabiesz, 2018).

The modern definition of ergonomics emphasizes the key role of aligning the mental and physical characteristics of humans with the technical systems involved in the work process (Żutowski, Kotuła, 2006). Ergonomics in its basic definition focuses on improving work. It can be described as an organized system of human cooperation with the means of work in a given material and social environment, aimed at producing an effective product (Muszyński, 2016).

The role of ergonomics in the management of an organization is extremely important, as it enables the work environment to be adapted to the needs and limitations of employees, which has a direct impact on productivity, health and employee engagement. Ergonomics supports organizational management at several key levels, which will be presented in detail below.

The relationship between ergonomics and increased productivity and efficiency is well documented in the research literature. Ergonomics, which focuses on adapting the work environment to the needs and capabilities of employees, directly improves comfort, health and job satisfaction, resulting in better job performance and greater organizational efficiency. Ergonomically designed workstations reduce the physical strain on employees, which reduces fatigue and increases their ability to work for longer periods of time without compromising the quality of their tasks. Workers who are less fatigued are more productive and their concentration is higher, allowing them to perform their duties more efficiently (Wilson, 2000). Computer workstations with monitors set at the right height and distance minimize strain on the neck and eyes, allowing people to work at the computer for longer periods of time without experiencing discomfort.

One of the many roles of ergonomics in supporting organizational management is the optimization of workstations. Comfortable, well-designed workstations allow workers to concentrate on their tasks, which reduces errors. Studies show that ergonomic workstations reduce physical stress, which in turn reduces mental stress, which is one of the causes of errors (Hendrick, 1996). This is the process of adapting working conditions to the physical and mental capabilities of employees, resulting in their comfort, health and efficiency. Properly designed workstations can significantly reduce the risk of injury, fatigue and improve overall productivity. The process involves a variety of aspects, from the arrangement of tools and equipment to lighting and interface design. There is no doubt that workers whose workstations are ergonomically optimized exhibit fewer defects in final products, which increases quality and reduces the costs associated with corrections.

Another important area is that thanks to ergonomic recommendations implemented in the company, the safety of employees is improved, which also indirectly improves work results. Ergonomics reduces the risk of work-related injuries, such as carpal tunnel syndrome, back pain and neck injuries. Studies show that organizations using ergonomic solutions have lower rates of absenteeism related to health problems (Wilson, Corlett, 2023). Fewer sick days mean that employees are available for work more often, which has a direct impact on organizational productivity. In addition, ergonomics increases employee satisfaction, which reduces turnover, which helps retain experienced employees and minimizes the cost of recruiting and training new people. It can therefore be concluded that ergonomics reduces injuries and absenteeism, which directly reduces costs for the organization. Costs related to absenteeism, compensation and the need for changes are lower in companies that implement ergonomic solutions (Dul, Weerdmeester, 2018). In the long run, ergonomic workstations save money, as fewer accidents and health problems mean lower medical and insurance costs.

In a 5.0 society, where human-technology interaction plays a key role, ergonomics enables a work environment conducive to effective collaboration with modern tools. Ergonomically designed interfaces and devices, such as mice, keyboards and software, allow for intuitive and efficient use, which increases employee productivity (Baba, 2017). The introduction of ergonomic digital tools and digital workstations allows for faster adoption of technology and better use of its capabilities, resulting in increased operational efficiency (Chapanis, 1996).

Increasing employee engagement and satisfaction through ergonomics is a key factor in employee motivation, loyalty and overall job satisfaction. Ergonomics influences the sense of comfort and safety in the workplace, which directly translates into a positive attitude towards the duties performed and identification with the organization. Implementing ergonomic solutions is a clear signal that the employer cares about the health, comfort and well-being of its employees. When an organization invests in improving working conditions, employees feel more valued and see that their needs are important to the company. This directly builds a sense of loyalty and increases commitment to the tasks at hand (Kamiński, 2023). It should be noted that ergonomic workstations help reduce physical strain, which reduces the risk of muscle and bone injuries and mental fatigue. Employees who do not experience back, neck or wrist pain can concentrate on tasks and are less likely to experience interruptions due to discomfort. Ergonomic workstations therefore improve mood and overall job satisfaction, which translates into greater willingness and enthusiasm to complete tasks. There is no doubt that employees tend to be more engaged when their workstation is comfortable and their safety and health needs are adequately met.

Further evidence that ergonomics plays an important role in organizational management is the fact that employees who are satisfied with their working conditions and have the opportunity to work in an ergonomic environment are less likely to decide to change employers. Improving ergonomics increases job satisfaction, which reduces employee turnover and stabilizes teams. Studies have shown that investing in ergonomic workstations can lead to higher retention of employees who are more motivated and committed to the long-term development of the organization (Hendrick, 2016). What's more, ergonomics also affects relationships between employees. Properly designed workstations that promote comfort and health reduce conflicts resulting from discomfort and stress. Employees who are less physically and mentally fatigued are more likely to be cooperative, better able to cope with challenges and have positive attitudes toward their co-workers, which has a positive impact on the morale of the entire team.

Summarizing the above considerations, it should be noted that the introduction of ergonomic solutions is indicative of an organizational culture that prioritizes employee well-being. This type of approach attracts employees who value organizations that take care of their needs, which increases the overall satisfaction and commitment of the team. Ergonomics thus becomes a tool for building a positive image of the organization as an employer that is fully committed to caring for the health and well-being of its employees.

3. Society 5.0 and cognitive ergonomics: integrating man and technology for enhanced comfort at work

Society 5.0 is a new socio-economic concept that originated in Japan and has been proposed as a response to the challenges of technological advances and an aging society. It is based on deep integration of digital technologies into daily life to improve people's quality of life and create a sustainable, collaborative work environment and society. The main pillars of society 5.0 are advanced artificial intelligence (AI), the Internet of Things (IoT), big data and robotics, which support people in various areas of life, from work to health and transportation. The Japanese government did the analysis and, based on that, developed the Fifth Science and Technology Base Plan, which was adopted in January 2016 (Hayashi, 2019) . The plan calls for a transition from Industry 4.0 to a society 5.0, in which all aspects of society, including industrial work, is shaped by the latest techniques and technologies. Japan has had to develop a new model for how society operates, as it is experiencing problems related to energy shortages and energy imports from abroad, limited natural resources and an aging population. One of the main ideas of policymakers is to use artificial intelligence (AI) to solve long-term problems (Ricciolli, 2023).

Society 5.0 relies on technology to serve people, to make their daily lives easier, to solve productivity problems, and to balance ecological and natural resource issues. Unlike the previous “society 4.0”, which focused mainly on the technological industrial revolution, society 5.0 aims to harmonize modern technology with humans. The goal is to create an inclusive society that reduces inequality and improves the quality of life, especially through access to resources and reducing risks from automation (Fukuyama, 2018). AI plays a central role in the 5.0 society, with the task of processing and analyzing large amounts of data in real time, which supports decision-making processes and increases operational efficiency in industry, healthcare and education. The Internet of Things enables the exchange of information between devices to automate and optimize many processes, such as resource management in cities and smart transportation that reduces traffic jams and reduces CO2 emissions (Mikołajewski, 2024).

It can be said that a hitherto underestimated area that finds an important place in the 5.0 society is cognitive ergonomics. Cognitive ergonomics is a field of ergonomics that focuses on the study of interactions between humans and information systems with respect to cognitive processes such as perception, attention, memory, thinking and decision-making. The goal of cognitive ergonomics is to design environments, tools, devices and systems that are compatible with the natural cognitive abilities of humans, thus minimizing cognitive load and the risk of errors, while improving work efficiency and comfort (Fiserova, 2013).

The most important task of cognitive ergonomics is to adapt the work environment to human cognitive abilities. In a 5.0 society, its role is particularly important, as it is intended to lead to the design of systems by understanding cognitive processes, taking into account how humans perceive, process and interpret information. Well-designed interfaces are those that take into account aspects of contrast, information hierarchy and intuitiveness. It is also important to design interfaces that support quick and accurate decision-making. This can be achieved, for example, through appropriate grouping of data, automatic completion of information or anticipation of user needs (Wasi, 2024). Thanks to the basic tenets of cognitive ergonomics, it is known that interfaces should allow the user to react immediately to actions and provide feedback in a comprehensible manner, which supports learning and adaptation processes. Cognitive ergonomics also seeks to minimize cognitive overload by streamlining access to information and reducing unnecessary stimuli. It is assumed that systems and tools should reduce the user's mental load (Kalakovski, 2019).

Society 5.0 uses a variety of technologies that integrate with cognitive ergonomics to create safe and productive workplaces. AI supports cognitive ergonomics, improving work efficiency, reducing cognitive load and increasing safety in the work environment. AI can analyze data about user behavior, habits and preferences to customize interfaces. This reduces the number of decisions the user has to make, which reduces the cognitive load (Hancock, Szalma, 2008). Another useful action may be that AI Algorithms can analyze biometric data (e.g., heart rate, eye movement) and behavioral patterns to detect signs of fatigue or excessive cognitive load. If such a condition is detected, the systems can suggest a break or a reduction in work intensity. AI-enabled systems, such as virtual assistants or real-time data analysis software, can suggest solutions to problems or prompts, allowing workers to focus on key tasks (Wilson, 2014). AI combined with virtual reality allows for the creation of adaptive training environments that respond to user behavior. This allows employees to hone their skills in a safe environment. By automating routine processes, AI frees employees from performing monotonous tasks, allowing them to focus on more complex tasks that require creativity and analysis (Davenport, Kidby, 2016).

Cognitive ergonomics plays a key role in reducing the cognitive load on workers by designing tools, systems and work environments in a way that optimizes human-technology interactions. It promotes work efficiency, improved safety and the psychological well-being of workers, especially in occupations that require intense concentration and rapid decision-making (Lagomarsino et al., 2022). By reducing the amount of information processed simultaneously, cognitive ergonomics enables better management of the user's cognitive resources, which reduces the risk of errors and occupational stress. For example, the introduction of adaptive user interfaces, which automatically adjust the presentation of data to the user's current needs, significantly reduces cognitive overload in occupations such as air traffic control and medical diagnosis (Parasuraman et al., 2000). In addition, cognitive ergonomics integrates supporting technologies such as artificial intelligence and virtual reality to simulate complex situations in a safe environment, thereby increasing the effectiveness of training and the readiness of employees to deal with real-world challenges (Hancock, Szalma, 2008). By using these solutions, organizations can increase the efficiency of work processes while reducing the negative effects of cognitive load on employee health and productivity.

4. Methodology and results

In order to assess the impact of ergonomics on work comfort and productivity, a survey was conducted at a plastics manufacturing company. The survey was conducted on a group of 63 employees working in various positions, including both production workers and office staff.

The aim of the survey was to identify key ergonomic factors affecting health, well-being and work efficiency in the context of the company's specifics. In addition, the survey aimed to determine how implemented ergonomic innovations, such as adjustable workstations, state-of-the-art tools or assistive technologies, affected overall employee productivity and satisfaction.

The questionnaire consisted of 18 questions, divided into 6 sections: general perceptions of ergonomics in the workplace, ergonomic innovation and comfort, ergonomics and productivity, ergonomics and health and well-being, ergonomics in the context of society 5.0, ergonomics and organizational productivity.

63.5% of production workers participated in the survey, that is, they were machine operators, production technicians, warehouse workers. Of the clerical staff, 23.8% were surveyed, and they were specialists in administration, production planning, quality control. On the other hand, 12.7% of those surveyed were executives, that is, production team leaders, shift managers, operations managers. 34.9% of women and 65.1% of men participated in the survey. Less than 30% of employees were between the ages of 40 and 50, 12.7% were over 50, and the youngest employees, before the age of 30, comprised 23.8% of respondents. The longest length of service was 20.6% of employees, while 15.9% worked for less than a year. Nearly 40% of employees had seniority of more than a year, but less than 5 years. The largest group of respondents were men between the ages of 30 and 39, with seniority of less than 5 years, working in manual labor.

Respondents represented a wide range of positions and experiences, which allowed data to be collected on various aspects of the impact of ergonomics in the organization. Production workers were the dominant group (63.5%), reflecting the nature of a manufacturing company, but the significant participation of office workers and management provided a comprehensive view of the issue. The diversity of age and seniority made it possible to analyze the impact of ergonomics on people at different stages of their careers.

Table 1.
Summary sheet of survey results (part 1)

Question from the survey questionnaire	Response scale				
	Very low impact	**Low impact**	**No impact**	**High impact**	**Very high impact**
Section 1: general perceptions of ergonomics in the workplace					
1. How do you assess the impact of ergonomics on the workplace?	3	17	0	23	20
2. To what extent do you think ergonomics in your workplace affects your productivity?	10	10	0	20	23
3. To what extent do you feel the impact of an ergonomic work environment on your well-being?	3	3	5	27	28
Section 2: ergonomic innovation and comfort					
	yes		no		don't know
4. Has your workplace recently introduced ergonomic innovations	35		25		3
5. If so, what innovations have had the greatest impact on your comfort level?	very low impact	low impact	no impact	high impact	very high impact
ergonomic furniture	0	0	0	5	30
IT equipment	7	10	0	10	8
supporting technologies	0	0	0	0	35
other - please specify	0	0	0	0	0

Cont. table 1.

6. To what extent have ergonomic innovations improved your comfort at work?	very low impact	low impact	no impact	high impact	very high impact
	2	2	1	15	5
Section 3: ergonomics and productivity					
	yes		no		don't know
7. Do you think ergonomic improvements allow for better time management?	48		12		3
8. Have you noticed a reduction in errors at work after ergonomic innovations?	53		7		3
9. What specific aspects of ergonomics have the greatest impact on your productivity?	very low impact	low impact	no impact	high impact	very high impact
adaptation of the workstation	0	0	0	1	62
ease of use of technology	0	0	0	2	61
elimination of physical nuisances	0	0	0	0	63

Source: own study.

In table 1 it was presented the results of a survey on the perception of ergonomics in the workplace and its impact on various aspects of employee functioning. Several important conclusions can be drawn from the analysis of the data. The majority of respondents (43 out of 63) consider ergonomics to have a "high" or "very high" impact on the workplace. This indicates a strong belief that ergonomics is a key element of work organization. 43 feel that ergonomics has a significant impact on productivity, highlighting its role in work efficiency. As many as 55 people indicate that ergonomics has a positive impact on their well-being, confirming its importance in health and psychological aspects.

In terms of ergonomic innovations, it turns out that 35 respondents indicated that their workplace has introduced ergonomic innovations, suggesting an interest in improving working conditions. The most appreciated innovations were ergonomic furniture and assistive technologies, which earned high ratings of "very high impact", 30 and 35 responses, respectively. Despite the improvements made, some groups, such as IT equipment, received relatively low ratings, which may suggest the need for further improvement.

The impact of ergonomics on productivity was also found to be significant, with as many as 48 people believing that ergonomic improvements support better time management, highlighting their impact on work organization. A large majority (53 people) noted a reduction in work errors due to ergonomics innovations, demonstrating their effectiveness. Factors such as eliminating physical inconveniences and adjusting the workstation have the greatest impact on productivity, indicating the fundamental importance of ergonomic fundamentals in workplace design.

The data clearly shows that ergonomics is a key element in supporting productivity, comfort and employee well-being. High ratings for innovations such as ergonomic furniture and assistive technologies suggest that investments in these areas can yield significant benefits. At the same time, relatively low ratings for some aspects, such as IT equipment, suggest the need for further improvements in these solutions. The table underscores the importance of ergonomics as a tool for improving both individual performance and the overall quality of the work environment.

Table 2.
Summary sheet of survey results (part 2)

Question from the survey questionnaire	Response scale				
	Very low impact	**Low impact**	**No impact**	**High impact**	**Very high impact**
Section 4: ergonomics and health and well-being					
1. How do you rate the impact of ergonomics at work on your physical health?	0	0	0	4	59
2. What impact does the ergonomics of your workplace have on your mental well-being and motivation to work?	0	0	0	8	55
3. What impact do the ergonomic recommendations implemented in your company have on reducing stress at your job?	0	1	0	17	45
Section 5: ergonomics in the context of society 5.0					
	yes		no		don't know
4. Does ergonomics supported by modern technology enable better use of human resources in your organization?	39		16		8
5. Do you think ergonomics should be a key component of an organization's management strategy in a 5.0 society?	30		10		23
6. How do you assess the role of ergonomics-enhanced technologies (e.g., artificial intelligence, robots) in improving the productivity of your work?	very low impact	low impact	no impact	high impact	very high impact
	0	8	0	15	40
Section 6: ergonomia a produktywność organizacji					
	yes		no		don't know
7. In your opinion, do ergonomic innovations introduced through society 5.0 contribute to the productivity of the entire organization?	48		12		3
8. Do you think investing in ergonomics has long-term benefits for the organization?	54		6		3
9. What areas of the organization do you think benefit most from ergonomic improvements?	very low impact	low impact	no impact	high impact	very high impact
efficiency of teams	0	0	0	3	60
reduction of absenteeism	0	1	0	12	50
improvement in quality of work	0	3	0	12	48

Source: own study.

Table 2 shows the results of a survey on the impact of ergonomics on various aspects of health, productivity and management strategies in the context of society 5.0. As many as 59 respondents out of 63 rated the impact of ergonomics on physical health as "very high", clearly indicating a strong belief in its beneficial impact in this area. The lack of responses in the "low impact" or "no impact" categories confirms widespread acceptance of the importance of ergonomics in the physical aspect. 55 respondents noted a "very high impact" of ergonomics on psychological well-being and motivation, indicating that a properly designed work environment not only improves health but also promotes employee engagement. 45 indicated a “very high impact,” while 17 responded “high impact”. These data suggest that ergonomic improvements are seen as an effective tool for reducing occupational stress.

Another area surveyed was ergonomics in the context of society 5.0 39 people believe that modern technologies supported by ergonomics enable better use of human resources, highlighting their importance in improving management in the context of society 5.0. In turn, 30 respondents consider ergonomics an important part of an organization's strategy in society 5.0, although as many as 23 people “have no opinion” on the subject, which may be due to insufficient education about the potential benefits. In contrast, ergonomic technologies such as artificial intelligence and robots received high marks: 40 people gave them a “very high impact” on improving productivity, underscoring their strategic importance in modern workplaces.

The section on ergonomics in the context of organizational productivity was then surveyed. 48 respondents indicated that ergonomic innovations in a 5.0 society contribute to improving organizational productivity, demonstrating their high value in the context of long-term strategy. 54 expressed the belief that investments in ergonomics have long-term benefits, highlighting the importance of this area in strategic planning. The most beneficial effects were seen in improving the efficiency of teams (60 “very high impact” ratings), reducing absenteeism (50 responses) and quality of work (48 responses). These results underscore that ergonomics has benefits at both the individual and team levels.

4. Conclusions

Ergonomics in organizational management is undoubtedly a supporting tool, but it is also one of many factors in the quest for productivity growth, especially in the context of society 5.0. As organizations embrace advanced technologies and foster human-centric environments, ergonomics bridges the gap between innovation and well-being. By prioritizing ergonomic principles, companies demonstrate a commitment to both productivity and employee welfare, creating workplaces that are not only efficient but also adaptive, inclusive, and future-ready.

Investments in ergonomic solutions—whether through advanced AI-driven tools, adaptable workstations, or streamlined workflows—translate into measurable benefits such as enhanced productivity, reduced absenteeism, and improved employee satisfaction. In a society 5.0, where the balance between technological advancement and human-centric values is paramount, the integration of ergonomics reflects a forward-thinking approach that aligns organizational goals with the evolving needs of the workforce.

Ultimately, leveraging ergonomics as a core component of management strategy empowers organizations to thrive in competitive, dynamic environments. It fosters a culture of innovation and trust, ensuring long-term sustainability and resilience in the ever-changing landscape of modern business. As we step further into the future, embracing ergonomics is no longer an option but a necessity for organizations aiming to lead in a society where human potential and technological excellence must coexist seamlessly.

It should be noted that the survey responses obtained are only for the surveyed group of employees. The analysis shows that ergonomics plays a key role in managing an organization in the context of Society 5.0. The application of ergonomic principles allows for more efficient use of human and technological resources, leading to increased productivity and improved employee health and well-being. By adapting working conditions to individual needs, organizations can increase employee engagement, reduce absenteeism and improve overall operational efficiency. Integrating ergonomics with modern management strategies fosters a sustainable and innovative work environment, an important factor for success in the era of digitization and automation. Conclusions from the paper underscore the need for further research on adapting ergonomics to specific technological and psychosocial requirements in a dynamically changing world of work.

References

1. Baba, M.L. (2017). Anthropology and business: Influence and interests. *Journal of Business Anthropology*, *2(1),* pp. 20-37.
2. Bartnicka, J., Kabiesz, P. (2018). Ergonomic and workflow study of sausage production process in the context of manual transport tasks. *Proceedings of the XV International Conference Multidisciplinary Aspects of Production Engineering MAPE*, ed. W. Biały, Gliwice: PANOVA, pp 695–-701.
3. Chapanis, A. (2016). *Human Factors in Systems Engineering*. John Wiley & Sons, p. 40.
4. Davenport, T.H., Kirby, J. (2016). Just how smart is smart? Automation, AI, and robotics in the workplace. *Harvard Business Review, 7,* p. 32.
5. Dul, J., Weerdmeester, B. (2018). *Ergonomics for Beginners: A Quick Reference Guide*. CRC Press, p. 21.
6. Fiserova, S. (2013). *Methods of cognitive ergonomics in assessment of psychosocial risks in work systems.* Zielona Góra: Wydawnictwo Polskiego Towarzystwa Profesjologicznego, p. 190.
7. Fukuyama, M. (2018). Society 5.0: Aiming for a New Human-Centered Society. *Journal of Economic and Financal Sciences*, pp. 47-48.
8. Hancock, P.A., Szalma, J.L. (2008). Performance under stress: A psychophysiological analysis of adaptive cognition. *Human Factors: The Journal of the Human Factors and Ergonomics Society, 50(3),* pp. 438-451.

9. Hendrick, H.W. (2016). The Ergonomics of economics is the economics of ergonomics. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, *40(1),* pp. 1-10.
10. Herzberg, F., Mausner, B., Snyderman, B.B. (1959). *The Motivation to Work*. John Wiley & Sons, p. 154.
11. Kalakoski, V. *Cognitive Ergonomics is a Matter of Cognitive Factors*. Finnish Institute of Occupational Health.
12. Kamiński, A. (2023). *Satysfakcja czy Zaangażowanie Pracowników: Kluczowe Różnice Wpływające na Sukces Organizacji*, conference materials. Szczecin.
13. Kotowski, R. (2008). *Ergonomia i zasady bezpiecznej pracy z komputerem.* Warszawa: Wydawnictwo Polsko-Japońskiej Akademii Technik Komputerowych, pp. 2-4.
14. Lagomarsino, M., Lorenzini, M., Momi, E., Ajoudani, A. (2022). Robot Trajectory Adaptation to Optimise the Trade-off between Human Cognitive Ergonomics and Workplace Productivity in Collaborative Tasks. *IEEE Transactions on Cognitive and Developmental Systems, Vol. 1,* p. 8.
15. Mikołajewski, D. (2024). The Internet of Things and AI-based optimization within the Industry 4.0 paradigm. *Bulletin of the Polish Academy of sciences technical sciences*, *Vol. 72(1),* pp. 3-5.
16. Muszyński, Z. (2016). Rozwój ergonomii w Polsce i na świecie. *Zeszyty Naukowe Małopolskiej Wyższej Szkoły Ekonomicznej w Tarnowie*, *29(1)*, 87-100.
17. Parasuraman, R., Sheridan, T.B., Wickens, C.D. (2000). A model for types and levels of human interaction with automation. *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans, 30(3),* pp. 286-297.
18. Ricciolli, L. (2023). Artificial Intelligence: innovation for society 5.0. *SSRN, 2,* p. 21.
19. Wasi, A.T. (2024). CogErgLLM: Exploring Large Language Model Systems Design Perspective Using Cognitive Ergonomics. *Human Computer Interaction*, *12(11),* p. 23.
20. Wilson, J.R. (2000). Fundamentals of ergonomics in theory and practice. *Applied Ergonomics*, *31(6)*, pp. 557-567.
21. Wilson, J.R. (2014). Fundamentals of ergonomics in engineering. *Applied Ergonomics*, *45(3),* pp. 337-345.
22. Wilson, J.R., Corlett, E.N. (2023). *Evaluation of Human Work*. CRC Press, p. 45.
23. Żutowski, P., Kotuła, W. (2006). Ergonomia w zarządzaniu organizacją. *Ergonomia*, *28(4)*, 18-26.

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INDUSTRY SKILLS CENTRES AS INSTITUTIONS SUPPORTING THE DEVELOPMENT OF VOCATIONAL EDUCATION IN LOWER SILESIA

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Purpose: The main objective of this article is to present the role played by the Industry Skills Centres (ISC) in developing vocational education in Lower Silesia. The aim is to identify how ISCs can contribute to educational and economic development in the region.
Design/methodology/approach: The author focused on analyzing available materials related to the role of Industry Skills Centres in the vocational education system, a new research area. Due to their innovative nature, the available literature is limited, and practical research is at an early stage of development. The bibliography, comprising seven entries, includes recent publications and materials, including government documents and organizations working in the field of education.
Conclusions: Recently, the Lower Silesian Industry Skills Centres have gained a key role in the vocational education system, responding to the needs of the dynamically changing labour market. Their activities not only support local businesses in attracting skilled workers but also promote innovation and integrate education with industry. ISCs also play a crucial role in shaping the workforce necessary for developing critical economic sectors such as automotive, IT, and renewable energy. Investment in these institutions, including in the National Recovery Plan, emphasizes a long-term approach to vocational education reform and effective collaboration between educational institutions and employers.
Research limitations/conclusions: As the available material on the above topics is limited and research on their effectiveness is still at an early stage, there is great potential for future research.
Social implications: The Sectoral Skills Centres in Lower Silesia will play a fundamental role in shaping a modern vocational education system. Their activities prepare young people for the challenges of the labour market and contribute to regional and social development by providing local companies with qualified personnel. Critical to ISC's continued success will be stable financial support, infrastructure development, and partnerships with industry, strengthening the effectiveness of vocational education in the region.
That being said, ISC also faces significant challenges. Among them is the need for stable funding, infrastructure upgrades, and closer business collaboration. The high cost of maintaining modern technology and appropriate learning environments can limit the availability of educational programs. Adapting educational offerings to the rapidly changing labour market remains a significant problem. Nonetheless, ISCs have the potential to become critical educational centres that offer quality education and training, which is essential in the face of the increasing demand for a skilled workforce.

Originality/value: The article may interest teachers and educators who want to understand how collaboration between education and industry can influence the quality of vocational education. Those working in local government may find valuable information on strategies to promote vocational education that contribute to the development of their regions. The author aimed the article at various audiences, including, but not limited to, entrepreneurs and managers from local companies looking for qualified staff to employ. In addition, young people and their parents seeking information about vocational training opportunities can learn about ISC programs that combine theoretical knowledge with practical skills to enhance employability. The article may also attract the attention of innovation and technology experts who see the potential in developing modern education programs. Finally, anyone interested in the future of the labour market and professional development can find relevant information on trends and challenges in vocational education, highlighting ISC as a critical player in this area.
Keywords: Industry Skills Centres, vocational education, integration of education and the labour market
Category of the paper: Research paper.

1. Introduction

Vocational education in Poland, including Lower Silesia, plays an essential role in meeting the needs of the labour market, as curricula in trade schools are designed with current and future economic trends and labour market needs in mind. Students gain practical knowledge that prepares them to work in industries facing a shortage of skilled workers. A key aspect of this type of education is the development of practical skills, which differentiates it from the general education system and makes graduates better prepared to enter the workforce quickly, increasing their competitiveness. A qualified workforce, especially in regions such as Lower Silesia, supports the local and national economy by providing companies with specialists in crucial industries such as manufacturing, automation, or logistics, which contributes to the region's competitiveness. Vocational education also plays an essential role in leveling the playing field for young people, offering stable and well-paid employment to those who do not choose the path of higher education. In Lower Silesia, thanks to the development of numerous economic zones, graduates of vocational schools have countless professional opportunities, often finding work immediately after completing their education. The region stands out from the rest of the country for its dynamic economic development, systemic approach to vocational education, and investment in Industry Skills Centres, which combine teaching with the real needs of industry. Local initiatives such as school-business collaborations, apprenticeships and employer engagement in education help to align education with labour market requirements, particularly in key sectors for the region.

Thus, vocational education plays a crucial role in shaping the future workforce and responding to the dynamically changing labour market needs. It connects the world of education with the labour market and responds to growing economic and technological needs. It meets the needs of the labour market by offering students practical skills that allow them to quickly find their way in their professions, making them more competitive. It also underpins the development of the economy by providing local companies with well-qualified employees, which translates into increased competitiveness for the region. It also levels the playing field for young people on the labour market, offering vocational school graduates stable employment, particularly in Lower Silesia's rapidly developing industrial sectors.

In the context of Lower Silesia, one of the most economically developed regions, investments have been made for years in developing vocational education to meet the demand for specialists in industries such as automotive, energy, or IT. One of the key elements supporting the development of vocational education is, and will continue to be, the Industry Skills Centres - modern institutions that link the world of education with the practical needs of the economy. ISCs offer students and teachers access to the latest technologies, training, and apprenticeships, enabling them to acquire the competencies needed to succeed in the labour market.

The main objective of this article is to present the role played by the Industry Skills Centres in the development of vocational education in the Lower Silesia region. The specific aim is to identify how ISCs can contribute to raising the region's education and economic development level.

2. Methodology

The author used the Desk Research method to prepare the above article. Without collecting primary data, desk research involves gathering information and data from available secondary sources, such as publications, reports, scientific articles, statistics, databases, archival materials, and online sources. It is one of the primary research methods used in social sciences, business, and other fields.

The author focused on the analysis of available literature and sources of information on vocational education, the labour market, and Industry Skills Centres and their influence on the development of vocational education in Lower Silesia. The author based his considerations on Polish literature, studying scientific articles and electronic sources.

The bibliography includes seven items. The number of bibliographic items is due to the highly new subject matter of the work - Sectoral Skills Centres and their role in vocational education are only gaining importance in Poland. Consequently, the available material is limited, and research into their effectiveness is still in its early stages. The publications included in the bibliography cover the latest available sources.

3. Industry Skills Centres – definition and goals

Industry Skills Centres are state-of-the-art educational units that aim to support the development of vocational education by directly linking the education system to the needs of the labour market. ISCs offer advanced technological facilities, laboratories, and workshops (tailored to the needs of the local labour market) that enable students to acquire practical skills in line with the latest industrial trends. These institutions are and will continue to be, a vital link between education and the business sector, facilitating young people's access to quality education and apprenticeships that allow them to adapt quickly to the labour market requirements. At the same time, the Sector Skills Centres collaborate with local businesses and educational institutions, providing knowledge and resources not only to students but also to teachers and vocational instructors, enabling them to develop their skills and access the latest technologies and teaching methods.

The Industry Skills Centre is a high-tech educational unit with a nationwide reach that is part of the education system. This facility goes beyond traditional models of vocational education, focusing on one area specific to a particular industry.

An industry skills centre is a nationwide education, training, and examination centre with a sectoral focus in one of the occupational fields defined in regulations issued based on Article 46c(1), which integrates schools providing vocational education, continuing education establishments, vocational training centres, universities and entities referred to in Article 3(1a) that operate in that occupational field, and which conducts:

a) education and training,
b) supporting cooperation of schools, establishments and universities with employers,
c) innovation and development activities disseminating knowledge and new technologies as well as ecological and digital transformation,
d) supporting implementation of vocational counseling for students and professional activation of students, doctoral students, and graduates of studies

addressed in particular to pupils, students, postgraduate students, teachers, university teachers, and employees, in this professional field (Act of 30 August 2023 amending the Act - Education Law and certain other acts).

The facility's activities include education, fostering collaboration between schools and employers, technological innovation, and career guidance. The unique nature of the ISC stems from its specialization and association with a national professional body, which ensures the integration of learning and professional practice.

The governing body of the ISC can be:

- local government units,
- natural persons or legal persons other than local self-government units, including professional organizations competent for a given professional field,
- ministers competent for the professions of vocational education.

The establishment and operation of an ISC require an agreement between the leading authority and the professional organization of the field in question unless the professional organization acts as the leading authority. Professional organizations must be nationwide in scope and operate under specific laws. An ISC must have a Council, and the educational offer is aimed at a broad audience, including pupils, students, and adults planning retraining (Ministry of Education and Science).

A vital element of the Industry Skills Centre's offer is an innovative, out-of-school form of lifelong learning - industry-specific vocational training, covering specialized skills valuable in a particular vocational field and digital and eco-transformation competencies. Pupils, students, and employees in the industry can benefit from this offer. The ISC also organizes further training courses for young workers and courses to acquire and update professional qualifications. In addition, the ISC is the only educational institution to offer industry-specific training for teachers of vocational subjects.

The education and training offered by the institution complement the vocational education and training provided in the education system and the higher education and science system and support lifelong learning in line with the Integrated Skills Strategy 2030 idea.

The ISC's activities also support integrating education and business, promoting innovation, and developing technology, particularly in the context of digital and ecological transformation. The centre also aims to support career counseling and cooperation between schools, universities, and employers, which distinguishes ISC from traditional vocational training institutions (Ministry of Education and Science).

ISCs, therefore, act as centres of excellence, offering opportunities for upskilling and retraining. In this way, they become a crucial element of sustainable regional development strategies, responding to the dynamically changing needs of the labour market. In Lower Silesia, the Industry Skills Centres play a significant role by supporting individual industrial sectors. Their activity is essential in modernizing vocational education, increasing the region's competitiveness against other parts of the country.

The main goals and tasks of the Industry Skills Centres focus on supporting the development of vocational education by adapting education to the real needs of the labour market and promoting innovative solutions in technical education. Above all, ISCs are designed to ensure that students can access modern technologies and tools to acquire practical skills crucial in a rapidly changing economy. These institutions also play a key role in integrating the education system with local industry, offering students opportunities for direct contact with the real needs of companies and organizations, which promotes better adaptation to the labour market after education.

One of ISC's primary objectives is to tailor curricula to the industries' specific requirements, which means working closely with businesses and the private sector to identify current and future professional competence needs. As part of this collaboration, ISCs organize internships, work placements, and workshops that allow students to gain valuable experience. As a result, graduates of schools cooperating with ISCs are more likely to be employed, and local businesses can count on an influx of well-trained staff (Gazeta Prawna, 3.01.2024).

In summary, ISCs act as centres of professional development for teachers and adults. Improving the qualifications of teaching staff is an important task of these institutions, as teachers and instructors need to keep up to date with new technologies and industry trends in order to transfer knowledge and skills to students effectively. Therefore, ISCs organize training courses and workshops for teachers to improve their professional and teaching competencies.

Finally, an essential task of ISCs is to promote vocational education in society and to support young people in making decisions about their career paths. ISCs are often involved in information campaigns and activities to make vocational education more attractive, which is particularly important in counteracting stereotypes about vocational schools. Such initiatives motivate young people to choose an educational path that offers genuine career prospects.

The role of the Sectoral Skills Centres in the vocational education system is crucial, as they are modern centres that effectively link/combine education with the needs of the economy and the labour market. One of the most critical tasks of ISCs is facilitating access to practical, high-tech tools and skills, which is particularly important in rapidly changing industries such as automotive, IT, or renewable energy. Through access to state-of-the-art infrastructure - laboratories, workshops, and equipment - students can gain work experience in actual working conditions, significantly increasing their competitiveness in the labour market after graduation.

ISCs also play an important role in integrating vocational education with local businesses. This cooperation includes not only the organization of internships and apprenticeships for students but also the joint development of curricula that meet the current needs of the labour market. This makes the education process more flexible and dynamically responsive to changing economic realities, enabling companies to have well-trained professionals ready to take up employment immediately after graduation.

The National Recovery and Resilience Plan (NRP) included the decision to establish industry-based skills Centres under Component A: ‘Economic Resilience and Competitiveness’. Specific objective A3 is to strengthen the education and lifelong learning system to meet the needs of the modern economy and foster innovation, technology transfer, and green and digital transformation. Reform A3.1 plans to prepare human resources for the needs of a modern economy and the ability to respond to crises.

Investment A3.1.1 supports the development of vocational education, higher education, and lifelong learning, emphasizing cooperation between vocational schools, universities, employers, research and development institutions, and other economic actors and promoting vocational education. In particular, it is planned to establish 120 sectoral skills centres as centres of vocational excellence (CoVEs).

The project operator is the Foundation for the Development of the Education System, which plans to establish all ISCs by the end of 2024, with the first 20 to be established by the end of 2023. Implementation requires cooperation with nationwide professional organizations, state-owned companies, or bodies running vocational schools.

On 4 July 2023, the first contracts in the ISC Project Competition were signed, and the recruitment process for subsequent phases is underway. Funding covers the construction of infrastructure, the creation of an institutional structure, the employment of staff, and the development of training curriculum documentation. The total amount of support is PLN 1,429,000,000, with anticipated grants in the range of PLN 9,000,000 to 16,000,000 for each of the 120 areas (Foundation for the Development of the Education System).

Ultimately, there will be 120 Industry Skills Centres located throughout the country. The current locations of the centres in individual voivodeships are shown on the map below.

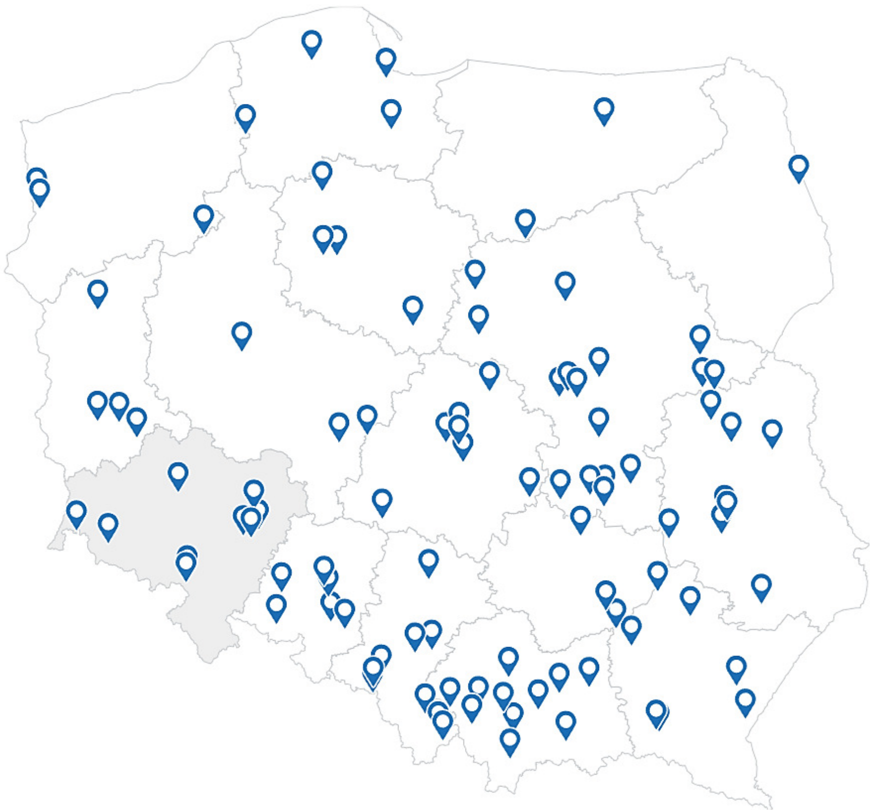

Figure 1. Industry skill Centres as of 24/10/2024.

Source: https://www.frse.org.pl/kpo-ISC-mapa (24.10.2024).

4. The role of the Industry Skills Centres in the development of vocational education - the example of Lower Silesia

Industry Skills Centres play a crucial role in developing the skills of both students and workers, offering advanced educational infrastructure and state-of-the-art training programmes that are tailored to the real needs of the labour market. One of the main ways in which ISCs support students' skills development is by providing access to modern laboratories, workshops, and technological tools. Students can work on equipment used in industry, which allows them to gain practical skills in conditions close to the natural working environment. In this way, education at ISC is not limited to theory but becomes accurate preparation for work in specific industries.

There are currently nine Industry Skills Centres in Lower Silesia. The table below shows the variety of vocational fields supported by ISCs in Lower Silesia and their geographical distribution in the region. It indicates the growing importance of vocational and continuing education in the context of local labour market needs. It is worth noting that most ISCs are planned to be established by the end of 2024, suggesting intensive development of these institutions in the coming years.

Tabela 1.

Industry Skills Centres in Lower Silesia - data as of 23.09.2024

Area	Contact details
Underground mining, processing of metal ores and mineral resources	The final recipient of support: Miedziowe Centrum Kształcenia Kadr sp. z.o.o. Address: Lubin, ul. Marii Skłodowskiej Curie 172A Website: https://ISC.mckk.pl/
Logistics	The final recipient of support: Międzynarodowa Wyższa Szkoła Logistyki i Transportu we Wrocławiu Address: Wrocław, ul. Sołtysowicka 19b Website: https://ISC-logistyka.pl/
Mechatronics	Final recipient of support: Gmina Wałbrzych – miasto na prawach powiatu Address: Wałbrzych, ul. Ogrodowa 2a Date of creation: till 31.12.2024
Occupational therapy	The final recipient of support: Daniel Sobczyk Address: Wałbrzych, ul. Jana Matejki 6 Date of creation: till 30.05.2025
Industrial automation	The final recipient of support: Gmina Wrocław Address: Wrocław, ul. Kiełczowska 43 Date of creation: till 31.12.2024
Electromobility	The final recipient of support: Gmina Wrocław Address: Wrocław, ul. Borowska 105 Date of creation: till 31.12.2024
Electrics	The final recipient of support: Gmina Wrocław Address: Wrocław, ul. Strzegomska 49a Date of creation: till 31.12.2024

Cont. table 1.

Power engineering	The final recipient of support: Powiat Zgorzelecki Address: Zgorzelec, ul. Francuska 6 Date of creation: till 31.12.2024
Hospitality	The final recipient of support: Województwo Dolnośląskie Address: Olszyna, Biedrzychowice 20 Date of creation: till 31.12.2024

Source: Fundacja Rozwoju Systemu Edukacji, data as at 22.10.2024, https://www.frse.org.pl/kpo-bcu-mapa, dostęp: 22.10.2023.

Industry Skills Centres are introducing new approaches to teaching and training in response to the rapidly changing labour market. In the face of technological advances, globalization, and the increasing demands of industry, traditional methods of vocational education need to be revised. ISCs, as state-of-the-art educational institutions, integrate innovative teaching strategies with practical skills, adapting education programmes to the real needs of employers and global trends.

Industry Skills Centres also find their place in the Lower Silesian Vocational Education Development Strategy (DSREZ), which sets out the main directions for the development of education in the Lower Silesian Voivodeship, taking into account the needs of all stakeholders in each of the four subregions (jeleniogórski, legnicki, wałbrzyski, wrocławski).

The Lower Silesian Vocational Education Development Strategy (DSREZ) serves as a guideline for all actions involved in cooperation to develop vocational education in the region. Vocational education is defined here broadly as a set of actions that support complete preparation for functioning in professional life - starting from early vocational preorientation at the pre-school stage to lifelong counseling and support in the process of lifelong learning.

The DSREZ strategy identifies eight areas of impact (cooperation with employers, practical learning, flexible skills acquisition, human resources, monitoring and information flow, career counseling, stakeholder cooperation, organization, and management), the key to developing the province's vocational education policy. Strategic objectives were identified for each area and broken down into more detailed operational objectives. Work on the detailed implementation guidelines included attempts to determine courses of action. In addition, each area, key, but not the only entities responsible for the implementation of the activities, were designated, and exemplary indicators were identified to assess the impact of the strategy.

Thus, DSREZ integrates the activities of various institutions and unifies the approach to the development of vocational education, enabling effective implementation of the strategy in response to regional labour market needs and supporting the harmonious development of vocational qualifications as part of the lifelong educational process (the University of Lower Silesia DSW, Marshal's Office of the Lower Silesian Voivodeship).

The activities of the Sector Skills Centres as complementary entities will support the implementation of the individual DSREZ objectives:

- Strategic objective: To implement and develop effective education methods at all stages of life.
- Strategic goal: Development of an effective model of cooperation for vocational education personnel and improvement of professional qualifications.
- Strategic goal: Development of cooperation solutions for the development of vocational education (Supporting the building of alliances and partnerships for vocational education, including cross-sectoral ones, for networking and exchange of experience between stakeholders from border regions, e.g., through building educational industry clusters and cooperation with ISC).
- Strategic goal: Building and development of effectively functioning vocational counselling.
- Strategic goal: To create mechanisms for effectively organizing and managing regional vocational education.

In summary, Industry Skills Centres represent a modern approach to vocational education that responds to the challenges of the changing labour market. By combining practice with theory, introducing modern technology into teaching, flexible educational programs, and close cooperation with industry, ISCs prepare students and workers for the challenges of today's economy.

5. Challenges and prospects for the development of Industry Skills Centres

The Sectoral Skills Centres, as new centres of lifelong education, have the potential to become technologically and organisationally advanced centres of education, training, and vocational examination. Their programs will be accessible to pupils, students, doctoral students, lecturers, and employees, thus fostering the integration of the academic and professional communities with employers. Each ISC is obliged to provide teaching staff with appropriate qualifications, modern teaching facilities, safe and hygienic learning conditions, infrastructure adapted to people with disabilities, supervision to improve the quality of education, and documentation of continuing education, including an annual training plan (Kwiatkowski, 2023).

Although they play a crucial role in supporting the development of vocational education in Lower Silesia, they face several challenges that may affect their effectiveness. The most critical issues are funding, infrastructure development, and cooperation with local industries.

One of the main challenges facing ISCs is stable and sufficient funding. Many Centres are funded by public and private resources, meaning their operations depend on effective collaboration with various stakeholders, including local governments, state institutions, and companies. Unfortunately, limited funding may lead to problems in maintaining modern technologies and infrastructure (after the period of investment support), which consequently affects the quality of education. More funding may also limit the availability of courses or the size of training groups. This is particularly problematic given the dynamic development of the labour market, which requires constant adaptation of the educational offer to new needs.

Another challenge affecting ISCs is the development and modernization of infrastructure. Industry Skills Centres need state-of-the-art equipment to offer students and employees access to up-to-date technologies and tools used in industry. Given the rapid technological development, investment in equipment is essential, but the cost can be significant. In addition, centres must ensure adequate working conditions for students, which involves upgrading buildings, workshops and labouratories. The lack of adequate infrastructure can limit opportunities for practical training, which is one of the cornerstones of vocational education.

Collaboration with industry, while one of the pillars of ISC's work, can also be challenging. The sectors that the centres work with are often characterised by a rapid pace of change, which requires flexibility in adapting curricula to current market needs. However, establishing lasting and effective company partnerships can take time and effort. Companies expect graduates to be fully prepared for the workplace, but differences in expectations and the constraints of available resources can lead to skills gaps. In turn, companies may need help to regularly engage in developing educational programmes, making it difficult to update and adapt them to current market requirements.

The creation and effective use of the opportunities offered by industry skills centres can be a significant boost further to strengthen the position of vocational education in Poland. Vocational education already covered 58.5% of students in the 2022/2023 school year, which is confirmed by the high employment rate of graduates - 82% in 2022. The expected increase in young people's interest in vocational education is due to the development of the labour market in sectors such as industry, construction, and services, as well as attractive offers from EU countries. Given these trends, the role of integrated educational institutions in lifelong learning is becoming increasingly important (Kwiatkowski, 2023).

In summary, Industry Skills Centres face several challenges, including securing stable funding, developing a modern infrastructure, and establishing sustainable partnerships with industry. These aspects are crucial to providing high-quality vocational education that meets the needs of the changing labour market while also being areas that require ongoing attention and support from the government, educational institutions, and companies.

6. Conclusions

The Industry Skills Centres in Lower Silesia are a crucial element of the vocational education system, which adapts education to the needs of the labour market. Their activities respond to local businesses' needs and support innovation and cooperation between education and industry. ISCs integrate theoretical knowledge with practical skills, increasing graduates' competitiveness. Students benefiting from the offer of these centres gain access to modern technology and apprenticeships, making it significantly easier for them to find employment in a rapidly growing region.

ISCs also make it possible to train a workforce that lays the foundation for developing critical sectors of the economy, such as automotive, IT, or renewable energy. The investment in these centres, included in the National Recovery Plan, demonstrates a long-term approach to vocational education reform and the importance of collabouration between schools and employers. ISCs are committed to promoting vocational education among young people, which contributes to overcoming stereotypes associated with this type of education.

However, it should be noted that ISCs face several challenges, such as securing stable funding, upgrading infrastructure, and establishing sustainable partnerships with industry. The high cost of maintaining state-of-the-art equipment and learning conditions can limit the availability of educational programmes. In addition, adapting educational programmes to the dynamically changing needs of the labour market remains a significant challenge. Despite these difficulties, ISCs have the potential to become leading vocational education centres, providing high-quality education and training, which is essential in the context of the growing demand for skilled workers.

In conclusion, the Industry Skills Centres in Lower Silesia play and will continue to play a crucial role in the modern vocational education system. Their activities prepare young people for the challenges of the labour market and support regional and social development by providing a skilled workforce to local businesses. Financial support, infrastructure development, and partnerships with industry will be critical to the further development of ISC and the effectiveness of vocational education in the region.

References

1. Fundacja Rozwoju Systemu Edukacji, Branżowe Centra Umiejętności – mapa. https://www.frse.org.pl/kpo-ISC-mapa, 24.10.2024.
2. Fundacja Rozwoju Systemu Edukacji. *Krajowy Plan Odbudowy – Branżowe Centra Umiejętności*: https://www.frse.org.pl/kpo-ISC, 24.10.2024.

3. Gazeta Prawna, 3.01.2024. *Branżowe centra umiejętności. Jakie cele zrealizuje nowy projekt MRPiPS?* https://www.gazetaprawna.pl/wiadomosci/kraj/artykuly/9394618,branzowe-centra-umiejetnosci-jakie-cele-zrealizuje-nowy-projekt-mrpip.html, 10.09.2024.
4. Kwiatkowski, S.M. (2023). *Edukacja ustawiczna w Branżowych Centrach Umiejętności, 4.* Edukacja Ustawiczna Dorosłych, p. 199.
5. Ministerstwo Edukacji i Nauki. *Branżowe Centra Umiejętności.* https://www.gov.pl/web/edukacja/branzowe-centra-umiejetnosci, 8.09.2024.
6. Uniwersytet Dolnośląski DSW, Urząd Marszałkowski Województwa Dolnośląskiego (2024). *Dolnośląska Strategia Rozwoju Edukacji Zawodowej*, https://www.dsw.edu.pl/badania-i-nauka/projekty-i-badania/dolnoslaska-strategia-rozwoju-edukacji-zawodowej, 10.09.2024.
7. Ustawa z dnia 30 sierpnia 2023 r. o zmianie ustawy - Prawo oświatowe oraz niektórych innych ustaw.

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INVESTMENT AS A KEY FACTOR IN THE DEVELOPMENT OF THE LUBUSKIE REGION ON THE 20TH ANNIVERSARY OF POLAND'S MEMBERSHIP IN THE EUROPEAN UNION

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Purpose: The aim of the publication is to present the changes and impact of investments on the development of the Lubuskie Voivodeship in the context of the 20th anniversary of Poland's membership in the EU. The aim of the work was also to present and describe key investments financed by the European Union in the Lubusz Voivodeship and their impact on the development of the region.
Design/methodology/approach: The method of statistical data analysis and source materials was used in the work. The work uses the analysis of statistical data from the Central Statistical Office and SWOT analysis.
Findings: the paper presents issues related to the analysis of data on public and private investments, assessment of the impact of investments on GDP growth, employment, productivity and the structure of the economy. Finally, a summary of the most important research results and the formulation of recommendations for further investment development of the voivodeship are included.
Originality/value: The paper is addressed to people interested in European funds, investments that have played a role in the transformation of the Lubuskie Voivodeship, and regional policy.
Keywords: labor market, regional development, region, Lubusz Voivodeship.
Category of the paper: research paper.

1. Introduction

The Lubuskie region, located in the western part of Poland, plays a strategic role in the country's regional development. The twentieth anniversary of Poland's membership in the European Union is an opportunity to analyze the impact of investments - both national and EU - on the economic, social and infrastructural development of the region. The article analyzes the key investment strategies implemented in Lubuskie Voivodeship from 2004-2024, their effects and future prospects. An analysis of secondary data, official reports and academic studies was used to present a coherent picture of the region's transformation. Established in

1999, Lubuskie Province has undergone a significant transformation since Poland joined the European Union in 2004. This accession opened up new financial and programmatic opportunities that contributed to the region's development. In the first years after accession, the province began to benefit from structural funds, which allowed the implementation of many key infrastructure projects, such as the modernization of roads and the development of public transportation.

Over the past two decades, the region has grown in importance, becoming an important economic and cultural center. In recent years, EU funds have supported the development of local businesses and innovation, which has contributed to an increase in employment and an improvement in the quality of life of residents However, despite the noticeable progress, the Lubuskie region faces many challenges, such as depopulation and inequalities in development between different areas of the region.

In a historical context, it is also worth noting that Lubuskie Province has had to deal with different models of management and development, which has influenced its current shape. As the region has adapted to changing conditions, more and more importance has been given to sustainable development strategies and integration with European standards

2. EU investments in Lubuskie province

Investments are counted among the more important factors of growth and socio-economic development in the region. Their absence is a barrier to regional development. There are feedback loops between the level and structure of investment and the rate of socioeconomic growth (Adamowicz, Lay, 2016, p. 20). Investment involves the use of financial resources with the intention of acquiring specific assets, as well as intangible fixed assets. In addition, these are assets acquired with the assumption of earning economic benefits as a result of growth from their value, as well as obtaining interest, dividends or many other sources, for example, from commercial transactions. Investments boil down to a financial commitment to a venture with the aim of obtaining benefits, which mainly consist of allocating financial resources to earn a certain profit in the future. In other words, investment is the outlay of economic funds on a venture to increase the value of the owner's assets. It is assumed that investment is an allocation of financial resources, peculiarized by such characteristics as benefit, outlay, and, in addition, risk and time, among others (Korzeniowska, Janiczak, 2024).

Lubuskie Voivodeship is located in central-western Poland. The location of this territorial unit near the border ensures economic cooperation with Germany. Currently, the main industries in the region are manufacturing to meet the needs of the automotive industry, woodworking and papermaking. There are also industries such as electronics, food processing, glass and building ceramics, mechanical engineering or biotechnology, transportation and logistics. Zielona Góra and Gorzów Wielkopolski are also important academic centers with significant scientific achievements (Polish Investment and Trade Agency, 2024).

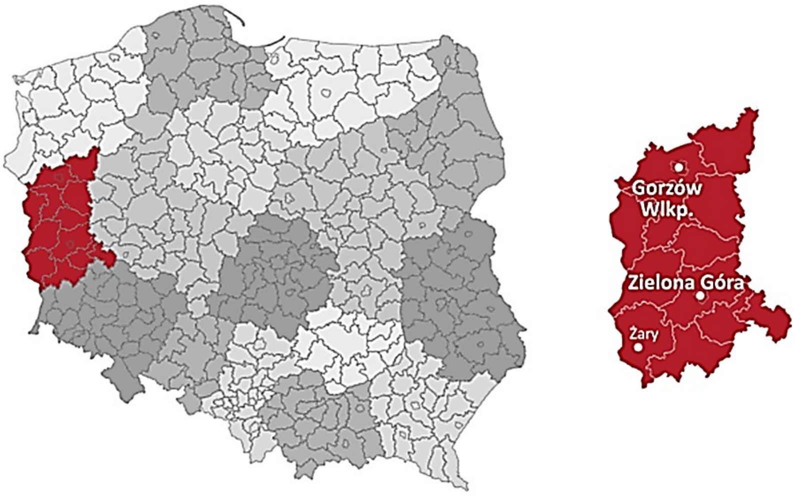

Figure 1. Location of Lubuskie Province.

Source: *Lubuskie*, www.paih.gov.pl/dlaczego_polska/regiony/wojewodztwa/lubuskie/, November 13, 2024.

Funds from the Union began to flow into the Lubuskie region even in the pre-accession period. As an example, the program of border cooperation between Poland and Germany (Phare) can be cited. The analyzed voivodeship became the main beneficiary of this program, while the efficiency of the people of the voivodeship in its implementation was praised as exemplary, if only in Warsaw, Berlin or Brussels. In 1994-2001, the region received more than €170 million from Phare. The money was used primarily to build roads and bypasses, sewage treatment plants or modernize border crossings. The funds were used to help organize bicycle paths and renovate cultural facilities (Polish Press Agency, 2024).

Above all, the aforementioned investments are reminded by information boards on which the EU flag has been placed. Their significance is extremely important, as they make many residents and politicians aware of the importance of the European Union's contribution and the benefits brought by Poland's membership in this community. As far as the Lubuskie region is concerned, the pre-accession funds allowed the development of valuable experience and foundations for skillfully reaching for greater financial resources, which began to appear after Poland's entry into the European Union (Polish Press Agency, 2024).

A large number of projects - both minor and major investments - have been carried out in Lubuskie Province with EU funds. Areas that have been supported with funds from the European Union are summarized in Table 1 below.

Table 1.
Areas that have been supported with funds from the European Union in Lubuskie Voivodeship.

Amount (PLN million)	Type of investment	Number of projects
758	research and innovation in the economy	236
644	transport infrastructure	40
558	low-carbon economy	167
542	health, social infrastructure	91
346	educational projects	264
325	environmental protection and cultural support	80
326	support for the regional labor market	231
294	social policy	262
199	development of the information society	40

Source: Own compilation based on: *20 Years of Poland in the European Union*, samorzad.pap.pl/sites/default/files/2024-04/raport-PAP_20-lat-w-UE.pdf, 15.11.2024.

Over the past 20 years, with the support of EU funds, almost the entire S3 highway in Lubuskie Province and the northern carriageway of the A8 highway have been built. This road, located next to the A2 highway, has the highest traffic in the area and is of economic and social importance. In terms of transport policy, the main objective of all projects was to increase the cohesion and integrity of the road network, as well as the accessibility of external communications in the sections through which the new roads pass. From a socio-economic point of view, this is mainly the creation of a safe highway network with visibly greater capacity and ease of movement, moving vehicles out of the city center and thus generally improving the living conditions of the province's residents (Polish Press Agency, 2024).

Currently, a trip between the two capitals of the Lubuskie region takes just over an hour, while before it was decided to build the S3 road it was necessary to spend a minimum of two hours on such a trip. The realization of this undeniably huge infrastructure project, which was the construction of the S3 expressway, was possible thanks to support precisely from EU funds. And it should be recalled that the implementation of the project had been sought for many years. The construction of the road from north to south made it possible to move transit traffic out of the centers of local cities. Passing through towns such as Gorzow Wielkopolski, Swiebodzin, Sulechow or Zielona Gora and many smaller towns was a major inconvenience for drivers. They also lost a lot of travel time. Such a solution was also very disadvantageous for the residents of the province. Well, transit traffic in cities generated traffic jams, a lot of noise and more air pollution. Cars were also a danger to pedestrians. The new road has definitely changed living conditions, and the social significance of this investment is enormous (Polish Press Agency, 2024).

Figure 2. A section of the S3 route.

Source: *20 years of Lubuskie in the European Union - what have we accomplished?* regionalna24.pl/article/20-lat-lubuskie-w-unii-n1242910, 14.11.2024.

EU money has also been used to establish a Space Technology Park. Electric buses, innovative streetcars have been purchased, and many bicycle routes have been built. EU financial support also includes scholarship programs, support for education and assistance for senior citizens. In addition, the Gorzow Philharmonic was built for PLN 136 million. Another PLN 132 million was allocated for the construction of the Maternal and Child Health Center in Zielona Gora, of which PLN 92 million was EU funding. The bridge in Milsk was erected for PLN 91 million, of which about PLN 67 million was EU funding. A Recreation and Sports Center in Zielona Gora with an indoor pool and sports hall was built for PLN 150 million. The post-industrial areas in Nowa Sol were revitalized. The industrial areas of the former "Odra" factory were rebuilt. Modernized tower building with adaptation to serve the function of social, economic and educational activation of both entrepreneurs and residents. A Wine Center was created in Zabor near Zielona, which is a reference to the wine traditions of the region. The Lubuskie Center of Competence and Shared Services, a server room for local hospitals and local governments, was built for PLN 70 million (Polish Press Agency, 2024).

Figure 3. Maternal and Child Health Center in Zielona Gora.

Source: *20 years of Lubuskie in the European Union - what have we accomplished?* regionalna24.pl/article/20-lat-lubuskie-w-unii-n1242910, 14.11.2024.

The European Union also plays an important role when it comes to environmental protection efforts. The organization wants to be an example for other countries in the world. For Poland, this is an opportunity for a systematic transition to a low-carbon economy. The transition from an energy point of view is a challenge for Poland, but nevertheless remains the direction in which the entire EU is currently moving (Buczkowska et al., 2024). As for the Lubuskie Voivodeship, within the scope of the current development strategy, among all the defined problems, such as an aging population and dynamic technological progress, the need to take measures to protect the environment and respond to climate change is mentioned (Lubuskie Voivodeship Assembly, 2021).

The province recognizes that climate change and the associated heavy rains, storms and other adverse weather events are dangerous to both human life and health, and damage to infrastructure is now a pressing problem. For this reason, it is very important to develop green and blue infrastructure, especially in urban areas. It should be noted that the improvement of the environment creates the need for extensive educational activities and support for biodiversity. In the course of the work on the new strategy, such challenges were pointed out as, among others, the necessity to modernize water and sewage infrastructure, especially in rural areas, take measures to counteract the negative consequences of climate change, develop pro-environmental infrastructure, implement drought or flood prevention measures, guarantee effective protection of biodiversity, undertake educational initiatives and the possibility of shaping pro-environmental attitudes among the local community, and appropriately manage rainwater (Sejmik Województwa Lubuskiego, 2021).

As a result, with regard to all programs that have been financed by the European Funds, more than PLN 22 billion has been transferred to Lubuskie Voivodeship. Some of this money is money that will be spent in the 2021-2027 perspective. The residents of the region under discussion, due to the geographic location of the province, are quite strongly affected by the transformation that has taken place in the 20 years since Poland joined the European Union. Lubuskie businesses have learned to compete in open European markets. It is also not unusual nowadays to study at university in Berlin, a city only 100 kilometers away from the Polish border (Buczkowska et al., 2024).

Figure 4. Center for Professional and Business Education in Gorzow Wielkopolski.

Source: *20 years of Lubuskie in the European Union - what have we accomplished?* regionalna24.pl/article/20-lat-lubuskie-w-unii-n1242910, 14.11.2024.

The money coming in from the EU contributes to the development not only of the province itself, but also of the people there. In addition, the region has far-reaching plans that are related to the implementation of the National Reconstruction Plan. A number of other investment tasks, estimated to be worth around PLN 107 million, are already awaiting their turn in implementation. Nearly half of these projects are to be allocated to the so-called green transformation. It includes such elements as smart mobility, raising the competitiveness of the local economy, health care or digital transformation, among others. It is virtually impossible to point to such an area or field in which the results of Poland's and the Lubuskie region's presence in the European Community will not be seen. The aforementioned transformations concern both infrastructural issues (construction of roads, city bypasses, sports, research, cultural or educational facilities), as well as many others, which were created precisely with the participation of EU funds. Many of the changes carried out in the region concern its residents themselves. They are the ones who have a sense of belonging to the European community and are learning to take full advantage of the benefits of EU membership (Buczkowska et al., 2024).

Poland in 2004 became a member of the group of modern countries that care about the development of civilization, democracy and all the basic values important to all open minds. Many of our achievements are financed in Europe. Thanks to them, the plans and creativity of the residents have turned into real investment. This has changed not only the reality around us, but also the way we think about the values of our membership in the EU. The use of EU funds for investment in Lubuskie was evaluated on the basis of a SWOT analysis. The results are presented in Table 2 below.

Table 2.
Use of EU funds for investment in Lubuskie voivodeship - SWOT analysis

STRENGTHS	WEAK POINTS
1. Lubuskie Voivodeship, like other regions of Poland, has access to significant funding from the European Union. 2. The region has a number of resources that can be used for investment, such as investment land, human resources and tourism potential. 3. There is a well-developed network of institutions supporting entrepreneurs and local governments in the process of obtaining and using EU funds. 4. The province already has experience in implementing EU projects, which translates into greater efficiency in using new financial instruments.	1. The complex system of procedures involved in obtaining and accounting for EU funds can be a barrier for many entities. 2. Some entrepreneurs and local governments may have limited knowledge of the possibilities and conditions for using EU funds. 3. The Lubuskie region competes for EU funds with other regions of Poland, which may make it difficult to obtain funding for all planned projects. 4. Lack of adequate competence in EU project management may lead to delays in investment implementation and increase the risk of irregularities.

Cont. table 2.

SEASONS	DANGER
1. EU funds can be used to modernize transportation, energy and telecommunications infrastructure, which will contribute to the region's investment attractiveness. 2. EU funds can be used to support the development of small and medium-sized enterprises, which will contribute to job creation and economic growth. 3. EU funds can be used for environmental and water and wastewater projects. 4. Investment in tourism infrastructure and promotion of the region can contribute to the development of this branch of the economy.	1. Changes in EU regional policy may affect the availability and conditions for the use of EU funds. 2. The economic downturn may limit investment opportunities. 3. Uncertainty about the amount of funds allocated to cohesion policy in the post-2027 financial perspective can make planning long-term investments difficult.

Source: Own study.

Based on the SWOT analysis, the following conclusions can be drawn. Lubuskie Voivodeship has significant potential for development, which can be strengthened through the effective use of EU funds. Despite the availability of funds, the region faces a number of challenges, such as bureaucracy, low awareness of beneficiaries and competition for funds. Success in the implementation of investments depends on a comprehensive approach, including not only the raising of funds, but also the effective management of projects and monitoring of their implementation.

Since Poland's accession to the EU, the Lubuskie region has been the beneficiary of numerous operational programs, such as the Operational Program Infrastructure and Environment (OPI&E), the Operational Program Human Capital (OPKL) and later the Operational Program Intelligent Development (OPIR). Of particular importance were investments in transportation infrastructure, environmental protection, and education and innovation.

Transportation and infrastructure

Between 2007 and 2013 and 2014-2020, the Lubuskie Province received significant funding for the modernization of its road and rail network. A key project was the modernization of the S3 route, which has become the main thoroughfare connecting northern and southern Poland, as well as the border bridges over the Oder River, enabling better integration with the German transport network (CSO, 2020).

Environmental protection

Investment in environmental protection in Lubuskie focused on the construction of modern wastewater treatment plants, modernization of water supply systems and protection of forest areas. These activities were co-financed by the Cohesion Fund and the European Regional Development Fund (EMFF). For example, a land restoration project along the Oder and Warta rivers allowed significant improvements in the ecological status of the rivers (EU Regional Policy, 2022).

Education and innovation

The Lubuskie region has benefited from investments in human capital development. The University of Zielona Góra and the Jakub z Paradyż Academy in Gorzów Wielkopolski have become beneficiaries of funds for the development of research and teaching infrastructure. The implementation of programs to support innovation in the small and medium-sized enterprise (SME) sector has increased the region's competitiveness, although innovation potential remains a challenge (Nowak, Kowalski, 2019).

The impact of investment on economic development firstly increases investment attractiveness in a region. EU funds have enabled the creation of special economic zones, such as the Lubuska Special Economic Zone, which have attracted domestic and foreign investment. As a result, the province has become a location for new industrial plants and logistics centers (Kowalski, 2023).

Another element of investment's impact on the region's development is the tourism sector. Thanks to investments in tourism infrastructure, including the restoration of castles, palaces and bicycle trails, Lubuskie Province has increased its tourist attractiveness. An example is the development of the "Lubuskie Wine and Honey Route", which is attracting a growing number of tourists from Poland and abroad (Lubuskie Marshal's Office, 2022).

Employment and the labor market is another element that influences investment in the region. EU investments have had a significant impact on job creation, especially in the construction and service sectors. Thanks to business support programs, unemployment, which was 25% at the beginning of Poland's EU membership, has been reduced to below 10% in 2020 (Eurostat, 2020).

Table 3.
Unemployment rate in Lubuskie province from 2004 to 2024

Year	Value	Unit of measure
2004	25,6	%
2005	23,0	%
2006	19,0	%
2007	14,0	%
2008	12,5	%
2009	16,2	%
2010	15,5	%
2011	15,4	%
2012	15,9	%
2013	15,7	%
2014	12,5	%
2015	10,5	%
2016	8,6	%
2017	6,5	%
2018	5,8	%
2019	4,9	%
2020	6,3	%
2021	5,1	%
2022	4,4	%
2023	4,3	%

Source: own compilation based on https://bdl.stat.gov.pl/, 17.11.2024.

Cohesion policy funds used in Lubuskie Voivodeship in 2004-2021

By the end of 2021, a total of PLN 16,377.7 million of cohesion policy funds were used in Lubuskie Voivodeship. Taking into account the cohesion policy funds per capita and in relation to GDP, the total in Lubuskie Voivodeship in 2004- 2021 amounted to PLN 16,619 and 3.0% of GDP, respectively. The value of funds per capita was higher than the national average (PLN 16,406 per capita). The ratio to GDP was higher than the national average (2.3% of GDP). Investments financed by EU funds constitute a significant but non-dominant part of public investment in Lubuskie - in 2021 their share was 43.5% of total public investment in the region (with the national average of 43.7%).

The impact of cohesion policy in the Lubuskie region from 2004 to 2021

In 2021. GDP per capita (in PPS) in Lubuskie was 62% of the EU-27 average. In the period 2004-2021, the distance between Lubuskie and the EU-27 as measured by GDP per capita (in PPS) decreased by 16 percentage points, of which about 22.2% (3.5 percentage points) was the result of the implementation of the cohesion policy. Thus, thanks to, among other things, EU funds, the gap in the level of economic development separating Lubuskie from the EU-27 average is gradually narrowing. The pace of the convergence process depends mainly on the region's economic growth rate. In the period 2004-202112, Lubuskie developed at an average rate of 3.6% (in constant prices), of which about 11.0% (0.39 p.p.) was the effect of investments co-financed by EU funds.

EU-funded infrastructure outlays and direct support for businesses are contributing to a significant recovery in investment activity. It is estimated that in 2021 the investment rate (the ratio of gross fixed capital formation to GDP) was 3.0 p.p. higher than in the scenario assuming no EU funds. At the time of its entry into the EU, Lubuskie Voivodeship had an employment rate of 52.8% for people aged 20-64, while in 2021 the value of this indicator was already 73.2%. About 14.3% (i.e. 2.9 p.p.) of the growth recorded during this period was the result of the impact of EU funds. The positive effect of European cohesion policy can be seen in the creation of new jobs, improvement of workers' skills and their better adaptation to changing conditions in the labor market. As of 2021, the number of jobs created in the Lubuskie Voivodeship as a result of investments co-financed by the EU budget is estimated at about 17,600. The positive impact of EU funds is also visible in the reduction of the unemployment rate. The unemployment rate of people aged 15+ in Lubuskie Voivodeship in the year of accession to the EU (2004) was as high as 25.3%, and in 2021 only 2.1%. To some extent, EU funds have contributed to the reduction in the unemployment rate - it is estimated that investments co-financed under the cohesion policy have reduced the region's unemployment rate by 0.9 percentage points in 2021 and by 1.3 percentage points on average in the 2004-2021 period (Ministry of Funds and Regional Policy, 2023).

3. Conclusions

Lubuskie Voivodeship, which has undergone significant transformation since Poland joined the European Union in 2004, is now facing many challenges and opportunities. Analyzing the achievements to date, it can be seen that investments, especially those supported by EU funds, have played a key role in the development of the region. Modernization of infrastructure, support for local businesses, and innovative approaches to education have helped to improve the quality of life of residents and increase the region's competitiveness compared to other parts of Poland (Nowak, 2021).

However, despite these successes, Lubuskie Province still faces significant challenges. Inequalities in development between different areas of the region, depopulation and the need to adapt to changing market conditions are just some of the problems that require effective solutions (Zielinski, 2022). Therefore, it is crucial to continue to invest in infrastructure development, innovation and sustainable development in order to maintain a positive growth trend (Kowalski, 2020).

In terms of the future, Lubuskie Province should focus on strategic actions that take into account both local needs and global challenges, such as climate change and technology development. Integration with European Union policies and active participation in EU programs can bring additional benefits and financial support for the implementation of key projects (Wisniewska, 2023).

In conclusion, Lubuskie has the potential to become a dynamic and sustainable region, but this requires coordinated action by local authorities, communities and the private sector. Continued investment in infrastructure, education, innovation and sustainable development will be key to ensuring sustainable

References

1. *20 Years of Poland in the European Union.* samorzad.pap.pl/sites/default/files/2024-04/raport-PAP_20-lat-w-UE.pdf, 13.11.2024.
2. Adamowicz. M., Kładź. M. (2016). The role of investments in the socio-economic development of the city of Biała Podlaska. *Economic and Regional Studies. Vol. 9, No. 4,* pp. 19-38.
3. Buczkowska, E. et al. *The European Green Deal in Questions and Answers*, www.pois.gov.pl/media/98573/zielony_lad_broszura_wersja_dostepna.pdf, 13.11.2024.
4. Central Statistical Office, https://bdl.stat.gov.pl/bdl/dane/podgrup/tablica, November 16, 2024.

5. Korzeniowska, A., Janiczak, M. *Investments*, mfiles.pl/en/index.php/Investments, 13.11.2024.
6. Ministry of Funds and Regional Policy (2023). *Impact of European funds on the socio-economic development of Poland and regions in 2004-2021,* 17.11.2024.
7. Polish Investment and Trade Agency. *Lubuskie*, www.paih.gov.pl/dlaczego_polska/regiony/wojewodztwa/lubuskie/, November 13, 2024.
8. Sejmik Województwa Lubuskiego. *Strategia rozwoju województwa lubuskiego 2030*, bip.lubuskie.pl/system/obj/51530_SRWL_2030__czysty_OST_19.02.2021.pdf, 13.11.2024.
9. Tuziak, A. (2022). Regional development and the paradigm of the new regionalism. *Social Inequality and Economic Growth, No. 70(2)*, pp. 55-69.

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ECONOMIC DEVELOPMENT OF REGIONS IN POLAND IN THE FACE OF THE RISK OF CHANGES IN THE MACROECONOMIC ENVIRONMENT

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Purpose: The purpose of the study was to analyse and assess the current conditions and opportunities for economic development in the face of changes in the level of risk of secondary impact of crisis phenomena on regional development in Poland.
Design/methodology/approach: The work included theoretical and empirical research on the conditions and possibilities of regional development in the face of economic changes and increased risk of negative effects of post-crisis phenomena. The research used statistical methods of aggregating data within time series and presenting results, including descriptive statistics methods.
Findings: Research results indicate that negative trends in the economy, particularly in production and consumption, have been consolidated in 2022-2024. This has had an impact on economic activity, which has been limited, but also on the prospects for further development in the regions. The general risk of doing business in Poland has increased.
Research limitations/implications: Dynamic socio-economic changes meant that the scope of research had to be limited to selected categories and factors. In some areas, there were difficulties with access to current data sources.
Practical implications: The directions of economic changes have revealed the occurrence of development difficulties in the regions and limited possibilities of returning to the path of sustainable development in a short time. The scope of negative effects resulting from the impact of crisis factors has been expanded.
Social implications: Economic changes were associated with specific social consequences. This applies in particular to the labor market and mass layoffs, but also to the public finance sector. Given the growing budget deficit, difficulties arose in the financing of social tasks.
Originality/value: The article addresses the research problem related to the prolongation of negative crisis phenomena. This poses a threat to development in the medium term. The research results revealed a slowdown in economic activity and an increase in the risk of conducting business activity, which may have long-term effects.
Keywords: Finance, economic development, regional development, investment risk, macroeconomic factors.
Category of the paper: Research paper.

1. Introduction

The economic transformation in Poland and in the global economy indicates a broad context of changes, conditioned by numerous factors with a diverse background and scope of impact. This leads to the destabilization of economic and social connections, which may concern an extended horizon of impact. In 2024, we continue to observe the impact of crisis phenomena, including geopolitical factors, escalation of armed conflicts (Ukraine, Middle East) and the shifting of economies of states to war tracks. This is not without impact on the economic and social situation, disruptions of development processes continue with varying intensity, although forecasts from the beginning of 2024 indicated realistic scenarios of rapid development. The research topic is still relevant in view of the directions of changes in the macroeconomic environment and the ongoing socio-economic changes of a quantitative and qualitative nature and a wide scope of impact.

The occurrence of secondary crisis phenomena in the economy has been noted, which have an impact on the economic slowdown and cause difficulties in returning to the path of sustainable development. The scope of the conducted research refers to economic changes caused by crisis phenomena and is associated with determining losses and expected directions of changes in the context of economic development of regions in the future. The undertaken research was an attempt to monitor macroeconomic changes in the conditions of cumulative impact of diverse crisis phenomena and their possible medium- and long-term effects. Empirical research and forecasts of international financial institutions, banks and independent expert communities indicate the possibility of extending and flattening the effects of earlier crisis phenomena from the years 2000-2023. There is a risk of perpetuation of changes on the demand side, production and fluctuations in the level of prices of goods and services and investment works. Therefore, the long-term effects caused in the public finance sector, including in particular the budget deficit and deepening public debt, cannot be omitted (Jarosiński, 2023).

Public debt is associated with the need to pursue long-term savings policy and systemic settlement of liabilities. As for the budget deficit, it can cause difficulties in balancing transactions on the current account of the balance of payments. Negative results are visible, some European Union member states, in accordance with the applicable regulations, have been covered by the excessive budget deficit procedure with all the consequences resulting from it: Belgium, France, Italy, Hungary, Malta, Poland and Slovakia (PAP, 2024).

The aim of the study was to conduct an analysis and assessment of the current conditions and possibilities of further economic development in the face of mitigating the impact of crisis phenomena and weakening the direct impact on the development of regions in Poland. At the regional level, there are clear differences in economic development in Poland. This state has historical conditions and is related to spatial development, as well as natural conditions, which contribute to stimulating economic development to a varying extent. Crisis phenomena can overlap with the above-mentioned processes and generate changes in the mechanisms of socio-economic development. Hence the need for research on the formation of real and hypothetical development trends and assessment of directions that could be maintained in conditions of stable economic development and in the face of observed post-crisis changes.

2. Literature review and methodology of empirical research

Socio-economic changes in regions have always shown differences in the level of development. Differences resulted both in the past and at present from specific conditions, most often classified on the side of public administration and on the side of economic entities operating in a given area of the region. The distinction is of fundamental importance when it comes to stimulating development processes in the long term. Public sector entities and organizational units operating within the competences and powers of public administration units and financed from public funds through the budget have a slightly different range of goals and preferences in the conditions of a market economy, which result from the need to implement public tasks identified in the strategic planning process (Edwards, 2007). In private enterprises we have a different situation, they are responsible for the implementation of specific development tasks in accordance with the adopted set of goals and strategic arrangements. The market dimension of activity refers to a wide range of instruments available to entrepreneurs within the framework of a market economy. Here we are dealing with a set of goals, where financial surplus takes up only one of the important places. In the event of crisis phenomena, the balance between support from public sector organizational units and the actual economic processes implemented by enterprises may be disrupted. As a result, changes in the economic development of the region may occur.

The economic development in regions may be significantly influenced by a friendly environment for the development of entrepreneurship and opportunities to support companies. This should be done in an unwavering manner, while maintaining the principle of sustainable development. Crisis phenomena limit this balance and lead to unforeseen consequences of the future. In the long term, the mutual connections between the activities of public administration and the public investments undertaken by this administration and the activity of private entities are important, which can create a specific economic architecture of the region (Strojny, 2013).

From a theoretical perspective, reference can be made to considerable achievements relating to both the problems of economic development from a macroeconomic perspective as well as economic development from a regional perspective. Studies indicate the evolutionary nature of changes in terms of views on shaping the directions of regional development. In economic development, the recognition of the links between regional development and location factors of industry and related sectors, initiated by A. Weber, generally dominated. It is also necessary to point out the possibilities of implementing transport links, distances in transport, infrastructure development, as well as demographic factors. In A. Marshall's approach, the scope of activity, specialization and possibilities of obtaining economies of scale in production and possibilities resulting from the expansion of sales markets and the development of foreign trade were not without significance. In the 1930s, an important turn took place in terms of shaping the theory of regional development, when W. Christaller proposed a theory based on the identification of central units, hierarchizing places in space according to their rank and functions (Antonescu, 2014).

The author's intention was not to present a systematic theory of regional and local development, but only to draw attention to an extensive and at the same time well-ordered set of concepts and theoretical achievements. It is assumed that the evolution of views on the theoretical premises of regional development has not ended. In retrospect, one can indicate important periods in the formation of the theory of economic development with elements of regional development (Antonescu, 2014). It is necessary to mention the creators of classical economics, supporters of the dominance of industry in the development process: A. Smith and D. Ricardo and their successors, J.H. von Thünen (location of agricultural activity), A. Weber (location of industry), T. Palandek (monopolistic competition), W. Christaller (location of services), A. Lösch (market identified as a key location factor), G. Myrdal (the concept of circular and cumulative causality), J.R. Boudeville, W. Isard, A.O. Hirschman, J. Paelinck (polarized economic growth), M. Greenhut, P. Krugman (new economic geography and spatial general equilibrium model) and others (Gałązka, 2017).

Within the framework of the conducted research on shaping the economic development of regions and their differentiation, three research trends should be indicated. Theories based on the assumption of endogenous growth should be indicated, where a large component is investment in human capital, investment in research and development activities, infrastructure development and the use of internal development factors. In this group of factors, an important role is played by public institutions, including the state and local government units. The new economic geography should be indicated, according to which the main factors leading to the concentration of economic activity in space, and consequently to differentiation in the level of development, are market integration of production, striving for economies of scale, optimization of transport costs, as well as easy access to specialized labor resources. The institutional economy should also be indicated, where public institutions have a significant impact on development processes and the use of potentials and the degree of use of available resources and, as a result, the level of economic development in the region depends on their capabilities (Sokołowska-Woźniak, 2010).

According to the growth pole theory by F. Perroux, the occurrence of regional differences in development is justified. It is in selected places constituting growth centers that the concentration of economic and innovative processes is to occur (Piętak, 2014). Subsequently, the effects of growth may spread. The diffusion of economic benefits occurs as a result of phenomena occurring in central centers in relation to the surrounding areas. This also applies to the regional approach, where the impact of such centers on peripheral areas becomes a natural process of change. The course of economic processes is uneven in terms of spatial location. According to the concept of A. Hirschman, development shows features of polarization. It is observed both in the regional and industry perspective. This results from location factors, mainly industry, which as a result does not provide the opportunity for proportional and even distribution of economic activity in the regional system. Mainly the increase in the number of people in urban centres and the processes of innovation and concentration of economic activity may lead in the further course to the transfer of effects generated in growth centres and lead to the improvement of the standard of living of inhabitants in peripheral areas. Differences in regional development in the indicator approach are therefore an immanent feature of development processes and will probably take place in such a form in the long term (Hirschman, 1967). Public investments may be of great importance, as they contribute to positive economic effects. Investments in the public sector would lead to the generation of multiplier effects, which have an impact on the general acceleration of the pace of economic development in the regions. The context of the regional economy is broad, referring to both strictly economic issues, but also encompassing a wide range of interdisciplinary issues, including social ones (Nijkamp, 1984).

Crisis phenomena may temporarily affect the course of development processes in the regional and local systems, but do not introduce significant changes in the short term in terms of differences in the level of economic development of regions. The occurrence of diverse macroeconomic conditions in the national system, as well as those resulting from conditions resulting from globalization processes, may lead to deepening development disparities at the regional level. In addition to changes in regional relations, there may be deepening differences in subregional relations, as well as in other territorial systems with different levels of productivity, between cities of different sizes and rural areas (Bachtler, Méndez, Vironen, 2014). The risk of the impact of crisis factors may necessitate the development of changes in the assumptions of regional policy and may have financial consequences, both in terms of the possibilities of external support for regional development, as well as in terms of the use of endogenous resources in the regions (Rubacha, 2014).

In economic practice, the scope and strength of the impact of diverse macroeconomic factors can be determined by defining the level of risk associated with the difficulties in achieving the planned results of development activities in the private sector, and despite the differences, in the public sector. The key problem is the future directions of socio-economic development in the system of countries and regions in the face of the risk of secondary effects and negative multiplier effects. This risk is so large that already in the short term, i.e. taking into account the years 2023 and 2024, negative trends in the economy have been noted (Rich, 1997). In Poland, a decline in the sales of industrial production, a decline in interest in consumer spending, and a reduction in business investments have been noted. There was a shift in the primary effects of the crisis phenomena in the regional system. The reduction in economic activity was associated with the administrative impact of public authorities and the temporary exclusion of industries and sectors from activity, but it was also associated with the disruption of the relationship between demand and supply in many markets.

In macroeconomic terms, the need to develop and implement coordinated stabilization measures to eliminate negative economic and social phenomena arose already in 2020. The measures were addressed to the corporate sector in the regional system, as well as more broadly to diverse social groups. The solutions used were incidental in nature. They concerned the financing of protective packages in the field of health, economy, public finances, as well as in the field of social assistance (Barrett et al., 2021). The economic crisis caused the need to make administrative decisions that led to clear disruptions in the functioning of enterprises and the state of public finances. The pandemic was the primary cause of implementing corrections in the rules of functioning of the global economy, including in particular reducing the risk associated with the disruption of supply chains in the economic system. Difficulties in supply chains, as well as aversion to consumption on the part of buyers, became one of the main reasons for the extension of economic difficulties and the risk of extension for the following years (Marvasi, 2022). Changes in the level of inflation can be considered, on the one hand, as a result of economic changes, but it can also be assumed that inflation has become the cause of other complex economic phenomena. In such a situation, it became necessary to launch mechanisms to limit the level of expenditures by changing the base interest rates (Ciżkowicz, 2010) and could not remain without impact on the economic situation of enterprises, including development investments (Easterly, Fischer, 2001).

The economic situation therefore leads to questions regarding the directions of changes in the economic situation in the future, nationally and regionally. The year 2024 revealed the occurrence of unfavourable trends in enterprises, which can be easily indicated in a number of reports on the state of the economy and the probable directions of its development (GUS, 2024). In addition to macroeconomic conditions, it has become necessary to recognise risk factors occurring in the investment environment, such as threats related to the instability of economic processes (Bock, Trück, 2011).

Regional development depends on identified endogenous factors that determine development potentials that can be used. In an open economy, the process of transferring goods, services and production factors is facilitated by the development of transport and means of communication. This means that it is possible to launch new, previously underutilized distribution channels for the free movement of material and non-material resources. This process can be considered natural, consistent with the possibilities and their use. Crisis phenomena can introduce new and unpredictable variables into the system of connections, which can lead to significant negative changes in the global economic system and affect the shape of the regional economy. The increase in the level of economic risk leads to the need for research on the impact of various factors on the course of development processes in the future.

The research process used the method of critical analysis of theoretical literature, qualitative research methods and statistical methods in the field of quantitative research, the method of trend function analysis based on empirical source data and data analysis to extrapolate the trend function. Tools from the field of descriptive statistics were also used. The research used available data sources within the resources of international institutions (European Central Bank, OECD, World Bank, International Monetary Fund, Ameco, Eurostat), national statistical resources, central banks and non-governmental organizations.

3. Results of empirical research and discussion

A group of macroeconomic measures has been distinguished in the literature that can illustrate changes in the socio-economic situation (GUS, 2024, 2024b). The research took into account measures that may have the relatively greatest impact on the course of economic processes and affect current development processes, and may also shape processes in the future. The study took into account the following macroeconomic measures: indicators of changes in the prices of goods and services (inflation), basic interest rates in Poland and interest rates in selected countries, changes in the value of gross domestic product (GDP), registered unemployment, public debt in total and in relation to GDP, deficit of the general government sector in relation to GDP, investment outlays in the economy and in the private sector in the voivodship system, total investment volume, investments in the private sector and the share of private investments in total investments. The research on regional development differences took into account: registered unemployment rate in the district system, number of small and medium-sized enterprises (SMEs) in the district system, number of enterprises per 10 thousand inhabitants. (SMEs) in total by district.

Table 1.
Selected macroeconomic indicators in Poland in 2019-2023 (in %)

Specification	2019	2020	2021	2022	2023
Total industrial production sold, previous year = 100%	105.1	98.1	114.7	109.1	98.1
Industrial processing previous year = 100% (in %)	105.4	97.9	114.0	108.9	98.2
Consumer durable goods previous year = 100% (in %)	103.1	104.5	122.2	98.4	
Mining and quarrying previous year = 100% (in %)	101.4	94.5	101.6	111.5	95.7
Total construction and assembly production sales, previous year = 100% (in %)	102.1	95.6	105.8	109.3	104.1
Debt of the government and local government sector (in PLN million), GDP, constant prices	1046153	1337044	1410966	1512778	1691216
Public debt in relation to GDP (in %)	45.2	56.6	53.0	48.8	49.7
Unemployment registered (in %)	5,2	6,3	5,4	5,2	5,1

Cont. table 1.

Total internal expenditure on research and development activities, current prices (in PLN million), including by financing source:	30285	32402	37676	44702	53116
Government sector (in %)	38.8	39.0	37.4	33.5	31.9
Enterprise sector (in %)	50.7	50.6	50.9	54.8	54.8
Higher education sector (in %)	3.0	2.7	3.1	3.3	3.5
Private non-commercial institutions sector (in %)	0.5	0.5	0.4	0.3	0.3
Internal expenditure on research and development in relation to gross domestic product (GDP), (in %)	1.32	1.39	1.43	1.44	1.56
Internal expenditure on research and development per capita (in PLN)	789	849	992	1182	1409
Current account balance of payments, (in EUR million)	-1424	12612	-7781	-14872	13485
Total retail sales of goods constant prices, (in %)	104.7	96.3	106.9	102.6	95.5

Source: own study based on Macroeconomic Data Bank, https://bdm.stat.gov.pl, 15.11.2024.

According to the data presented in Table 1, in the years 2019-2023 there were significant changes in the basic macroeconomic indicators in Poland. In particular, attention should be paid to the change in the level of sold industrial production in general, changes in the level of production of consumer goods and construction and assembly production. It is also worth pointing out the change in the level of debt of government and local government institutions, which increased significantly in the years 2019-2023. The increase in debt in this period amounted to 61.2%. As a result, the public debt ratio expressed in relation to GDP also changed. However, here we were dealing with multidirectional changes in the value of the indicator. This was related to the nominal increase in GDP caused by inflation. It is also worth paying attention to unemployment, which was also relatively low, subject to changes, but the disclosed level of registered unemployment in comparison with the results obtained in other countries of the world should be considered satisfactory.

Despite the crisis phenomena in 2019-2023, there was an increase in nominal expenditure on research and development activities. This is important because the main trend of these changes took place in the enterprise sector, followed by the activities of the government sector, the remaining types of activity fell on the local government sector and diversified organizational units of the public sector. It is also worth noting the increase in the value of expenditure on research and development activities per capita. In the period under review, nominal expenditure almost doubled.

An unfavorable phenomenon was the low dynamics of retail sales of goods and services at constant prices. In 2020, there was a decrease in sales compared to 2019. The situation repeated itself in 2023, when a decrease was also recorded compared to the previous year. As it results from the first market information, the situation did not improve in 2024 either. The decrease in consumption, combined with other factors, resulted in a reduction in production, as well as the definitive withdrawal of some entrepreneurs from conducting business in Poland through the liquidation of enterprises and the transfer of production to other countries of the world. This mainly concerns the industrial processing industry, which, due to its sensitivity, was the first to feel the negative effects of the decrease in consumption. Inflation had a significant impact on the economic situation in the regions in Poland.

Symptoms of a possible increase in the prices of goods and services appeared in 2020. It was already known then that the monetary policy pursued, as well as administrative restrictions on the functioning of the market, would have to lead to an increase in the prices of goods and services. An unfavorable situation occurred in 2022, with inflation at 14.4%. In the following years, inflation decreased slightly. In 2023, the consumer price index was at 11.4%, while in 2024, it was at 5.0% over 10 months, with a decreasing trend in November 2024. The first half of 2024 was the end of a significant decrease in the inflation rate compared to 2023. The third quarter saw an increase in the inflation rate year-on-year. This was therefore a temporary improvement on the market. The inflation rate began to increase again in mid-2024, which may have negative effects on the directions of economic changes in 2025-2026 (NBP, 2024).

In terms of gross domestic product, Poland has experienced significant changes in the value of gross domestic product. In the years 2015-2023, they occurred in a balanced manner with a stable price level. The differences between individual years in terms of the dynamics of changes were relatively small and did not play a major role in shaping public expenditure, especially on development investments. They also did not have a significant impact on the private sector, where a fairly rapid development of enterprises and new investments were noted. Figure 1 presents the dynamics of changes in gross domestic product in the years 2015-2023 and presents a prospective analysis of changes in the level of gross domestic product in the years 2024-2028.

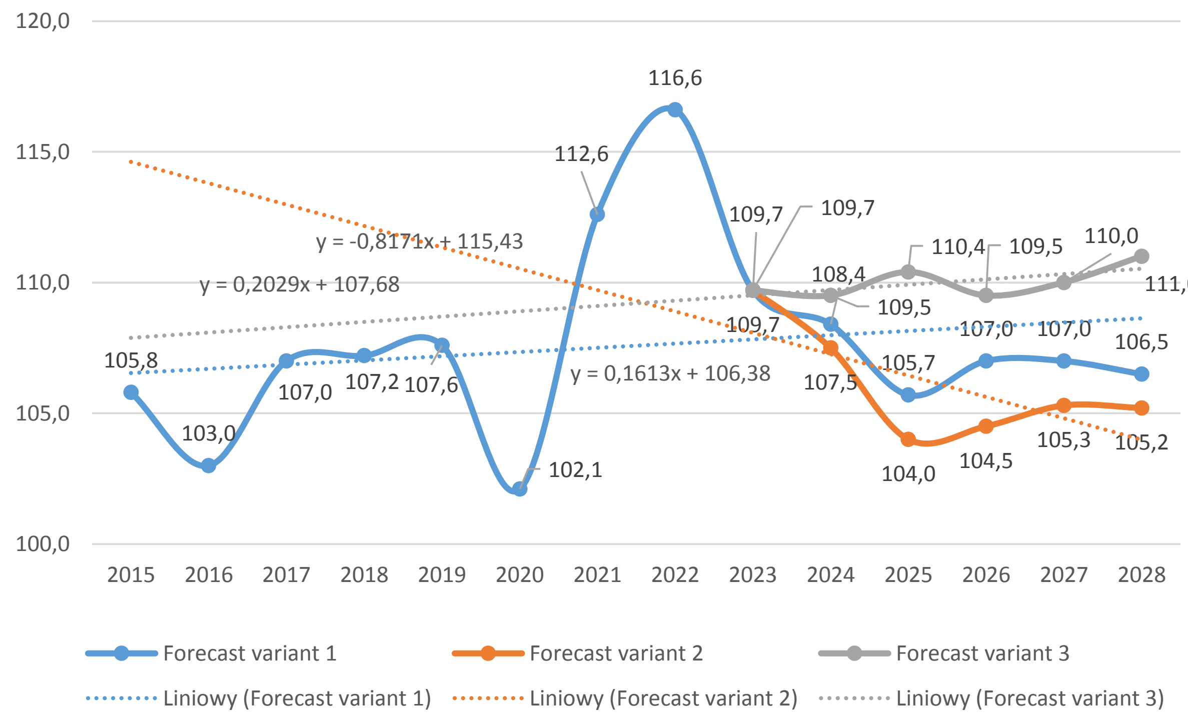

Figure 1. Dynamics of GDP change in 2015-2023 and projection for 2024-2028 in Poland, current prices (in %).

Source: own study based on Macroeconomic Data Bank, https://bdm.stat.gov.pl, 15.11.2024.

The situation changed significantly in 2020, in nominal terms there was a significant decline in gross domestic product, which was associated with the previously mentioned administrative solutions, limiting production and services and, as a result, ultimately resulted in a permanent decrease in the volume of GDP. The years 2021-2023 were characterized by varied dynamics of changes in gross domestic product. In Poland, particularly high growth was recorded in 2021, when the total GDP value increased nominally by 12.6% compared to 2020. A jump in the value of GDP by 16.6% in nominal terms was also recorded in 2022 compared to 2021. One of the reasons was excessive inflation, which caused an inflationary increase in the value of GDP.

In the following years, further increases in gross domestic product were recorded in nominal terms, and these increases were also associated with price increases. It is also worth noting the expected directions of changes in the gross domestic product in nominal terms until 2028. There are 3 scenarios that may take place depending on the development of the socio-economic situation and the accompanying values of macroeconomic indicators. Therefore, we have scenario 1, optimistic, where a fairly high year-on-year growth in gross domestic product should be expected, and scenario 2, balanced, can also be indicated, which is characterized by slightly lower indicators, but generally also with a relatively high level of growth. Variant number 3, pessimistic, can also be indicated, where in nominal terms the GDP growth rate may reach lower values. The further course of economic events depends on economic stability in national terms, but also on the general situation in the international system. In the second half of 2023 and in 2024, a number of negative phenomena were recorded in the enterprise sector, as well as in the field of individual consumption. One of the important factors that indicate unfavorable economic changes may be the reduction of production, as well as group layoffs and liquidation of enterprises and transfer of production outside Poland.

Real GDP changes in Poland should be assessed slightly differently using constant prices, i.e. after eliminating the impact of inflation on the result in individual years of the study. Figure 2 presents changes in GDP dynamics year-on-year in the years 2015-2028. This part of the study uses actual data for the years 2015-2023, as well as forecast values for the years 2024-2028.

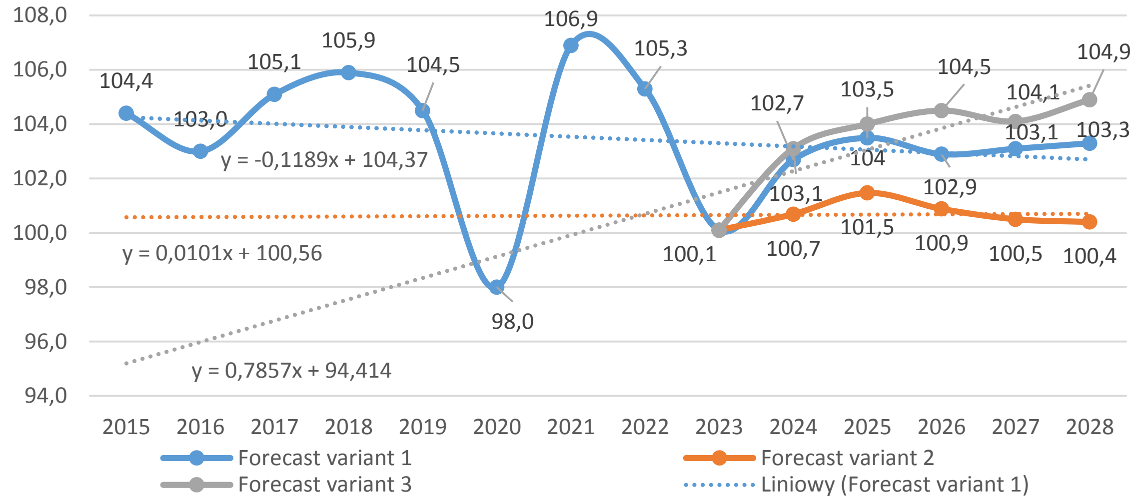

Figure 2. Dynamics of GDP changes in the years 2015-2023 and projection for the years 2024-2028 in Poland (constant prices, in %).

Source: own study based on Macroeconomic Data Bank, https://bdm.stat.gov.pl, 15.11.2024.

After eliminating price volatility, the dynamics of changes in the gross domestic product were characterized by a varied level of indicators, with the largest changes occurring between 2019 and 2020. As shown in Figure 2, in 2020, after eliminating the impact of inflation, the real gross domestic product was 2.0% lower than in the previous year. In the following year, 2021, a clear increase of over 6 percent in the dynamics indicator was noted, which was typical for 2021. Due to the impact of macroeconomic factors stabilizing the economy in the following years, i.e. in 2022 and 2023, the dynamics of changes in the gross domestic product in Poland was decreasing. Thus, in 2023, this indicator amounted to 100.1%, while for 2024 the final values are not yet known, but this increase may be at the level of 0.50%. The gross domestic product dynamics indicator forecasted in January for 2024 seems not to be achieved. The state of the economy at the end of 2024 is characterized by a slowdown, which will not remain without impact on the final result of the GDP. As for the possible development scenario after 2024, especially in 2025, the dynamics of changes in the gross domestic product, depending on the adopted assumptions and the macroeconomic situation, may range from 0.5% to 3.1%. This will depend on the combination of circumstances in terms of the internal situation, including changes in the prices of electricity and other energy carriers. These factors have a strong impact on the Polish economy and will probably have an impact in the future. The presented 3 possible scenarios for the further development of the gross domestic product in Poland are an open question (Macroeconomic Data Bank, 2024).

It should be expected that in the near future, stabilization in the national and international system will facilitate Poland's return to the path of sustainable development. Considering both the development of the economic situation in the past and the changes that may take place in the future, it is worth citing the results of the study on registered unemployment in the years 2019-2024. In the period under review, the unemployment rate was relatively low, ranging from 6.3% in 2020 to 5.1% in 2023. A slightly different situation occurred in the European Union, where the unemployment rate averaged a stable level of 6-7%. The relatively worst situation occurred in Spain, where in 2019-2024 the unemployment rate periodically reached 15.5%, while in 2023 it is estimated at 12.1% (Ameco, 2024).

In terms of the unemployment rate, disparities are closely linked to the overall macroeconomic situation in individual countries and the economic policy pursued by the authorities of these countries. Generally, it should be stated that the differences in unemployment levels are a secondary effect of the economic situation, which has not yet stabilized in terms of the effects caused by the Covid-19 pandemic. According to experts and the European Commission, 2024 was to be characterized by a significant improvement in the economic situation, including changes in the unemployment level, but as data for 11 months of 2024 show, the actual situation will differ slightly from the expectations that occurred at the beginning of 2024. During the research, the formation of interest rates in Poland and in selected countries of the world in 2022-2024 was identified. It is easy to notice that in the period from April 2020 to September 2022, a systematic increase in interest rates was observed in Poland. This was a reaction to changes related to the increase in inflation and the need to limit its negative impact on the economy and protect the personal income of the population.

The years preceding the emergence of the Covid-19 pandemic were characterized by a stable interest rate policy in Poland. Thus, in the first months of 2020, the base rate was at an exceptionally low level of 0.1%. Since May 2020, a rapid increase in base interest rates has been recorded. They reached their highest value in September 2022. In the following months, a slight decrease was recorded, to the level of 5.75 and 5.25%, respectively. This level was maintained until the end of November 2024. This means that we are dealing with a persistent hard money policy, which is directly related to counteracting a renewed increase in inflation, which at the end of October 2024, year-on-year, reached 5.0% in Poland, which, however, is not without impact on the economic situation in the enterprise sector. For prudential reasons, the Monetary Policy Council has been maintaining a stable level of interest rates since October 2023, which, combined with the risk of rising inflation, is intended to stabilize the market and curb the excessive money supply (NBP, 2024).

The countries studied adopted diverse monetary policies and implemented interest rate scenarios depending on the economic goals set. The relatively fastest reaction took place in Poland. Eurozone countries pursued a slightly different policy, initially trying to pursue a policy of relatively low interest rates within the European Central Bank, which has been consistently maintained to this day. In the United States, the Fed's response was slightly delayed, but in 2022, systematic increases in key interest rates began, which reached their peak at the end of 2023 and lasted until the end of the first quarter of 2024. After that date, slow declines in key interest rates were recorded in line with market expectations. A special case is the central bank in Japan, which maintained key interest rates at a low level with negative values throughout the pandemic. This changed in March 2024, when a slight increase in key interest rates was recorded. The policy of basic interest rates of the central banks of individual countries depended on the internal situation, as well as on the economic potential and the assessment of the possibilities of further economic development. The differences that occurred should therefore be considered a natural phenomenon that was supposed to contribute to the stabilization of the economies of the countries (Ameco, 2024). An illustration of economic changes in the regional system, divided into total investments and private investments, is presented in Table 2.

Table 2.
Indicators of changes in investment outlays by regions in 2019-2022 (current prices, in %)

Specification	**Total investment**			**Private investment**		
	2020 previous year = 100	2021 previous year = 100	2022 previous year = 100	2020 previous year = 100	2021 previous year = 100	2022 previous year = 100
Poland, provinces total	-3.5	10.4	17.1	-7.2	12.5	19.9
Dolnośląskie	-10.3	0.8	10.8	-11.4	-3.8	9.7
Kujawsko-pomorskie	7.2	10.4	18.8	10.3	13.2	17.4
Lubelskie	0.4	1.0	10.3	-1.7	7.8	32.3
Lubuskie	-5.5	33.3	9.1	-18.9	50.8	8.6
Łódzkie	-6.4	8.1	12.6	-14.6	9.4	10.5
Małopolskie	-0.5	12.0	17.3	-1.8	9.1	21.6
Mazowieckie	-3.9	16.3	20.0	-3.9	20.3	19.5
Opolskie	-14.7	8.5	19.8	-23	12.1	24.9
Podkarpackie	-8.2	12.5	3.1	-20.3	7.9	27.8
Podlaskie	0.5	14.8	18.3	-8.0	10.9	12.7
Pomorskie	1.5	14.5	12.0	-6.7	28.5	13.6
Śląskie	-10.1	2.0	28.5	-15.2	3.1	37.2
Świętokrzyskie	-1.4	10.2	18.5	-1.7	21.3	23.8
Warmińsko-mazurskie	-0.5	15.0	13.2	-14	18.7	13.9
Wielkopolskie	-7.0	12.6	17.0	-5.5	16.4	19.5
Zachodniopomorskie	31.8	4.8	22.6	22.9	4.3	23.8

Source: own study based on Local Data Bank, https://bdl.stat.gov.pl/bdl/, 15.11.2024.

The collected and processed source data indicate a deterioration in the situation in terms of investment outlays in Poland in general and in individual regions. In the initial phase of the crisis, in nominal terms in 2020 compared to 2019, most regions recorded declines in the value of investment outlays compared to the previous year, only in the Kujawsko-Pomorskie, Zachodniopomorskie, Podlaskie, Pomorskie and Lubelskie regions positive change indicators were recorded. Therefore, taking into account the increase in the prices of construction and assembly works, investment outlays in real terms in 2020 compared to 2019 were at an even lower level. We were therefore dealing with a sudden deterioration in the situation in the investment sphere. This applies to both total investment, i.e. investment in the private and public sectors combined, and the private sector, where the declines compared to 2019 were significant (GUS, 2024, 2024a).

The situation improved somewhat in the following years, i.e. in 2021 and 2022. At that time, positive growth rates were recorded for both total investment and investment in the private sector, only in the Lower Silesian region investment expenditures were still lower in 2021 than in the previous year. The following years, especially 2022, were characterized by a relatively high rate of growth in investments, which in most regions reached a relatively high level both in terms of total investment and investment in the private sector. This phenomenon should be explained by the need to implement investment projects that had already been started even in the conditions of the crisis caused by the pandemic. We were dealing with an increase in the prices of materials, energy prices and prices of investment works, however, large enterprises in particular decided to complete investments that had been started before 2020. A slightly different situation occurred in the small and medium-sized enterprise sector, where, due to the market situation, there was a risk of many bankruptcies and the risk of discontinuing business activity (Local Data Bank, 2024).

The numerical data presented in Table 3 indicate the occurrence of significant changes in the total industrial production sold in the years 2019-2023. In this short period, 2 specific periods can be distinguished, i.e. 2020 compared to 2019 and 2023 compared to 2022. In 2020, an absolute decrease in industrial production sold was recorded compared to 2019. Here again we have a clear effect of the economic slowdown caused by the previously discussed factors resulting from the COVID 19 pandemic.

Table 3.
Indicators of changes in total industrial production sold in the years 2019-2023, constant prices from 2015, (in %)

Specification	2019	2020	2021	2022	2023
Mazowieckie	4.9	6.3	13.1	11.4	-0.8
Dolnośląskie	6.5	5.3	15.5	9.8	-1.9
Kujawsko-Pomorskie	3.6	4.0	9.3	6.0	-2.4
Zachodniopomorskie	7.5	3.5	11.6	16.8	2.4
Łódzkie	-0.4	2.8	12.2	14.4	1.2
Podlaskie	12.9	2.8	8.4	10.1	-0.5
Świętokrzyskie	5.4	-1.8	12.3	10.5	-1.6
Polska	5.1	-1.9	14.7	9.3	-1.9
Opolskie	6.2	-2.7	17.1	6.3	-2.4
Lubelskie	6.5	-2.9	14.9	8.9	-0.8
Małopolskie	10.1	-3.7	18.3	2.6	-2.8
Lubuskie	1.2	-5.3	9.8	3.6	-0.7
Wielkopolskie	7.9	-5.4	11.1	5.5	-0.2
Pomorskie	10.2	-5.5	11.3	-2.4	-2.3
Podkarpackie	10.7	-5.9	15.1	16.8	2.5
Śląskie	0.8	-7.1	13.4	14.3	1.3
Warmińsko-Mazurskie	4.4	-14.9	12.8	4.3	-1.2

Source: own study based on Local Data Bank, https://bdl.stat.gov.pl/bdl/, https://bdl.stat.gov.pl/bdl/, 24.11.2024.

In 2021, clear symptoms of economic growth were recorded, which resulted in a significant increase in the value of industrial production sold in the regions. This situation continued in 2022, but in 2023, a renewed collapse of the consumption market and a decrease in the value of industrial production sold was recorded in almost all regions. It can be assumed that the discussed changes illustrating economic fluctuations resulting from post-crisis phenomena continue to have an impact on the economy in Poland. Similar trends, as shown by the data, continued in 2024, where significant declines in production and the value of production sold were recorded.

An important part of the research is the characterization of changes in the total number of business entities per 10,000 inhabitants and changes in the number of SME enterprises employing up to 9 employees in 2019 and 2023. Figure 3 graphically presents the directions of changes in terms of the number of entities in the spatial layout. An important phenomenon was the increase in the number of business entities in 2019 and 2023. The increase in the number of enterprises concerned in particular the western part of Poland, as well as some voivodeships in the north and south of the country. Figure 4 graphically presents the directions of changes in the number of business entities registered between 2019 and 2023 classified as small and medium-sized enterprises (SMEs) in the range of up to 9 employees. Entities of this size group constitute the dominant number of enterprises in Poland in total and are usually very susceptible to any unforeseen changes, including those caused by crisis phenomena. In accordance with the adopted legend convention, the same size class ranges have been maintained on both figures 3 and 4. This means that we can see changes in the spatial layout and changes in the number of regions with an increasing number of enterprises.

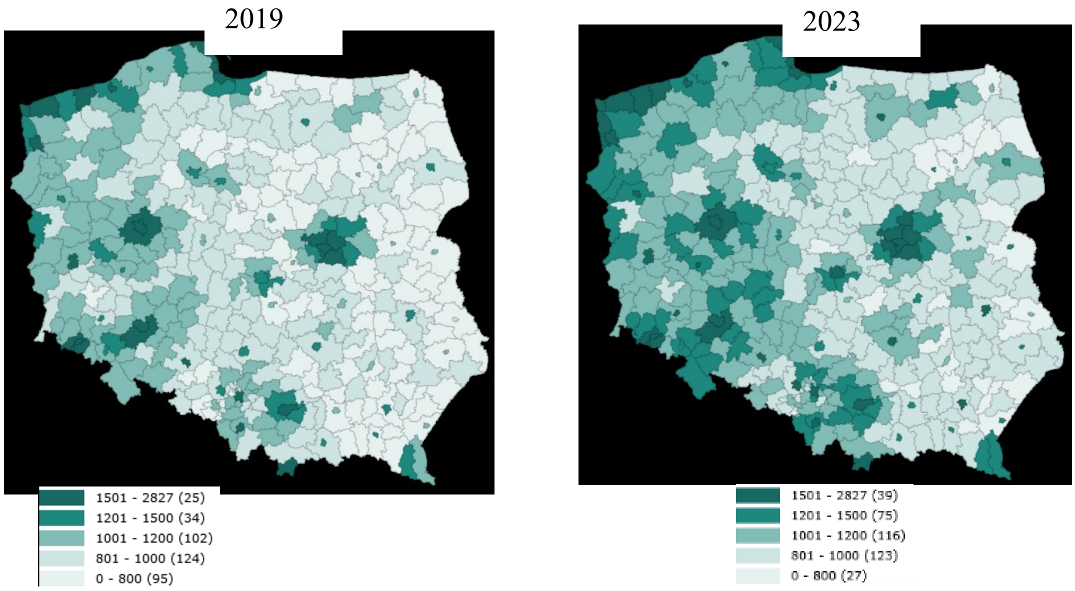

Figure 3. Entities entered in the REGON register per 10 thousand inhabitants in 2019 and in 2023.
Source: own study based on Local Data Bank, https://bdl.stat.gov.pl/bdl/, 15.11.2024.

The situation in the area of small and medium-sized enterprises is presented in Figures 3 and 4. The spatial distribution of SMEs employing up to 9 people clearly indicates that there has been further development of small businesses in urban centres with a large population, as well as in their immediate vicinity. Therefore, it is necessary to indicate the area of central Pomorze, Małopolska, Dolny Śląsk, Warsaw and its metropolitan area, as well as Białystok, Lublin, Rzeszów and Poznań. Changes in the number of the smallest enterprises indicate high motivation and entrepreneurship potential in the group of people planning or already running a business. This group is exceptionally susceptible to change and is also able to react to changes quickly.

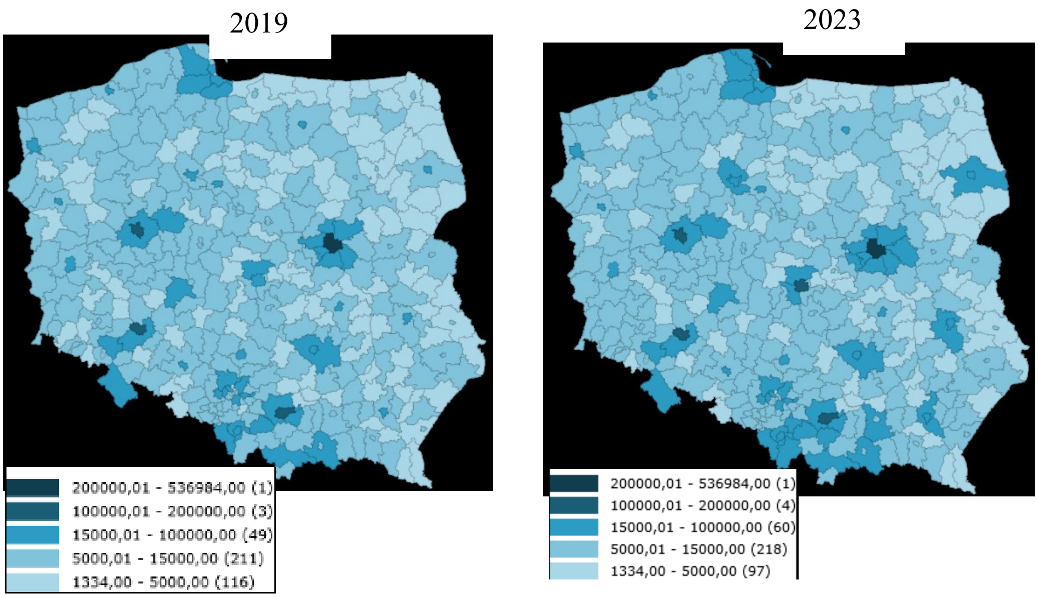

Figure 4. Number of SMEs in the 0-9 group employed by districts in 2019 and 2023.

Source: own study based on Local Data Bank, https://bdl.stat.gov.pl/bdl/, 15.11.2024.

The smaller areas, districts, have maintained their function as growth centers and in these regions, relatively larger changes in the number of small and medium-sized enterprises have been recorded. Changes in the number of SMEs in Poland are a characteristic phenomenon, as they indicate a relatively high mobility of the population, as well as a relatively high level of entrepreneurship, which as a result contributed to rapid reactions to changing conditions resulting from the Covid-19 pandemic. The position of small and medium-sized enterprises turned out to be better than that of large enterprises, which in 2023 and 2024 recorded economic difficulties, given the limited consumer demand and the parallel reduction or decrease in interest in new investments on the part of enterprises became factors slowing down development.

4. Summary

The second decade of the 21st century in Poland was characterized by stable socio-economic development, as well as maintaining a relatively high level of private and public investment. This period was beneficial for the Polish economy compared to the changes taking place in the economies of highly developed countries. It was therefore a period of gradual, accelerated elimination of development differences within the European Union.

The crisis caused by the 2020 pandemic forced the introduction of certain organizational and financial changes and involved the launch of various administrative mechanisms, which were intended to quickly implement changes consisting in actions to improve the health situation of society and to influence the economy in order to limit the negative economic effects on the side of enterprises. In the period covered by the study, changes in economic and social factors resulted in an increase in the risk of conducting business activity, including an aversion to investment due to the uncertain market situation and the increase in the price of credit money, as well as due to a significant decrease in consumption. The temporary improvement in economic results and a slight economic recovery in 2022 were short-term in nature.

In the regional system, development disparities were observed to be deepening, and development differences and disparities between regions were consolidated. The consequences of the discussed phenomena were a deterioration of the general situation in the regions, a slowdown in the GDP growth rate, and changes in the unemployment level. In the districts system, a relatively low level of entrepreneurship development was noted, although the number of SMEs in the group of companies employing up to 9 people in the years 2019-2023 increased slightly.

Studies have shown the need to use factors that promote the diffusion of development impulses to underdeveloped areas and to use available funds to curb the deepening of development differences. The main growth factors should be private consumption and wage growth, but also increased spending at the state level. Reducing inflationary pressure and improving foreign exchange results are also important. Studies have shown the negative impact of increased general risk of conducting business activity, especially investment risk. The increase in general risk was influenced by external factors, i.e. those related to price fluctuations, especially of energy carriers, financial factors, manifested by limited access to capital, changes in the legal environment and new regulations and random factors characteristic of the crisis period. Based on the conducted studies, it can be assumed that the effects of the crisis will be felt in the long term due to the instability of macroeconomic factors in the system of countries and regions. It should be assumed that the coming years may be a period of fluctuations, especially when it comes to shaping the basic measures of economic and social activity.

References

1. Ameco (2024). Retrieved from: https://dashboard.tech.ec.europa.eu/qs_digit_dashboard_mt/public/sense/app/667e9fba-eea7-4d17-abf0-ef20f6994336/sheet/2f9f3 ab7-09e9-4665-92d1-de9ead91fac7/state/analysis, 9.10.2024.

2. Antonescu, D. (2014). Theoretical approaches of regional Development. *MPRA Paper, No. 60627*, pp. 1-14.
3. Bachtler, J., Méndez, C., Vironen, H. (2014). *Regional development and policy in Europe Contributions for the debate in Latin America*. Madrid: European Policies Research Centre, pp. 6-88.
4. Barrett, P., Das, S., Magistretti, G., Pugacheva, E., Wingender, P. (2021). After-Effects of the Covid-19 Pandemic: Prospects for Medium-Term Economic Damage. *IMF Working Paper, WP/21/203*, pp. 2-6.
5. Bock, K., Trück., S. (2011). Assessing Uncertainty and Risk in Public Sector Investment Projects. *Technology and Investment, No. 2*, pp. 105-123.
6. Bojarski, W. (1984). *Podstawy analizy i inżynierii systemów*. Warszawa: PWN, p. 259.
7. Ciżkowicz, P. (2010). *Inflacja, inwestycja, polityka pieniężna*. Warszawa: PWE, pp. 93-97.
8. Easterly, W., Fischer, S. (2001). Inflation and the Poor. *Journal of Money, Credit and Banking*, *No. 33(2),* pp. 160-179, https://doi.org/10.2307/2673879.
9. Edwards, M.E. (2007). *Regional and Urban Economics and Economics Development.* New York: Auerbach Publications, pp. 327-361.
10. Gałązka, A. (2017). Teoretyczne podstawy rozwoju regionalnego – wybrane teorie, czynniki i bariery rozwoju regionalnego, *Studia BAS*, *No. 1(49)*, pp. 9-61.
11. GUS (2024). *Macroeconomic factors*. Retrieved from: https://stat.gov.pl/wskazniki-makroekonomiczne/, 20.12.2024.
12. GUS (2024a). Socio-economic situation of the country –the 1st quarter to the 3rd quarter of 2024. *Statistical analyses, 9*, pp. 3-89.
13. GUS (2024b). Sytuacja społeczno-gospodarcza kraju w 1 półroczu 2024 r. *Analizy statystyczne, 6*, pp. 14-80.
14. Hirschman, A. (1967). *Die Strategie der wirtschaftlichen Entwicklung*. Stuttgart: Fischer Verlag, p. 77.
15. Jarosiński, K. (2003). Finansowanie inwestycji komunalnych w Polsce w warunkach samorządności lokalnej. *Monografie i Opracowania*, *No. 523*, pp. 130-133.
16. Jarosiński, K. (2023). Macroeconomic instability and development disparities of peripheral areas in regions in Poland. *Scientific Papers of Silesian University of Technology*, *No. 173*, pp. 241-260.
17. Local Data Bank (2024). Retrieved from: https://bdl.stat.gov.pl/bdl/, 24.11.2024.
18. Macroeconomic Data Bank (2024). Retrieved from: https://bdm.stat.gov.pl
19. Marvasi, E. (2022). Global Value Chain Resilience and Reshoring During Covid-19: Challenges in a Post-Covid World. *Departmental Working Papers of Economics, No. 271*, pp. 1-22.
20. NBP (2024). Retrieved from: https://www.google.com/search?client= firefox-b-d&q=nbp, 10.11.2024.

21. Nijkamp, P. (1984). A multidimensional analysis of Regional Infrastructure and Economic Development. In. A.E. Ånderson, W. Isard, T. Puu (Eds.), *Regional and Industrial Development Theories, Models and Empirical Evidence* (pp. 267-294). Amsterdam: North-Holland.
22. PAP (2024). *Excessive budget deficit procedure*. Retrieved from: https://www.pap.pl/aktualnosci/ke-objela-procedura-nadmiernego-deficytu-polske-i-szesc-innych-krajow-unijnych, 24.11.2024.
23. Piętak, Ł. (2014). Teoria biegunów wzrostu François Perroux i implementacja jej założeń w Hiszpanii w latach 1964-1975. *Ekonomia XXI wieku*, *No. 1(1)*, pp. 185-205.
24. Rich, D.Z. (1997). *Crisis Theory.* Westport: Praeger Publishers, pp. 124-127.
25. Rubacha, B. (2014). Wpływ światowego kryzysu gospodarczego na kształtowanie polityki regionalnej w Polsce. *Prace Komisji Geografii Przemysłu Polskiego Towarzystwa geograficznego*, *No. 26*, pp. 9-24.
26. Strojny, J. (2013). *Model wykorzystania instrumentów stymulujących rozwój gospodarczy regionu na przykładzie województwa podkarpackiego*. Rzeszów: Oficyna Wydawnicza Politechniki Rzeszowskiej, pp. 3-37.

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IMPLEMENTATION OF ARTIFICIAL INTELLIGENCE FOR EMPLOYEE ONBOARDING IN LIGHT OF LITERATURE REVIEW

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Purpose: The purpose of this study was to review the latest reports and developments in the implementation of artificial intelligence (AI) in the professional adaptation of new employees based on literature research.
Design/methodology/approach: The method of analysis and criticism of the literature was used. A search was performed according to accepted searches in scientific databases: Google Scholar, Scopus, Science Direct, and EBSCO. Scientific items were supplemented by industry literature and online sources treating issues within the scope of the subject matter.
Findings: The potential of applying artificial intelligence to the professional adaptation of employees has not yet been thoroughly explored. The state of knowledge in artificial intelligence in onboarding is small, as is the number of literature items on the subject. Based on the analysed literature, it can be concluded that the cooperation of humans and artificial intelligence is indispensable in the HR department, as it has much potential for improving its processes. It facilitates the smooth transition of new employees from one company to another and faster socialisation. Modern technologies have changed onboarding processes, leading to their personalisation and, consequently, an increase in the engagement of newly hired employees and satisfaction with their work.
Practical implications: Implementing artificial intelligence contributes to the automation of deployment processes, individualisation, and continuous monitoring of new employees' progress. Analysing the data derived from the adaptation process makes it possible to identify areas that require modification.
Social implications: Socialization-oriented onboarding promotes good moods among new employees. Onboarding with elements of artificial intelligence makes hired individuals feel "taken care of," which reduces the stress of changing work environments and increases self-esteem. The employee adapts faster to the new work environment and identifies with the organisation's values.
Originality/value: The article presents a comprehensive picture of onboarding practices using AI in the human resources department. Drawing on foreign literature on the subject enriches the existing body of research on human capital in the enterprise, signalling the author's contribution to developing the discipline of management and quality sciences.
The article is aimed primarily at researchers and scholars working in the field of human resource management. In addition, the article is of value to HR managers and employees who are directly affected by implementing modern technologies in onboarding.

Keywords: onboarding, artificial intelligence, employee onboarding.
Category of the paper: General review.

1. Introduction

Today, no area of an organisation can do without modern and innovative technologies, including artificial intelligence. Initially, digitisation, automation and technologies using artificial intelligence were seen as threatening to human resources (HR) employees, as they feared for their employment. However, influenced by global trends, modern technologies have become known as "virtual assistants" to support the work of HR professionals (Xiang et al., 2023). The transformation that is taking place in the process of employee adaptation through artificial intelligence is enabling HR professionals to increase the efficiency and productivity of their work (Krishnan, Praveen, Poorani, 2024; Nafea, Kumar, 2024; Nawaz et al., 2024).

An employee's induction into the work process and environment is one of the most critical stages in his or her professional life. It is a crucial stage for a new hire, as it determines whether the person will stay with the company long-term or quit. A poorly prepared onboarding process, or lack thereof, causes organisations to lose employees before they have had time to get to know the company and acclimate to it (Brown, 2024). The consequences of poorly prepared onboarding can result in low retention rates and high employee turnover rates (Xiang et al., 2023). According to (Brown, 2024; Xiang et al., 2023), the antidote to the above problems may be using artificial intelligence in employee adaptation. (Krishnan, Praveen, Poorani, 2024) stated that the employee deployment process is being redefined through artificial intelligence.

The purpose of this study was to review the latest reports and solutions for implementing artificial intelligence in the professional adaptation of new employees based on literature research. To achieve the stated goal, the following research questions were formulated:

1. Will using artificial intelligence help personalise the deployment of new people?
2. Do AI-assisted activities improve employee engagement and satisfaction during onboarding?
3. What are the challenges of implementing artificial intelligence in employee deployment?

2. Research Methodology

A method of literature analysis and criticism was used. A search was performed according to the accepted searches in the scientific database resources: Google Scholar, Scopus, ScienceDirect, and EBSCO. A non-systematic literature review was carried out based on the following keywords: onboarding, artificial intelligence, employee onboarding, and various combinations using Boolean operators (AND, OR, NOT). The first database used was Google Scholar, which contained 25 articles combining the above words. The Scopus database contained 62 literature items. Restricting it to business, management and accounting, economics, econometrics, and finance yielded 13 and 8 literature items, respectively. A search in the ScienceDirect database yielded 4987 scientific sources and 361 after narrowing the subject area to social sciences. The last database analysed, containing 48 scientific publications, was EBSCO. In the next step, the compatibility of the selected materials' content with the article's topic was checked. A detailed analysis of the resulting literature (28 items) was then carried out, presenting the main findings in the research section. No literature in Polish was found in the examined databases. Industry literature, Internet sources, and blogs supplemented the research items.

3. Results and Discussion

Implementing artificial intelligence into the HR department marks a fundamental change in its operation. Tasks "outsourced" to artificial intelligence have undergone quite a transformation. It started with automating tedious and time-consuming administrative tasks to machine learning and natural language processing (NLP). Today, AI can understand and interpret human language and recognise moods in employees (Pazare et al., 2024).

In the next five years, nearly one in four companies will use artificial intelligence in the HR department (Shah, 2023). Generative artificial intelligence can process the large amounts of data available to HR departments. This makes it possible to optimise many procedures, such as generating job offers and publishing them on relevant websites, analysing resumes, streamlining deployment processes, and even helping to determine salary based on a comparative analysis of salaries in the external labour market (Shah, 2023).

In 2017 (Chandar et al., 2017) wrote about a conversational system called "Chip" used during the occupational adaptation stage. Unlike humans, this system could be accessed 24 hours a day and 7 days a week. In addition to providing human-level interaction, it sent proactive messages to new employees to remind them of tasks to be completed, answered questions about company policies and procedures, and facilitated searching the company

Intranet. It acted as a knowledge base, and its capabilities were not limited to searching the company's internal documents. However, they could search for information on employee demographics and experts in a specific field and redirect to publicly available websites.

According to (Sudhakar, 2022; Xiang et al., 2023), conversational AI chatbots and virtual assistants will become indispensable partners in HR departments in the next few years. Indeed, conversational AI can provide support for newly hired employees. Due to its ability to process natural language, AI understands the rhythm of speech, inarticulate sounds and, increasingly, words with double meanings. With such capabilities, AI demonstrates constant availability and uptime by providing immediate support to new hires. Employees can ask the same questions, and AI can repeatedly answer them without involving HR specialists (Kanaiyalal, Sinha, 2023; Krishnan et al., 2024; Shiurkar, 2024). AI algorithms are tailored to ask a large number of questions frequently. In addition, conversational AI technologies can personalise conversations with employees who feel more at ease during dialogue and are not afraid to ask the same or uncomfortable questions several times (Sudhakar, 2022). By providing immediate and round-the-clock support, they reduce the time it takes to provide answers and smoothly guide new employees through onboarding. As a result, employees do not have the impression of being left behind. In addition, if they cannot find an answer to a question they have, AI-based platforms can suggest which internal expert the new employee should meet with (Fallmann, 2023; Nawaz et al., 2024; Shiurkar, 2024) or redirect to one themselves. Shah (2023) indicates that self-service HR chatbots will work best for onboarding employees hired in a different time zone.

Research indicates (Reinhard et al., 2024) that as newly hired employees become convinced of artificial intelligence and treat it as a "collaborator" with whom they can converse, their engagement increases. The authors point to the paradox that time spent talking to a chatbot leads to reduced mental workload. Despite the increased time spent in written conversation, employees feel less workload. This suggests that a virtual co-worker effectively supports new employees, which can alleviate adaptation challenges. Reduced workload and increased engagement may increase job satisfaction and offer hope for lower turnover rates. Care should be taken to design virtual "associates" in such a way as to tailor their capabilities to the specific needs of entry-level employees.

A chatbot can be regarded as the newest member of the HR team, which can find answers to almost all questions and dispel many doubts. A workplace equipped with AI-enabled tools is already the present, not the distant future (Srivastava, Panchal, 2024; Wassan et al., 2021).

The most frequently cited benefits of using AI in the professional adaptation process are the introduction of virtual assistants, rapid access to information (knowledge), collaboration and knowledge sharing, and personalisation of implementation activities (Fallmann, 2023). Internal search engines based on artificial intelligence speed up access to information from structured and unstructured sources. This is quite a convenience for new hires who want to acquire knowledge about the company or their job. Overall, search technologies backed by artificial intelligence speed up the onboarding process and make it more efficient. Employees who are hired differ in their skills and level of knowledge. Each of them has a different experience. Platforms using artificial intelligence teach employees to learn to work more effectively themselves. "Understanding the strengths and weaknesses of individuals makes it possible to recommend and deliver personalised courses, training modules and other resources to users. The more personalised the system's approach, the faster an employee's skill development and understanding of relevant information will be" (Fallmann, 2023).

By selecting the right educational content, learning systems based on artificial intelligence can offer individual employees a personalised and customised training system. This happens on a learning platform that uses machine learning algorithms to perform analysis on, among other things, employees' skills and preferences. Chatbots provide employees with personalised instruction and the support they need (Krishnan et al., 2024; Nawaz et al., 2024; Srivastava, Panchal, 2024). AI makes it possible to identify individual training needs, create directions for development, and assign individual virtual mentors tailored to the employee's needs and expectations (Maity, 2019). Personalisation also applies to delivering training and development courses in multiple languages (Kanaiyalal, Sinha, 2023). Artificial intelligence makes it possible to analyse learning progress, find training gaps, and provide virtual instruction and feedback to improve learning (Kanaiyalal, Sinha, 2023).

The results of a study conducted by (Anisha et al., 2024) show that artificial intelligence positively impacts knowledge sharing and employee engagement through personalised feedback, coaching and training programs. To ensure that artificial intelligence tools do not hurt employee engagement, it is necessary to create responsible and transparent rules for their use, ensuring users' privacy is respected. The authors point out that organisations can use AI-based tools such as virtual assistants, decision support systems, coaching programs and learning platforms. Consequently, this will provide employees with more development opportunities and clarify learning needs, increasing employee engagement. Similar conclusions have been reached by (Huang et al., 2023; Modgil et al., 2022; Nawaz et al., 2024), stating that by using AI personalisation in HR departments, companies influence higher levels of engagement and satisfaction of new hires, leading to improved efficiency, reduced turnover, and ultimately cost and time savings.

Combining virtual reality (VR) with artificial intelligence in onboarding can be used effectively in interactive training programs. VR creates realistic simulations by allowing employees to practice specific skills, deal with challenges, and experience complex situations in a controlled environment (Nafea, Kumar, 2024; Srivastava, Panchal, 2024). By analysing training results, AI algorithms can identify areas where additional training or other developmental activities may be required (Shiurkar, 2024). This individualised approach positively impacts how new employees perceive organisational support and self-esteem in the workplace (Nafea, Kumar, 2024). The ability of artificial intelligence to customise training programs based on the individual needs of newly hired employees has increased their effectiveness, optimising learning outcomes and facilitating smooth, professional deployment (Shiurkar, 2024).

Ritz et al. (2023), based on literature research and interviews conducted, created six areas within onboarding in which artificial intelligence has been implemented. These are preparation, implementation, supporting tools and processes, coaching, training, and feedback.

The use of artificial intelligence simplifies employee deployment tasks. These tasks can include generating employee accounts and assigning rights to them, filling out employment paperwork, analysing organisational documents, preparing training lists for new hires, and sending out surveys to collect employee feedback (Xiang et al., 2023). Artificial intelligence can create quiz questions, send automatic reminders to new hires, create deployment materials from scratch, create personal scorecards, and tailor training and seminar topics. In addition, HR professionals can see in real-time whether new hires have completed each training course and what stage of implementation they are currently at (Trisca, 2023; Zielinsky, 2019). AI can quickly translate all onboarding materials for employees of different languages (Fallmann, 2023). Findings (Ritz et al., 2023; Xiang et al., 2023) show that implementing automation and AI-based technology into activities such as welcoming new hires via email, connecting them with team members, and sending personalised messages from a supervisor or HR specialist increases the confidence of new hires. They make them feel welcome and support their engagement and the socialisation process in their new work environment.

It is worth noting (Aguinis et al., 2024) in their article that large language models such as ChatGPT can be used effectively in human resources. The authors created a list of recommendations for those using generative AI to assist HR professionals. According to the authors, AI is meant to serve as an aid, not a substitute, which means that the knowledge and skills of trained professionals cannot be replaced by artificial intelligence. Nor can it replace human empathy and ethical decision-making. Decisions cannot be made based on AI's suggested solutions without first verifying them, as it may turn out that the suggestions were generated based on incomplete or biased data.

The integration of artificial intelligence into the field of human resources offers a broad spectrum of opportunities for resourcefulness but also poses many challenges. Among the most important of these are (Aguinis et al., 2024; Fallmann, 2023; Madanchian et al., 2023; Panda et al., 2023 Pazare et al., 2024; Sabil et al., 2023; Trisca, 2023; Xiang et al., 2023):

- Data quality and availability - the effectiveness of applied AI tools in the HR department "largely depends on the quality and comprehensiveness of the data fed into AI systems. Inaccurate or incomplete data sets can lead to erroneous insights, affecting decision-making processes. In addition, collecting extensive and relevant data while considering privacy concerns can be a complex task" (Pazare et al., 2024, pp. 3-2). Errors and inaccuracies in the data entered are reflected in decisions or recommendations.

- Technical challenges of integrating AI tools and software used in HR departments. The older the software, the weaker the integration and the reduced effectiveness of implemented solutions.
- Employees' resistance to change and uncertainty about continuing in their current positions. HR professionals will need to acquire new skills and make an effort to integrate employees' work with artificial intelligence.
- Ethical concerns and, within them, uncertainty about the security of sensitive employee data. Organisations need to use secure data storage and processing methods to ensure that the privacy of employees and their data is not compromised. In addition, there is a real possibility of perpetuating algorithm errors that lead to unfair or discriminatory actions. This can perpetuate and reinforce existing social prejudices. To prevent such situations, algorithms should be regularly updated with diverse and representative data, and AI systems should be audited for bias and discrimination. Organisations must use AI fairly and transparently.
- Modern AI-based technologies require significant funding, adequate resources and expertise. This can be too challenging for small and less financially well-resourced organisations. Before implementing modern technology, it is essential to analyse the costs of implementation and the potential benefits.

A study by (Arslan et al., 2022) emphasises that while artificial intelligence has great potential to revolutionise human resource management, addressing the challenges of trust, ethics, and human-artificial intelligence collaboration is essential. With the abovementioned challenges, the chances of mistakes or errors are almost zero, and artificial intelligence helps perform tasks faster and more accurately (Nawaz et al., 2024).

4. Limitations

The author of the article is aware of the limitations contained in it. Firstly, the literature review was based solely on scientific databases such as Google Scholar, Scopus, Science Direct, and EBSCO, which may have limited the number and value of the search results. Second, the literature search used a specific combination of keywords using a Boolean operator, which could have omitted some scientific items and limited other authors' insights.

The article focuses on the English-language literature published mainly between 2022 and 2024 and briefly references the body of work from earlier years. In addition, publication bias is possible in that only the articles the author thought were the most valuable were considered, and others were omitted.

The literature review is based on the existing literature and does not present baseline (primary) data. Summarising results and insights from various studies does not provide new empirical data.

5. Conclusions and Practical Implications

Artificial intelligence tools are being implemented in many areas of business operations. Even though great potential lies in the implementation of AI into HR departments and the onboarding process, their employees mainly focus on incorporating AI tools into recruitment, selection, employee engagement surveys or talent acquisition, usually skipping onboarding (Ritz et al., 2023; Srivastava, Panchal, 2024; Wassan et al., 2021; Xiang et al., 2023).

In answering the first research question posed in the Introduction, one can refer to (Tariq, 2024), who argues that newly hired employees expect onboarding to be tailored to their individual preferences and needs regarding their learning style, work pace, duties performed or role. By working with a modern virtual agent, an employee will acclimate to the new work environment more quickly and effectively and stay there longer. Referring to the second research question, it is clear that artificial intelligence positively impacts the commitment and satisfaction of newly hired employees. This is influenced, for example, by the aforementioned personalised approach to humans. Onboarding processes run more dynamically and efficiently and relieve employees from unnecessary tasks. The risk of an AI making a mistake is lower than an employee overloaded with work or an excess of messages.

Using AI algorithms increases engagement, motivation and recall of large amounts of information. According to (Srivastava, Panchal, 2024), artificial intelligence can identify employee preferences and personality, identify signs of lack of commitment, and conduct sentiment analysis of employee communications. As for the third research question, mention should be made of ethical challenges, technical challenges, employee resistance to upcoming changes and the uncertainty of their continued employment. Mention should be made of possible problems with the quality and incompleteness of data-feeding AI algorithms.

Several practical implications have been developed based on the analysed content of scientific and industry items. First, implementing artificial intelligence will automate repetitive and monotonous activities, such as filing documents, scheduling mandatory training, and preparing individual implementation materials. As a result, HR professionals can allocate more time to conceptual work, creative and imaginative work that requires deep thinking, and work that will not cause fatigue or burnout. Second, it is recommended that AI chatbots and virtual assistants be used throughout the entire period of professional adaptation. Such "care" creates positive impressions for new hires and relieves HR staff of routine tasks. Third, managers should strive to build personalised training paths. In this regard, artificial intelligence, which can analyse employees' preferences and the activities they perform on the job, is proving helpful. With personalised training paths, the implementation process is tailored to the individual needs of the people hired. Fourth, AI can identify emerging trends and patterns by analysing large amounts of data related to the deployment process. With these, managers can make informed decisions that will translate into increased effectiveness of existing onboarding programs.

In addition, it is possible to analyse employee feedback and performance data by implementing AI algorithms into onboarding. Based on the results of these analyses, employees in charge of onboarding programs can continuously improve and optimise them. It is important to remember that it is up to human beings to decide whether artificial intelligence will be their ally or enemy software. Openness to change, curiosity about the world and new technologies make it easier to "make friends" with the inevitable - the digital employee.

Despite the identified organics, the following article can provide a basis for further practical research. It should be noted that not much research has been done in this area. The potential of artificial intelligence applications for deploying new employees is so great that they provide ample opportunities to explore this topic.

References

1. Aguinis, H., Beltran, J.R., Cope, A. (2024). How to use generative AI as a human resource management assistant. *Organisational Dynamics*, *Vol. 51, No. 3,* https://doi.org/10.1016/j.orgdyn.2024.101029
2. Anisha Estherita, S., Vasantha, S. (2024). Fostering employee engagement and knowledge sharing through artificial intelligence. *Salud, Ciencia y Tecnología - Serie de Conferencias, Vol. 3*, https://doi.org/10.56294/sctconf2024897
3. Arslan, A., Cooper, C., Khan, Z., Golgeci, I., Ali, I. (2022) Artificial intelligence and human worker interaction at team level: a conceptual assessment of the challenges and potential HRM strategies. *International Journal of Manpower*, *Vol. 43, No. 1*, pp. 75-88, https://doi.org/10.1108/IJM-01-2021-0052
4. Brown, J. (2024). The Impact of Artificial Intelligence in Employee Onboarding Programs. *Advances in Developing Human Resources*. *Vol 26, Iss. 2-3*, pp. 108-114, https://doi.org/10.1177/15234223241254775
5. Chandar, P., Khazaeni, Y., Davis, M., Muller, M., Crasso, M., Liao, Q.V., Shami, N.S., Geyer, W. (2017). Leveraging Conversational Systems to Assists New Hires During Onboarding. In: R. Bernhaupt, G. Dalvi, A. Joshi, D.K. Balkrishan, J. O'Neill, M. Winckler (Eds.), *Human-Computer Interaction - INTERACT 2017* (pp. 381-391). Cham: Springer International Publishing. DOI: 10.1007/978-3-319-67684-5_23

6. Fallmann, D. (2023). How Can AI-Powered Search Accelerate Employee Onboarding? *Forbes.* Retrieved from: https://www.forbes.com/sites/forbestechcouncil/2023/07/19/how-can-ai-powered-search-accelerate-employee-onboarding/, 04.08. 2024.
7. Huang, X., Yang, F., Zheng, J., Feng, C., Zhang, L. (2023). Personalized human resource management via HR analytics and artificial intelligence: Theory and implications. *Asia Pacific Management Review, Vol. 28, No. 4*, pp. 598-610, https://doi.org/10.1016/j.apmrv.2023.04.004
8. Kanaiyalal, T.G., Sinha, K. (2023). Human Resource Management, Accounting and Artificial Intelligence-A Promising Integration. *Chartered Secretary*, pp. 81-87. Retrieved from: https://www.icsi.edu/media/webmodules/CSJ/May/20ArticleTalsaniyaGauravkumarKanaiyalalDrKunalSinha.pdf
9. Krishnan, L.R.K., Praveen, K., Poorani, S. (2024). Artificial Intelligence in Human Resource Management: Enhancing Efficiency and Transforming Employee Experience. *The Indian Journal of Industrial Relations. A Review of Economic and Social Development, Vol. 59, No. 4,* pp. 589-605. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4782399, 10.08.2024.
10. Madanchian, M., Taherdoost, H., Mohamed, N. (2023). AI-Based Human Resource Management Tools and Techniques; A Systematic Literature Review. *Procedia Computer Science*, *Vol. 229*, pp. 367-377, DOI:10.1016/j.procs.2023.12.039
11. Maity, S. (2019). Identifying opportunities for artificial intelligence in the evolution of training and development practices. *Journal of Management Development, Vol. 38*, *No. 8*, pp. 651-663, https://doi.org/10.1108/JMD-03-2019-0069
12. Modgil, S., Singh, R.K., Hannibal, C. (2022). Artificial intelligence for supply chain resilience: Learning from COVID-19. *The International Journal of Logistics Management, Vol. 33, No. 4*, pp. 1246-1268, https://doi.org/10.1108/IJLM-02-2021-0094.
13. Nafea, R.M.E., Kumar, N. (2024). The effectiveness of different employee onboarding programs by HR of organizations. *JANOLI International Journal of Economics and Management Science*. *Vol. 1, Iss. 1*, pp. 1-4. Retrieved from: https://iijems.janolijournals.org/paper/NzE, 9.08.2024.
14. Nawaz, N., Arunachalam, H., Pathi, B.K., Gajenderan, V. (2024). The adaption of artificial intelligence in human resource management practices. *International Journal of Information Management Data Insights, Vol. 4, No. 1,* DOI: 10.1016/j.jjimei.2023.100208
15. Panda, G., Dash, M.K., Samadhiya, A., Kumar, A., Mulat-weldemeskel, E. (2023). Artificial intelligence as an enabler for achieving human resource resiliency: past literature, present debate and future research directions. *International Journal of Industrial Engineering and Operations Management*. https://doi.org/10.1108/ijieom-05-2023-0047
16. Pazare, S., Kawa, V., Maurya, R., Metha, D., Shah, A. (2024). HR Automation: Enhancing Candidate Onboarding Processes. *International Journal of Scientific Research in Engineering and Management*, *Vol. 8, Iss. 4*, pp. 1-5, DOI: 10.55041/IJSREM31260

17. Reinhard, P., Neis, N., Kolb, L., Wischer, D., Li, M.M., Winkelmann, A., Teuteberg, F., Lechner, U., Leimeister J.M. (2024). Augmenting Frontline Service Employee Onboarding via Hybrid Intelligence: Examining the Effects of Different Degrees of Human-GenAI Interaction. In: M.Y. Mandviwalla, M. Söllner, T. Tuunanen (eds.), *International Conference on Design Science Research in Information Systems and Technology.* Sweden.
18. Ritz, E., Fabio, D., Elshan, E., Rietsche, R. (2023) *Artificial socialisation? How Artificial Intelligence applications can shape a new era of employee onboarding practices*. Proceedings of the 56th Hawaii International Conference on System Sciences, pp. 155-164, https://hdl.handle.net/10125/102648
19. Sabil, S., Bangkara, B.M.A.S.A., Mogea, T., Niswan, E., Timotius, E. (2023). Identification of HRM Improvement Strategy Using Artificial Intelligence in Modern Economic Development. *International Journal of Professional Business Review*, *Vol. 8, No. 6*, https://doi.org/10.26668/businessreview/2023.v8i6.1835
20. Shah, N. (2023). The future of HR and AI. How will HR Professionals need to adapt to AI. *Cabinet African Journals, No. 11*, pp. 30-31.
21. Shiurkar, S.U. (2024). AI role in employee engagement and performance management. In: K.N. Marimuthu, L. Kanagalakshmi, C. Vallabhapurapu, R.K. Kumar (Eds.), *Futuristic Trends in Management, Vol. 3, Book 24*, pp. 397-406. https://www.doi.org/10.58532/V3BHMA24CH42
22. Srivastava, S., Panchal, S.D. (2024). AI-Driven HRM: Unlocking Employee Experience and Engagement in the Future. In: K. N. Marimuthu, L. Kanagalakshmi, C. Vallabhapurapu, (Eds.), *Futuristic Trends in Management*, *Vol. 3, Book 24,* pp. 195-202. Iterative International Publisher, Selfypage Developers Pvt Ltd, https://www.doi.org/10.58532/V3BHMA24CH24.
23. Sudhakar, M. (2022). How Conversational AI is Hanging the HR Landscape. Retrieved from: https://www.hr.com/en/magazines/talent_acquisition/february_2022_talent_acquisition_excellence/how-conversational-ai-is-changing-the-hr-landscape_kzr5b3id.html, 4.08.2024.
24. Tariq, Z. (2024). *Enhancing Onboarding with AI: Designing a Modern Conversational Agent for Onboarding*. Lahti: Lappeenranta-Lahti University of Technology LUT.
25. Trisca, L. *AI in HR Examples: 9 Companies Successfully Using AI Innovation In Key People Processes*. Retrieved from: https://www.zavvy.io/blog/ai-in-hr-examples, 4.08.2024.
26. Wassan, S., Gulati, K., Pallathadka, H., Suhail, B., Kuhar, P., Gupta, A. (2021). How Artificial Intelligence Transforms the Experience of Employees. *Turkish Journal of Computer and Mathematics Education (TURCOMAT), Vol. 12, No. 10,* pp. 7116-7135. https://doi.org/10.17762/turcomat.v12i10.5603

27. Xiang, H., Lu, J., Kosov, M.E., Volkova, M.V., Ponkratov, V.V., Masterov, A.I., Elyakova, I.D., Popkov, S.Y., Taburov, D.Y., Lazareva, N.V., Muda, I., Vasiljeva, M.V., Zekiy, A.O. (2023). Sustainable Development of Employee Lifecycle Management in the Age of Global Challenges: Evidence from China, Russia, and Indonesia. *Sustainability. Vol. 15, No. 6*, https://doi.org/10.3390/su15064987
28. Zielinsky, D. (2019). Optimizing onboarding. The right tools can make new hires more productive faster and save time for HR. *HR Magazine, Summer 2019*, pp. 96-98.

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INVESTMENT ATTRACTIVENESS OF POLISH VOIVODESHIP IN THE CONTEXT OF LABOUR RESOURCES – DYNAMIC APPROACH

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Purpose: The purpose of the article is to identify the potential investment attractiveness of Poland's voivodeships in the context of the labour resources, and identifying changes over time.
Design/methodology/approach: The measurement of the potential investment attractiveness of Poland's voivodeships was made on the basis of secondary data derived from the Central Statistical Office. The identification of investment attractiveness in the context of the labour resources was made on the basis of the synthetic index constructed from five standardized variables. Thus, three classes of voivodeships (A, B, C) were distinguished.
Findings: At the beginning of analysis – in 2014 – the highest level of potential investment attractiveness in the labour resources (class A) had six voivodeships: Warmińsko-Mazurskie, Świętokrzyskie, Lubuskie, Dolnośląskie, Kujawsko-Pomorskie and Zachodniopomorskie. In 2023 this included only four units: Świętokrzyskie, Podkarpackie, Opolskie and Warmińsko-Mazurskie. Investment attractiveness, measured by individual variables within the labour resources pillar, varies significantly in Polish voivodeships. The voivodeships with the lowest labour costs, i.e. the most attractive for efficiency-seeking investors, were Warmińsko-Mazurskie, Podkarpackie, Świętokrzyskie i Kujawsko-Pomorskie. The highest value of labour productivity was observed in Mazowieckie and Dolnośląskie. Particularly important in the context of investment attractiveness is the availability of labour resources, which can be measured by the unemployment rate. The most attractive in this variable were: Warmińsko-Mazurskie and Kujawsko-Pomorskie. The labour market is especially in demand for people with vocational and technical skills. In this area, the most attractive voivodeships were: Opolskie, Kujawsko-Pomorskie, Wielkopolskie, and Warmińsko-Mazurskie Voivodeship. An important indicator of the quality of labour resources is the percentage of graduates in the fields of biological and technical sciences. Among the regions with the highest values of this indicator were Dolnośląskie, Świętokrzyskie and Małopolskie.
Research limitations/implications: Due to the variability over time of the determinants of business location choice, studies to identify them should be conducted successively. It should also be noted that due to the changes of assessments of investment attractiveness determined by the specifics of businesses, it is reasonable to take into account its types in future studies.

A serious problem is the limitations in access to data, as well as the growing reluctance of entrepreneurs to participate in surveys.
Practical implications: The results of the study have practical applications in decision-making processes regarding the choice of business location. They can also be used by institutions working for the socio-economic development of regions to encourage investors to choose their areas as places to locate capital.
Originality/value: Although the topic of investment attractiveness has been addressed frequently in the available literature, there are no studies devoted specifically to the context of labour resources in Poland.
Keywords: investment attractiveness, Polish voivodeships, labour resources.
Category of the paper: Research paper.

1. Introduction

The investment attractiveness of a region is a set of factors considered in its selection as a place to make an investment. The primary considerations for investors' decisions are the assessments of location benefits. The investment attractiveness of a region can be assessed as 1) potential and 2) real. The former is the result of an assessment of the factors that could potentially be considered in the choice of an area as an investment location and the importance of a particular factor for investors, while the latter is the result of a retrospective assessment of their decision to choose a region as a business location (Jaworek et al., 2022, p. 12). The measurement of investment attractiveness can be carried out at different levels of aggregation of the analysed spatial division units: at the national level, at the regional level (e.g. voivodeships) or subregional level. It should be emphasised that the assessment of investment attractiveness is always individual. Investors tend to consider the configuration of location factors, but also the occurrence of a specific factor (e.g. availability of highly qualified employees), when guided by the expected benefits. These factors can be grouped into relatively uniform attractiveness pillars, an example of which is provided in the diagram below (Figure 1).

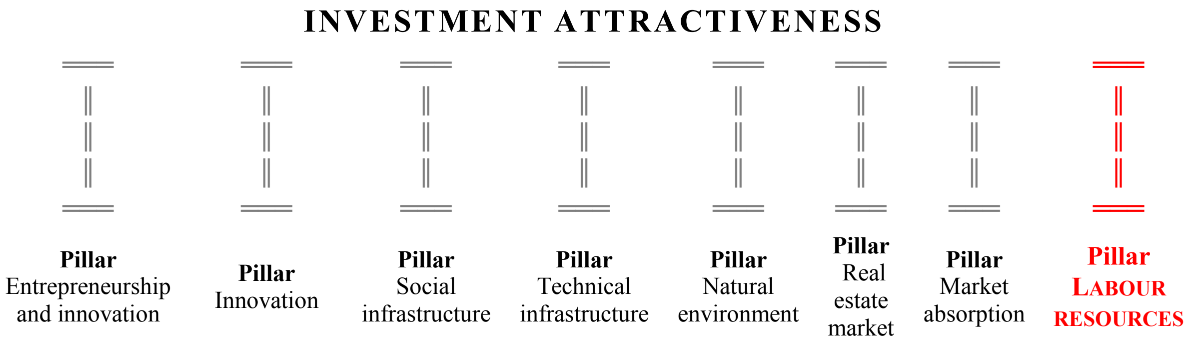


Figure 1. Investment attractiveness pillars.

Source: own elaboration.

Despite the presence of a wide range of locational attractiveness factors, a pillar related to labour resources is currently gaining particular importance. Labour resources, their condition, quality characteristics, and price, are undoubtedly among the basic factors considered in assessing the investment attractiveness of a region. The ability to employ workers with the right qualifications, professional skills, and experience is a prerequisite for doing business in a given area. Of course, the needs in this regard vary depending on the type of activity. The conduct of manufacturing activities is conditioned to a greater extent by the ability to employ workers with professional education than service activities, where there is a greater need for highly qualified workers in various fields of education. One of the parameters that indicates the availability of labour resources is the unemployment rate. Its high level means that the labour market is characterised by a large scale of supply, followed by competitive prices. However, in numerous cases, high unemployment does not indicate the ability to meet the needs of hiring workers with certain skills (especially high skills). Thus, the assessment of labour resources is multifaceted.

Although the topic of investment attractiveness is often discussed in the literature, identifying potential attractiveness, labour resources as a pillar, being a configuration of many factors of attractiveness, has not been comprehensively considered. The scope of the analysis, the results of which are presented in this study, fills this gap.

Therefore, the purpose of the article is to identify the potential investment attractiveness of Polish voivodeships in the context of the labour resources.

The rest of this paper is organised as follows. The following section provides a brief general overview of the literature related to investment attractiveness. The methodology used in the research is presented next. Then, the research findings are discussed. Finally, the general conclusions are stated.

2. Literature review

Potential investment attractiveness is often identified through the prism of foreign direct investment, i.e. from the perspective of a foreign investor deciding to locate capital in a particular place. The Polish literature is significant in this area (i.e. Dworzecki, 1995; Janton-Drozdowska et al., 2002; Kociszewska, Kamińska, 2008; Stawicka, 2008; Kućmierczyk, 2009; Nizielska, 2010; Orchwa-Malizewska et al., 2010; Krawczyk, Figna, 2011; Lizińska, 2012; Jedliński, 2013; Pakulska, Poniatowska-Jaksch, 2013; Owczarczuk, 2014; Pilarska, 2017; Sporek, 2017; Kisiel, Graszkiewicz, 2018; Szypuła, Leszczyńska, 2021). The focus of many scientists has also been on measuring the potential investment attractiveness of individual regions, subregions, cities, or rural areas of Poland. Using secondary data, researchers have identified the investment attractiveness of various areas or pillars (i.e. Gawlikowska-Hueckel, 1997; Swianiewicz, Dziemianowski, 1999; Tarkowski et al., 2015; Hildebrandt et al., 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013; Godlewska-Majkowska et al., 2007, 2008, 2009, 2013; Banak et al., 2008; Godlewska-Majkowska, 2008, 2011; Guzik, 2008; Wierzbińska, Surówka, 2008; Lizińska, 2010; Pawlas, 2011; Raszkowski, 2011; Zarębski, 2012; Zarębski, Godlewska-Majkowska, 2013; Makowiecka, 2019; Godlewska-Majkowska, Komor, 2021). In these studies, factors related to labour resources appeared. However, these surveys did not analyse labour resources as a comprehensive pillar consisting of a wide variety of quantitative and qualitative diagnostic variables.

Labour market-related variables also appeared in studies on the identification of the determinants of foreign investment in host countries. In particular, they concerned labour cost (Schneider, Frey, 1985; Wheeler, Mody, 1992; Hennart, Park, 1994; Buckley, Casson, 1998; Tatoglu, Glaister, 1998; Globerman, Shapiro, 1999; Cheng, Kwan, 2000; Tahir, Larimo, 2004; Vijayakumar et al., 2010). Currently, labour resource determinants are not only concerned with the search for low-cost labour but also highly skilled workers (Peluffo, 2015; Mayeko, 2024). Studies also indicate that the lack of skilled labour has a limiting effect on foreign investment inflows (Kinda, 2010).

Factors related to labour resources were also important for investors undertaking foreign direct investments in Poland. In the first decade of the 21st century, investors indicated mainly low labour costs among the most important determinants (Pissulla, 1997; PAIZ/PAIiIZ, 2000, 2003, 2005; Jaworek, 1999; Witkowska, 1998; Housh, 1997; Karaszewski, 2001; Prices Waterhouse Coopers, 2002, Stawicka, 2007; Jaworek, 2006; Jaworek, Karaszewski, 2008; Różański, 2010). Over the last 15 years, investors have indicated the level of skills, competences and qualifications of employees, and work efficiency as the most important determinants (Polsko-Niemiecka Izba Przemysłowo-Handlowa, 2012, 2013, 2015, 2016, 2017; PAIiH, 2016, 2017; EY, 2017).

3. Methods

The assessment of potential investment attractiveness in the context of the labour resources was carried out by collecting and compiling information and data presented in the Local Data Bank of the Statistics Poland. Research was conducted at the turn of September and October 2024. The indicators characterising the attractiveness within the pillar "Labour resources" were calculated as arithmetic means of the standardised factors. Each of the diagnostic variables was standardised based on the following formulae:

$$F'_{ij} = \frac{F_{ij} - F_{minj}}{F_{maxj} - F_{minj}} \cdot 100 \quad (1)$$

for a stimulant, and

$$F'_{ij} = \frac{F_{maxj} - F_{ij}}{F_{maxj} - F_{minj}} \cdot 100 \qquad (2)$$

for a destimulant.

The division of statistical units into investment attractiveness classes (A, B, C, D) was based on the natural division according to the Jenks optimisation method. The set of location factors related to the labour resources used in this study is presented in Table 1.

Table 1.
Investment Attractiveness Factors in the Context of the Labour Resources

Pos.	Factor Group/Factor Type	Designation	Character
	Efficiency determinants ($F_{eff.}$)		
1	Gross value added per 1 employed person (PLN)	$F_{eff.}1$	Stimulant
2	Average monthly gross wages and salary in relation to the average domestic (Poland = 100%)	$F_{eff.}2$	Destimulant
	Resource factor ($F_{res.}$)		
3	Registered unemployment rate (%)	$F_{res.}1$	Stimulant
4	Percentage of graduates of stage I sectoral vocational schools and technical secondary schools in total number of graduates upper secondary and post-primary schools (%)	$F_{res.2}$	Stimulant
5	Percentage of graduates in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering trades, architecture and building (%)	$F_{res.}3$	Stimulant

Source: own study.

4. Discussion and Results

Among the efficiency factors in the area analysed, the labour productivity appears to be especially important for foreign investors. We measure it with the gross value added per 1 employed person ($F_{eff.}1$). In 2014, at the beginning of the analysis period, this value for Poland reached PLN 108.5 thousand, while in 2021 (the last year for which data were available) it was already 155.1. The highest value of this factor (class A) was observed in Mazowieckie (PLN 142.3 thousend/employed person in 2014 *versus* 193.3 in 2022) and Dolnośląskie (123.8 *versus* 170.9). In 2014 many voivodeships located in western Poland registered the gross value added per 1 employed person exceeded PLN 100 thousend (Śląskie, Pomorskie, Zachodniopomorskie, Wielkopolskie, Lubuskie, Opolskie) or was very close to this level (Łódzkie), which placed them in a high class B in terms of labour productivity. In 2022, only three voivodeships remained in this class, where the value of the described indicator exceeded PLN 150 thousand (Śląskie, Pomorskie i Zachodniopomorskie). In 2014, Lubelskie, Podkarpackie and Świętokrzyskie were among the voivodeships with the lowest labour productivity (class D), while in 2022 it also included the first two and the Podlaskie Voivodeship (Figure 2, Table 2).

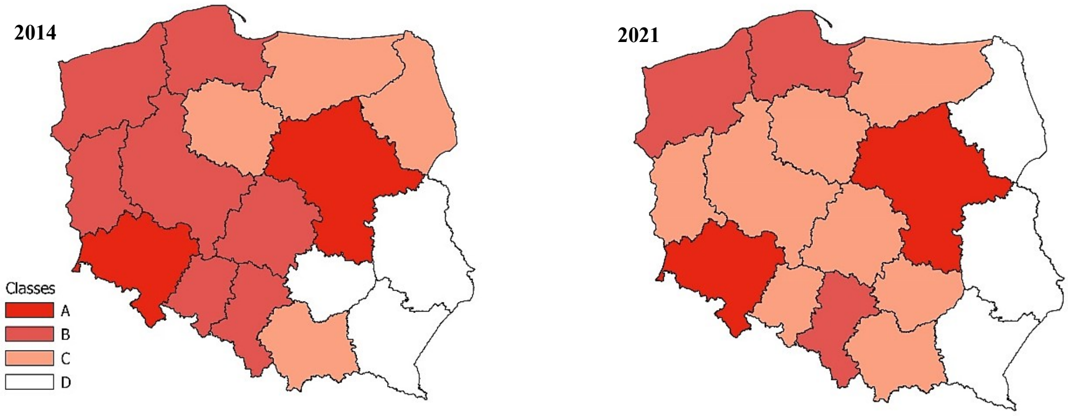


Figure 2. Classes of Polish voivodeships in terms of "gross value added per 1 employed person" factor in years 2014 and 2021.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

As indicated in the literature review, labour costs were an important factor in the location of FDI in Poland. But over time, its importance began to decline in favour of qualitative factors such as the qualifications and skills of the workforce (Jaworek, Karaszewski, 2018). From a regional perspective, the highest labour costs are observed in the Mazowieckie Voivodeship (in 2014 it amounted to 123.1% average monthly gross wages and salary in relation to the average for Poland ($F_{eff.}2$), in 2023 – 117.6%). Other voivodeships with high labour costs were Dolnośląskie, Śląskie and, in 2023, Małopolskie, but it should be noted that in the analysed period, the average monthly gross wages and salary in these units was similar to the average for the whole country (the exception was the Małopolskie Voivodeship, in which in 2014 the described labour costs indicator amounted to 92.4% of domestic avarage). On the other hand, the voivodeships with the lowest labour costs, i.e. the most attractive for efficiency-seeking investors, were Warmińsko-Mazurskie, Podkarpackie, Świętokrzyskie i Kujawsko-Pomorskie, where the average monthly gross wages and salary did not exceed 90% of the average for Poland, both in 2014 and 2023. The importance of this factor for investment attractiveness was confirmed by the results of studies conducted in the Warmińsko-Mazurskie and Kujawsko-Pomorskie provinces. Foreign investors ranked the unemployment rate in 2nd and 7th place, respectively, among the determinants of choosing this voivodeship (Kisiel et al., 2016; Jaworek et al., 2016). The picture of the investment attractiveness of Poland's regions in terms of labor costs presented in figure 3 was also confirmed in the results of the Chidlow et al. (2009) study.

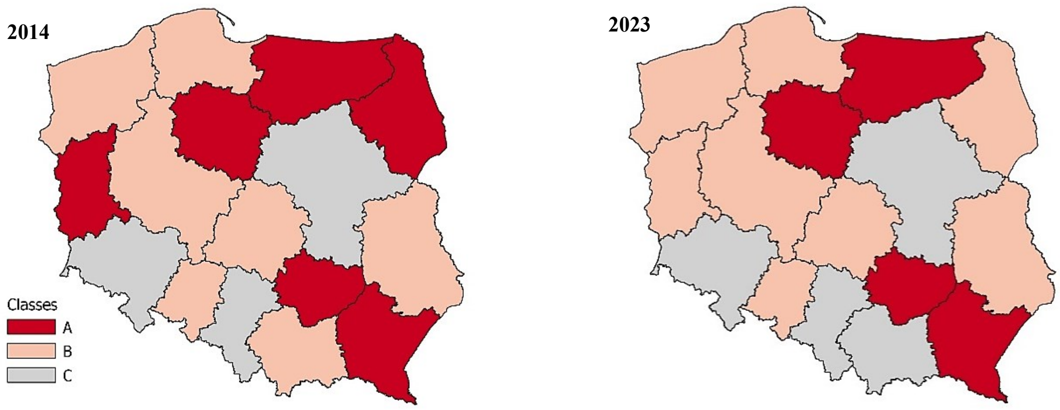


Figure 3. Class of Polish voivodeships in terms of "average monthly gross wages and salary in relation to the average domestic" factor in years 2014 and 2023.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

Particularly important in the context of investment attractiveness is the availability of labour resources. In general terms, this availability is potentially greater in regions with higher unemployment. In 2014 the registered unemployment rate ($F_{res.}1$) in Poland was relatively high, reaching 11.4% compared to 5.1% in 2023. At the beginning of the analysed period, the highest unemployment rate was registered in northern Poland, in the Warmińko-Mazurskie (18.7%), Kujawsko-Pomorskie (15.5%) and Zachodniopomorskie (15.5%) voivodeships. These regions were also among the voivodeships with the highest unemployment in 2023, but it was much lower, with Warmińsko-Mazurskie at 8.3%, Kujawsko-Pomorskie at 7.1% (class A) and Zachodniopomorskie at 6.7% (class B). In 2023, a relatively high unemployment rate (class A) was also recorded in the Podkarpackie (8.7%), Świętokrzyskie (7.8%) and Lubelskie (7.6%) voivodeships. The region with the lowest registered unemployment rate was Wielkopolskie, with a rate of 7.6% in 2014 and 3.0% in 2023.

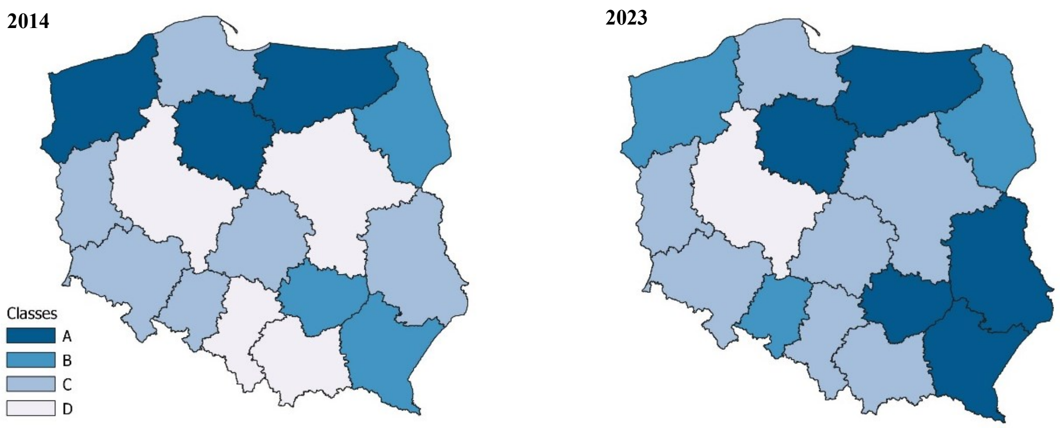


Figure 4. Class of Polish voivodeships in terms of "registered unemployment rate" in years 2014 and 2023.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

Research studies conducted by the authors, in particular one of the most recent ones on the investment attractiveness of the Kujawsko-Pomorskie Voivodship, showed that for investors the qualifications of labour resources are particularly important, including above all education that prepares them well for future work. The labour market is especially in demand for people with vocational and technical skills. In 2014 in Poland the percentage of graduates from stage I sectoral vocational schools and technical secondary schools in the total number of graduates upper secondary and post-primary schools ($F_{res.}2$) amounted to 45.6%, compared to 50.2% in 2023. In the years analysed, the Opolskie, Kujawsko-Pomorskie, Wielkopolskie, and Lubuskie achieved the highest described rate (class A), and in 2023 the Warmińsko-Mazurskie joined to them. The leader in terms of graduates of stage I sectoral vocational schools and technical secondary schools was the Opolskie Voivodeship with an analysed indicator at 53.9% in 2014 and 60.2% in 2023. On the contrary, the lowest percentage in this field registered in Mazowieckie Voivodeship was 37.1% in 2014 (class D), 36.6% in 2023 (class C). The high attractiveness of the Wielkopolske and Kujawsko-Pomorskie, in terms of labour force qualifications, was confirmed by the results of a survey of foreign investors, who ranked this factor among the most important determinants of FDI location choice (Pawlak et al., 2015; Jaworek et al., 2016, 2023).

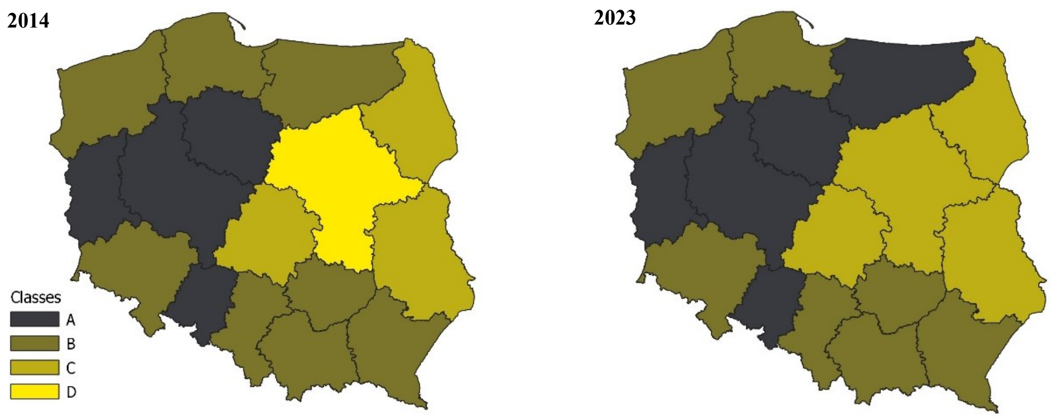


Figure 5. Class of Polish voivodeships in terms of "the percentage graduates of stage I sectoral vocational schools and technical secondary schools in total number of graduates upper secondary and post-primary schools" in years 2014 and 2023.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

An important indicator of the quality of labour resources is the percentage of graduates in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering trades, architecture, and building ($F_{res.}3$). Significant saturation of well-qualifited resources is particularly important for investors from innovative high-tech sectors. In Poland in 2015 the percentage of graduates from this type of study was 21.7%, falling to 19.6% in 2022[1]. Among the regions with the

[1] The time period adopted for this indicator is determined by the availability of data.

highest described indicator (class A) were Dolnośląskie (27.5% in 2015 *versus* 25.8% in 2022), Świętokrzyskie (27.5% *versus* 21.1%), Małopolskie (27.0% *versus* 25.4%), and in 2015 also Pomorskie (25.1% *versus* 18.8%). The high attractiveness of Małopolskie in terms of this factor was indicated in the research by Domański et al. (2006, 2008). The authors concluded that it is the region's main asset for FDI deposits. In 2015 the lowest percentage of graduates in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering trades, architecture, and building (class D) was registered in the Opolskie (16.3%), Mazowieckie (17.4%), and Kujawsko-Pomorskie (17.6%), while in 2022 it was Warmińsko-Mazurskie (13.2%) and Kujawsko-Pomorskie Voivodeship (14.0%).

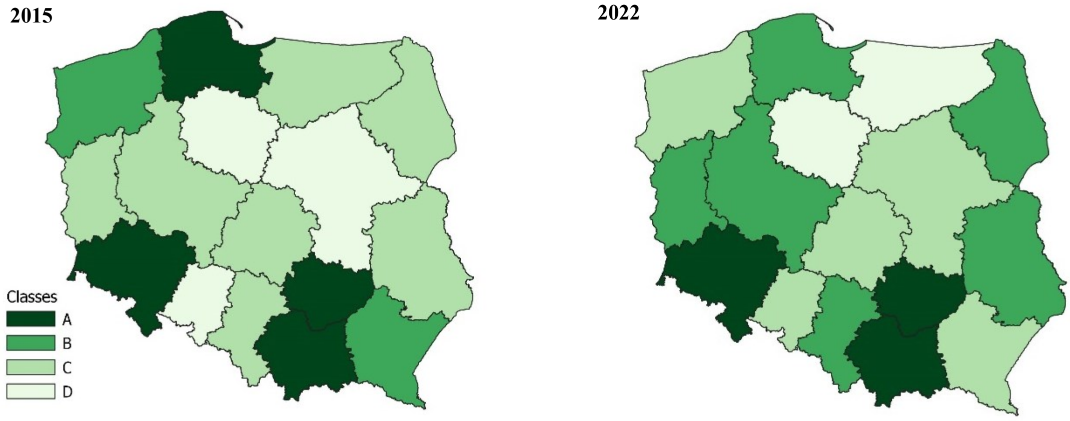
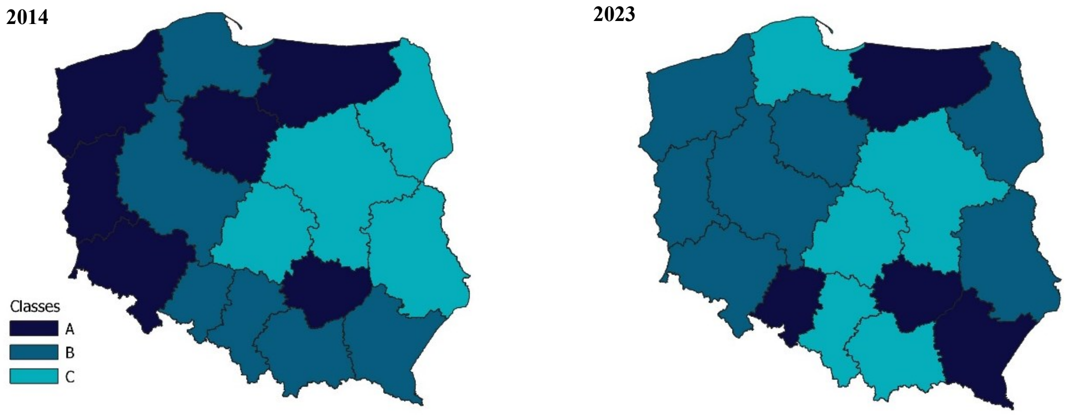


Figure 6. Classes of Polish voivodeships according to "the percentage of graduates in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering trades, architecture and building" factor in years 2015 and 2022.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

Based on the numerical values of the synthetic parameter, calculated as the average value of partial parameters characterising individual factors, three classes of voivodeships were distinguished. At the beginning of our analysis the highest level of potential investment attractiveness in the labour resources (class A) had six voivodeships: Warmińsko-Mazurskie, Świętokrzyskie, Lubuskie, Dolnośląskie, Kujawsko-Pomorskie and Zachodniopomorskie, in 2023 this included only four units: Świętokrzyskie, Podkarpackie, Opolskie and Warmińsko-Mazurskie. In both years analysed, the worst summary result was achieved by the Mazowieckie Voivodship due to its high cost of labour and relatively low intensity of well-qualified potencial employees. In 2014, the following voivodeships were also in the lowest class (C): Lubelskie, Łódzkie, Podlaskie, and in 2023: Łódzkie, Śląskie, Pomorskie and Małopolskie.



Notes: the gross value added per 1 employed person data were available up to 2021 ($F_{eff.}1$), and the percentage of graduates in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering trades, architecture and building ($F_{res.}3$) covered the years 2015 and 2022.

Figure 7. Potential investment attractiveness of Polish voivodeships in the labour resources area.

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

5. Summary

The investment attractiveness of a region is due to the interaction of numerous factors and barriers. Their identification is essential in formulating action programmes for the economic and social development of the region. The results may be useful in this regard, indicating that the variability of the attractiveness factors over time implies the need for continuous research, the results of which should be considered by organisations involved in supporting entrepreneurship and, above all, by institutions responsible for formulating economic policy instruments.

The picture of potential investment attractiveness in the context of labour resources is not adequate to the actual state. Indeed, the results of our study indicated that the voivodeships with the highest potential investment attractiveness in the area of labour resources are those in which FDI are relatively small. The greatest ability to attract investment is characterised by the Mazowieckie Voivodeship. This is largely due to the high investment attractiveness of this province in other pillars and the unquestionable advantage associated with having within its borders the capital of Poland. Although from the point of view of investors, high wages, characteristic of this province, are not a stimulant to locate capital there, they are a regional asset that increases the ability to attract workers with the appropriate skills. The voivodeships that bear the effort to generate this resource are drained of it, thus deprived of their locational advantage. This advantage is shifted affecting the investment attractiveness of high-wage voivodeships that do not generate the appropriately skilled labour resources sought by investors.

Hence, regional decision-makers must make efforts for effective promotion in order to attract investors capable of implementing locally educated labour resources, thus intensifying local development.

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References

1. Banak, M., Draga, I., Natusiewicz, A., Nowak, S., Paczka, K., Szmyt, B., Uptass, T. (2008). Atrakcyjność inwestycyjna gmin województwa mazowieckiego. *Kwartalnik Nauk o Przedsiębiorstwie*, *No. 4*, pp. 79-84.
2. Buckley, P.J., Casson, M.C. (1998). Analysing foreign market entry strategies: extending the internationalization approach. *Journal of International Business Studies*, *Vol. 29*, *No. 3*, pp. 539-562.
3. Cheng, L.K., Kwan, Y.K. (2000). What are the determinants of the location of foreign direct investment? The Chinese experience. *Journal of International Economics*, *Vol. 51*, *No. 2*, pp. 379-400.
4. Chidlow, A., Salciuviene, L., Young, S. (2009). Regional determinants of inward FDI distribution in Poland. *International Business Review*, *Vol. 18*, *Iss. 2*, pp. 119-133.
5. Domański, B., Działek, J., Górecki, J., Gwosdz., K., Janas, K., Jarczewski, W., Kocaj, A., Micek, G., Padło, T. (2008). *Inwestycje zagraniczne w Małopolsce*. Kraków, Polska: Urząd Marszałkowski Województwa Małopolskiego, p. 113.
6. Domański, B., Gwosdz, K., Działek, J., Huculak, M., Janas, K., Jarczewski, W., Micek, G., Sobala-Gwosdz, A. (2008). *Inwestycje zagraniczne w Małopolsce 1989-2005*. Kraków, Polska: Urząd Marszałkowski Województwa Małopolskiego, p. 110.
7. Dworzecki, Z. (1995). Międzynarodowa atrakcyjność inwestycyjna Polski. *Przegląd Organizacji*, *No. 11*, pp. 8-10.
8. EY (2017). *Mature leader of the CEE region, EY's Attractiveness Survey Poland*. Warszawa: EY.

9. Gawlikowska-Hueckel, K. (1997). Atrakcyjność inwestycyjna Polski – ujęcie regionalne. *Nowe Życie Gospodarcze*, *No. 42*, pp. 41-43.
10. Globerman, S., Shapiro, D.M. (1999). The impact of government policies on foreign direct investment: the Canadian experience. *Journal of International Business Studies*, *Vol. 30*, *No. 3*, pp. 513-532.
11. Godlewska-Majkowska, H. (2008). Atrakcyjność inwestycyjna regionów w usługach. *Kwartalnik Nauk o Przedsiębiorstwie*, *No. 1*, pp. 75-81.
12. Godlewska-Majkowska, H. (2011). Atrakcyjność inwestycyjna polskich regionów i przedsiębiorczość regionalna – ujęcie kompleksowe. *Studia i Analizy Instytutu Przedsiębiorstwa*, pp. 25-47.
13. Godlewska-Majkowska, H. (Ed). (2008). *Atrakcyjność inwestycyjna polskich regionów. W poszukiwaniu nowych miar*. Warszawa: Oficyna Wydawnicza Szkoły Głównej Handlowej.
14. Godlewska-Majkowska, H. (Ed) (2009). *Atrakcyjność inwestycyjna regionów Polski a kształtowanie lokalnych i regionalnych specjalizacji gospodarczych*. Warszawa: Oficyna Wydawnicza Szkoły Głównej Handlowej.
15. Godlewska-Majkowska, H. (Ed) (2012). *Atrakcyjność inwestycyjna jako źródło przedsiębiorczych przewag konkurencyjnych*. Warszawa: Oficyna Wydawnicza SGH.
16. Godlewska-Majkowska, H. (Ed) (2013). *Atrakcyjność inwestycyjna jako źródło przedsiębiorczych przewag konkurencyjnych*. Warszawa: Oficyna Wydawnicza Szkoły Głównej Handlowej.
17. Godlewska-Majkowska, H., Komor, A. (2021). Energy as a Factor of Investment Attractiveness of Regions for Agricultural Enterprises. *Energies*, *No. 14*, pp. 1-24.
18. Godlewska-Majkowska, H., Łyciuk-Bzdyra, M., Wodecki, A., Zarębski, P., Zarębski, K. (2010). Atrakcyjność inwestycyjna polskich regionów w 2007 roku. *Studia i Analizy Instytutu Przedsiębiorstwa*, pp. 55-234.
19. Guzik, B. (2008). Atrakcyjność inwestycyjna województw. *Gospodarka Narodowa. The Polish Journal of Economics*, *Vol. 222, No.* 3, pp. 39-64.
20. Hennart, J.F., Park, Y.R. (1994). Location, governance and strategic determinants of Japanese manufacturing investments in the United States. *Strategic Management Journal*, *Vol. 15*, *No. 6*, pp. 419-436.
21. Hildebrandt, A., Kalinowski, T., Nowicki, M., Susmarski, P., Tarkowski, M. (2005). *Atrakcyjność inwestycyjna województw i podregionów Polski 2005*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
22. Hildebrandt, A., Kalinowski, T., Nowicki, M., Susmarski, P., Tarkowski, M. (2006). *Atrakcyjność inwestycyjna województw i podregionów Polski 2005*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.

23. Hildebrandt, A., Kalinowski, T., Nowicki, M., Susmarski, P., Tarkowski, M. (2007). *Atrakcyjność inwestycyjna województw i podregionów Polski 2005*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
24. Hildebrandt, A., Kalinowski, T., Nowicki, M., Susmarski, P., Tarkowski, M. (2008). *Atrakcyjność inwestycyjna województw i podregionów Polski 2005*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
25. Hildebrandt, A., Nowicki, M., Susmarski, P., Tarkowski, M. (2009). *Atrakcyjność inwestycyjna województw i podregionów Polski*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
26. Hildebrandt, A., Nowicki, M., Susmarski, P., Tarkowski, M. (2010). *Atrakcyjność inwestycyjna województw i podregionów Polski.* Gdańsk: Instytut Badań nad Gospodarką Rynkową.
27. Hildebrandt, A., Nowicki, M., Susmarski, P., Tarkowski, M. (2011). *Atrakcyjność inwestycyjna województw i podregionów Polski.* Gdańsk: Instytut Badań nad Gospodarką Rynkową.
28. Hildebrandt, A., Nowicki, M., Susmarski, P., Tarkowski, M., Woźniak, W. (2012). *Atrakcyjność inwestycyjna województw i podregionów Polski*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
29. Hildebrandt, Nowicki, M., Susmarski, P., Tarkowski, M., Wandałowski, M. (2013). *Atrakcyjność inwestycyjna województw i podregionów Polski 2005*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
30. Janton-Drozdowska, E., Majewska, M., Grala, J. (2002). Atrakcyjność inwestycyjna Polski w świetle zagranicznych inwestycji bezpośrednich. *Ruch Prawniczy, Ekonomiczny i Socjologiczny*, *Vol. 64*, *No.* 3, pp. 131-153.
31. Jaworek, M. (2006). *Bezpośrednie inwestycje zagraniczne w prywatyzacji polskiej gospodarki*. Toruń: TNOiK „Dom Organizatora".
32. Jaworek, G. (1999). *Deutsche Directinvestitionen in Polen – Motive, Ergebnisse und Folgewirkungen*. Warszawa: Deutsch-Polnische Industrie und Handelskammer.
33. Jaworek, M., Czaplewski, L., Kuczmarska, M., Kuzel, M. (2016). Stymulanty i destymulanty podejmowania przez inwestorów zagranicznych inwestycji bezpośrednich w wybranych województwach Polski. In: W. Karaszewski (Ed.), *Bezpośrednie inwestycje zagraniczne w wybranych województwach Polski – analiza porównawcza* (pp. 121-154). Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.
34. Jaworek, M., Karaszewski, W. (2018). Ewolucja determinant podejmowania bezpośrednich inwestycji zagranicznych w Polsce. *Kwartalnik Naukowy Uczelni Vistula*, *Vol. 56*, *Iss. 2*, pp. 42-59.
35. Jaworek, M., Karaszewski, W., Kuczmarska, M., Kuzel, M., Szałucka, M., Krajewska, M., Siemińska, E. (2023). *Raport końcowy projektu naukowo-badawczego pn. Atrakcyjność inwestycyjna województwa kujawsko-pomorskiego zrealizowanego przez zespół*

Uniwersytetu Mikołaja Kopernika w Toruniu zleconego przez Pomorską Specjalną Strefę Ekonomiczną sp. z o.o. Toruń: Uniwersytet Mikołaja Kopernika w Toruniu.
36. Jaworek, M., Karaszewski, W., Kuczmarska, M., Kuzel, M., Szałucka, M., Krajewska, M., Siemińska, E. (2023). *Investment attractiveness of Kujawsko-Pomorskie voivodeship – a synthesis report on the research results*. Toruń: Uniwersytet Mikołaja Kopernika w Toruniu.
37. Jaworek, M., Karaszewski, W., Kuczmarska, M., Kuzel, M., Szałucka, M., Krajewska, M., Siemińska, E. (2023). *Investment attractiveness of Kujawsko-Pomorskie Voivodeship – a synthesis report on the research results*. Toruń: Uniwersytet Mikołaja Kopernika, Pomorska Specjalna Strefa Ekonomiczna.
38. Jaworek, M., Karaszewski, W., Siemińska, E. Jaworek, M., Czaplewski, L., Kuzel, M., Szałucka, M., SzóstekKuczmarska, M., Kuzel, M., Szałucka, M., Krajewska, M., Siemińska, E. (2023). *Investment attractiveness of Kujawsko-Pomorskie Voivodeship – a synthesis report on the research results*. Toruń: Uniwersytet Mikołaja Kopernika, Pomorska Specjalna Strefa Ekonomiczna.
39. Jedlińska, R. (2013). Atrakcyjność inwestycyjna Polski – wybrane aspekty. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *No. 305*, pp. 252-263.
40. Karaszewski, W. (2001). *Przedsiębiorstwa z udziałem kapitału zagranicznego w Polsce w latach 1990-1999 (miejsce w gospodarce kraju, czynniki i perspektywy rozwojowe)*. Toruń: Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.
41. Kinda, T. (2010). Investment climate and FDI in developing countries: firm-level evidence. *World development*, *Vol. 38*, *No. 4*, pp. 498-513.
42. Kisiel, R., Graszkiewicz, K. (2018). Atrakcyjność inwestycyjna a napływ bezpośrednich inwestycji zagranicznych (na przykładzie wybranych krajów Europy Środkowo-Wschodniej). *Przegląd Wschodnioeuropejski*, *Vol. 9*, *No. 1*, pp. 33-48.
43. Kisiel, R., Lizińska, W., Marks-Bielska, R., Babuchowska, K., Serocka, I. (2015). *Bezpośrednie inwestycje zagraniczne w województwie warmińsko-mazurskim. Raport z badania*. Olsztyn: Uniwersytet Warmińsko-Mazurski w Olsztynie, Samorząd Województwa Warmińsko-Mazurskiego.
44. Kociszewska, I., Kamińska, M. (2008). Atrakcyjność inwestycyjna regionów Polski dla inwestorów zagranicznych. *Prace Naukowe Akademii Ekonomicznej w Katowicach*, pp. 261-271.
45. Krawczyk, S., Figna, A. (2011). Atrakcyjność inwestycyjna Polski. *Zeszyty Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *No. 221*, pp. 292-301.
46. Kućmierczyk, E. (2009). Atrakcyjność inwestycyjna Polski w opinii niemieckich inwestorów. *Prace Naukowe Akademii Ekonomicznej w Katowicach*, pp. 173-191.
47. Kuźmiak, J. (2008). Atrakcyjność inwestycyjna Polski dla inwestorów japońskich. *Prace Naukowe Uniwersytetu we Wrocławiu*, *No. 28*, pp. 138-146.

48. Lizińska, W. (2012). *Klimat inwestycyjny jako czynnik bezpośrednich inwestycji zagranicznych w Polsce (studium na poziomie układów terytorialnych)*. Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie, p. 340.
49. Lizińska, W., Marks-Bielska, R., Janicka, J. (2010). Czynniki atrakcyjności inwestycyjnej w wybranych województwach Polski Wschodniej. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *No. 111*, pp. 381-391.
50. Local Data Bank of the Statistics Poland (2023). Retrieved from: https://bdl.stat.gov.pl, 6.11.2024.
51. Makowiecka, M. (2019). Atrakcyjność inwestycyjna obszarów przygranicznych Polski i Słowacji. *Studia Ekonomiczne. Gospodarka, Społeczeństwo, Środowisko*, *No. 4*, pp. 47-59.
52. Mayeko, L. (2024). Skilled Labor: A Lever for Foreign Direct Investment Inflows. *Journal of Investment, Banking and Finance*, *Vol. 2. No. 1*, pp. 1-10.
53. Nazarczuk, J.M. (2014). *Potencjał rozwojowy a aktywność inwestycyjna województw i podregionów Polski*. Olsztyn: Wydawnictwo Uniwersytetu Warmińsko-Mazurskiego w Olsztynie, p. 295.
54. Nizielska, A. (2010). Atrakcyjność inwestycyjna Europy Środkowo-Wschodniej – metodyczny aspekt badań. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, *No. 150*, pp. 242-251.
55. Owczarczuk, M. (2014). Atrakcyjność inwestycyjna Polski z perspektywy instytucjonalnej. *Studia Ekonomiczne*, *No. 184*, pp. 168-180.
56. PAIH (2017). *Polska ze stabilnym klimatem dla inwestorów zagranicznych. Wyniki 11. edycji badania „Klimat inwestycyjny w Polsce"*. Warszawa: Polska Agencja Inwestycji i Handlu.
57. PAIiIZ (2005). *Opinie inwestorów o warunkach działalności w Polsce. Raport z badania przeprowadzonego przez CBM Indicator*. Warszawa: Polska Agencja Informacji i Inwestycji Zagranicznych.
58. PAIiIZ (2016). *Polska utrzymuje dobry klimat dla zagranicznego biznesu. Wyniki 10. edycji badania „Klimat inwestycyjny w Polsce"*. Warszawa: Polska Agencja Informacji i Inwestycji zagranicznych.
59. PAIiZ (2000). *Opinia inwestorów zagranicznych o społecznych i ekonomicznych warunkach działalności w Polsce. Raport z badania przeprowadzonego przez CBM Indicator pod kierownictwem J. Garlickiego, J. Błuszkowskiego*. Warszawa: Polska Agencja Inwestycji i Handlu.
60. PAIiZ (2003). *Opinia inwestorów zagranicznych o społecznych i ekonomicznych warunkach działalności w Polsce. Raport z badania przeprowadzonego przez CBM Indicator pod kierownictwem J. Garlickiego, J. Błuszkowskiego*. Warszawa: Polska Agencja Inwestycji i Handlu.

61. Pakulska, T., Poniatowska-Jaksch, M. (2013). Atrakcyjność inwestycyjna Polski – prawda i mity. *Kwartalnik Nauk o Przedsiębiorstwie*, *Vol. 28, No. 3*, pp. 5-14.
62. Pawlak, K., Standar, A., Kołodziejczak, M., Kołodziejczak, W. (2015). *Bezpośrednie inwestycje zagraniczne w województwie wielkopolskim. Raport z badania*. Poznań: Uniwersytet Przyrodniczy w Poznaniu, Urząd Miasta i Gminy w Kłodawie.
63. Pawlas, I. (2011). Potencjalna atrakcyjność inwestycyjna województwa śląskiego. *Prace Naukowe Uniwersytetu Ekonomicznego w Katowicach*, pp. 74-107.
64. Peluffo, A. (2015). Foreign direct investment, productivity, demand for skilled labour and wage inequality: An analysis of Uruguay. *The World Economy*, *Vol. 38*, *No. 6*, pp. 962-983.
65. Pilarska, Cz. (2017). *Międzynarodowa konkurencyjność gospodarki polskiej na tle nowych krajów członkowskich Unii Europejskiej*. Kraków: Wydawnictwo Uniwersytetu Ekonomicznego w Krakowie, p. 527.
66. Pissulla P. (1997). *Deutsch-polnische Joint Venture: Ergebnisse einer Befragung*. Hamburg: HWWA – Institut für Wirtschaftsforschung.
67. Polsko-Niemiecka Izba Przemysłowo-Handlowa (2012). *Ankieta koniunkturalna EŚW 2012*. Warszawa: AHK.
68. Polsko-Niemiecka Izba Przemysłowo-Handlowa (2013). *Ankieta koniunkturalna Europa Środkowo-Wschodnia 2013*. Warszawa: AHK.
69. Polsko-Niemiecka Izba Przemysłowo-Handlowa (2015). *Ankieta koniunkturalna 2015*. *Polska w ocenie inwestorów zagranicznych*. Warszawa: AHK.
70. Polsko-Niemiecka Izba Przemysłowo-Handlowa (2016). *Ankieta koniunkturalna 2016. Polska w ocenie inwestorów zagranicznych*. Warszawa: AHK.
71. Polsko-Niemiecka Izba Przemysłowo-Handlowa (2017). *Ankieta koniunkturalna 2017. Polska w ocenie inwestorów zagranicznych*. AHK.
72. PWC (2002). *Poland as attractive place for investment – perception does matter*. Warszawa: PriceWaterhouseCoopers.
73. Raszkowski, A. (2011). Atrakcyjność inwestycyjna regionów – wybrane zagadnienia. *Ekonomia*, *No. 17*, pp. 258-272.
74. Różański J. (2010). *Przedsiębiorstwa zagraniczne w Polsce. Rozwój. Finansowanie. Ocena*. Warszawa: PWE.
75. Schneider, F., Frey, B.S. (1985). Economic and political determinants of foreign direct investment. *World Development*, *Vol. 13*, *No. 2*, pp. 161-175.
76. Sporek, T. (2017). Atrakcyjność inwestycyjna Polski w latach 1990-2016 – trendy, struktura i perspektywy. *Studia Europejskie – Studies in European Affairs*, *No. 4*, pp. 95-118.
77. Stawicka, M. (2007). *Atrakcyjność inwestycyjna Polski*. Warszawa: CeDeWu.
78. Stawicka, M. (2008). Atrakcyjność inwestycyjna polskich województw. *Prace Naukowe Akademii Ekonomicznej we Wrocławiu. Ekonomia i Międzynarodowe Stosunki Gospodarcze*, *No. 1193*, pp. 320-334.

79. Swianiewicz, P., Dziemianowicz, W. (1999). Atrakcyjność inwestycyjna miast 1998-1999. *Polska Regionów*, *No. 7*, pp. 109.
80. Szypuła, K., Leszczyńska, M. (2021). Atrakcyjność inwestycyjna Polski dla firm z kapitałem zagranicznym. Wprowadzenie i problem badawczy. In: O.A. Іващенко, (Ed.), *Бізнес-аналітика в управлінні зовнішньоекономічною діяльністю: Матеріали VIII Міжнародної науково-практичної конференції,* 17 березня 2021 року. Упоряд, Київ: ДП Інформаційно-аналітичне агентство.
81. Tahir, R., Larimo, J. (2004). Understanding the location strategies of the European firms in Asian countries. *Journal of American Academy of Business*, *Vol. 5*, *No. 1/2*, pp. 102-109.
82. Tarkowski, M., Kalinowski, T., Hildebrandt, A., Nowicki, M., Susmarski, P. (2008). *Atrakcyjność inwestycyjna województw i podregionów Polski*. Gdańsk: Instytut Badań nad Gospodarką Rynkową, p. 99.
83. Tarkowski, M., Nowicki, M., Susmarski, P., Wandałowski, M., Woźniak, W. (2015). *Atrakcyjność inwestycyjna województw i podregionów Polski*. Gdańsk: Instytut Badań nad Gospodarką Rynkową.
84. Tatoglu, E., Glaister, K.W. (1998). Western MNCs' FDI in Turkey: an analysis of location specific factors. *Management International Review*, *Vol. 38*, *No. 2*, pp. 133-159.
85. Vijayakumar, N., Sridharan, P., Rao, K.C.S. (2010). Determinants of FDI in BRICS countries: A panel analysis. *International Journal of Business Science and Applied Management*, *Vol. 5*, *No. 3*, pp. 1-13.
86. Wierzbińska, M., Surówka, A. (2008). Atrakcyjność inwestycyjna regionów Polski Wschodniej. *Prace Naukowe Akademii Ekonomicznej we Wrocławiu*, *No. 1191*, pp. 706-716.
87. Witkowska, J. (1998). Motywacje inwestorów zagranicznych – aspekty porównawcze. In: Z. Olesiński (Ed.), *Bezpośrednie inwestycje zagraniczne w Polsce* (pp. 70-86). Warszawa: PWE.
88. Zarębski, P. (2012). Atrakcyjność inwestycyjna obszarów wiejskich w Polsce. *Zeszyty Naukowe SGGW w Warszawie – Problemy Rolnictwa Światowego*, *Vol. 12, No. 4*, pp. 169-178.
89. Zarębski, P., Godlewska-Majkowska, H. (2013). Atrakcyjność inwestycyjna regionów Polski na tle UE. *Studia i Analizy Instytutu Przedsiębiorstwa*, pp. 43-85.

Appendix

Table 2.
Determinants of labour resources attractiveness of Polish voivodships

Voivodeship	$F_{eff.}1$				$F_{eff.}2$				$F_{res.}1$				$F_{res.}2$				$F_{res.}3$			
	2014		2021		2014		2023		2014		2023		2014		2023		2015		2022	
	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij	Fi	Fij
	PLN	%	PLN	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Dolnośląskie	123,787	71.03	170,858	69.86	101.0	57.40	103.4	43.16	10.4	25.23	4.4	24.56	46.5	55.95	48.6	50.85	27.5	100.00	25.8	100.00
Kujawsko-Pomorskie	97,497	29.91	140,805	29.51	85.9	96.62	88.5	88.45	15.5	71.17	7.1	71.93	52.5	91.67	57.9	90.25	17.6	11.61	14.0	6.35
Lubelskie	78,373	0.00	118,828	0.00	90.0	85.97	89.2	86.32	12.6	45.05	7.6	80.70	38.8	10.12	48.4	50.00	20.2	34.82	19.9	53.17
Lubuskie	105,305	42.13	144,717	34.76	85.5	97.66	90.6	82.07	12.5	44.14	4.3	22.81	53.4	97.02	57.8	89.83	20.1	33.93	20.0	53.97
Łódzkie	99,526	33.09	145,260	35.49	90.4	84.94	92.9	75.08	11.8	37.84	5.4	42.11	41.6	26.79	46.8	43.22	18.2	16.96	17.6	34.92
Małopolskie	94,523	25.26	140,410	28.98	92.4	79.74	101.9	47.72	9.7	18.92	4.2	21.05	47.6	62.50	51.6	63.56	27.0	95.54	25.4	96.83
Mazowieckie	142,305	100.00	193,307	100.00	123.1	0.00	117.6	0.00	9.6	18.02	4.0	17.54	37.1	0.00	36.6	0.00	17.4	9.82	15.3	16.67
Opolskie	104,156	40.33	149,726	41.49	90.7	84.16	91.8	78.42	11.8	37.84	5.9	50.88	53.9	100.00	60.2	100.00	16.3	0.00	18.4	41.27
Podkarpackie	80,379	3.14	125,529	9.00	85.2	98.44	84.7	100.00	14.6	63.06	8.7	100.00	46.3	54.76	53.2	70.34	23.2	61.61	18.4	41.27
Podlaskie	86,491	12.70	124,390	7.47	88.2	90.65	89.6	85.11	12.9	47.75	7.0	70.18	42.2	30.36	47.8	47.46	21.1	42.86	19.8	52.38
Pomorskie	112,002	52.60	157,236	51.57	100.2	59.48	99.4	55.32	11.1	31.53	4.6	28.07	48.3	66.67	53.5	71.61	25.1	78.57	18.8	44.44
Śląskie	114,735	56.88	163,597	60.11	102.4	53.77	100.2	52.89	9.6	18.02	3.6	10.53	48.6	68.45	51.6	63.56	20.3	35.71	19.4	49.21
Świętokrzyskie	82,366	6.25	127,784	12.02	85.8	96.88	86.7	93.92	14.1	58.56	7.8	84.21	46.4	55.36	53.9	73.31	27.5	100.00	21.1	62.70
Warmińsko-Mazurskie	97,159	29.38	136,600	23.86	84.6	100.00	84.9	99.39	18.7	100.00	8.3	92.98	47.4	61.31	55.3	79.24	20.8	40.18	13.2	0.00
Wielkopolskie	105,617	42.61	148,316	39.59	89.9	86.23	89.2	86.32	7.6	0.00	3.0	0.00	50.0	76.79	57.4	88.14	21.3	44.64	20.8	60.32
Zachodniopomorskie	110,704	50.57	150,710	42.81	91.1	83.12	92.3	76.90	15.5	71.17	6.7	64.91	43.7	39.29	52.2	66.10	21.7	48.21	18.6	42.86

Note. F_i – level of the variable; F_{ij} – level of the standardised variable; $F_{eff.}1$ – gross value added per 1 employed person (PLN); $F_{eff.}2$ – average monthly gross wages and salary in relation to the average domestic (Poland = 100%); $F_{res.}1$ – registered unemployment rate (%); $F_{res.}2$ – graduates of stage I sectoral vocational schools and technical secondary schools in total number of graduates upper secondary and post-primary schools (%); $F_{res.}3$ – percentage of students in the fields of biological sciences, environment, health, physical sciences, mathematics and statistics, information and communication, engineering and engineering, architecture and building (%).

Source: own study based on (Local Data Bank of the Statistics Poland, 2024).

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FOREIGN DIRECT INVESTMENT IN THE VISEGRAD GROUP IN THE CONTEXT OF THEIR INTERNATIONAL COMPETITIVENESS

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Purpose: The aim of the article is to identify foreign direct investments in the Visegrad Group countries against the background of selected rankings measuring the parameters of the competitiveness of economies.
Design/methodology/approach: For the study identifying foreign direct investments in the Visegrad Group in the context of its international competitiveness, a literature query was carried out using the Scopus database. Additionally, using the VOSwiewer programme, keyword links of articles related to the subject under consideration were presented. Next we based on information obtained from statistical sources published by institutions dealing with the identification of international capital flows, as well as international competitiveness: the United Nations Conference on Trade and Development, World Economic Forum, World Bank, Heritage Foundation, Legatum Institute. This study uses a variety of methods, such as statistical and economic analyses, comparisons, analogies, synthesis, the method of measuring and aggregating data, and the tabular method.
Findings: The results of this study indicated that the Czech Republic and Poland are the most competitive countries among the Visegrad Group. They also absorbed the highest capital in the form of FDI in the analysed period. It was due to their macroeconomic stability, high productivity of labour resources, innovation capability, and, in the case of Poland, market size.
Practical implications: The results of the study might have practical applications in decision-making processes regarding the choice of business location in the Visegrad Group countries.
Originality/value: Although the topic of foreign direct investment in the Visegrad Group countries has been discussed in the available literature, there is only a few studies conducted in the context of the international competitiveness of these countries.
Keywords: international competitiveness, foreign direct investment (FDI), Visegrad Group (V4).
Category of the paper: Research paper.

1. Introduction

The countries of the Visegrad Group (V4) are linked by a common history, geopolitical conditions, cultural and religious elements. Of great importance for their current economic situation was the event that took place after World War II. The analysed countries were incorporated into the Eastern Bloc under the control of the USSR, which decided their foreign policy and the fundamental directions of economic policy. For almost half a century, the economic system of the V4 countries was based on social ownership of production. Politically, these countries were united by their participation in the Warsaw Pact and the Council for Mutual Economic Assistance, which had a major impact on their economies and social structure. In the early 1990s, the V4 countries began a process of transformation, transforming their economies from centrally planned to market-based. It was a period of difficult economic reforms including privatisation of state-owned enterprises, trade liberalisation and tax reforms. Countries opened up to foreign direct investment, seeing it as an engine of development. Despite the implementation of common policies within the Visegrad Group, countries compete to attract foreign direct investment (FDI). Their efforts in this regard focus on improving competitiveness, as reflected in various rankings.

The aim of the article is to identify foreign direct investments in the Visegrad Group countries against the background of selected rankings that measure the parameters of the competitiveness of economies.

The rest of this paper is organised as follows. The following section provides a brief general overview of the literature related to national competitiveness of countries and FDI. The methodology used in the research is presented next. The research findings are then discussed. Finally, the general conclusions are stated.

2. Literature review

The competitiveness of countries is perceived mainly through productivity, as it is the primary determinant of growth, income levels, and long-term standard of living. Productivity is the value of the output produced by a unit of labour or capital. The productivity of labour resources determines employee wages and improves the welfare of the society, while the productivity with which the capital is engaged determines the rate of return for investors (Porter, 1990). Therefore, it is often emphasized that countries with higher productivity (more competitive) may offer more to both their society and investors who locate capital there.

The World Economic Forum (2016), which has been measuring competitiveness among countries, defines it as "the set of institutions, policies and factors that determine the level of productivity of a country". Countries' competitiveness is assessed in various areas, which mostly comprise the macroeconomic environment, innovation, infrastructure, market size, education, labour market efficiency, health of society and institutional factors. Those ingredients create a favorable environment for running business, increasing productivity and incomes. It is especially important in the context of international business, because foreign capital scours the world in search of best location. Therefore, individual countries compete with each other for foreign direct investors, and those that have the advantages they need, i.e. are attractive for investors, have a chance to raise capital.

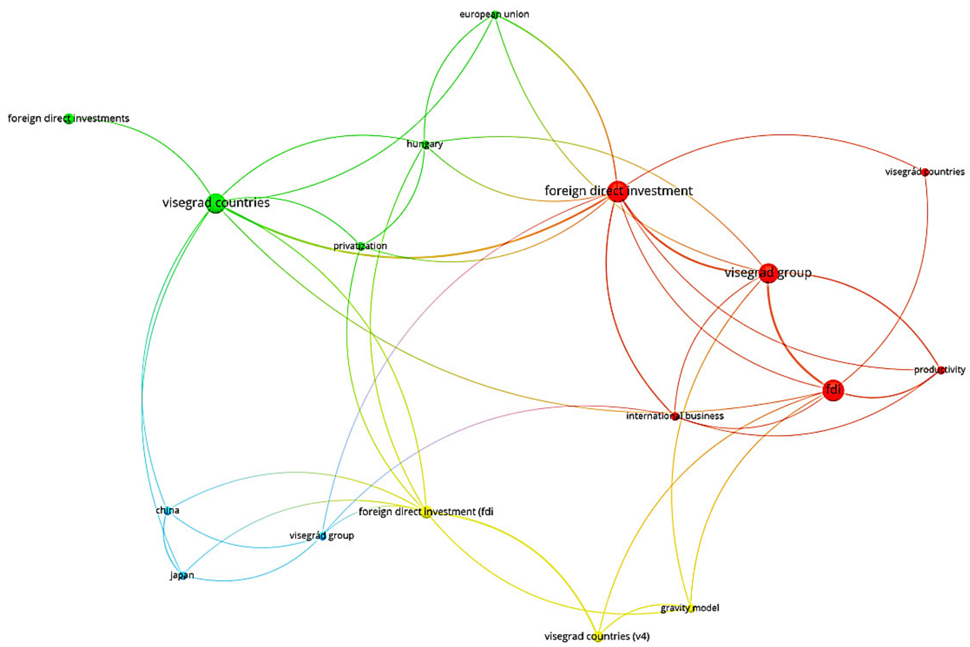
Countries located close to each other often have very similar locational advantages. In this case, competing for foreign capital is particularly difficult and requires creating more favourable conditions for investment than the others. Multinational enterprises regularly compare the relative location specific advantages (competitive advatages) of particular countries, when deciding where to invest. Therefore, it is especially important to constantly work on country's advantages development and to offer investors what they need (Dunning, Zhang, 2008).

In this regard, researches often assume that the more competitive (productive) a country is, the more likely it is to attract FDI. Therefore, the scale of inward FDI in a country it used to expresses its competitiveness as a business location. On the other hand, FDI is also perceived as a source of a country's competitiveness, because they improve the country's productivity through knowledge and technology transfer (Gabor, 2000; Stankov, Damnjanović, Roganović, 2018).

Despite the high importance of the issue of the relationship between foreign direct investment and the competitiveness/attractiveness of countries, it is not a research problem often explored in the context of Visegrad countries. Based on a review of articles indexed in the Scopus database using the keywords 'foreign direct investment' or 'FDI' and 'Visegrad Group' or 'Visegrad countries', it was possible to identify 39 papers, including only one on FDI and competitiveness (Novák, Darmo, Osusky, 2024). More articles deal with topics such as inflows or sectoral and geographic analysis of FDI (Chetverikova, 2022; Szunomár, 2021; Gubik et al., 2020; Vlčková, 2018; Kuzel, 2017; Klich, 2017); factors influencing FDI decision and role of macroeconomic and institutional variables in attracting FDI (Jedlička, 2023; Hassan, 2022; Singh, 2022; Salamaga, 2021; Klimek, 2020; Wojciechowski, Makieła, 2019; Su, 2018; Wach, Wojciechowski, 2016; Dorożyński, Kuna-Marszałek, 2016; Wojciechowski, 2013); FDI and trade relations (Lomachynska et al., 2020; Zysk, Smiech, 2014; Clarke, Slovik, 2007), the importance of FDI for economies or their selected economic areas (Leitão, 2023; Salamaga, 2023; Darfo-Oduro, 2022; Éltető et al., 2022; Kottková, 2022; Makiela et al., 2021; Hintošová et al., 2020; Capik, Drahokoupil, 2011; Dudas, Lukac, 2014; Vlachos, Kalimeris, 2010). Furthermore, among other non-replicated themes, one can point to FDI in the context of

EU integration (Cristani, 2021); profit reinvestment issues (Prochazka, Cerna, 2022) or the post-COVID-19 shift in FDI strategies (Kalotay, Sass, 2021). A visualisation of the keywords used in the 39 articles analysed is presented in the following diagram.

In addition, a linkage analysis of the author's keywords included in the examined articles was performed using the VOSviewer programme. Due to the relatively small number of publications, the number of occurrences was used on level 2. Visualisation of these links is presented in figure 1. The visualisation shows 4 distinct clusters. The first cluster (red) contains the main keyword 'foreign direct investment' strongly linked to the terms 'visegrad group', 'international business' and 'productivity'. Second cluster (green) contains the main keyword 'visegrad countries', which is linked to the terms: 'foreign direct investment', 'privatization', 'european union' and 'hungary'. The third cluster with the main words 'china', 'japan' occurs in relation to the term 'visegrad group'. The last cluster (yellow) contains the main keyword 'foreign direct investment (fdi)' occurring in relation to 'visegrad countries (v4)' and 'gravity model'.



Note: Minimum number of occurrences of authors keywords: 2 of the 152 keywords, 17 meet the threshold.

Figure 1. Keyword map.

Source: own study based on Scopus and VOSviewer.

3. Methods

For the study identifying foreign direct investments in the Visegrad Group in the context of its international competitiveness, a literature query was carried out using the Scopus database. Additionally, using the VOSwiewer programme, keyword links of articles related to the subject under consideration were presented.

The study is based also on information obtained from statistical sources published by institutions dealing with the identification of international capital flows, as well as international competitiveness: the United Nations Conference on Trade and Development, World Economic Forum, World Bank, Heritage Foundation, Legatum Institute. The information includes the following: 1) The position of V4 countries in the world according to the Doing Business Index in the years 2010-2020 and Business Ready in 2024, 2) The position of V4 countries in the world according to the Legatum Prosperity Index in the years 2011-2023, 3) The position of V4 countries in the world according to the Index of Economic Freedom in the years 2010-2024, 4) The position of V4 countries in the world according to the Global Competitiveness Index in the years 2011-2023 and 5) FDI flows and stocks in V4 countries in the years 2010-2023. This study uses a variety of methods, such as statistical and economic analyses, comparisons, analogies, synthesis, as well as the method of measuring and aggregating data, and the tabular method. The choice of economic parameters presented below is based on the results of a preliminary query of the scientific literature on the subject, available statistical data, as well as the research experience of the authors and their own conclusions.

4. Results and Discussion

Numerous scientific research and consulting centres around the world share their research results and help companies make decisions on foreign direct investment. When choosing where to allocate capital (country of investment), the results of research on investment attractiveness or international competitiveness, included in various rankings, are important (Jaworek et al., 2022).

The World Bank reports published until 2020, assessing the ease of doing business through the Doing Business Index (DBI), were internationally recognised studies on an important area of international economic competitiveness, which is the issue of ease of doing business. The Doing Business Index covered 12 areas of business regulation. Ten of these areas – Starting a Business; Dealing with Construction Permits; Getting Electricity; Registering Property; Getting Credit; Protecting Minority Investors; Paying Taxes; Trading across Borders; Enforcing Contracts; Resolving Insolvency – were included in the ease of doing business score and ease of doing business ranking. *Doing Business* also measured regulation on employing workers and contracting with the government, which were not included in the ease of doing business score and ranking. A higher position in the Doing Business ranking meant better, usually simpler, regulations governing matters related to doing business and stronger protection of property by law. In 2021, the World Bank announced that it would stop developing and presenting the ranking. In 2024, it was replaced by a new ranking, i.e. Business Ready (B-Ready), which takes into account three pillars: I – Regulatory Framework; II – Public Services; and III – Operational Efficiency. The first pilot project involved 50 countries (unfortunately, excluding Poland and the Czech Republic).

The Visegrad Group countries have generally been in the upper part of the ranking, although outside the top 20. In recent years, Poland and the Czech Republic have achieved higher positions compared to Slovakia and Hungary, while in the initial years of the analysis they were ranked higher. However, the general trend shows that all of these countries have stable and relatively friendly business conditions, although detailed results may vary depending on the categories analyzed[1] (Table 1).

Table 1.
The position of the Visegrad Group countries in the world according to the DBI in the years 2010-2020 and Business Ready in 2024

Country	Doing Business										B-Ready		
											PI	PII	PIII
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2024		
Czech Republic	63	64	65	75	44	36	27	30	35	41	-	-	-
Poland	70	62	55	45	32	25	24	27	33	40	-	-	-
Slovak Republic	41	48	46	49	37	29	33	39	42	45	4	7	12
Hungary	46	51	54	54	54	42	41	48	53	52	1	5	14

Note: Poland and the Czech Republic are not included in the new Business Ready programme prepared by the World Bank, because at the current stage of the pilot implementation of the report, the World Bank decided to include a smaller group of countries; colors: ● 1st place among V4, ● 2nd place, ● 3th place, ● 4th place.

Source: own study based on World Bank Group from 2011-2020.

The Legatum Prosperity Index (LPI) is an annual report prepared by the Legatum Institute. The index allows each country to compare itself to others under various pillars and indicate which aspects of prosperity are more or less developed. In 2011 – 2014, the Legatum Prosperity Index consisted of nine pillars: Country, Economy, Entrepreneurship and Opportunity, Governance, Education, Health, Safety and Security, Personal Freedom, Social Capital. In 2015, there was a slight change in the index, which built 9 pillars: Economic Quality, Business Environment, Governance, Personal Freedom, Social Capital, Safety and Security, Education; Health, Natural Environment. As of 2019 the index consisted of 12 pillars: Safety and Security; Personal Freedom; Governance; Social Capital; Investment Environment; Enterprise Conditions; Infrastructure and Market Access; Economic Quality; Living Conditions; Health; Education; Natural Environment.

Throughout the analysis period, the Czech Republic placed among the high-ranking countries, while Poland, Slovakia, and Hungary placed among the upper middle-ranking countries. Until 2017 Poland was ahead of Slovakia and as of 2018 it ranked slightly lower. Hungary was ranked the lowest. In the ranking for 2023. The Czech Republic was in the first quartile (Q1) of countries with the highest prosperity (Table 2).

Table 2.
The position of the Visegrad Group countries in the world according to the LPI in the years 2011-2023

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Czech Republic	26	28	29	29	26	27	26	27	28	29	27	27	25
Poland	28	32	34	31	29	34	32	33	36	36	36	36	37
Slovakia	32	36	38	35	35	36	35	32	32	35	35	35	35
Hungary	36	39	41	39	45	47	45	42	46	46	44	43	42

Note: ● High ranking countries (30), ● Upper middle ranking countries (31-71).

Source: own study based on Legatum Institute from 2011-2020.

The Index of Economic Freedom (IEF), compiled by the US-based Heritage Foundation, has a special place in assessments of the economic freedom of countries around the world. The index reflects the restrictiveness of the law and the extent of coercion in the economic sphere by the apparatus of power in the countries of the world under evaluation. The Index of Economic Freedom considers 12 elements of economic freedom in 4 areas: Rule of Law; Size of Government; Effectiveness of Regulation; Open Markets.

Between 2011 and 2024, the Visegrad Group countries occupied different positions in the economic freedom ranking. Throughout this period, the Czech Republic held the highest position in the group, achieving its best result in 2022 (20th place). Although they dropped to 24th place in 2024, they still remain the leader among V4 countries. Poland ranked 68th in 2011, but improved its position, reaching 38th in 2022. Slovakia showed fluctuations in the ranking, with the best result in 2023 (33rd place) and the worst in 2019 (64th place), achieving stability in recent years. Hungary's competitive position decreased during the review period, reaching 72nd place in 2024 (Table 3).

Table 3.
The position of the Visegrad Group countries in the world according to the IEF in the years 2010-2024

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Czech Republic	29	32	29	26	24	21	28	25	23	23	27	20	21	24
Poland	68	64	57	51	43	39	45	45	45	47	42	38	40	42
Slovakia	37	50	42	57	50	56	57	59	64	60	60	36	33	34
Hungary	51	49	48	52	54	58	56	55	65	62	55	48	54	72

Note: ● 1st place among V4, ● 2nd place, ● 3th place, ● 4th place.

Source: own study based on Heritage.org, 10.11.2024.

The Global Competitiveness Index (GCI) was regularly compiled by the World Economic Forum until 2019. The index consisted of more than 110 variables, two-thirds of which came from the Executive Opinion Survey and one-third from publicly available sources such as the United Nations. The variables formed 12 pillars, each representing an area that determines competitiveness. In 2020 WEF announced that it would discontinue publication of the classic Global Competitiveness Report due to the impact of the COVID-19 pandemic, focussing instead on reports tailored to new realities, such as assessing the readiness of economies to recover from a pandemic. The WEF has changed its approach to assessing economies, placing greater emphasis on areas such as sustainability, digitisation and resilience to crises.

Throughout the period analysed, the Czech Republic maintained the first place among the Visegrad Group countries. The second place was held by Poland. Slightly further down the ranking were Hungary and Slovakia. At the end of the review period, all countries increased their competitiveness compared to 2011. In 2019, only the Czech Republic was in the first quartile (Q1) of the world's most competitive countries out of 141 assessed (Table 4).

Table 4.
The position of the Visegrad Group countries in the world according to the GCI in the years 2011-2023

Country	2011	2012	2013	2014	2015	2016	2017	2018	2019
Czech Republic	38	39	46	37	31	31	31	29	32
Poland	41	41	42	43	41	38	39	37	37
Slovakia	69	60	78	75	67	65	59	41	42
Hungary	48	71	63	60	63	69	60	48	47

Note: ● 1st place among V4, ● 2nd place, ● 3th place, ● 4th place.

Source: own study based on: World Economic Forum 2011-2029.

Analysing all the rankings of international competitiveness presented above, it should first be pointed out that the Visegrad Group countries occupied similar positions in them. In the three indexes, i.e., the Legatum Prosperity Index, the Index of Economic Freedom and the Global Competitiveness Index, the Czech Republic was the leader, while the highest position in the Doing Business Index was achieved by Poland. Throughout the analysed period, only in the Global Competitiveness Index increased the positions of all Visegrad countries. An increase in the Index of Economic Freedom was recorded by the Czech Republic, Poland, and Slovakia. It is worth noting that in the last mentioned country the increase in recent years has been significant – from the 60th place in 2021 to the 34th in 2024. In the Doing Business Index, Poland and the Czech Republic improved their positions. On the other hand, only the Czech Republic recorded an increase in the Index of Economic Freedom. In this ranking, Poland recorded the largest decrease – from 28th place in 2011 to 37th in 2023. In all four presented rankings, among the V4 countries, Hungary occupied the last place.

Focusing on the level of FDI inflows to the Visegrad Group countries, in the years 2010-2023 Poland had the largest average annual FDI inflow of USD 16.7 billion, ranking it eighth among EU countries. The Czech Republic took the second place among the V4 group and the 13th in the EU at the same time, with an average annual FDI inflow of USD 7.3 billion. It was followed by Hungary (USD 4.2 billion, 18th place among EU) and Slovakia (USD 1.3 billion, 23th place among EU). Among the countries analysed, Poland and Hungary had the highest volatility of FDI inflows. Between 2021 and 2023, Poland registered the highest value of FDI inflows in history, reaching approximately USD 30 billion per year, placing it among the top countries in the world in terms of FDI inflows (13th place in 2021, and 14th in 2022 and 2023) (UNCTAD, 2023, 2024). Hungary, on the other hand, recorded minus FDI inflows in 2015-2016 of USD -14.5 billion and USD -5.4 billion, respectively.

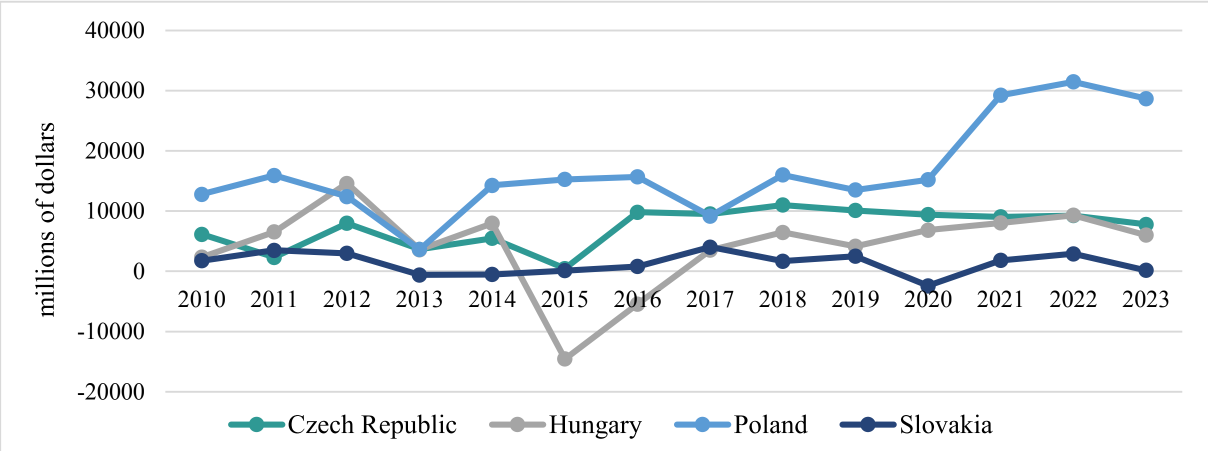


Figure 2. FDI inflows to the Visegrad Group countries in the years 2010-2023 (millions of dollars). Source: UNCTAD, 2024.

At the end of 2023, the total value of FDI instocks in the Visegrad Group countries reached nearly USD 731.7 billion. The highest value of capital in this form was received by Poland – USD 335.5 billion (45.9% of total FDI instocks in the V4 countries). The Czech Republic came second, with an investment in FDI of USD 216.6 billion (29.6%). Hungary ranked third, with nearly USD 119.0 billion (16.3%), and the last place belongs to Slovakia, which at the end of 2023 received USD 60.5 billion in FDI stock (8.3%) (Figure 2). However, when considering the FDI instock per capita, the Czech Republic takes the leading position, followed by Hungary, Slovakia, and in the last place Poland.

In 2010-2023, the average annual growth rate of FDI instock in the V4 group amounted to 4.1%, which was lower than for all EU countries (6.4%). Again, Poland was the leader in this regard (5.4%), followed by the Czech Republic (4.5%), Hungary (2.5%) and Slovakia (1.8%). Over the whole analysed period, the value of FDI stocks in Visegrad Group countries increased by nearly 60.0% (in Poland 78.9%, Czech Republic 68.6%, Hungary 30.7%, and Slovakia – 20.3%). For all EU countries, this increase was double in this period.

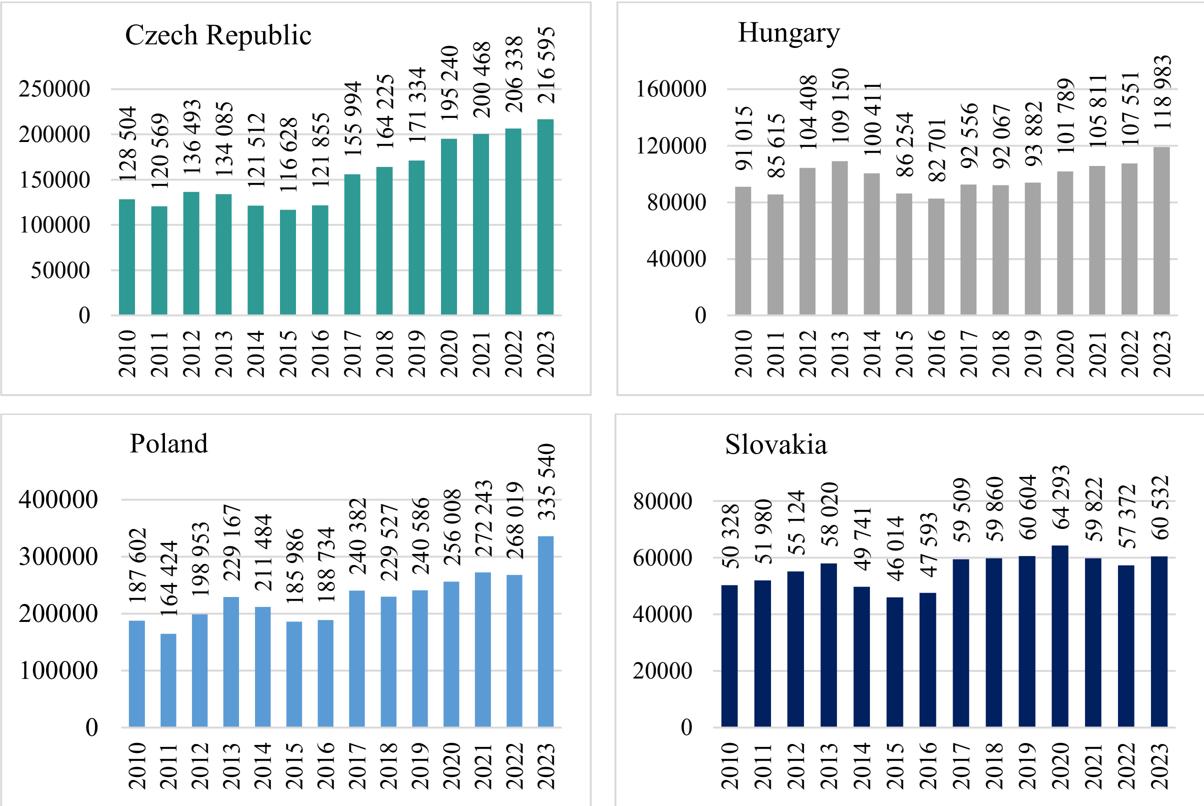


Figure 3. FDI instocks in the Visegrad Group countries in the years 2010-2023 (as at the end of the year, millions of dollars)

Source: UNCTAD, 2024.

The data presented allows us to conclude that in the Visegrad Group there may be some relationship between a country's competitiveness and the scale of FDI inflows. The countries that attracted the most capital in the form of FDI – the Czech Republic and Poland – tended to occupy leading positions in the international competitiveness rankings presented above. However, these relationships require a more in-depth analysis.

Studies on this issue usually focus on whether FDI inflow affects the country's competitiveness. Novák, Darmo, and Osusky (2024) carried out the regression analysis found that FDI inflow is a significant variable that affects the competitiveness of V4 countries, but this relationship was negative. Therefore, the authors suggest that the V4 countries need to support mainly the FDI with high value added and advanced technology.

Interesting results were also achieved by Rusu and Roman (2018), who studied the main economic factors that influence the competitiveness of Central and Eastern European countries. They used the classification of particular economies by their stage of development, dividing countries according to the Global Competitiveness Report into three groups: efficiency-driven, innovation-driven, and those that are transforming from efficiency-driven to innovation-driven. The Czech Republic was among the innovation-driven economies, while Poland, Hungary, and Slovakia were included in the transition stage of their development. The results they obtained indicated that only for innovation-driven countries (so from the V4 Group only for the Czech Republic), FDI are an important determinant of competitiveness.

5. Summary

The scale of FDI inflows to individual countries depends on a variety of factors, including, among others, market size, labour resources (their availability and skills), innovation capacity, and institutional environment. These factors determine the international competitiveness of countries and are taken into account by foreign investors when deciding where to locate their capital.

Among the Visegrad Group countries, Poland and the Czech Republic are the largest receivers of FDI, and also took the lead among V4 countries in the competitiveness rankings presented. Taking into account the pillars that comprise the various country competitiveness indexes indicated in the article, Poland compared to the other V4 countries has a large market size (according to the WEF, in 2019 it ranked 22nd in the world in this term). The results of numerous studies on the determinants of FDI demonstrate that market-related factors are among the most important to investors. Poland's locational advantages are also high productivity of labour resources, their qualifications, and macroeconomic stability.

The Czech Republic, as well as Poland and Slovakia, is a country with high macroeconomic stability, and among the V4 countries it has the highest productivity of labour resources, well- skilled employees (including digital skills), and the highest innovation capability. For both countries, an important advantage is their geographic location; in the case of Poland, it is access to Baltic ports and a central location in Europe; for the Czech Republic, it is proximity to Germany, the largest economy in EU.

There is less foreign investor interest in Hungary and Slovakia, which in turn is due to their smaller markets and, in the case of Slovakia, also a small and undiversified labour market. Hungary, on the other hand, has the lowest level of labour productivity in the region and the lowest macroeconomic stability. This country ranked last among the V4 countries in all the competitiveness rankings presented.

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References

1. Capik, P., Drahokoupil, J. (2011). Foreign direct investments in business services: transforming the Visegrád Four Region into a knowledge-based economy? *European Planning Studies*, *Vol. 19*, *No. 9*, pp. 1611-1631.
2. Chetverikova, A.S. (2022). Investment ties of Visegrad countries. *Mirovaia ekonomika i mezhdunarodnye otnosheniia*, *Vol. 66*, *No. 3*, pp. 90-100.
3. Clarke, D., Slovik, P. (2007). Modeling of exports flows in the Visegrad sub-region. *Ekonomicky Casopis*, *Vol. 55*, *No. 8*, pp. 747-761.
4. Cristani, F. (2021). The Role of sub-regional systems in shaping international investment law-making: The case of the Visegrád Group. *European Yearbook of International Economic Law*, pp. 135-153.
5. Darfo-Oduro, R., Stejskal, J. (2022, September). FDI spillover channel and its effect on innovation. *Proceedings of the 23rd European Conference on Knowledge Management, vol. I.* Academic Conferences International Limited.
6. Dorożyński, T., Kuna-Marszałek, A. (2016). Investments attractiveness: The case of the Visegrad Group countries. *Comparative Economic Research. Central and Eastern Europe*, *Vol. 19*, *No. 1*, pp. 119-140.
7. Dudas, T., Lukac, M. (2014). Increase in labour productivity in the context of FDI inflows into the automotive industry of Visegrad Group member states. *Актуальні проблеми економіки*, *No. 12*, pp. 96-105.
8. Dunning, J.H., Zhang, F. (2008). Foreign direct investment and the locational competitiveness of countries. *Transnational Corporations, Vol. 17, No. 3*, pp. 1-30.
9. Éltető, A., Sass, M., Götz, M. (2022). The dependent Industry 4.0 development path of the Visegrád countries. *Intersections: East European Journal of Society and Politics*, *Vol. 8, No. 3*, pp. 147-168.
10. Gabor, H. (2000). *International Competitiveness Impacts of FDI in CEECs. Research Report*, *No. 268*. Vienna: The Vienna Institute for International Economic Studies.
11. Gubik, A.S., Sass, M., Szunomár, Á. (2020). Asian foreign direct investments in the Visegrad countries: What are their motivations for coming indirectly? *Danube*, *Vol. 11, No. 3*, pp. 239-252.
12. Hassan, A.S. (2022). Does country risk influence foreign direct investment inflows? A case of the Visegrad Four. *Economies*, *Vol. 10*, *No. 9*, pp. 221.
13. Heritage Foundation (2024). Retrieved from: https://www.heritage.org/index/pages/all-country-scores, 20.11.2024.
14. Hintošová, A.B., Bruothová, M., Vasková, I. (2020). Does foreign direct investment boost innovation? The case of the Visegrad and Baltic countries. *Quality Innovation Prosperity*, *Vol. 24*, *No. 3*, pp. 106-121.

15. Jaworek, M., Karaszewski, W., Kuczmarska, M., Kuzel, M. (2022). *Bezpośrednie inwestycje zagraniczne w Republice Kazachstanu (na przykładzie aktywności inwestycyjnej polskich przedsiębiorstw)*. Toruń: Wydawnictwo Naukowe Mikołaja Kopernika, p. 324.
16. Jedlička, V. (2023). Taxation as a factor in investment attractiveness in the Visegrád countries. *Post-Communist Economies*, *Vol. 35*, *No. 4*, pp. 368-383.
17. Kalotay, K., Sass, M. (2021). Foreign direct investment in the storm of the COVID-19 pandemic and the example of Visegrad countries. *Acta Oeconomica*, *Vol. 71*, *No. S1*, pp. 73-92.
18. Klich, J. (2014). Foreign direct investment in the Visegrad countries after 2004: Have the Visegrad countries' membership in the European Union changed something? *Entrepreneurial Business and Economics Review*, *Vol. 2, No. 3*, pp. 19-32.
19. Klimek, A. (2020). Determinants of foreign direct investment in advanced business services. *Acta Oeconomica*, *Vol. 70*, *No. 3*, pp. 407-421.
20. Kottková, S. (2022). Influence of structural distribution of FDI inflows on labour productivity of Visegrad countries. *Ekonomski pregled*, *Vol. 73, No. 6*, pp. 825-846.
21. Kuzel, M. (2017). The investment development path: Evidence from Poland and other countries of the Visegrad Group. *Journal of East-West Business*, *Vol. 23*, *No. 1*, pp. 1-40.
22. Legatum Institute (2011). *The 2011 Legatum Prosperity Index^{TM}. An inquiry into global wealth and wellbeing*. England: The Legatum Institute Foundation.
23. Legatum Institute (2012). *The 2012 Legatum Prosperity Index^{TM}. An inquiry into global wealth and wellbeing*. England: The Legatum Institute Foundation.
24. Legatum Institute (2013). *The 2013 Legatum Prosperity Index^{TM}*. England: The Legatum Institute Foundation.
25. Legatum Institute (2014). *The 2014 Legatum Prosperity Index^{TM}*. England: The Legatum Institute Foundation.
26. Legatum Institute (2015). *The 2015 Legatum Prosperity Index^{TM}*. England: The Legatum Institute Foundation.
27. Legatum Institute (2016). *The 2016 Legatum Prosperity Index^{TM}. Bringing prosperity to life* England: The Legatum Institute Foundation.
28. Legatum Institute (2017). *The 2017 Legatum Prosperity Index^{TM}*. England: The Legatum Institute Foundation.
29. Legatum Institute (2018). *The 2018 Legatum Prosperity Index^{TM}*. England: The Legatum Institute Foundation.
30. Legatum Institute (2019). *The 2019 Legatum Prosperity Index^{TM}. A tool for* transformation. England: The Legatum Institute Foundation.
31. Legatum Institute (2020). *The 2020 Legatum Prosperity Index^{TM}. A tool for* transformation. England: The Legatum Institute Foundation.
32. Legatum Institute (2021). *The 2021 Legatum Prosperity Index^{TM}. A tool for* transformation. England: The Legatum Institute Foundation.

33. Legatum Institute (2023). *The 2023 Legatum Prosperity Index^{TM}. A tool for transformation*. England: The Legatum Institute Foundation.
34. Leitão, N.C., Dos Santos Parente, C.C., Balsalobre-Lorente, D., Cantos Cantos, J.M. (2023). Revisiting the effects of energy, population, foreign direct investment, and economic growth in Visegrad countries under the EKC scheme. *Environmental Science and Pollution Research*, *Vol. 30*, *No. 6*, pp. 15102-15114.
35. Lomachynska, I.A., Babenko, V., Yemets, O., Yakubovskyi, S.O., Hryhorian, R.A. (2020). Impact of the foreign direct investment inflow on the export growth of the Visegrad Group countries. *Estudios de Economia Aplicada*, *Vol. 38*, *No. 4*.
36. Makieła, K., Wojciechowski, L., Wach, K. (2021). Effectiveness of FDI, technological gap and sectoral level productivity in the Visegrad Group. *Technological and Economic Development of Economy*, *Vol. 27*, *No. 1*, pp. 149-174.
37. Novák, M., Darmo, L., Osusky, D. (2024). Is foreign direct investment a determining factor in the competitiveness of the Visegrad Group Countries? *International Journal of Interdisciplinary Global Studies*, *Vol. 19*, *No. 1*, pp. 63-83.
38. Porter, M.E. (1990). The competitive advantage of nations. *Harvard Business Review, March-April 1990*, pp. 71-94.
39. Prochazka, P., Cerna, I. (2022). Reinvestment and effective corporate income tax rates in V4 countries. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *Vol. 1*, *No. 7(3)*, pp. 581-605.
40. Rusu, V.D., Roman, A. (2018). An empirical analysis of factors affecting competitiveness of CEE countries. *Economic Research [Ekonomska Istraživanja], Vol. 31, No. 1*, pp. 2044-2059.
41. Salamaga, M. (2021). Modelling the risk of foreign divestment in the Visegrad Group countries during the COVID-19 pandemic. *Studies in Classification, Data Analysis, and Knowledge Organization*, pp. 319-335.
42. Salamaga, M. (2023). Study on the survival rate of foreign direct investments in the countries of the Visegrad Group using event history analysis. *Argumenta Oeconomica*, *Vol. 51, No. 2*, pp. 83-99.
43. Schwab, K. (Ed.) (2011). *The Global Competitiveness report 2011-2012*. Geneva: World Economic Forum, p. 545.
44. Schwab, K. (Ed.) (2012). *The Global Competitiveness report 2012-2013*. Geneva: World Economic Forum, p. 545.
45. Schwab, K. (Ed.) (2013). *The Global Competitiveness report 2013-2014*. Geneva: World Economic Forum, p. 565.
46. Schwab, K. (Ed.) (2014). *The Global Competitiveness report 2014-2015*. Geneva: World Economic Forum, p. 565.
47. Schwab, K. (Ed.) (2015). *The Global Competitiveness report 2015-2016*. Geneva: World Economic Forum, p. 400.

48. Schwab, K. (Ed.) (2016). *The Global Competitiveness report 2016-2017*. Geneva: World Economic Forum, p. 400.
49. Schwab, K. (Ed.) (2017). *The Global Competitiveness report 2017-2018*. Geneva: World Economic Forum, p. 393.
50. Schwab, K. (Ed.) (2018). *The Global Competitiveness report 2018*. Geneva: World Economic Forum, p. 656.
51. Schwab, K. (Ed.) (2019). *The Global Competitiveness report 2019*. Geneva: World Economic Forum, p. 649.
52. Singh, D. (2022). Factors hinder the foreign entities business operation in Visegrad countries. *Business Strategy & Development*, *Vol. 5*, *No. 3*, pp. 274-285.
53. Stankov, B., Damnjanović, J., Roganović, M. (2018). Pillars of competitiveness as FDI determinants in host countries: a review of the panel data empirical studies. *School of Business, Vol. 2,* pp. 98-116.
54. Su, W., Zhang, D., Zhang, C., Abrhám, J., Simionescu, M., Yaroshevich, N., Guseva, V. (2018). Determinants of foreign direct investment in the Visegrad Group countries after the EU enlargement. *Technological and Economic Development of Economy*, *Vol. 24*, *No. 5*, pp. 1955-1978.
55. Szunomár, Á. (2021). Japanese foreign direct investment in the Visegrád Four: Trends, characteristic and driving forces. *Foreign Policy Review*, *Vol. 14*, *No. 1*, pp. 53-64.
56. UNCTAD. (2023). *World Investment Report 2023: Investing in sustainable energy for all*. Geneva: United Nations.
57. UNCTAD (2024). *World Investment Report 2024: Investment facilitation and digital government*. Geneva: United Nations.
58. Vlachos, V.A., Kalimeris, D. (2010). International business spillovers in emerging markets: the Visegrad group. *International Journal of Economic Policy in Emerging Economies*, *Vol. 3*, *No. 4*, pp. 330-345.
59. Vlčková, J. (2018). Visegrad countries in global production networks: Value creation, control and capture. *Geographia Polonica*, *Vol. 91*, *No. 4*, pp. 427-448.
60. Wach, K., Wojciechowski, L. (2016). Determinants of inward FDI into Visegrad countries: Empirical evidence based on panel data for the years 2000-2012. *Economics and Business Review*, *Vol. 2*, *No. 1*, pp. 34-52.
61. Wojciechowski, L. (2013). The determinants of FDI flows from the EU-15 to the Visegrad Group countries: A Panel gravity model approach. *Entrepreneurial Business and Economics Review*, *Vol. 1*, *No. 1*, pp. 7-22.
62. Wojciechowski, L., Makieła, K. (2019). Determinants of foreign direct investments in the Visegrad Group countries. *Folia Oeconomica. Acta Universitatis Lodziensis*, *Vol. 4*, *No. 343*, pp. 103-121.
63. World Bank Group (2024). *Business Ready 2024*. Washington, DC: World Bank.

64. World Bank Group (2010). *Doing Business 2011. Making a difference for Entrepreneurship*. Washington, DC: World Bank.
65. World Bank Group (2011). *Doing Business 2012. Doing business in a more transparent world*. Washington, DC: World Bank.
66. World Bank Group (2012). *Doing Business 2013. Smarter regulations for small and medium-size enterprises*. Washington, DC: World Bank.
67. World Bank Group (2013). *Doing Business 2014. Understanding regulations for small and medium-size enterprises*. Washington, DC: World Bank.
68. World Bank Group (2014). *Doing Business 2015. Going beyond efficiency*. Washington, DC: World Bank.
69. World Bank Group (2015). *Doing Business 2016. Measuring regulatory quality and efficiency*. Washington, DC: World Bank.
70. World Bank Group (2016). *Doing Business 2017. Equal opportunity for all*. Washington, DC: World Bank.
71. World Bank Group (2017). *Doing Business 2018. Reforming to create jobs*. Washington, DC: World Bank.
72. World Bank Group (2018). *Doing Business 2019. Training for Reform*. Washington, DC: World Bank.
73. World Bank Group (2019). *Doing Business 2020 Comparing Business Regulation in 190 Economies*. Washington, DC: World Bank.
74. World Economic Forum (2016). Retrieved from: https://www.weforum.org/stories/2016/09/what-is-competitiveness/, 25.11.2024.
75. Zysk, W., Śmiech, S. (2014). The influence of foreign direct investment on foreign trade in the Visegrad countries from 2001 to 2011. *Entrepreneurial Business and Economics Review*, *Vol. 2*, *No. 3*, pp. 7-18.

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DRAFTING THE ACCESSIBILITY OF FINANCIAL SERVICES IN THE LIGHT OF EMPIRICAL RESEARCH

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Purpose: The purpose of this article is to present the main conclusions of the 2024 survey of respondents' level of understanding of the content of financial contracts. On the basis of these conclusions, directions for supporting people with special needs in the area of using financial services such as personal accounts or cash loans are formulated.
Design/methodology/approach: The research was conducted using CAWI (Computer Assisted Web Interview) and CAPI (Computer Assisted Personal Interview) methods on a group of 600 respondents. This included 300 so-called 'average customers', 150 older people 65+ and 150 people with disabilities. In addition, focus groups were conducted with 11 deaf people assisted by two sign language interpreters.
Findings: The main finding of the research is the falsification of the hypothesis that simplifying the language in which financial contracts are written will significantly increase the level of understanding by respondents. In the light of the research, it turned out that the level of understanding of the content of these contracts, as tested by a specially designed test, is not correlated with the degree of simplification of the language in which these contracts are written. No statistically significant differences in the form of correct answers to the test questions were noted between the groups of respondents:

a) those reading the contract in its original version (the level of vagueness of the text scored 14 on the Gunning Fog Index),
b) those reading a simplified version of the contract with a FOG level of 10,
c) reading a simplified contract up to FOG level 8.

The lack of differences applied to all groups of respondents.
Practical implications: This paper therefore outlines other ways to make financial services accessible than simply simplifying the language in contracts. Among these are:

a) simplifying contracts as much as possible in terms of their layout and content,
b) using technology to help focus the reader's attention on the key points of the contract,
c) extending support to the entire process of using an account or repaying a loan, and not just the point at which the contract is signed,
d) enhancing the role of education in the financial area.

Originality/value: The findings of the research falsified the common and intuitive belief that simplifying the language used in the content of financial contracts will significantly improve understanding of contracts among respondents. This finding directs efforts to ensure the accessibility of financial services to the other areas characterised above.

Keywords: accessibility of financial services, use of plain language in contracts , universal design.
Category of the paper: Research article - presenting research findings.

1. Introduction

A study was commissioned by the Ministry of the Fund and Regional Policy together with the Financial Ombudsman to assess the comprehensibility of contracts used in the financial sector. Directive (EU) 2019/882 of the European Parliament and of the Council of 17 April 2019 on accessibility requirements for products and services imposes a number of obligations on retail banking service providers (as defined in Article 3(28) of the Directive - in particular banks) to ensure that the services provided are accessible to persons with disabilities and other persons who experience functional limitations such as the elderly.

The main objective of the research was to assess the level of understanding of the contracts used in the financial sector.

The research question was: How does the use of plain language affect the recipient's level of understanding of these documents?

This involved verifying the level of comprehension of the content of contracts by both the so-called 'average' consumer and a person with special needs, i.e. elderly people, people with intellectual disabilities, people on the autism spectrum and people with visual and hearing disabilities.

The primary research hypotheses were that:

1. The more simplified the contract in terms of language, the more comprehensible it will be to respondents.
2. People with special needs (i.e. people with disabilities and older people) will have more need to simplify these contracts in order to better understand their provisions than 'average customers'.
3. People with special needs will find it more difficult to understand the contracts than 'average customers'.

However, the results of the quantitative research falsified these hypotheses.

2. Description of the sample and research methods

In preparation for the implementation of the requirements of this EP Directive 2019/882, 600 respondents were quantitatively surveyed in three groups:

1. so-called average consumers/customers (N = 300),
2. people with disabilities (N = 150),
3. older people 65+ (N = 150).

The research was conducted in the summer of 2024 in the form of a CAWI (Computer Assisted Web Interview) survey and a CAPI (Computer Assisted Personal Interview) interview, which was particularly used with people with disabilities and older people.

Respondents were qualified using the Polish National Panel organization (https://www.panelnarodowy.pl/), which brings together those willing to participate in the research. The sample selection was a random quota. First, representative quotas were determined for the relevant categories of respondents (here, the elderly 65+, people with disabilities and so-called "average customers"). Then, respondents meeting the criteria to fill these quotas were randomly selected. Invitations are emailed to respondents/panellists registered with the Polish National Panel, which currently has 170,000 registered panellists. Due to the random nature of the invitations sent to a broad group of potential respondents, the survey sample selection process can be considered to ensure that the sample is representative and, thus, that the conclusions can be generalized to the entire population.

In addition, a focus survey was conducted with a group of deaf people. The survey was conducted at the headquarters of the Opole branch of the Polish Association of the Deaf with the participation of 11 deaf people from the Opole and Lower Silesia provinces1. The duration of the qualitative research was 2 hours with the participation of two PJM (Polish Sign Language) interpreters. The focus interview was conducted on the basis of an individual conversation with the respondents. This interview was free-form and used a categorised set of questions without suggestive answers. Three moderators (qualitative researchers) actively participated in the study.

The research was based on the analysis of two contracts:

1. A bank account and debit card agreement with one of the commercial banks.
2. A cash loan agreement with one of the loan companies specialising in short-term loans.

Each of these contracts was simplified in terms of language to two levels of simplification based on the Gunning Fog Index (Gunning, 1952, pp. 36-37).

Fogginess index = 0.4 x (average number of words per sentence + percentage of difficult words)

The Fogginess Index (FOG) is one tool for analysing the readability of a text, particularly useful for assessing its complexity and accessibility for the average reader. It is a popular measure in a variety of fields such as education, marketing, journalism, and technical editing, where it is important to tailor content to the comprehension level of the audience.

The material of these contracts prepared for the study in the first simplification had a text vagueness index of 10 and was comprehensible to a person after at least 10-11 years of education. The simplified version of the second simplification had a vagueness index of 8 and

[1] See: https://www.pzgopole.pl/index.php/jezyk-migowy/pjm

was comprehensible to a person after 8 years of education. The contracts in the simplified first and second degree versions were prepared by a plain language expert with many years of experience.

The intention of the project was not to simplify the contract to a FOG = 3 or 4 which would have been understandable to a person after 4 years of education, as such a simplification option would have definitely negatively affected the study and would not have shown the weaknesses and incomprehensible provisions in the current bank contracts. Therefore, it was decided to simplify the contracts to a FOG index of 10 and 8.

The contracts in the original version had a FOG index of 14.

Respondents were randomly given one of the versions of the contracts among the six variants:

1. Account Agreement in the original version (FOG 14).
2. Simplified account agreement up to FOG.
3. Account agreement in a simplified version up to FOG.
4. Loan agreement in original version FOG 14.
5. Loan agreement simplified version up to FOG 10.
6. Loan agreement simplified to FOG 8.

Respondents familiarised themselves with the content of the agreements and then answered test questions verifying the level of comprehensibility of the provisions contained in these documents.

The selection of the research sample by customer segment and the type of agreements they evaluated is presented in Table 1.

Table 1.
Respondents by category and versions of the agreements they received for analysis

	FOG account agreement 14	FOG account agreement 10	FOG account agreement 8	FOG loan agreement 14	FOG 10 loan agreement	Loan agreement FOG 8
Average customers N = 300	50	50	50	50	50	50
People with disabilities N = 150	25	25	25	25	25	25
Elderly 65+ N = 150	25	25	25	25	25	25

Source: own elaboration.

After learning about the content of the contract, they answered the survey questions. The structured interview questionnaire was standardised so that ultimately comparisons could be made between the results of the surveys conducted in each subgroup. It consisted of 8 metric questions and 13 questions for the bank account agreement and 14 questions for the cash loan agreement. The survey questions were supplemented by several open-ended questions of a qualitative nature allowing primarily to obtain information from the respondents on their actual knowledge/familiarity with banking or financial products.

The survey sample was balanced in terms of a number of criteria like:

1. Gender:
   - women 50 % (301 persons),
   - men 47 % (281 persons),
   - refusal to answer 2% (13 indications),
   - other gender 1% (5 indications).
2. Age proportional distribution, each age group is represented in fairly large numbers and there are no significant disparities:
   - 18-24 years old 14%,
   - 25-34 years 17%,
   - 35-44 years 20%,
   - 45-65 years 23%,
   - Over 65 years 26%.
3. Place of residence - there is no significant disproportion to the actual situation in our country. Two groups of respondents prevail - residents of rural areas 33% of declarations and residents of large cities 24% of indications.

   However, when considering the criterion of residence, it should be considered that it is not a significant circumstance differentiating the surveyed population in terms of understanding the content of financial contracts.
4. Education - in terms of education, people with secondary education dominate the surveyed population with 38%, followed by higher education with 20% and vocational education with 18%.
5. Respondents mostly already use banking services 85% of the declarations. They did not use bank services 13% and refused to answer 3%.
6. Loan companies were used by 16%, not used by 78% and refused to answer by 6% of respondents.

3. Survey results

Analysing further questions from the survey - a test of respondents' understanding of the content of financial contracts, it was noted that there were no statistically significant differences in responses to most test questions. This was true for both the different groups of respondents ('average' customers, older people, people with disabilities) and the level of simplified language used in the content of these agreements.

Test questions for the bank account agreement included:

- An assessment of the legibility of the font and layout of the contract.
- The contracting party and the currency of the account.
- The possibility of using electronic banking channels.
- The way in which personal data is processed.
- Possibility of obtaining bank statements.
- Documents provided by the bank as part of the conclusion of the contract.
- Terms and conditions of the account, such as security packages or possible claims by the bank.

In the case of a loan agreement, the test questions covered the terms on which the agreement is concluded:

- The period for which the contract is concluded.
- the amount to be repaid.
- the deadline for withdrawal from the contract.
- conditions for obtaining another loan.
- processing of complaints.
- possibility to repay the loan early.

The distributions of responses to the above questions did not differ significantly between versions of these agreements (FOG 14, FOG 10, FOG 8) . This was true for each group of respondents ('average' customers, senior citizens, people with disabilities).

No significant variability was identified between the questionnaires for the FOG 14, FOG 10, FOG 8 versions of the contracts in terms of respondent characteristics (gender, education, place of residence, age between 18-65 years).

An interesting phenomenon was observed in the answers to some questions in the form of significantly better results (more correct answers) given by the group of senior citizens surveyed. The group of seniors 65+ outperformed the other two surveyed groups of respondents in some aspects in the following questions:

- with which bank is the contract concluded?
- in which currency will the account be held?
- do you know the duration of the bank's account agreement with you?
- concerning the bank's claims and enforcement.

In these questions, the responses of older people had significantly more correct indications than the other two populations surveyed. Identifying the reasons for this is not possible using quantitative research. Only in the course of in-depth qualitative research would it be possible to establish the influencing factors.

It can only be speculated that the older people surveyed had:

- more time to devote to the interviewers,
- more life experience, from which they were better able to associate information,

- greater involvement in the research process, due to an appreciation of their importance as well as their role in the process - see the Hawthorne Effect (Moczydłowska, Pawelec, 2023).

The same was true for respondents who were presented with a loan agreement. Here, too, seniors had significantly more correct indications than the other two surveyed populations in their responses to the questions:

a) identifying the parties with whom the contract is signed: the company Soonly Finance sp. z o. o. is…
b) verifying knowledge of the amount respondents would have to give back to the lender: The amount you will have to give to the lender – is…
c) calculation task to be solved based on the data entered in the contract: If the lender lent you £4800 and the annual interest rate is 18.5%, what amount of interest will you pay for one month?
d) The possibility of repaying the loan early: Can you repay the loan early?
e) knowledge of the abbreviation ADO (Administrator of Personal Data): What does the abbreviation ADO stand for?

In the case of people with disabilities, a lower number of correct answers is observed compared to other groups of respondents ('average' customers, seniors 65+). This is true for all versions of the contracts (FOG 14, FOG 10 and FOG 8). This observation is not surprising and should have been expected given that the majority of ON respondents are deaf and mentally disabled. Importantly, however, no significant differences in the distributions of correct test responses between the versions of the contracts (FOG 14, FOG 10 and FOG 8) were identified in the ON population studied. Which indicates a small role for simplifying language as a means of increasing understanding of the content of financial contracts in this group of people surveyed.

4. Example distributions of respondents' answers to the test questions

Due to the volume of the article, distributions of responses to only two selected survey questions will be presented. One question was selected from each of the financial contracts surveyed, which most clearly illustrated the research insights discussed above.

4.1. Bank account agreement

The distribution of respondents' answers to the question on the duration of the bank account agreement is shown in Table 2. The correct answer was indefinite duration.

Table 2.
Distribution of responses regarding the duration of the bank account agreement across respondent groups

Groups of respondents	Responses	FOG 14	FOG 10	FOG 8
Average customers Group size 50 per contract version	For an unlimited period	66%	60%	42%
	However, I do not remember	28%	20%	36%
People with disabilities Group size 25 persons for each contract version	For an indefinite period	40%	52%	40%
	However, I do not remember	10%	32%	44%
Older people 65+ Group size 25 persons for each contract version	Indefinite	96%	100%	96%
	However, I do not remember	0%	0%	4%

Source: own elaboration.

Among the elderly, virtually full awareness of an indefinite contract was observed.

In the case of average customers, most of them indicate an indefinite term. Although here a rather interesting phenomenon can be observed that as the language is simplified in the different versions of the contracts, the number of correct answers decreases from 66% (FOG 14) to 42% (FOG 8). At the same time, the number of indications of "However, I do not remember" increases from 28% to 36%.

Among people with disabilities, the average number of correct answers is below half of the respondents. There is also a significant increase in the number of 'However, I do not remember' responses as the language in the contracts is simplified from 10% (FOG 14) to 44% (FOG 8). This fact is difficult to interpret on a quantitative basis. Explaining this phenomenon would require deeper research in a qualitative way.

4.2. Loan agreement

As an illustration of the general conclusions presented above, the distribution of respondents' answers to the question about the possibility of repaying the loan early will be discussed here. This question did not cause respondents any great problems, with most of them marking the correct answer 'yes, always'.

The distribution of the answers to this question across the different groups of respondents is presented in Table 3.

Table 3.
Respondents' answers to the question on the possibility to repay the loan early

Groups of respondents	Responses	Loan agreement FOG 14	FOG loan agreement 10	Loan agreement FOG 8
Average customers Number of groups of 50 for each version of the contract	Yes always	74%	68%	76%
Persons with disabilities Number of groups of 25 persons per contract version	Yes always	36%	40%	32%
Older persons 65+ Group size 25 persons per contract version	Yes always	92%	80%	84%

Source: own study.

Average customers answered 68-76% correctly

People with disabilities found it more difficult to answer correctly, declared by 32-40% of respondents in this group.

Older people 65+ had the highest percentage of correct answers 80-92%.

These observations support the conclusions that older people read the contract more carefully and that people with disabilities (especially intellectual disabilities, and these were the highest in this group) have more difficulty in understanding the provisions of the loan contract.

Analysing the distribution of responses between the language versions of the contracts in the different groups of respondents, no regularity or correlation between the degree of simplified language and the number of correct responses of the respondents can be seen.

5. Qualitative research - focus group

The research was enriched by a qualitative element in the form of a focus group interview, which took place at the headquarters of the Opole branch of the Polish Association of the Deaf on 25.09.2024. 11 deaf people aged 20 - 60 took part in the focus group interview. In addition, a research team supported by two sign language interpreters participated.

The issues discussed were mainly:

1. The specifics of PJM (Polish Sign Language) its possibilities and limitations and its influence on the perception of reality by deaf people.

   In the dams of this issue, problems such as:

   a) The difference between the syntax, grammar and logic of PJM statements and the spoken and written Polish language results in the fact that for deaf people Polish is a foreign language, often incomprehensible.
   b) Language has a significant impact on the way the world is perceived. Due to the limitations of sign language, it is very difficult for deaf people to use abstract concepts or to make hypothetical considerations about the future.
   c) Sign language signs are much more ambiguous - a lot of content is explained based on context.
   d) Lack of codification of PJM - there is no universally recognised written sign language, resulting in a lack of a linguistic standard, which again results in significant differences in PJM across regions or even social groups among Deaf people.
   e) Difficulties in translating Polish into PJM and vice versa. Translation into PJM is not a simple 1:1 translation like translation between national languages, but a different way of representing ideas or conceptual constructions. This means that in the translation process, the role of the translator and his or her interpretation

of these concepts is invaluable in order for the recipients to understand the message well.

f) As a consequence of the above observations, it is worth noting that deaf people are heavily dependent on interpreters/assistants whom they know, with whom they have established a thread of trust, who sign in a way that they understand as much as possible.

2. Deaf support technologies , where special attention was paid to:

   a) Deafness diagnosis, implantation of hearing aid processors and rehabilitation of Deaf people. This results in a decreasing number of people who only use sign language. However, as things stand today, there are, and will continue to be for the next few decades, needs to support Deaf people who are not implanted, are not rehabilitated, have great difficulty with mastering/understanding the Polish language.

   b) Online PJM interpreters as a commonly used technique to support (inlcude) Deaf people are not viewed enthusiastically by the Deaf community. First and foremost, there are reservations about the comprehensibility of such an interpreter's sign language for Deaf customers of banks, clinics, offices etc. The online interpreter is two-dimensional - making it more difficult for Deaf people to understand than a live interpreter service. In addition, there are regionalisms in PJM which also makes mutual understanding difficult, as online interpreters usually operate from the institution's head office, most often from Warsaw. But above all, focus participants indicated that they do not trust online interpreters because they see them incidentally, usually for the first time in their lives. And it is the factor of trust in the interpreter/assistant that is crucial in the deaf community. Added to this are the problems of providing stable and fast internet connections and good screen resolutions. In addition, an online interpreter does not help to fill in documents and Deaf people prefer to rely on the help of a real assistant/family/trusted people.

   c) The role of artificial intelligence AI and automation in the form of e.g. holograms, avatars or humanoid robots assisting Deaf people is a song of the future. The technology is developing, but as of today, such solutions are in the conceptual or, at most, prototype stage. This does not mean that the topic is unperspective. However, the horizon for the real use of such technologies seems quite distant.

The qualitative research carried out has contributed to a broadening of perceptions regarding the design of financial service accessibility. Instead of focusing on simplifying the language in the content of contracts, a number of steps should be taken towards improving the accessibility of financial services (These will be presented in section 7). Similar conclusions were reached by Brazilian researchers A. Sales, Y.P. Costa Aguiar, U. Maritan and T. de Araujo in their focus group research (Sales et al., 2020).

6. Conclusions of the quantitative research conducted

The main conclusion of the research is that respondents, but also customers (because the vast majority of these respondents have bank accounts and a large proportion of them have taken out cash loans), do not read contracts carefully. Sometimes they look at them very briefly, sometimes they even sign them without being familiar with their content.

On the basis of the quantitative research carried out, a general conclusion can be drawn that the degree of simplification of language in financial contracts is not the most important factor influencing respondents' level of understanding of the content of these contracts. The research did not identify any significant differences between respondents' understanding of contracts with financial institutions regardless of the level of simplification of the language contained in their content. This observation extends to all respondent groups surveyed.

In light of the results of the quantitative research, it should be considered that all three of the research hypotheses posed have been falsified.

The reasons for this can be sought in the following circumstances

1. Respondents' cursory familiarity with the content of the contracts presented to them. This behaviour may be influenced by the following factors:
   a) Difficulty in focusing attention on dozens of pages of text (even after simplifying the language).
   b) The belief that there is a certain level of security provided by the Financial Supervision Commission, which looks after the interests of the clients of financial institutions for them on behalf of the clients, which makes the clients to some extent able to trust the institutions that the contracts are not dangerous for tchem.
   c) The general lack of time of respondents, who are voluntarily engaged by the interviewer.
2. The inability to negotiate these contracts which results in the customer either agreeing to the terms of the contract or not receiving the financial product. The process is therefore analogous to shopping in a shop - either I buy the product offered off the shelf or I don't. At most, it is possible to compare competitor products, but in the case of contracts at other/competing financial institutions, this requires spending a lot of time and acquiring some knowledge of financial instruments. Since a bank account, as well as a small cash loan, are not expensive, passionate or luxury goods (like cars, travel or yachts) then customers are not willing to devote significant attention to considering multiple options (competitive offers). They choose a product that they know about, is recommended by friends or enforced by the bank (e.g. property insurance for which a mortgage has been obtained, etc.) or advertised in the media (e.g. an extra freebie to get started), or the banking outlet is located close by.

3. For people with disabilities (especially intellectual disabilities and deaf and hard of hearing disabilities), there is a problem with being able to understand contractual provisions in Polish due to their various perception limitations. Particularly for deaf and hard-of-hearing persons using sign language on a daily basis, text written in Polish makes it very difficult to understand the content.

The conclusions of these conducted studies are not alone. There are results in the literature indicating that plain language in financial contracts is not a determinant of higher levels of understanding of these contracts. This is indicated in several research articles from recent years:

1. A. Rossetti, P. Cadwell and S. O'Brien, on the basis of a focus study on the level of understanding of financial contracts conducted on older people, indicate that there is no benefit from the use of plain language in these contracts (Rossetti et al., 2020).
2. A. Felici, C. Griebel on the basis of a study of Swiss insurance company leaflets indicate that simplifying the language does not always guarantee good communication with the audience (Felici, Gribel, 2019, pp. 167-191).
3. A critical approach to the use of plain language as a method to increase the accessibility, comprehensibility and usability of bank mortgage documents is presented by N.N. Jones and M.F. Williams (2017, pp. 412-429).
4. The shortcomings associated with the ambiguity of plain language in legal documents are pointed out by J. Barnes (2010).
5. L.E. Allen and C.R. Engholm point out that plain language alone in legal documents is not sufficient they emphasise the role of document structure (Allen, Engholm, 1979).

Since this article primarily presents the results of the research conducted by the authors, the literature cited only reinforces the conclusions drawn from this research. The articles cited above are not a systematic review of the literature. They are examples of studies that showed no or limited relationship between language simplification and respondents' level of understanding of the text of contracts and similar documents.

It is worth noting that the research described in this article was based on verification of the level of understanding of contracts through test questions answered by respondents immediately after reading the content of contracts. Thus, the level of understanding of contracts was verified and objectified. Most studies on the use of plain language in official or financial documentation are based on respondents' declarations about whether the text they read seems more comprehensible/readable/clear to them. Thus, they are based on the subjective feelings of respondents (e.g., Ronka-Chmielowiec, 2018). Conclusions from survey respondents' feelings usually support the implicit thesis that the easier / simpler the text, the better the understanding. However, according to the authors, such conclusions are based on the erroneous basic assumption that respondents read the content of contracts or documents thoroughly and with understanding. They only form their opinions about the legitimacy of simplifying the language in these texts.

7. Proposals for improving the accessibility of financial services

Based on the results of the quantitative research enriched by a focus group interview. Several suggestions can be made

1. The aim should be to simplify contracts as much as possible, not only in terms of the language used but also in terms of the layout and content contained therein, as well as the use of technology to support the reader's focus on the key points of the contract (especially those mandatorily required by the legislator). In this context, it is advisable to offer a contract whose provisions fit on one A4 page with a tabular layout in bold.
2. It is possible to conclude the contract in an electronic version, which further enriches the range of presentation possibilities for the content of the contract.

In the electronic version, the client may be able to choose:

- font size,
- the language version of the contract,
- sign language translation in various language versions - PJM (Polish Sign Language), SJM (Sign Language System), BSL (British Sign Language), ASL (American Sign Language), DGS (German Sign Language) LSF (French Sign Language), Russian Sign Language, etc.),
- versions for the visually impaired with a magnifying part of the image,
- visually impaired and blind versions with audio descriptors.

In addition, scrolling control can be introduced here for the text the customer is looking at. You can slow down the scrolling so that the reader cannot move the contract all the way to the end in a single movement of the mouse or touchpad. You can also use a forced response in the form of actions (e.g. clicking on checkboxes) confirming that the customer has familiarised themselves with the important parts of the contract.

In an advanced electronic version, a method of tracking the reader's gaze can be included to verify that the contract provisions have been viewed long enough by the user.

Electronic versions of contracts with interactive elements with additional explanations and links to additional information, definitions, etc., can be included.

In addition, in order to make it easier to familiarise oneself with the content of the agreement and to encourage a careful study of it, one could enforce the development of tutorials available on YouTube showing step-by-step how to log into and further use the e-banking channels. Such steps are already being taken, but are not mandatory for financial institutions. Such tutorials could also be armed with language options (including sign language), video zooming, video audiodescription, etc.

Analogous measures could be taken for cash loan agreements:

1. Enhancing the role of education in the financial area. Here, one could point to extending secondary school education to include financial literacy. Specific programmes on this subject should be developed for special schools educating young people with special needs. Encourage both young people and people of all ages to take a greater interest in the area of financial services through:
   a) information campaigns,
   b) raising awareness of financial engineering issues - the very name financial engineering is more attractive than personal finance,
   c) knowledge competitions on financial instruments,
   d) Developing a textbook for students or secondary school pupils on finance/economics/management written in plain language.
2. A system-process approach instead of point support. Above all, it is worth considering extending support to the whole process of using an account or repaying a loan, and not just the point at which the contract is signed. This is particularly important for people with special needs.

Support at the moment of decision-making in the form of signing a contract is only the initial moment, followed by real action in the form of the use of financial products or services, usually spread over a longer period of time of financial products or services, usually spread over many years. One of the key conclusions of the focus group research is the recommendation to set up assistant support centres run by institutions at central as well as at local government level. These centres could be used by people in need, such as Deaf people needing support from a PJM interpreter and at the same time an assistant in the form of personal contact rather than a two-dimensional online image. In the case of people with with mental disabilities, assistant support in the decision-making process for financial agreements would also be highly desirable. The sustainability of such centres should be ensured by funding not from floating projects, but from a fixed fund provided by the state or local government budgets. The services provided by the assistants would personally assist people with special needs in dealing with a wide range of issues (health care, taxes, administrative matters, etc.) and this would include the use of financial services and products.

8. Conclusion

This paper presents the results of empirical research on a large sample of 600 respondents and, in addition, a focus group with 11 deaf people.

In the light of the research, the basic research hypotheses have been falsified, and through this, the answer to the main research question posed: to what extent will simplifying the language in contracts increase the level of understanding?

The main findings of the research point to the small role of simplified language as a factor in raising understanding of financial contracts. While intuitively it would seem that significant improvements in accessibility to financial services could be achieved quickly (by simplifying the language in financial contracts), the reality turned out to be more complicated.

In addition to fulfilling the purpose of the article, i.e. to discuss the research findings, this also achieved the objective set in the research project albeit in a non-obvious way. The degree of understanding of financial contracts among the respondents must be assessed as low, and this is true no matter what language they were written in. However, this made it possible to look for other ways to improve the accessibility of financial services, among which the following were suggested:

a) simplifying contracts as much as possible in many aspects, not only in terms of the language used in them,
b) taking advantage of the rich possibilities offered by electronic versions of the contract,
c) taking a broader view of the problem, not only at the point of contract, but throughout the entire period/process of use of financial services by customers,
d) increasing the level of financial education among the public.

References

1. Allen, L.E., Engholm, C.R. (1979). The need for clear structure in plain language legal drafting. *U. Mich. JL Reform*, *13*, 455.
2. Barnes, J. (2010). When'plain language'legislation'is ambiguous: sources of doubt and lessons for the plain language movement. *Melbourne University Law Review*, *34*(3), 671-707
3. Felici, A., Griebel, C. (2019). The challenge of multilingual 'plain language'in translation-mediated Swiss administrative communication: A preliminary comparative analysis of insurance leaflets. *Translation Spaces, 8(1),* 167-191.
4. Gunning, R. (1952). *The Technique of Clear Writing*. McGraw-Hill. pp. 36-37.
5. Jones, N.N., Williams, M.F. (2017). The Social Justice Impact of Plain Language: A Critical Approach to Plain-Language Analysis. *IEEE Transactions on Professional Communication*, *vol. 60, no. 4,* pp. 412-429, doi: 10.1109/TPC.2017.2762964
6. Moczydłowska, J., Pawelec, G. (2023). *The Hawthorn experiment - a breakthrough in the role of social energy in an organization,* https://wiz.pb.edu.pl/akademia-zarzadzania/wp-content/uploads/sites/3/2023/09/1.2.-J.M.-Moczydlowska-G.-Pawelec-Eksperyment-w-

Hawthorn-%E2%80%93-przelom-w-rozumieniu-roli-mechanizmow-spolecznych-w-organizacji.pdf, 20.11.2024.

7. Ronka-Chmielowiec, W. (2018). *Czytelność Ogólnych Warunków Ubezpieczenia – teoria i zastosowanie w praktyce ubezpieczeniowej [Readability of the General Insurance Terms and Conditions – theory and application in insurance practice],* https://www.wir.ue.wroc.pl/info/phd/WUT03e5b5f5160d4fa7b2b74650e5af36dc/
8. Rossetti, A., Cadwell, P., O'Brien, S. (2020). *The Terms and Conditions Came Back to Bite In International Conference on Human-Computer Interaction*. Springer, 699-711; https://link.springer.com/chapter/10.1007/978-3-030-60149-2_53
9. Sales, A., Costa Aguiar, Y.P., Maritan, U., de Araujo, T. (2020). Participatory Design Workshops for Adapting a Form for Deaf Respondents. In: M. Antona, C. Stephanidis (eds.), Universal Access in Human-Computer Interaction. Applications and Practice. *HCII 2020 Lecture Notes in Computer Science, vol. 12189*. Cham: Springer. https://doi.org/10.1007/978-3-030-49108-6_9

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UNIVERSAL DESIGN IN THE ORGANIZATION OF WORKPLACES – A LITERATURE REVIEW

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Purpose: This paper aims to identify and evaluate the application of universal design (UD) principles in workplace organisation through a systematic literature review. The research aims to: 1. Analyse the dimensions of accessibility, including physical, digital, information, communication, social and sensory aspects in the workplace. 2. Identify specific applications of UD in organising accessible and inclusive workplaces.3. Identify the benefits, challenges and best practices associated with implementing UD principles to increase inclusion and productivity in the workplace.
Design/methodology/approach: This paper uses a systematic literature review methodolog, analysing articles from databases such as Scopus, Web of Science and PubMed.
Findings: The literature review reveals several critical findings: 1. Applications of UD: Ergonomic design, assistive technologies, etc. were highlighted as key applications of UD in workplace design. 2. Benefits: Increased integration, improved employee satisfaction and retention, increased productivity and innovative workplace solutions**.** 3. Challenges: Financial constraints, limited awareness and lack of training, contextual differences and insufficiently researched sensory accessibility needs. 4. Best practices: Early integration of UD principles, stakeholder engagement, adapted strategies and adoption of new technologies to enhance workplace accessibility.
Research limitations/implications: Lack of sectoral research on specific industry needs. Limited research on the lasting impact of UD in the work environment. Under-representation of description of sensory accessibility in the literature.
Practical implications: The research findings suggest practical recommendations for organisations:
1. Invest in training programmes to raise awareness and build expertise in UD principles.
2. Incorporate UD into the early stages of workplace design to avoid costly retrofitting.
3. Use assistive technologies and flexible infrastructure to meet the diverse needs of the workforce.
Social implications: This research highlights the importance of UD in supporting equitable and inclusive workplaces, by contributing to:
1. Improving the quality of life of employees, particularly those with disabilities or cognitive and sensory needs.
2. Positive socialetal attitudes towards diversity and inclusion.

3. Influence corporate social responsibility (CSR) and public policy to prioritise accessibility in the workplace.
Originality/value: This article provides a comprehensive synthesis of the literature on UD in workplace organisation, identifying under-researched dimensions such as sensory accessibility and the potential of new technologies.
Keywords: Universal design, workplace accessibility, inclusive design, ergonomic adaptations, assistive technologies.
Category of the paper: research paper.

1. Introduction

Universal Design (UD) is becoming one of the most important considerations in the design of public spaces, including the design of workplaces according to UD principles. UD has emerged as a transformative approach to creating inclusive environments that meet the diverse needs of individuals. UD is a concept with the principle of equality at its core; it aims to proactively design spaces, tools proactively, and processes that can be used by all, regardless of age, gender, ability, or background. In the context of the workplace, the integration of UD principles is becoming increasingly important as organisations strive to support inclusion by improving the wellbeing of their employees.Workplaces are dynamic environments shaped by technological advances, demographic changes and evolving organisational cultures. The application of UD in workplace organisation addresses different dimensions of accessibility, including physical, digital, cognitive, social and sensory accessibility. For example, the incorporation of assistive technologies and UD features, such as adjustable workstations and accessible digital tools, supports employees with disabilities and provides a more inclusive workforce (Mueller, 1998). Similarly, ergonomic adaptations and user-sensitive design frameworks are indicated to improve working conditions for ageing workers,and promote retention and well-being (Gonzalez, Morer, 2016). In addition to physical accessibility, cognitive and social accessibility have also received attention, particularly in supporting employee engagement with neurodiversity through collaborative design processes (Trotman, McGinley, 2018).

Despite the growing recognition of the benefits of UD, implementing UD in the context of the workplace remains a challenge. Organisations often face barriers such as financial constraints, lack of awareness among employers and employees and resistance to change (Corcuff et al., 2022). Furthermore, while the literature highlights advances in physical and digital accessibility, significant gaps remain in sensory accessibility and the integration of new technologies, such as artificial intelligence (AI) and the Internet of Things (IoT), to support dynamic workplace design (Begnum, Igeltjørn, 2024).

The authors focused on the thematic scope of Universal Design (UD), workplace accessibility, and diversity and inclusion in workplace design.

The aim of the article is to identify and evaluate the application of the universal design concept in the organisation of workplaces, based on the systematic literature review. Other aims of the article are:

G1. analysis of the literature on physical, digital, informational, communicative, social and sensory accessibility in the workplace,

G2. identification of applications of UD in the context of organising accessibility in the workplace,

G3. recognition of benefits, challenges, and best practices associated with the implementation of UD.

In order to achieve the research goal, the authors posed the following research questions:

R1. How is UD used in the context of workplace organization? In which areas? (e.g. social, digital, physical?)

R2. How does Universal Design influence the organisation of the workplace?

R3. What are the main benefits of implementing UD in the workplace?

R4. What are the main challenges and practices in implementing UD?

The analyses carried out in this article seek to:

1. Identify the relevance of Universal Design as an approach to creating inclusive work environments adapted to the diverse needs of users, including people with disabilities.
2. Identify key areas of research related to the implementation of UD in the workplace, including:
   - physical accessibility,
   - digital accessibility,
   - ergonomics and design.
3. Explore the benefits and challenges of implementing Universal Design in different organisational contexts.
4. Identify existing research gaps and make recommendations for future research and workplace design practitioners.
5. Facilitate the practical application of research findings by identifying best practices and strategies for implementing UD in professional settings.

2. Methods

In the research process, the authors used procedures typical of systematic literature reviews: selection of documents for review, the methodology for data identification, and the analysis of the results. The study was carried out in December 2024. The selection criteria for the literature were as follows:

- Timeframe of publications (from 1996 to 2024).
- Types of the literature sources: peer-reviewed scientific research.
- Management field.

The authors analysed articles using databases such as Scopus, Web of Science (WoS), and PubMed. The authors also supported their search methods with AI tools (ChatGPT 4.0, notebookLM), but these were only used for supportive searches.

Both Scopus and WoS were used as the most comprehensive databases for peer-reviewed literature (Baas et al., 2020; Baier-Fuentes et al., 2019; Mazur et al., 2018; Piwowar-Sulej, Iqbal, 2023) – both are comprehensive databases for systematic reviews. In the case of PubMed, its usefulness for analysing the impact of universal design on ergonomics and employee health was considered. The authors looked at the title, abstract, and keywords, using the following combination of words: universal design and management; universal design and workplace; physical, digital and social accessibility in the workplace; universal design in the workplace and best practices; universal design in the workplace and challenges. Authors used the following combinations of keywords:

- Universal Design, Workplace Organization, Accessibility.
- Inclusive Design, Physical Accessibility, Digital Accessibility, Social Inclusion.
- Universal Design, Ergonomics, Workplace Adaptation.
- Barrier-Free Design, Human-Centered Design, Inclusive Work Environments.
- Diversity and Inclusion, Organizational Performance, Workplace Productivity.
- Employee Engagement, Diverse Teams, Social Benefits of Universal Design.
- Implementation Challenges, Universal Design, Best Practices.
- Workplace Accessibility, Design Standards, Policy Guidelines.
- Universal Design Evaluation, Systematic Review, Research Trends.
- Litee Review, Comparative Analysis, UD Implementation Strategies.

The search strategies for each database are described below.

2.1. Scopus

(TITLE-ABS-KEY(universal AND design* AND workplace* AND organization AND accessibility*) OR TITLE-ABS-KEY(universal AND design* AND ergonomics AND workplace AND adaptation*) OR TITLE-ABS-KEY(barrier-free AND design* AND human-centered AND design* AND inclusive AND work AND environments) OR TITLE-ABS-KEY(diversity AND inclusion AND organizational AND performance* AND workplace* AND productivity) OR TITLE-ABS-KEY(employee AND engagement AND diverse AND teams AND social AND benefits AND of AND universal AND design*) OR TITLE-ABS-KEY(implementation AND challenges AND universal AND design* AND best AND practices) OR TITLE-ABS-KEY(workplace* AND accessibility AND design* AND standards AND policy AND guidelines) OR TITLE-ABS-KEY(universal AND design* AND evaluation AND systematic AND review AND research AND trends) OR TITLE-ABS-KEY(Literature

Review AND Comparative Analysis AND Universal Design Implementation Strategies)) AND (LIMIT-TO (SUBJAREA,"BUSI")) AND (LIMIT-TO (PUBSTAGE,"final")) AND (LIMIT-TO (SRCTYPE,"j")) AND (LIMIT-TO (LANGUAGE,"English"))

2.2. Web of Science (WoS)

universal AND design* AND workplace* AND organization AND accessibility* (All Fields)or **universal AND design* AND ergonomics AND workplace AND adaptation*** (All Fields)or **barrier-free AND design* AND human-centered AND design* AND inclusive AND work AND environments** (All Fields) or **diversity AND inclusion AND organizational AND performance* AND workplace* AND productivity** (All Fields) or **employee AND engagement AND diverse AND teams AND social AND benefits AND of AND universal AND design*** (All Fields) or **implementation AND challenges AND universal AND design* AND best AND practices** (All Fields) or **workplace* AND accessibility AND design* AND standards AND policy AND guidelines** (All Fields) or **universal AND design* AND evaluation AND systematic AND review AND research AND trends** (All Fields) or **literature AND review AND comparative AND analysis AND universal AND design AND implementation AND strategies** (All Fields) and **Article** or **Review Article** or **Proceeding Paper** (Document Types) and **Management** (Web of Science Categories)

2.3. PubMed

Universal Design, Workplace Organization, Accessibility; Inclusive Design, Physical Accessibility, Digital Accessibility, Social Inclusion; Universal Design, Ergonomics, Workplace Adaptation; Barrier-Free Design, Human-Centered Design, Inclusive Work Environments; Diversity and Inclusion, Organizational Performance, Workplace Productivity; Employee Engagement, Diverse Teams, Social Benefits of Universal Design; Implementation Challenges, Universal Design, Best Practices; Workplace Accessibility, Design Standards, Policy Guidelines; Universal Design Evaluation, Systematic Review, Research Trends; Literature Review, Comparative Analysis, UD Implementation Strategies.

The authors focused mainly on the publications that included the following categories:

- application of Universal Design in diverse areas: digital, social, and physical accessibility,
- challenges and barriers to implementing UD,
- benefits of implementing UD in the workplace.

The research process was also based on the identification of research gaps in various areas of management and universal design, especially in relation to specific groups of employees (e.g. seniors, people with different disabilities).

After the research according to the strategy described above, the authors conducted a content analysis of the titles and abstracts of the articles, considering only material relevant to the research topic. The final sample consisted of 14 articles and other publications.

In the final stage, the authors conducted an in-depth qualitative analysis of the content of selected publications.

To ensure that good quality publications were selected for analysis, the authors established quality assessment criteria such as: reputation of scientific journal or other source; the number of citations (impact factor), the methodology of research (e.g. empirical research, systematic reviews); topicality of the publication and relevance of the topic.

3. Results

As a result of using the search in **Scopus**, the authors found 5 articles according to the following limits:

- publish stage – final,
- document type – final,
- subject area – UD in the workplace,
- language – English,
- years of publications – 1996-2024.

The authors identified thematic categories related to management, as shown in Table 1.

Table 1.
Key results – subject areas, in the context of UD in Management (Scopus)

No.	Authors	Title of the publication, source, year	Thematic category	Corresponds to the topic of the research (yes/no)
1	Torres, E.N. (Torres, 2024)	Why great service is difficult to achieve: insights from theory and practice, International Journal of Contemporary Hospitality Management, 2024	The study examines the challenges of developing and implementing theory in service marketing and hospitality management. Key thematic areas: challenges of the marketing theory, implementation of service theory, theory-practice gap, human resources management, customers' behaviors.	No
2	Venter, A., de Vries, M. (Venter, de Vries, 2023)	Demonstrating the Elaborated Action Design Research (eADR) Model to Address Communication Challenges During Software Development, Systemic Practice and Action Research, 2023	The text describes a study conducted at CGIS, where ineffective communication during software development led to delays and quality issues in projects. Key thematic areas: communication in IT, effective communication.	No

Cont. table 1.

3	Coetzer, G. (Coetzer, 2016a)	An empirical examination of the mediating influence of time management on the relationship between adult attention deficit and role stress, Personnel Review, 2016	The study empirically examined the impact of time management on the relationship between adult attention deficit (ADD) and job role stress. Key thematic areas: time management, attention deficit hyperactivity disorder, occupational stress.	Yes
4	Singh, S., Kumar, R., Kumar, U. (Singh et al., 2015)	Applying human factor analysis tools to a railway brake and wheel maintenance facility, Journal of Quality in Maintenance Engineering, 2015	Ergonomics and human factors in the context of maintenance tasks (case study: railway workshop). It analyzes aspects such as technicians' posture, repair time and perception of job demands. Key thematic areas: ergonomics, human factor, safety.	Yes
5	Tu, K.-J., Loftness, V. (Tu, Loftness, 1998)	The effects of organisational workplace dynamics and building infrastructure flexibility on environmental and technical quality in offices, Journal of Corporate Real Estate, 1998	Study of the impact of changing working conditions on the quality of the office environment and infrastructure. It analyzes the relationship between dynamic changes in the organization of workspace (e.g. density of workstations, equipment) and the stiffness of building infrastructure, especially HVAC systems, lighting and telecommunications. The study showed statistically significant relationships between these factors and employee satisfaction. Key thematic areas: workplace dynamics, flexible infrastructure, the quality of workplace environment, employees' satisfaction.	Yes

Source: Own sources based on literature review

As a result of using the search in **WoS**, the authors found 10 publications (years 2008-2024), according to the following publication types: journals and book chapters. The main information on the authors, and the publication, as well as the thematic category are listed in the table below.

Table 2.
Key results – subject areas, in the context of UD in Management (Web of Science)

No.	Authors	Title of the publication, source, year	Thematic category
1.	Moody, L., Saunders, J., Rebernik, N., Leber, M., Curin, A., Wójcik-Augustyniak, M., Szajczyk, M.	Tackling Barriers to the Inclusion of Disabled People in the European Workplace Through Ergonomics, Part of the book series: Advances in Intelligent Systems and Computing (AISC, vol. 498), 2016	The ERGO WORK project implemented by academic and business partners focuses on identifying and eliminating barriers to exclusion in the workplace. Preliminary research has shown the need to improve the working conditions of disabled people and to train employees and employers in ergonomics and universal design. The projects brought together business, disabled employees, students and scientists, focusing on adapting workplaces, designing tasks and products to individual needs. Key thematic areas: inclusion in workplace, ergonomics and design, training in ergonomics, workplace adaptation. **Corresponds to the subject of the research.**
2.	Torres, E.N.	Why great service is difficult to achieve: insights from theory and practice, International Journal of Contemporary Hospitality Management, 2023	The study examines the challenges of developing and implementing theory in service marketing and hospitality management. Key thematic areas: challenges of the marketing theory, implementation of service theory, theory-practice gap, human resources management, customers' behaviors. **Does not correspond to the subject of the research.**
3.	Steyn, M.	Organisational benefits and implementation challenges of mandatory integrated reporting Perspectives of senior executives at South African listed companies, Sustainability Accounting, Management and Policy Journal, 2014	The study examines the perceptions of the benefits and challenges of implementing integrated reporting (IR) among CEOs, CFOs and other senior managers of South African listed companies. Key thematic areas: Integrated Reporting in South Africa, challenges of IR implementation. **Does not correspond to the subject of the research.**
4.	Usman, L.	Assessing the universal basic education primary and Koranic schools' synergy for Almajiri street boys in Nigeria, International Journal of Educational Management, 2008	The paper examines the policy's management implementation practices and challenges, as well as provides policy options that may minimize discrepancies for effective management. Major findings include the boys' adoption to the free lunch feeding policy as motivation to partial school attendance. Management shortcomings of the synergy include ineffective communication and collaboration, poor instructional supervision and cultural insensitivity to boys' school retention. Key thematic areas: policy's management implementation practices and challenges, discrepancies for effective management. **Does not correspond to the subject of the research.**

Cont. table 2.

5.	Venter, A., de Vries, M.	Demonstrating the Elaborated Action Design Research (eADR) Model to Address Communication Challenges During Software Development, Systemic Practice and Action Research, 2023	The text describes a study conducted at CGIS, where ineffective communication during software development led to delays and quality issues in projects. Key thematic areas: communication in IT, effective communication. **Partially correlates with the topic of the research.**
6.	Busco, C., Walters, J., Provoste, E.	Stakeholder management within PPP-arranged civil engineering megaprojects: a systematic literature review of challenges, critical success factors and stakeholder roles, 2024	This paper focuses on the interplay between stakeholder management, challenges, critical success factors (CSFs), and the overall success of PPP-arranged civil infrastructure megaprojects. Key thematic areas: PPP project management, stakeholder involvement. **Does not correspond to the subject of the research.**
7.	Coetzer, G.	An empirical examination of the mediating influence of time management on the relationship between adult attention deficit and role stress, Personnel Review, 2016	The study empirically examined the impact of time management on the relationship between adult attention deficit (ADD) and job role stress. Key thematic areas: time management, attention deficit hyperactivity disorder, occupational stress. **Partially correlates with the topic of the research.**
8.	Miles, A., Fleming, M., McKinney, A.P.	Retaliation: legal ramifications and practical implications of discriminatory acts in the workplace, Equality, Diversity and Inclusion, 2010	The purpose of this paper is to review retaliation legislation to clarify for employers and employees the protected provisions and provide guidance for complying with this important anti- discrimination statute to aid in promoting a fair and unbiased work environment. Key thematic areas: anti-discrimination law in workplace. **Does not correspond to the subject of the research.**
9.	Baranchenko, Y., Yukhanaev, A.	Barriers to Using Qualitative Methods in Business and Management Research in Ukraine, Proceedings of the 12th European Conference on Research Methodology for business and management studies, 2013	The authors in the article indicate obstacles to conducting qualitative research and discrepancies between the education systems in Western Europe and the former USSR countries. The results help understand the challenges of harmonizing the Ukrainian education system with international standards. Key thematic areas: higher education reform, academic traditions in the USSR. **Does not correspond to the subject of the research.**
10.	Popovic, D., Slivar, I., Bozac, M.G.	Accessible Tourism and Formal Planning: Current State of Istria County in Croatia, MDPI, Administrative Sciences, 2022	The article analyzes the tourist market, focusing on the needs of older people, families with small children and people with disabilities. The study highlights the importance of tourism accessibility, covering physical, information and service aspects. Key thematic areas: accessible tourism, adjusting infrastructure. **Corresponds to the subject of the research.**

Source: own sources based on literature review.

The authors identified 90 results in PubMed, as described in the table below. After analysing the titles and abstracts, 11 publications were identified as suitable for further analysis in the topic. After in-depth consideration of each of the publications, the authors identified 3 that were relevant to the research topic.

Table 3.
Results of the PubMed search - number of publications

No.	Key words	Results (number of publications)	Results (number of publications consistent with the research topic)
1.	Universal Design, Workplace Organization, Accessibility	13	4
2.	Inclusive Design, Physical Accessibility, Digital Accessibility, Social Inclusion	30	1
3.	Universal Design, Ergonomics, Workplace Adaptation	1	1
4.	Barrier-Free Design, Human-Centered Design, Inclusive Work Environments;	1	1
5.	Diversity and Inclusion, Organizational Performance, Workplace Productivity	12	3
6.	Employee Engagement, Diverse Teams, Social Benefits of Universal Design;	0	0
7.	Implementation Challenges, Universal Design, Best Practices;	18	0
8.	Workplace Accessibility, Design Standards, Policy Guidelines	5	1
9.	Universal Design Evaluation, Systematic Review, Research Trends	10	0
10.	Literature Review, Comparative Analysis, UD Implementation Strategies.	0	0
SUM		90	11

Source: Own sources based on literature review.

Table 4.
Further research results of the PubMed search - identification of the publications corresponding to the topic of the article

No.	Authors	Title of the publication, source, year	Content	Corresponds to the topic of the research (yes/no)
1.	Begnum, M.E.N., Igeltjørn, A.	Universal Design of Public Services: A Case Study of the Norwegian Labour and Welfare Administration. Stud Health Technol Inform, 2024	This paper presents how employees in a governmental organization strive towards incorporating universal design into their work practices when developing digital solutions – and what workplace aspects helps and hinders them in their efforts to ensure the digital services they build are accessible for all users.	Yes

Cont. table 4.

2.	Corcuff, M., Routhier, F., Paquette-Raynard, E., Gagnon, M., Battalova, A., Mwaka, C., Lamontagne, M.E.	Organizations' Strategies to Improve Implementation of Universal Accessibility Principles: Protocol for a Scoping Review. JMIR Res Protoc, 2022	The aim of this study is to identify strategies that are contextually appropriate and provide guidelines for organizations to promote successful implementation of universal accessibility. The results of this scoping review are expected to help the research community in various fields, local organizations, and stakeholders to identify better ways to improve implementation strategies of universal accessibility practices.	Yes
3.	Mueller, J.L.	Assistive technology and universal design in the workplace. Assist Technol. 1998	In the labor market, employers strive to stay competitive by attracting and maintaining a diverse workforce. A diverse workforce means different and unique needs among employees. One way employers can meet these needs is by using equipment that includes universal design (UD) features. UD features are integrated into devices, environments, processes, and systems such as architecture, kiosks, telecommunications, restrooms, and workplace elements. This publication provides helpful tips for choosing equipment that includes UD features, a process for choosing AT for employees with disabilities, and resources for additional information.	Yes
4.	Dannenberg, A.L., Cramer, T.W., Gibson, C.J.	Assessing the walkability of the workplace: a new audit tool. Am J Health Promot. 2005	Walking can be incorporated into most people's daily routines if the process is made convenient by a well-designed built environment. Walkability rarely is assessed in the workplace, where adults spend much of their time. Facility planners may find this walkability instrument useful in identifying and eliminating barriers to convenient walking opportunities in workplaces such as office parks and university campuses.	No
5.	Trotman, N., McGinley, C.	Design and the Mind Engaging and Collaborative Workshops for the Neurodiverse. Stud Health Technol Inform. 2018	A central goal of Design and The Mind (DTM) is to demystify the invisible barriers and issues surrounding cognitive, physical, digital access and engagement with the Wellcome Collection Hub, the wider organisation and Hub partners to improve inclusion and accessibility, and its resources; this approach formed an integral and positive part of the design process, through spotlighting opportunities for innovation. This paper highlights the most salient observations of a live research project. This project seeks to reframe notions and approaches for engagement with neurodiverse groups and individuals using a developed design suite of functioning and dynamic tools and methods underpinned by inclusive principled guidelines.	Yes

Cont. table 4.

6.	Gonzalez, I., Morer, P.	Ergonomics for the inclusion of older workers in the knowledge workforce and a guidance tool for designers. Appl. Ergon., 2016	The ageing of the population and the inverted population pyramid is bringing important changes to society as a whole. These changes are associated with the inclusion of an older workforce in knowledge work and the challenge they represent in adapting the work environment accordingly. In order to approach a more universal design of the work environment, industrial designers need support from user-sensitive inclusive design studies. there is a need to develop more appropriate tools for Industrial Designers that cover the initial phase of the design process. This study provides a review of the available tools and guidelines and proposes a theoretical framework intended for developing a design guidance tool for inclusive workstation design.	Yes
7.	Burelli, A., Simone, C.	Policies and Processes for Accessibility from a UD Perspective: The Integrated Approach Supported by the Friuli Venezia Giulia Region (IT). Stud Health Technol. Inform. 2022	In order to promote change and to impart this change of approach, the Autonomous Region of Friuli Venezia Giulia has envisaged integrated actions, aimed, as a whole, at accompanying the process that guides the project culture towards a progressive adherence to the methodological criteria of Universal Design, introducing, at the same time, support measures aimed at financing the Municipalities of the Region both for the preparation of barrier elimination plans (PEBAs) and the implementation of the interventions identified in those plans. Among the envisaged actions, the most important is a general accessibility mapping, which includes the adoption of a terminology system (accessibility ontology) integrated in a specific computer application, through which the municipalities will be able to detect architectural barriers, in a homogeneous way, over the entire regional territory.	No
8.	Gross-Gołacka, E., Kupczyk, T., Wiktorowicz, J.	Towards a Better Workplace Environment-Empirical Measurement to Manage Diversity in the Workplace. Int. J. Environ. Res. Public. Health. 2022	The use of quantitative methods in the decision-making process of an organization can have a significant impact on the quality of its management. In the case of building an inclusive environment and implementing activities for diversity management, the proposed 5P architecture (planning, processes, people, possessions, and profits) could significantly support this process. Therefore, it is recommended to use the proposed 5P architecture in practice, for example, to diagnose the scope and quality of actions taken for diversity management, as well as to build a diverse working environment in key areas of the organization.	Yes

Cont. table 4.

9.	Liu, J., Zhu, Y., Wang, H.	Managing the negative impact of workforce diversity: The important roles of inclusive HRM and employee learning-oriented behaviors. Front Psychol. 2023	Based on the workplace diversity theories (e.g., the categorization-elaboration model), this study examined how workforce diversity was positively related to interpersonal conflict through impacting one's affective states, and to what extent this indirect effect can be weakened by organization-initiated practices (i.e., the inclusive human resources management (HRM) practices) and employee-initiated behaviors (i.e., employee learning-oriented behaviors).	Yes
10.	McGann, S., Jancey, J., Tye, M.	Taking the stairs instead: The impact of workplace design standards on health promotion strategies. Australas. Med. J. 2013	This paper is aimed at highlighting the gap in health promotion knowledge by addressing how the disciplines of architecture and health promotion can work together to challenge the regulations that dictate design practice and ultimately bridge that gap for long-term change. The overarching aim is to undertake further evidenced-based research that will inform best practice in the planning and design of workplaces to reduce sedentary behaviour and increase opportunities for physical activity.	No

Source: Own sources based on literature review.

4. Theoretical Background

The inspirations for the meaning of Universal Design started in the 1960s, with the first legislation in the US: the Civil Rights Movement of the 1960s inspired the Disability Rights Movement that greatly influenced the legislation of the 1970s, 1980s, and 1990s. These new laws prohibited discrimination against people with disabilities and provided access to education, places of public accommodation, telecommunications, and transportation". The very concept originated in the fields of architecture and design. Its definition was coined by Ronald L. Mace, architect and product designer. He stated the term universal design as a concept of designing products and environments for the needs of people, regardless of their age, ability or status in life (Persson et.al., 2014). In 2001 the Committee of Ministers of the Council of Europe accepted the final version of the definition of Universal Design: "Universal design is a strategy that aims to make the design and composition of different environments and products usable for everyone. It attempts to do this in the most independent and natural manner possible, without the need for adaptation or specialized design solutions. The intent of the universal design is to simplify life for everyone by making the built environment, products and communications equally accessible, usable, and understandable at little or no extra cost. The universal design concept emphasizes user-centred design by following a holistic approach to accommodate the needs of people of all ages, sizes and abilities. It provides for the changes that all people experience throughout their lives. Consequently, universal design is becoming an integral part of architecture, design and planning of the built environment" (Null, 2014).

According to the Center for Universal Design (1997) there are seven main Universal Design principles:

1. Equitable Use - the design is useful and marketable to people with diverse abilities.
2. Flexibility in Use - The design accommodates a wide range of individual preferences and abilities.
3. Simple and Intuitive Use - The use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.
4. Perceptible Information - The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
5. Tolerance for Error - The design minimizes hazards and the adverse consequences of accidental or unintended actions.
6. Low Physical Effort - the design can be used efficiently and comfortably and with a minimum of fatigue.
7. Size and Space for Approach and Use - Appropriate size and space is provided for approach, reach, manipulation, and use regardless of the user's body size, posture, or mobility.

There are some key categories of accessibility; the ones most frequently described in the literature are listed in the table below.

Table 5.
Key categories of accessibility, with examples of literature sources

Category of accessibility	Description	Examples of literature sources
Digital	Digital accessibility means that websites, tools, and technologies are designed and developed so that people with disabilities can use them (World Wide Web Consortium W3C)	*W3C (2008). Web Content Accessibility Guidelines (WCAG) 2.0.* *Horton, Sarah & Quesenbery, Whitney (2013). A Web for Everyone: Designing Accessible User Experiences.* *Cooper, Alan, et al. (2014). About Face: The Essentials of Interaction Design* (Cooper, 2014; Horton, 2014)
Physical (architectural)	Refers to the design, construction, and modification of buildings and physical environments to ensure they can be accessed, used, and navigated by all individuals, including those with disabilities. It focuses on eliminating physical barriers that may prevent people with mobility, sensory, or cognitive challenges from fully utilizing spaces.	Mace, Ronald L. (1985). *Accessible Environments: Toward Universal Design.* Preiser, Wolfgang F.E. (ed.) (2001). *Universal Design Handbook.* Ostrowska, Alicja (2008). *Architektura bez barier: podręcznik dla projektantów* (Mace, 1985; Ostrowska, 2008; Preiser, 2001)

Cont. table 5.

Informational	Refers to ensuring that all individuals, regardless of their abilities, can access, comprehend, and use information effectively.	W3C (2018). *Web Content Accessibility Guidelines (WCAG) 2.1.* *Gulliksen, Jan, et al. (2005).* *Making Information Usable and Accessible.* *Fajardo, Inmaculada, et al. (2014).* *Easy-to-Read Texts for People with Cognitive Disabilities.* (Fajardo, 2014; Gulliksen, 2005; W3C, 2018)
Communication	Refers to the ability of all individuals, regardless of their abilities or disabilities, to access and understand messages, information, and interactions. It ensures that everyone, including people with visual, auditory, cognitive, and physical disabilities, can engage in communication in an inclusive, meaningful, and effective way.	Beukelman, David & Mirenda, Pat (2013). *Augmentative and Alternative Communication.* W3C (2017). *Accessible Communication Formats: Guidelines for Effective Practices.*(Beukelman, 2013; W3C, 2017)
Educational	Refers to the design and implementation of educational environments, tools, and content that ensure all students, regardless of their abilities or disabilities, can fully participate in learning opportunities.	Rose, David H. & Meyer, Anne (2002). *Teaching Every Student in the Digital Age: Universal Design for Learning.* Burgstahler, Sheryl (2015). *Universal Design in Higher Education: From Principles to Practice.* Hehir, Thomas (2009). *Effective Inclusive Schools: Designing Successful Schoolwide Programs* (Burgstahler, 2015b; Hehir, 2009; Rose, 2002).
Social	Aims to remove barriers that prevent individuals, especially those with disabilities or other marginalized groups, from fully participating in social, cultural, and community activities. It is about creating an inclusive environment where everyone, regardless of their abilities, social status, or identity, can engage in social, recreational, and community life.	Oliver, Michael (1990). *The Politics of Disablement.* Shakespeare, Tom (2013). *Disability Rights and Wrongs Revisited.* Barnes, Colin (1991). *Disabled People in Britain and Discrimination (Burgstahler, 2015a; Hehir, 2009; Rose, 2002)*
Sensory	The goal of sensory accessibility is to ensure that all people, regardless of their sensory abilities, can fully engage with and participate in their environment, whether it's public spaces, digital co tent, or social interactions.	Calvillo-Arbizu, Jorge, and Badiola, Kepa (2015). *Universal Design and Accessibility for Sensory Disabilities in Public Spaces.* *Gulliksen, Jan et al. (2015).* *Universal Design as a Practical Strategy for Accessible ICT.* *Tobias, Jon L. (2017).* *Accessible Environments for the Visually Impaired.* *Loomis, Jack M. et al. (2012).* *Visual Accessibility: Advances in Orientation and Mobility Technology.* *Napier, Jemina, and Leeson, Lorraine (2016).* *Sign Language in Action.* *Farina, Barbara (2018).* *Hearing Accessibility in Public Spaces: Acoustics and Assistive Devices.* *Mostafa, Magda (2014).* *Architecture for Autism: Autism ASPECTSS Design Index.* (Calvillo-Arbizu, 2015; Farina, 2018; Gulliksen, 2015; Loomis, 2012; Mostafa, 2014; Napier, 2016; Tobias, 2017)

Source: Own sources based on literature review.

Legal context

There are international and national regulations that promote the idea of universal design, and they result from such ideas as equality, accessibility, or counteracting exclusion. Key legal acts and standards related to the UD concept are described below:

1. International law:
   - UN Convention on the Rights of Persons with Disabilities (CRPD), 2006. The CRPD introduces the concept of UD - products, environments, programs and services should be designed in a way that allows everyone to use them, without the need for adaptation or specialized solutions. What is more, in article 4, the states are obliged to take legislative, administrative and other actions to implement the principles of accessibility, promote research and development of technologies and accessible products that comply with the principles of UD, and eliminate architectural, communication, technological and other obstacles and barriers. The most important article in the context of UD is article 9, in which states are obliged to ensure the availability of: buildings, roads, transport and other public space, information and communication services, including digital technologies, and mass media. This article requires the application of UD principles, to enable people with disabilities to independently use spaces, products and services.
   - UN 2030 Agenda for Sustainable Development - goal 11 "Sustainable cities and communities" emphasizes the need to create inclusive and accessible urban spaces.
2. EU regulations:
   - European Accessibility ACT (EAA) 2019 aims to facilitate access to products and services with disabilities; stimulating the EU internal market in terms of available products and services; reducing barriers and differences in accessibility rules between member states. All products and services must be designed in accordance with the principles of UD. All the provisions have to be applied to national legislation till June 28th 2025.
3. Polish regulations:
   - Constitution - guarantees equality and prohibition of discrimination (art. 32).
   - Polish Act on ensuring accessibility for people with special needs 2019 - a key legal act regulating accessibility issues in Poland, developed in response to requirements arising from: CRPD, EAA and national obligations in the field of counteracting social exclusion.
   - Labor code - regulations related to the adaptation of workplaces of people with disabilities (art. 207).

4. Technical standards (examples):
   - ISO 21542: *Building Construction – Accessibility and Usability of the Built Environment* - provides guidelines for designing buildings and facilities that are accessible to all users.
   - **ISO 9241**: *Ergonomics of Human-System Interaction* - focuses on the usability of interactive systems, including accessibility for digital products like software, hardware, and interfaces.
   - **EN 301 549**: *Accessibility Requirements for ICT Products and Services.*
   - Web Content Accessibility Guidelines (European standard for ICT accessibility) - an international standard for the accessibility of Internet content.

5. Discussion

The above analyses have revealed a relatively small number of articles describing the phenomenon under study. What is surprising is the relatively small number of these articles describing the phenomenon in detail in typical scientific databases such as Scopus and Web of Sciences. More detailed analyses can be found in the articles listed in the PubMed search engine, as will be shown below.

Table 6 below provides a list of the articles identified in Scopus, WoS and PubMed according to the search strategy that answers the research questions and correlates with the main and specific aims of the article.

Table 6.
Analysis of articles in Scopus, WoS, and PubMed to answer the research questions and correlation with the main and specific objectives

Literature database	**Author**	**Answers for Research Questions**	**Correlation with the main goal**	**Correlation with the specific goals (G)**
Scopus	1. (Coetzer, 2016)	**RQ1** Touches on cognitive accessibility by discussing time management as a means of reducing stress in the workplace. **RQ2** Suggests that addressing cognitive needs (e.g., through time management tools) improves workplace productivity.	Limited relevance. The article examines occupational stress, which indirectly touches on cognitive accessibility (e.g., accommodating employees with ADHD).	G1. Cognitive accessibility G3. Indirectly through time management G3. Benefits: reduced stress; lacks broader UD applicability.
	2. (Singh et al., 2015)	**RQ1** Focuses on **physical accessibility** through ergonomic adjustments to improve technician safety and efficiency. **RQ2** Shows how workplace adaptations can reduce physical	Strongly correlated. The article examines **ergonomics** and workplace adaptations, directly addressing physical	G1. Physical accessibility G2. Ergonomic tools, workplace design

		strain and improve task performance. **RQ3** Emphasises the benefits of ergonomic design in terms of increased safety, productivity and employee wellbeing. **RQ4** Identifies the need for task-specific tools and training to implement ergonomic solutions.	accessibility in workplace organisation	G3. Benefits: safety, productivity. Challenges: training needs.
	3. (Tu, Loftness, 1998)	**RQ1** Focuses on **physical and environmental accessibility**, emphasising adaptable infrastructure (e.g., HVAC systems, lighting). **RQ2** Demonstrates how infrastructure flexibility can meet diverse workplace needs, improving inclusion and satisfaction. **RQ3** Shows statistically significant links between infrastructure adaptability and employee satisfaction. **RQ4** Discusses the difficulty of retrofitting rigid infrastructure and the importance of proactive planning.	Strongly correlated. This article explores how flexible infrastructure supports workplace adaptability in line with UD principles.	G1. Physical, environmental accessibility G2. Flexible infrastructure G3. Benefits: adaptability, satisfaction. Challenges: retrofitting.
WoS	1. Moody et al. (2016)	**RQ1** Addresses physical accessibility and social inclusion through ergonomic adaptations and training. **RQ2** Demonstrates how UD principles improve workplace accessibility for employees with disabilities. **RQ3** Highlights benefits such as increased inclusivity, improved working conditions, and employee satisfaction. **RQ4** Discusses challenges such as lack of awareness and the need for targeted training.	Strongly correlated. Addresses **physical and social accessibility** through ergonomic design and workplace adaptation. Highlights applications of UD (e.g., training and accommodation). Discusses benefits (inclusiveness, satisfaction) and challenges (lack of awareness).	G1. Physical, social accessibility G2. Ergonomic design, workplace adaptation G3. Benefits: inclusivity, satisfaction. Challenges: training needs.
	2. Venter, de Vries (2023)	No answer to the research questions.	Partially correlated: - Discusses communicati on accessibility **in** IT projects. Relevant to a narrow aspect of workplace accessibility but lacks general UD applications.	G1. Communication accessibility (limited) G2. Indirectly addresses IT environments G3. Highlights communication challenges but lacks broader UD context.

	3. Coetzer (2016)	**RQ1:** Addresses cognitive accessibility by exploring stress reduction strategies for people with ADHD. **RQ2:** Suggests addressing cognitive needs through time management tools to improve productivity.	Partially correlated: - Addresses cognitive accessibility (e.g., stress management for employees with ADHD). Highlights indirect UD applications such as time management tools.	G1. Cognitive accessibility G2. Time management tools G3. Benefits: reduced stress. Lacks broader UD applicability.
	4. Popovic et al. (2022)	**RQ1** Discusses physical and information accessibility in the context of tourism, with applications to workplace accessibility. **RQ2** Demonstrates how infrastructure changes can accommodate different user needs. **RQ3** Highlights benefits such as increased inclusivity and user satisfaction.	Strongly correlated - Examines physical and informational accessibility in infrastructure. Highlights UD applications (e.g., infrastructure adaptations for accessibility). Discusses benefits (inclusivity) and challenges (cost of retrofitting).	G1. Physical, informational accessibility G2. Infrastructure adjustments G3. Benefits: inclusivity, user satisfaction. Challenges: retrofitting.
PubMed	1. Begnum et al. (2024)	**R1.** Focuses on digital and communication accessibility, addressing workplace barriers to accessibility in digital solutions. **R2**. Emphasises efforts to create accessible digital services for diverse users. R3. Improving the inclusivity and usability of digital services. **R4.** Challenges: Limited resources and resistance to putting UD principles in practice. **Best practices:** Training employees and collaborative design of digital tools.	Strongly correlated - Addresses digital and communication accessibility**.** Discusses UD applications in public services. Highlights barriers, training, and collaborative design as key practices.	G1. Digital, communication accessibility G2. Accessible digital service design G3. Highlights barriers, emphasizes training, and collaborative design.
	2. Corcuff et al. (2022)	**R1.** Discusses strategies for **physical and social accessibility**. **R2.** Identifies effective strategies for implementing UD principles, such as stakeholder engagement and contextual adaptation. **R3**. **Benefits:** increased inclusivity in the workplace and improved adoption of accessibility practices. **R4. Challenges:** Contextual variations and inconsistencies in implementation. **Best practices:** Tailored strategies and collaborative efforts.	Strongly correlated - Covers physical and social accessibility**.** Identifies strategies for implementing UD. Emphasises contextual variations and the importance of stakeholder involvement.	G1. Physical, social accessibility G2. Tailored UD implementation strategies G3. Benefits: inclusivity. Challenges: contextual variations.

	3. Mueller (1998)	**R1.** Focuses on physical and digital accessibility through assistive tools and workplace features. **R2.** Demonstrates how assistive technology (AT) and UD features can be integrated into workplace environments (e.g. restrooms, kiosks). **R3.** Inclusion, productivity, and satisfaction for employees with disabilities. **R4. Challenges:** Financial and technical constraints. **Best practices:** Choosing cost-effective and adaptable tools for different needs.	Strongly correlated - Focuses on physical and digital accessibility through assistive technologies. Demonstrates UD applications in the workplace environment. Highlights the challenges of inclusivity and cost.	G1. Physical, digital accessibility G2. Assistive technologies and tools G3. Benefits: inclusivity, productivity. Challenges: cost, adaptability.
	4. Trotman, McGinley (2018)	**R1.** Focuses on removing invisible barriers for neurodiverse people through collaborative design. **R2.** Collaborative design processes for neurodiverse groups promote innovation in workplace solutions. **R4.** Cognitive and invisible accessibility needs are often overlooked. Involving neurodiverse people in the design process leads to better outcomes.	Strongly correlated - Explores cognitive, digital, and social accessibility**.** Demonstrates collaborative design to address neurodiverse needs. Identifies innovation as a benefit of UD.	G1. Cognitive, digital, social accessibility G2. Collaborative design for neurodiverse groups G3. Benefits: innovation. Challenges: addressing invisible barriers.
	5. Gonzalez, Morer (2016)	**R1.** Discusses ergonomic design for older workers to accommodate age-related physical limitations. **R2.** Ergonomic design improves working conditions for older workers, leading to higher retention. **R3.** Ergonomic tools support the health and well-being of older workers. **R4.** Incorporating UD principles during the initial design stage avoids costly retrofitting.	Strongly correlated **–** Addresses **physical and social accessibility**, focusing on ergonomic design for older workers. - Emphasises user-sensitive frameworks and inclusivity in the workplace.	G1. Physical, social accessibility G2. Ergonomic workstation design G3. Benefits: retention, wellbeing. Challenges: user-sensitive design
	6. Gross-Gołacka et al. (2022)	**R1.** Discusses diversity management frameworks to promote inclusiveness in the workplace. **R2.** Inclusive frameworks (e.g., 5P architecture) create environments that meet the needs of diverse workforces. **R3.** Structured frameworks improve decision making and workplace efficiency.	Partially correlated - Focuses on social accessibility and diversity management frameworks (5P). Relevant to workplace inclusivity but lacks focus on wider UD applications.	G1. Social accessibility G2. Inclusive frameworks (5P) G3. Benefits: workplace diversity. Challenges: measuring inclusivity**.**

	7. Liu et al. (2023)	R3. Inclusive HR practices reduce interpersonal conflict in diverse workplaces.	Partially correlated - Addresses diversity and **social accessibility** but lacks a specific focus on UD or workplace applications.	G1. Social accessibility. G2. **Applications:** Inclusive HRM and learning-oriented practices for diverse workplaces. G3. **Benefits:** Reduction in workplace conflicts and enhanced diversity management. **Challenges:** Limited focus on physical or cognitive accessibility.

Source: Own sources based on literature review.

The table above shows that the use of UD in workplace design and organisation should address accessibility needs while promoting inclusion, productivity and employee satisfaction. This discussion synthesises the findings from the literature and relates them to the research questions and specific objectives of the analysis in the areas of physical, digital, information, communication, social and sensory accessibility of workplaces.

From the detailed analysis of the articles, the following findings emerge as a platform for further research in this area:

Areas of accessibility

a. Physical accessibility

Several articles highlight the importance of physical accessibility as a basis for the use of UD in the workplace:

- Singh et al. (2015) emphasise the role of ergonomic adaptations in improving the safety and performance of the technicians, reducing physical strain and increasing productivity. This is in line with (G1) on physical accessibility and emphasises the importance of task-specific tools and training (G2).
- Gonzalez, Morer, (2016) further emphasise the importance of ergonomic designs adapted to an ageing workforce, which contributes to employee retention and wellbeing. Incorporating UD principles at the design stage avoids costly retrofitting (G3).

b) Digital accessibility

Digital accessibility remains a critical area for workplace inclusion:

- Begnum, Igeltjørn, (2024) focus on the development of accessible digital services in public organisations. The study highlights the challenges of limited resources and resistance to adopting UD principles but emphasises training and co-design as key strategies (G2, G3).

- Mueller, J.L. (1998) shows how assistive technologies and digital tools, such as kiosks and telecommunications systems, can increase inclusion and productivity in the workplace (G1, G2, G3).

c) Cognitive accessibility

Cognitive accessibility is crucial in supporting neurodiverse employees and those with specific cognitive needs:

- Coetzer (2016b) addresses the relationship between time management tools and reduced stress in employees with ADHD. This highlights the indirect use of UD through cognitive accessibility (G1, G2).
- Trotman, McGinley, (2018) advocate collaborative design process to address the invisible barriers encountered by neurodiverse employees. Their findings suggest that involving employees in the design process promotes innovation and better workplace solutions (G2, G3).

d) social accessibility.

Social inclusion frameworks also play a key role in UD in the workplace:

- Gross-Gołacka et al. (2022) propose a 5P architecture (planning, process, people, ownership, profit) for managing diversity in the workplace. This framework supports decision making, improves inclusion and increases workplace productivity (G1, G2, G3).
- Liu et al. (2023)explore inclusive HR practices and learning-oriented behaviours to mitigate interpersonal conflict in diverse workplaces. These practices are consistent with social accessibility goals while improving collaboration and employee wellbeing (G3)

The benefits of universal design are also described in the literature. These include:

a) Inclusion and diversity: Moody, (2016) and Corcuff et al. (2022) highlight how UD promotes inclusion by enabling employees with diverse needs to participate fully in the workplace.
b) Increased productivity: Singh et al. (2015) and Mueller, J.L. (1998) show that ergonomic adaptations and assistive technologies directly contribute to increased productivity by reducing physical strain and increasing workers' capabilities.
c) Employee retention and satisfaction: Gonzalez, Morer, (2016) show how UD principles increase employee satisfaction and retention, especially for ageing workers.

The literature review also highlights the challenges of implementing UD. While the benefits of UD are clear, several challenges hinder its widespread adoption:

a) Financial constraints: As noted by Mueller, J.L. (1998), the cost of upgrading infrastructure and implementing assistive technologies can be prohibitive.

b) Awareness and training: Moody (2016) and Begnum, Igeltjørn, (2024)and Begnum et al. (2024) highlight the lack of organisational knowledge and training in UD principles, which limits effective implementation.
c) Adaptation: (Corcuff et al., 2022) emphasise that UD strategies need to be adapted to specific organisational and cultural intentions.

The above considerations highlight esearch gaps and future trends in the use of UD in workplace design. Few articles make explicit reference to sensory accessibility, such as accommodation for hearing or visual impairments. Future research should include tactile navigation systems, visual alarms and other sensory-friendly workplace solutions. In addition, there is limited research on how advanced technologies such as IoT, AI and AR/VR can make workplaces more accessible. Exploring their potential to create adaptive and responsive environments is a key area for future research. The long-term impact of UD on productivity, diversity and employee wellbeing in the workplace remains under-researched. Most descriptions analyse general applications of UD without considering the unique requirements of specific industries, such as healthcare, retail or manufacturing. Sector-specific research would enable UD strategies to be adapted.

In summary, the application of UD principles in workplace organisation increases inclusion, productivity and employee satisfaction while meeting diverse accessibility needs. However, financial constraints, limited awareness and gaps in sensory and technological applications hinder the full potential. By addressing these challenges and expanding research into new technologies, sensory accessibility, and industry strategies, organisations can create realistically inclusive and flexible workplaces for all employees.

6. Conclusion

The above discussion provides some critical insights into the application of universal design (UD) in workplace design, addressing the different dimensions of accessibility, the benefits of implementing UD and the challenges encountered. General conclusions are presented below:

1. Applying UD in the workplace:
    - **Physical accessibility:**
        - Ergonomic adaptations (Singh et al., 2015; Gonzalez, Morer, 2016) and assistive technologies (Mueller, 1998) are key strategies for ensuring inclusive physical work environments.
        - Flexible infrastructure (Tu, Loftness, 1998) supports adaptability to the diverse needs of employees.

- **Digital accessibility:**
  - Accessible digital services (Begnum et al., 2024) and tools designed according to UD principles (Mueller, 1998) improve the inclusion of employees with disabilities.
- **Cognitive accessibility:**
  - Time management strategies (Coetzer, 2016) and collaborative design processes for neurodiverse workers (Trotman, McGinley, 2018) address cognitive barriers.
- **Social Accessibility:**
  - Diversity management frameworks (Gross-Gołacka et al., 2022; Liu et al., 2023) promote inclusion and reduce conflict in the workplace.

2. Benefits of Universal Design:
   - Increased **inclusivity** improves access for different groups of employees (Moody et al., 2016; Corcuff et al., 2022).
   - Increased **employee satisfaction** and retention, particularly for an ageing workforce (Gonzalez, Morer, 2016).
   - Increased **productivity** through assistive technologies and ergonomic design (Mueller, 1998; Singh et al., 2015).
   - Encourages **innovation** in workplace solutions by involving neurodiverse workers in co-design processes (Trotman, McGinley, 2018).
3. Challenges in implementing universal design:
   - **Financial constraints:** High costs of upgrading older infrastructure and purchasing assistive technology (Tu, Loftness, 1998; Mueller, 1998).
   - **Awareness and training:** Lack of organisational knowledge of UD principles hinders effective implementation (Moody et al., 2016).
   - **Contextual differences:** Strategies need to often be adapted to specific cultural, organisational or industrial contexts (Corcuff et al., 2022).
   - **Addressing invisible barriers:** Cognitive and sensory accessibility remains under-researched and poorly implemented (Trotman, McGinley, 2018).
4. Best practices for implementing universal design:
   - **Training programmes:** Educating employees and stakeholders about the principles of UD increases their acceptance (Begnum et al., 2024).
   - **Stakeholder engagement:** Collaboration between designers, workers and decision-makers ensures effective strategies (Corcuff et al., 2022).
   - **Early planning:** Incorporating sustainability principles at the initial design stage avoids costly retrofits (Gonzalez, Morer, 2016).
   - **Data-driven framework:** Tools such as the 5P architecture improve decision-making and integration efforts (Gross-Gołacka et al., 2022).

References

1. Begnum, M.E.N., Igeltjørn, A. (2024). Universal Design of Public Services: A Case Study of the Norwegian Labour and Welfare Administration. *Studies in Health Technology and Informatics*, *320*, 388–395. https://doi.org/10.3233/SHTI241032
2. Beukelman, D. (2013). *Augmentative and alternative communication: Supporting children and adults with complex communication needs: Vol. (4th ed.)*. MD: Paul H. Brookes Publishing.
3. Burgstahler, S. (Ed.) (2015a). *Universal design in higher education: From principles to practice* (2nd ed.). MA: Harvard Education Press.
4. Burgstahler, S. (Ed.) (2015b). *Universal design in higher education: From principles to practice: Vol. (2nd ed.)*. MA: Harvard Education Press.
5. Calvillo-Arbizu, J. (2015). Universal design and accessibility for sensory disabilities in public spaces. *Universal Access in the Information Society*, *14(3)*, 343-351.
6. Coetzer, G. (2016a). An empirical examination of the mediating influence of time management on the relationship between adult attention deficit and role stress. *Personnel Review, 45(4),* 681-706. https://doi.org/10.1108/PR-04-2015-0105
7. Coetzer, G. (2016b). *An empirical examination of the mediating influence of time management on the relationship between adult attention deficit and role stress*. Personnel Review.
8. Cooper, A. (2014). *About Face: The Essentials of Interaction Design* (4th ed.). Wiley.
9. Corcuff, M., Routhier, F., Paquette-Raynard, E., Gagnon, M., Battalova, A., Mwaka, C., Lamontagne, M.E. (2022). Organizations' Strategies to Improve Implementation of Universal Accessibility Principles: Protocol for a Scoping Review. *JMIR Research Protocols, Vol. 11, Iss. 7*. JMIR Publications Inc. https://doi.org/10.2196/33641
10. Fajardo, I. (2014). Easy-to-read texts for people with cognitive disabilities: Linguistic factors affecting comprehension. *Journal of Applied Research in Intellectual Disabilities, 27(3)*, Wiley*,* 212-225.
11. Farina, B. (2018). *Hearing accessibility in public spaces: Acoustics and assistive devices.* Springer.
12. Gonzalez, I., Morer, P. (2016). Ergonomics for the inclusion of older workers in the knowledge workforce and a guidance tool for designers. *Applied Ergonomics*, *53*, 131-142. https://doi.org/10.1016/J.APERGO.2015.09.002
13. Gross-Gołacka, E., Kupczyk, T., Wiktorowicz, J. (2022). Towards a Better Workplace Environment—Empirical Measurement to Manage Diversity in the Workplace. *International Journal of Environmental Research and Public Health*, *19*(23). https://doi.org/10.3390/ijerph192315851

14. Gulliksen, J. (2005). *Making information usable and accessible. Interacting with Computers, Vol. 17(5)*. Elsevier.
15. Gulliksen, J. (2015). Universal design as a practical strategy for accessible ICT. *Lecture Notes in, Vol. 9188.* Springer.
16. Hehir, T. (2009). *Effective inclusive schools: Designing successful schoolwide programs.* CA: Jossey-Bass.
17. Horton, S. (2014). *A Web for Everyone: Designing Accessible User Experiences*. Rosenfeld Media.
18. Liu, J., Zhu, Y., Wang, H. (2023*).* Managing the negative impact of workforce diversity: The important roles of inclusive HRM and employee learning-oriented behaviors. *Frontiers in Psychology, 14*. https://doi.org/10.3389/fpsyg.2023.1117690
19. Loomis, J.M. (2012). Visual accessibility: Advances in orientation and mobility technology. *Annual Review of Vision Science*, *3(4),* 273-296.
20. Mace, R.L. (1985). *Accessible environments: Toward universal design. Design Interventions for Attaining Accessibility in the Built Environment*. NC: Center for Universal Design.
21. Moody, L. (2016). *Tackling Barriers to the Inclusion of Disabled People in the European Workplace Through Ergonomics, Part of the book series: Advances in Intelligent Systems and Computing*.
22. Mostafa, M. (2014). *Architecture for autism: Autism ASPECTSS design index.* UK: Cambridge Scholars Publishing.
23. Mueller, J.L. (1998). Assistive technology and universal design in the workplace. *Assist Technology*, *10*(1), 37-43.
24. Napier, J. (2016). *Sign language in action*. UK: Palgrave Macmillan.
25. Ostrowska, A. (2008). *Architektura bez barier: Podręcznik dla projektantów*. Oficyna Wydawnicza Politechniki Warszawskiej.
26. Preiser, W.F.E. (Ed.) (2001). *Universal design handbook*. New York, NY: McGraw-Hill.
27. Rose, D.H. (2002). *Teaching every student in the digital age: Universal design for learning*. VA: Association for Supervision and Curriculum Development (ASCD).
28. Singh, S., Kumar, R., Kumar, U. (2015). Applying human factor analysis tools to a railway brake and wheel maintenance facility. *Journal of Quality in Maintenance Engineering*, *21*(1), 89-99. https://doi.org/10.1108/JQME-03-2013-0009
29. Tobias, J.L. (2017). *Accessible environments for the visually impaired: Strategies and technologies for inclusive design.* FL: CRC Press.
30. Torres, E.N. (2024). Why great service is difficult to achieve: insights from theory and practice. *International Journal of Contemporary Hospitality Management*, *36*(1), 41-70. https://doi.org/10.1108/IJCHM-05-2022-0580

31. Trotman, N., McGinley, C. (2018). Design and the mind engaging and collaborative workshops for the neurodiverse. *Studies in Health Technology and Informatics*, *256*, 223-235. https://doi.org/10.3233/978-1-61499-923-2-223
32. Tu, K.-J., Loftness, V. (1998). The effects of organisational workplace dynamics and building infrastructure flexibility on environmental and technical quality in offices. *Journal of Corporate Real Estate*, *1*(1), 46-63. https://doi.org/10.1108/14630019910810953
33. Venter, A., de Vries, M. (2023). Demonstrating the Elaborated Action Design Research (eADR) Model to Address Communication Challenges During Software Development. *Systemic Practice and Action Research*, *36*(3), 407-425. https://doi.org/10.1007/s11213-022-09614-y
34. W3C (2017). *Accessible communication formats: Guidelines for effective practices* (World Wide Web Consortium (W3C), Ed.).
35. W3C (2018). *Web Content Accessibility Guidelines (WCAG) 2.1*. World Wide Web Consortium (W3C).

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CUSTOMER ENGAGEMENT IN CONTACT WITH BRANDS ON THE EXAMPLE OF POLISH MARKET OF BANKING PRODUCTS AND MOBILE PHONES

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Purpose: This paper aims to identify forms of customer engagement (CE) in interactions with banking services and mobile phone brands in Poland. The specific objectives include presenting the CE concept based on literature, assessing customer attitudes towards these services, and identifying key engagement forms in brand relationships.
Design/methodology/approach: The study is based on secondary research (critical literature analysis and documentary method) and exploratory primary research (CAWI method).
Findings: Polish consumers engage with banking and mobile phone brands primarily through communication (sharing opinions about products/brands) and value co-creation (participation in needs assessments and independent offer configuration). However, engagement levels vary across product categories. The most significant differences appear in brand-related activities—consumers interact more frequently with mobile phone brands than banking products.
Research limitations/implications: Understanding consumer activity in communication, complaints, and value co-creation is crucial for customer and company value management. Limitations arise from analyzing only two product categories with diverse characteristics and engagement levels in the buying process.
Practical implications: Findings are valuable for academics, practitioners, and managers in the consumer products and services market, helping refine engagement strategies.
Originality/value: This is one of the few studies in Poland comparing CE across different product categories. It offers insights into engagement intensity among Polish consumers and significantly contributes to Polish and international literature on CE.
Keywords: customer engagement, consumer attitudes, banking services, mobile phones.
Category: research paper.

1. Introduction

The dynamic development of innovative information and communication technologies (ICT) has significantly transformed customer-brand interactions. It enables fast and seamless information exchange between enterprises and their current and potential customers, as well as among consumers themselves. Additionally, it allows buyers to continuously monitor enterprise offerings, compare products, and actively shape brands through engagement and feedback. In an era where customer engagement (CE) plays a crucial role in building brand loyalty, trust, and competitive advantage, understanding the forms and intensity of consumer involvement is essential. CE is not only a marketing tool but also a determinant of long-term business success, influencing customer satisfaction, innovation processes, and brand perception. Given that banking services and mobile phones represent two highly dynamic and competitive sectors, where digital transformation significantly impacts consumer behavior, studying how Polish consumers engage with brands in these industries is particularly relevant.

The category of customer engagement (CE), primarily based on Toffler's theory of prosumption (from 1972), service dominant logic in marketing (Vargo, Lusch, 2004; Grönroos, 2006) and the concept of the open model of innovation (Thomke, von Hippel, 2002; Chesbrough, 2003) is an important element of modern relationship marketing (Vivek, Beatty, Morgan, 2012) and value-based marketing (Doyle, 2008). As one of the new concepts referring to consumer activity in co-creating value (offered by the company), it is considered a new perspective of customer value management (Verhoef et al., 2010; Harmeling et al., 2016; Kotler, 2018; Weinstein, 2020).

The CE concept, introduced to marketing literature by the Gallup Institute in 2001, has become the subject of research of many authors in recent years. It caused a dynamic increase in the number of publications on the issue. Two main trends can be identified in these studies. The first is focused on CE as a multidimensional phenomenon, i.e. of cognitive, emotional and behavioural nature, for example Brodie et al. (2011) and Bowden (2009), whereas the second emphasizes only the behavioural dimension of CE (often in the context of CE management by an enterprise), for example van Doorn et al. (2010), Verhoef et al. (2010).

Despite the growing importance of CE, relatively few empirical studies have explored the specifics of customer engagement within the Polish market, especially in the context of distinct product categories. This study addresses this gap by identifying how consumers interact with banking and mobile phone brands, which engagement forms dominate, and how these interactions differ between industries. The study adopts the behavioural approach to CE. It focuses on CE forms initiated both by the consumer and the enterprise, with respect to two product categories diversified in terms of the level and form of customer involvement. The main purpose of the study was to identify the forms of customer engagement in interactions/relations with brands of banking services and mobile phones on Polish market. This primary objective is associated with several specific objectives. The specific objectives of the work include a theoretical-cognitive aspect, such as the description of the customer engagement concept based on literature studies. Additionally, the study incorporates a utilitarian perspective, which includes the indication of the general attitude of surveyed customers towards banking services and mobile phones and the identification of the main forms of their activity in relations to brands/providers of these services. By integrating both theoretical and practical dimensions, the study provides a comprehensive understanding of customer engagement, contributing to both academic research and practical business applications.

Polish customers of two categories of goods are the subject of the research. They are diverse in terms of characteristics and the level of engagement in the purchasing process (according to the Foote, Cone and Belding engagement model), i.e. in banking services (intangible products with high cognitive involvement) and mobile phones (tangible products with high cognitive and emotional involvement).

The research assumes that surveyed consumers of both categories of products engage in contacts with brands in the sphere of communication and value co-creation. However, the level and forms of their engagement in contacts in both above areas are diverse. It also depends on the product category.

Results of secondary research (based on the method of critical analysis of the subject literature and documentary method) and exploratory primary research (with the use of the CAWI method) are the source basis for the paper.

The paper is organised as follows. The second part of the paper is the review of the literature on the subject related to the category of customer engagement. The third part of the paper presents the research method, and the fourth part contains the results of the research and discussion. The research results focus on respondents' attitudes towards banking services and mobile phones as well as the forms of their activities concerning brands and providers of both categories of products. The final part concludes the paper and presents its limitations.

2. Category of Customer Engagement - Conceptual Framework

Research on the notion of consumer engagement was started in marketing after 2001 when Gallup Institute developed a new research tool under the name of customer engagement (CE). It was used to predict customer loyalty[1], while the very notion of CE referred to emotional relationship between customers and enterprise/brand (GALLUP, 2018).

[1] The tool was based on three key loyalty determinants, i.e. buyer's satisfaction with the purchase of a specific brand (product), intention of its another purchase as well as recommendation intention. It also comprised eight measures of emotional attachment of buyer to brand, including buyer's trust in brand, their emotional relationship with it and pride related to its possession (Appelbaum, 2001).

Analysing results of research by various authors, it can be stated that the notion of engagement is used in the literature on marketing in diverse connotations (see Karpen, Conduit, 2020; Hao, 2020). They most often concern customer (customer engagement (Patterson, de Ruyer, 2006; Brodie et al., 2011), consumer (consumer engagement (Vivek, Beatty, Morgan, 2012; Pansari, Kumar, 2017)), customer behaviour (customer engagement behaviour (van Doorn et al., 2010; Beckers, van Doorn, Verhoef, 2017)), customer relationship with brand (customer brand engagement (Hollebeek, 2011; Hollebeek et al., 2021)), online customer engagement (Mollen, Wilson, 2010; Wiggins, 2022), and customer relationship with company (customer company's engagement – this specifically refers to B2B market (Brennan, Canning, McDowell, 2010). Therefore, CE category is also defined in diverse ways. Its two major approaches, i.e. a narrow and a broad one, can be distinguished. The narrow approach is focussed only on consumer behaviour (customer engagement behaviour - CEB). This approach is represented by Bowden (2009), van Doorn et al. (2010), Verhoef, Reinartz, Krafft (2010) and Beckers et al. (2017) among others. Bowden identifies customer engagement with psychological process that reflects mechanism underpinning establishment of loyalty of new customers of a company and strengthening of loyalty of its current customers. Van Dorn in turn, refers CE to aspects associated with customer behaviour towards brand and company. This is about behaviours brought by specific stimuli that go beyond ordinary product purchase. Verhoef approaches CE in a similar way. According to him it is an expression of customer behaviour towards brand or company that is not related to the very purchase transaction. Beckers perceives CE similarly to van Doorn, however, he additionally distinguishes between CEB initiated by the customers and the enterprise. Therefore, in a narrow approach, CE category is perceived in only one, i.e. behavioural, dimension.

In a broad approach, apart from behavioural dimension, CE category takes into consideration two additional dimensions of customer behaviour, i.e. cognitive and emotional (affective). In this approach it is identified with:

- the level of customer "presence" in their relationships with the enterprise, while this presence concerns physical, emotional and cognitive aspects (Patterson et al., 2006; Mollen, Wilson, 2010),
- the level of customer engagement caused by brand, and their attitude, shaped as a result of direct and indirect interactions with it (the level of intensity of this engagement is determined by cognitive, emotional, and behavioural-related activity of the customer when contacting with brand) (Hollebeek, 2011; Karpen, Conduit, 2020),
- participation of current and potential customers in shaping of offer, other marketing activities, and their relationships with them (these activities can be initiated both by customers and the enterprise) (Vivek et al., 2012; Beckers et al., 2017),

- psychological condition of customer, characterised by changing intensity (depending on specific context), and revealed under the influence of their experience with brand/product (gained for example as a result of interactions or value creation) (Brodie et al., 2013, Rather et al., 2019; Kumar, 2020),
- personal relationship between the customer and the brand, manifested in their cognitive, affective and behavioural reaction not related to the purchase (So et al., 2014).

In the light of the above definitions, it can be stated that CE category in a broad approach is characterised not only by multidimensional character, but also complexity and dynamic nature. Furthermore, all definitions, also those approaching CE in a narrow way, emphasise focusing this category on interactions, or more broadly relationships occurring between customers and company or brand/product, as well as its dependence on a specific context (Żyminkowska, Wiechoczek, Kieżel, Żyminkowski, 2018).

Unlike CE concept the followers presenting broad holistic approach, some supporters of CEB concept, basically oppose to going beyond the sphere of consumer behaviour at conceptualisation of the CE notion. In their view this can bring overlapping of CE with other notions especially such as co-creation and value creation (Wiechoczek, 2016).

Research in the paper focuses on the aspect of customer engagement behaviour, and specifically the forms of this involvement (initiated by both consumers and the company). It applies classification of consumer behaviour proposed by Bijmolt et al. (2010) and Jaakkola, Alexander (2014), and identifies the following general types of behaviour:

- consumer communication about enterprise – it involves consumers' engagement in word-of-mouth activity (WOM), sharing recommendations and giving advice to other consumers, as well as customer engagement in other types of interactions (including initiating them),
- co-creation of value by customer and company – this specifically concerns co-creation of product innovations and improvement of current goods and/or services,
- claims and complaints submitted by consumers.

The phenomenon of customer engagement can be considered one of the key research categories in contemporary relationship marketing and value marketing. This is associated with the gradually growing importance of consumers in co-creation of values for both the customer and the company. This is because the impact of customers on the market image of a company/brand is also growing as a result of communicating positive or negative opinions by them to other consumers. Due to the fact that all forms of CE can contribute to a certain degree to co-creating value for the customer and the company (and thus they should be an important management object), this justifies complementing research in this area. It can also be noticed that empirical studies referring to the issue are still rare, especially when it comes to specific product categories. Therefore, a cognitive gap can be noticed in this area. It concerns, among others, the preferred forms of activities in the sphere of exchange of information on financial products and mobile phones, whether using traditional word-of-mouth channels or modern electronic channels, especially social platforms. Little is also known in these product categories about the actual activities of consumers in the sphere of making complaints or undertaking cooperation to improve them as forms of cooperation with companies.

3. Research method

Polish customers of two categories of goods, diversified with respect to features and the level of engagement in buying process (according to Foote, Cone and Belding's model of engagement), i.e. banking services (intangible products of high cognitive engagement) and mobile phones (tangible products of high cognitive and emotional engagement) are the object of direct research.

The main purpose of the research is to recognise attitudes and opinions of Polish customers towards brands of the two indicated product categories, whereas specific objectives assumed in the research include the following:

- description of the general attitude of surveyed customers towards banking services and mobile phones,
- identification of major forms of activities undertaken by surveyed customers, regarding brands and providers of banking services and mobile phones.

It is assumed in the research that surveyed customers of both product categories engage in contacts with brands in the sphere of communication and value co-creation. However, the level and forms of their engagement in contacts in the two abovementioned areas are diversified. They also depend on a specific product category. It is also assumed that consumers are more often involved in contacts with brands of mobile phones rather than of banking products. This especially applies to activities towards brands. On the other hand, the smallest differences between the studied product categories were predicted in the sphere of cooperation with company at development of specific solutions.

The forms of customer engagement adopted in this study were selected on the basis of the synthesis of various CE typologies in behavioural approach. Three forms of consumer engagement are distinguished, i.e. consumer activity in the sphere of communication towards the product/brand (customers' communication), customer complaints and customer cooperation with company. While choosing the number of statements describing specific forms of CE, proposals known from literature are used, including Muntinga, Moorman & Smit (2011), Stauss & Seidel (2014) and Jaakkola & Alexander (2014).

Research was conducted with Computer-Assisted Web Interview (CAWI) method on quota-random sample. This sample reflects a representative structure of Poles in 15-64 age range (by sex and age characteristics). In the case of banking services, the size of sample included in total 521 people, whereas in the case of mobile phones – 518 people. Major characteristics of research sample is included in Table 1.

Interviews were conducted on Polish market between February and March 2024.

The research results are presented with the use of the percentage approach, to characterize the structure of the studied variables, and the chi-square test of compatibility is used to identify whether there is a relationship between the two analysed product categories (i.e. banking products and mobile phones) with the reference to the forms of activities performed by respondents in the three studied areas (i.e. activities towards brands; activities in the sphere of making claims and complaints; activities in the sphere of cooperation with company)[2].

Table 1.
Description of research sample by demographic and social criteria

Criterion		Banking services (n = 521 people)	Mobile phones (n = 518 people)
sex	women	50%	50%
	men	50%	50%
age	aged 15-29	28%	28%
	aged 30-45	33%	33%
	aged 46-64	39%	39%
education	elementary	1%	1%
	junior high school/vocational	9%	10%
	secondary	41%	36%
	higher vocational	14%	15%
	university with MA degree	36%	37%
place of residence	village	18%	15%
	city with a population of over 10 thousand inhabitants	6%	8%
	city with a population of 11-50 thousand inhabitants	16%	15%
	city with a population of 51-100 thousand inhabitants	14%	13%
	city with a population of 101-250 thousand inhabitants	14%	13%
	city with a population of 251-400 thousand inhabitants	10%	10%
	city with a population of over 400 thousand inhabitants	22%	26%
financial situation	we live a wealthy life	14%	14%
	we manage	67%	66%
	we hardly manage	18%	18%
	practically we do not manage	1%	2%

Source: own research.

4. Research findings and discussion

4.1. Respondents' attitudes towards banking products and mobile phones

While describing their attitudes towards banking products and mobile phones, the respondents answered the question of what a given product category is for them. Responding to the question, they indicated statements (within each of seven pairs) their views

[2] Broader analyzes, e.g. the analysis of average rating values, are included by the authors in: Żyminkowska, Wiechoczek, Kieżel, Żyminkowski (2018).

are closest to. The scope of responses for each pair of statements ranged between -3 and +3 (non-enforcement semantic differential scale with neutral level 0 was applied).

Results of research on respondents' attitudes to banking products show, that they most agree with the statement "important"; this was indicated in total by almost half of the respondents (i.e. 42.1% valued the products as +2 or +3). Slightly smaller number of respondents (in total 41.9%) stated that they are "necessary" (scores +2 and +3) (Figure 1).

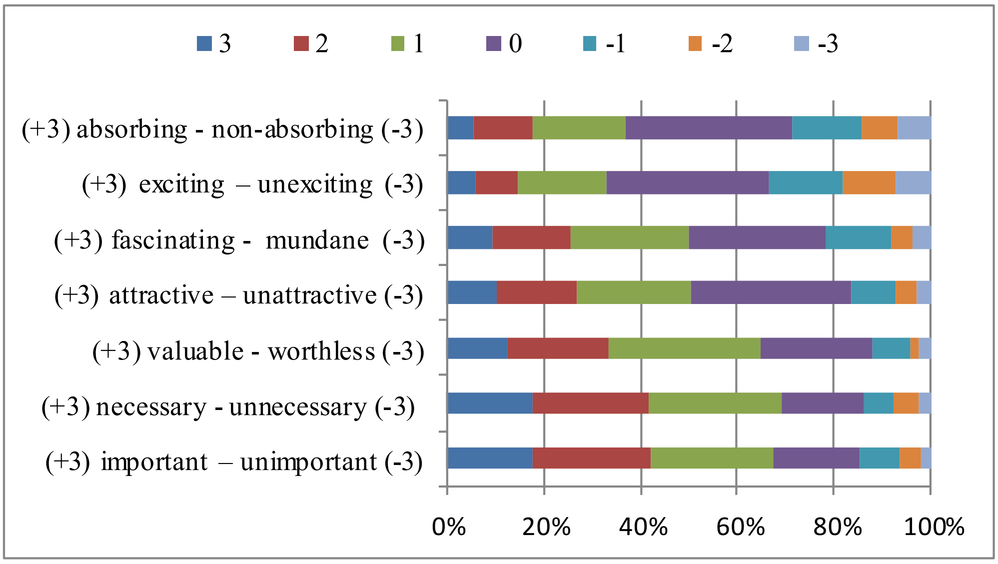

Figure 1. Respondents' attitudes towards banking products.

Source: own study

On the other hand, taking into consideration average results, five statements concerning respondents' attitudes to banking products obtained positive evaluation and two were valued negatively. The respondents most agree with the statements "necessary" (average +1.26 on the scale -3 to +3), and then "important" (average +1.05) and "valuable" (average +0.92). In the case of two statements, the assessment was closer to negative statements – "mundane" (average -0.26) and "unexciting" (-0.05). The respondents are the least decided in the choice between "non-absorbing – absorbing" (average +0.10).

Analysing the respondents' attitudes to mobile phones (Figure 2) the highest rate of respondents (53.6% in total) state that mobile phones are "necessary" (scores +2 and +3). Slightly smaller number of respondents (in total 48.4% and 46.5%) perceive mobile phones as "important" and "attractive" (scores +2 and +3). The least of all respondents (28.3%) consider mobile phones "fascinating" (scores +2 and +3).

Taking into consideration average results, all statements regarding respondents' attitudes to mobile phones were evaluated positively. The respondents most agree with the statements "necessary" (average +1.43), and then "attractive" (average +1.21), "important" (average +1.14) and "valuable" (average +1.13). Five other statements had average negative results. The respondents are the least decided in the sphere of choice between "exciting" and "unexciting" (average +0,58), "fascinating - mundane" (average +0.45) and "absorbing - non-absorbing" (average +0.44).

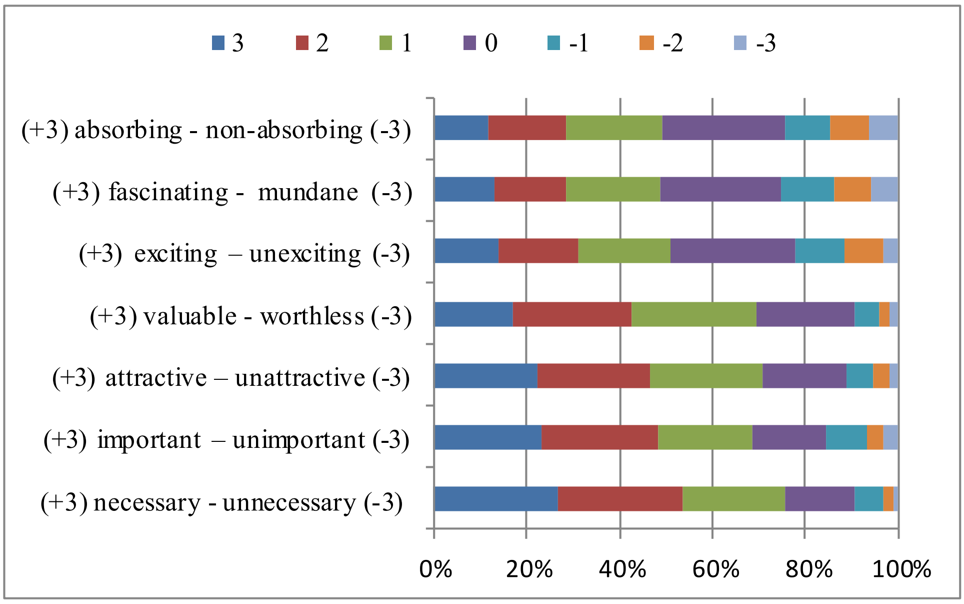

Figure 2. Respondents' attitudes towards mobile phones.

Source: own study.

4.2. Respondents' forms of activities concerning brands and providers of banking products and mobile phones

While identifying customers' forms of activity (engagement) towards brands and their providers, the respondents were asked whether they exchanged opinions about products and/or brands in a specific way (Kieżel, Wiechoczek, 2016). The respondents were to show their attitudes towards eight forms of activity presented to them (selected on the basis of CEB classification), while evaluating them on a five-degree scale (Likert scale was applied).

Studying respondents' activities towards banking products, the highest rate indicate providing help and giving advice to family members and friends in product selection (in total 67% of the research sample /"definitely yes" and "rather yes" responses/), and personal encouragement to purchase a product they use (in total 66.6% /"definitely yes" and "rather yes" responses/). Slightly less than half of the respondents indicated "liking" brands or bank, for example on the Facebook – "definitely yes", indicated by 13.4% respondents and "rather yes" – 33%. The smallest rate of research sample post photos and films related to mobile phone brand on the Internet and spread negative opinions about it on the Internet. This form of activity was indicated as "definitely yes" by respectively 5.8% and 4.6% and "rather yes" – 15.2% and 19.0%. Results of the study is shown in figure 3.

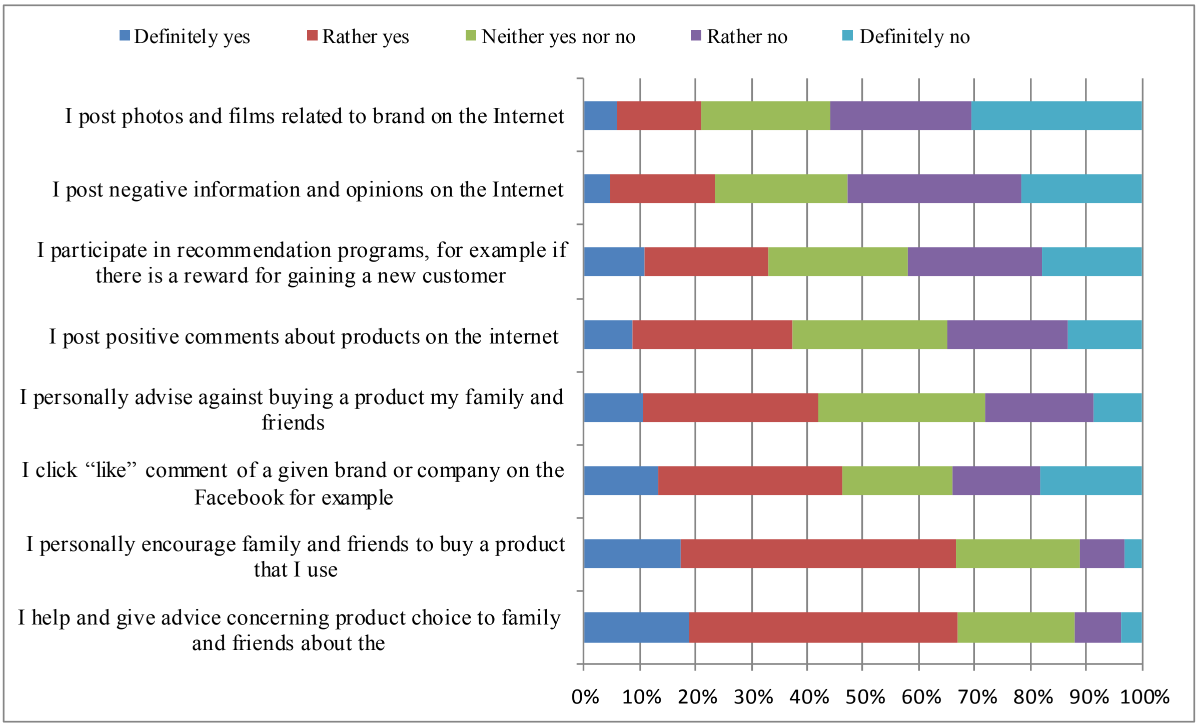

Figure 3. Forms of respondents' activities towards products or brands of banking products and their providers.

Source: own study.

In the case of mobile phones, the highest rate of respondents show activity in the sphere of helping and giving advice to family members and friends while choosing the phone (in total 68.9% of research sample /"definitely yes" and "rather yes" responses/), and personal encouragement for family and friends to buy a product the respondents use (in total 67.6% /"definitely yes" and "rather yes" responses/). In this group, slightly more respondents (by 1.4 percentage point) definitely provide personal encouragement to their family or friends when they purchase a product rather than definitely help or give advice when they select a product. Results of research are shown in figure 4.

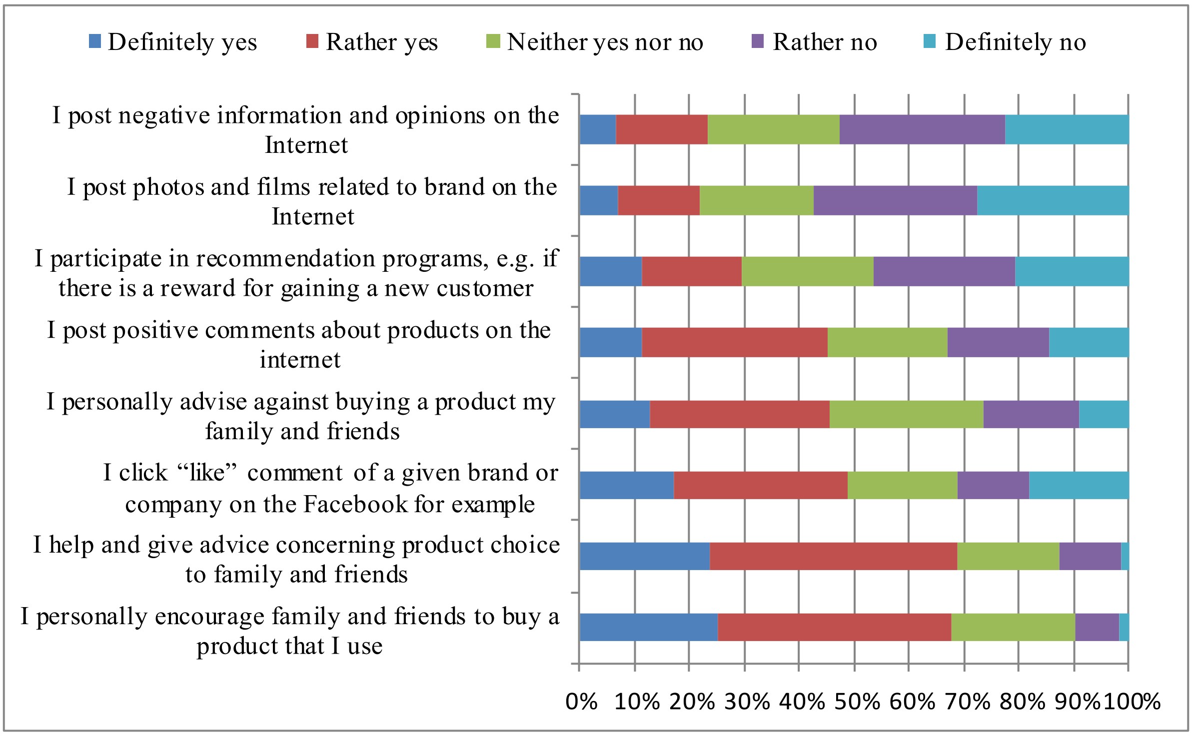

Figure 4. Forms of respondents' activities towards products or brands of mobile phones and their providers.

Source: own study.

"Liking" content of a specific mobile phone brand and clicking "likes" (e.g. on the Facebook profile) is the third most popular respondents' activity. "Definitely yes" is indicated by 17% respondents and "rather yes" by 31.7%. The smallest rate of research sample publishes photos and films regarding a mobile phone brand and post negative opinions about it on the Internet. "Definitely yes" was indicated by respectively 6.8% and 6.6%, whereas "rather yes" by 15.1% and 16.6%.

The result of the chi-squared test shows that there is a statistically significant relationship between banking products and mobile phones in the case of two out of eight studied forms of respondents' activities towards products or brands (Table 2).

Table 2.
Chi-squared test results concerning forms of respondents' activities towards products or brands of banking products and mobile phones and their providers

Forms of activities	Chi-squared test value ($\chi2$)	Statistical significance (α)
I post positive comments about products on the internet	9,171	0.057
I personally encourage family and friends to buy a product that I use	12.106	**0.017**
I post photos and films related to brand on the Internet	3.924	0.416
I post negative information and opinions on the Internet	2.782	0.595
I personally advise against buying a product my family and friends	2.066	0.724
I help and give advice concerning product choice to family and friends	14.927	**0.005**

Cont. table 2.

I participate in recommendation programs. e.g. if there is a reward for gaining a new customer	3.134	0.536
I click "like" comment of a given brand or company on the Facebook for example	3.564	0.468

Source: own study.

The strongest relation is observed in the case of giving advice concerning product choice to family and friends. Slightly smaller correlation between both analysed product categories is found regarding personally encouraging family and friends to buy a product used by the respondent. Both activities are statistically more often performed towards mobile phones. No statistically significant relations are found for other forms of respondents' activities towards brands of banking products and mobile phones.

Consumer behaviour in CEB sphere also concerns making claims and complaints. In the case of banking sector, most willingly chosen activity in this sphere is responding to questions while dealing with claims/complaints and providing information in oral form when purchase is made afterwards. Slightly fewer respondents indicate answering the questions asked by customer service workers that allow for informing about their dissatisfaction. Such forms of activities are indicated as "definitely yes" by slightly over 1/5, and "rather yes" by almost half of respondents (Figure 5).

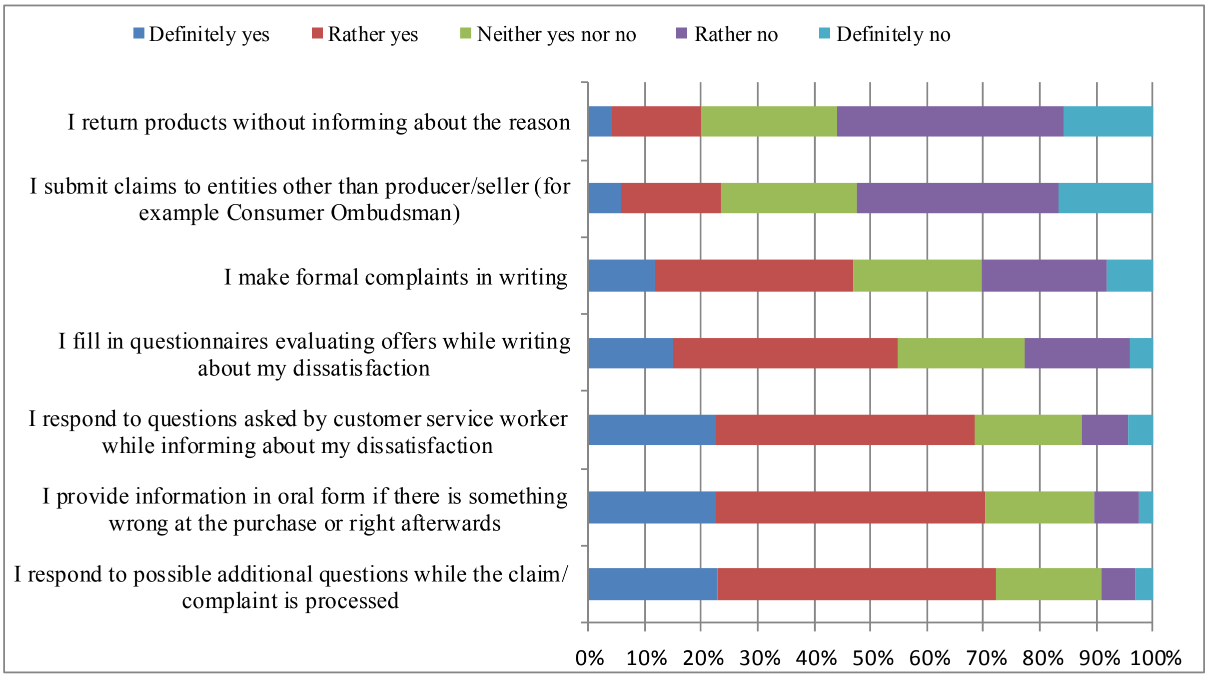

Figure 5. Respondents' activities in the sphere of claims and complaints concerning banking products.

Source: own study.

Product return without giving reasons and submitting claims to entities other than producer/seller (for example to media or Consumer Ombudsman) are the least willingly selected forms of activity by respondents.

Considering mobile phones, respondents' activities in the sphere of making claims and complaints concern mainly answering the questions asked by customer service workers or call centre, informing about their dissatisfaction and answering additional questions formulated when dealing with claims or complaints. It also includes providing comments in oral form by respondents when product is purchased and directly afterwards. Such activities were indicated as "definitely yes" by over 1/5 and "rather yes" by almost half of respondents (Figure 6).

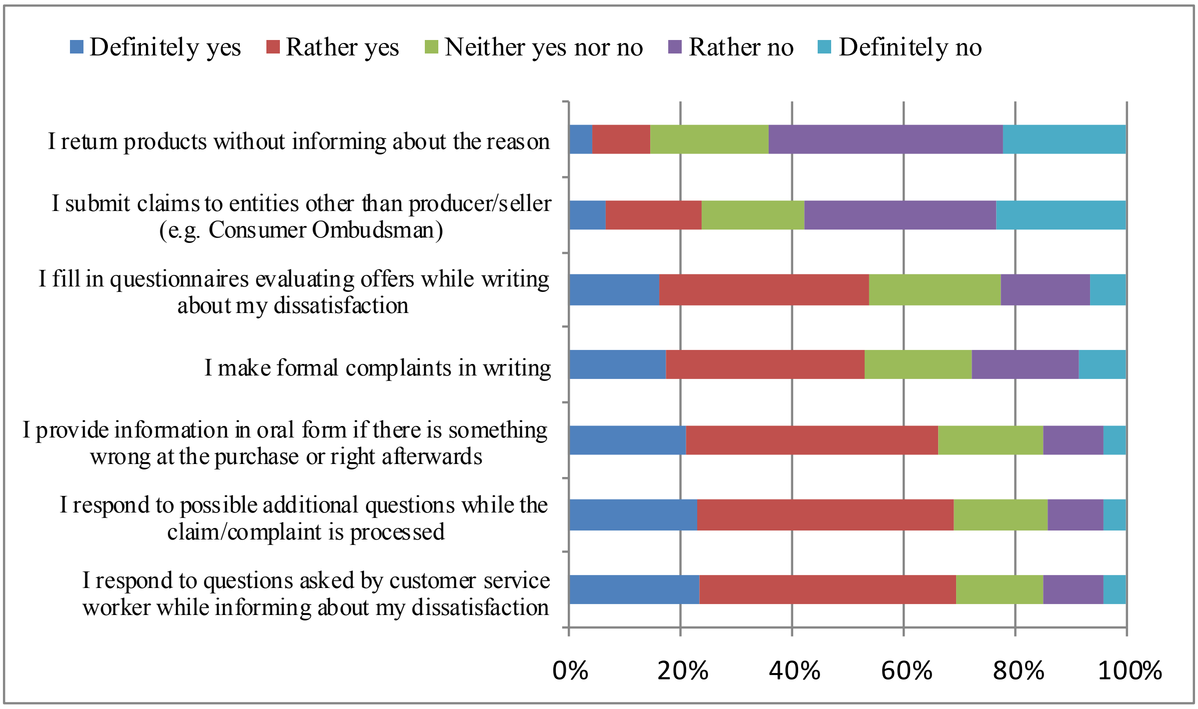

Figure 6. Respondents' activities in the sphere of making claims and complaints concerning mobile phones.

Source: own study.

The smallest rate of respondents returns a product without informing about the reason for that, and submit claims to entities other than a producer or seller, e.g. Consumer Ombudsman or media.

Analysing the relationships between banking products and mobile phones in the sphere of claims and complaints (using Chi-squared test), statistically significant differences are observed in two out of seven activities performed by respondents. The strongest relationship occurs when they return products without informing about the reason (Table 3). Statistically, the respondents return banking products without giving any reasons more frequently than mobile phones.

Table 3.
Chi-squared test results for respondents' activities in the sphere of claims and complaints concerning banking products and mobile phones

Forms of activities	Chi-squared test value	Statistical significance
I make formal complaints in writing	8.440	0.077
I provide information in oral form if there is something wrong at the purchase or right afterwards	4.648	0.325
I fill in questionnaires evaluating offers while writing about my dissatisfaction	3.960	0.411
I respond to questions asked by customer service worker while informing about my dissatisfaction	4.386	0.356
I return products without informing about the reason	11.892	**0.018**
I respond to possible additional questions while the claim/complaint is processed	6.706	0.152
I submit claims to entities other than producer/seller (e.g. Consumer Ombudsman)	10.277	**0.036**

Source: own study.

A smaller relationship between the analysed product categories is observed in the case of complaints submitted to entities other than producer / seller (e.g. Consumer Ombudsman). This type of activity is statistically more often performed by the respondents in relation to mobile phones. For the remaining five activities in the sphere of claims and complaints, statistically insignificant results were obtained.

Furthermore, CEB includes creation of specific solutions by customer, together with a company or brand, for example product improvement in the sphere of advertising, sale and customer service or www pages. Therefore, the research also includes customers' activity in the area of such cooperation.

Taking part in studies of needs and expectations towards a product, configuration of offer related to the needs, and participation in voting for the best product are the activities most often indicated by respondents in the area of cooperation for the benefit of company or brand of banking products. In total, over half of the respondents indicated their engagement in presented activities as "definitely yes" or "rather yes" (i.e. 59.7%, 53.6% and 50.7% respectively). Prototypes and own product designs are least frequently financed – "definitely yes" or "rather yes" was indicated as their engagement by only 14.4% and 13.8% respondents respectively. Detailed results of research are shown in figure 7.

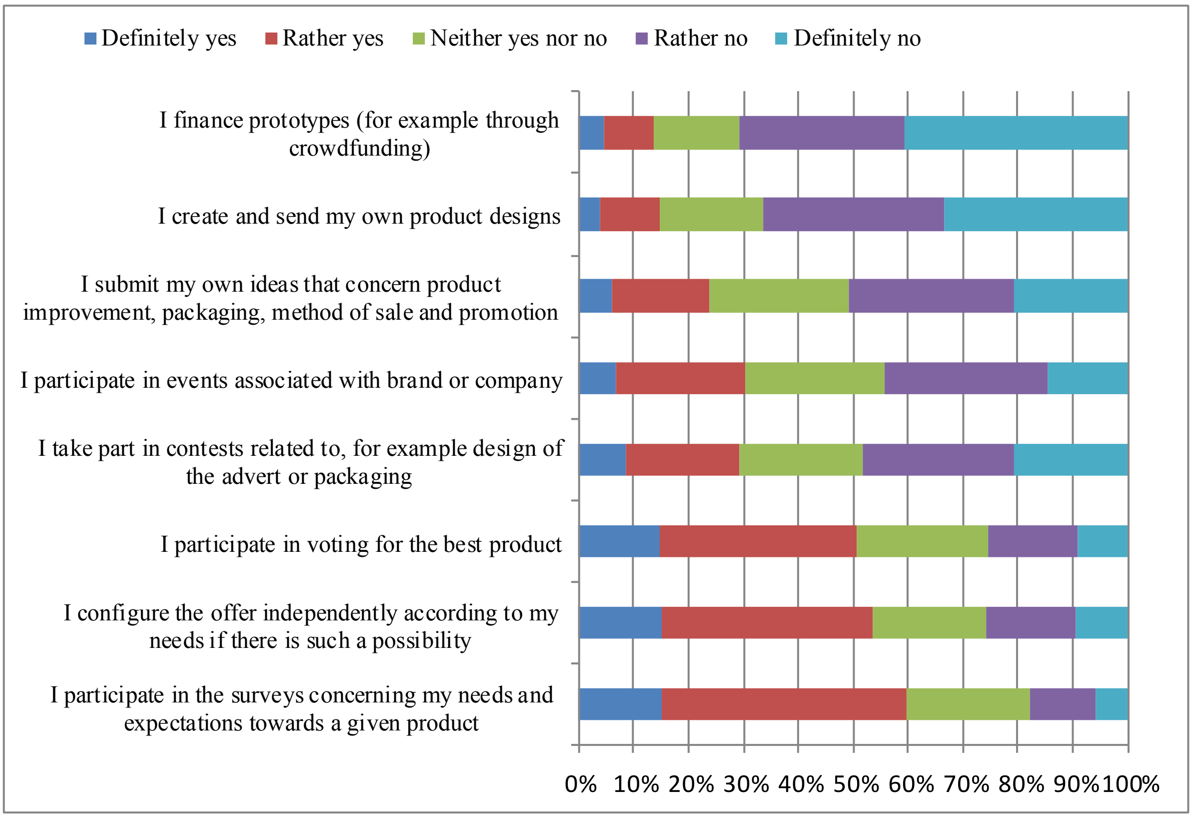

Figure 7. Respondents' activities in the sphere of cooperation with company when specific solutions related to banking products are developed.

Source: own study.

In the case of mobile phones, within the scope of co-creation with company/brand, the respondents most often individually configure the offer (according to their preferences) from the modules proposed by the provider. They take part in researching the needs and expectations of customers towards a specific product and participate in voting for the best product. In total, over half of the respondents indicate "definitely yes" or "rather yes" in engagement in specific activities (i.e. 57.4%, 54.0% and 51.4% respectively). Detailed research results are shown in figure 8.

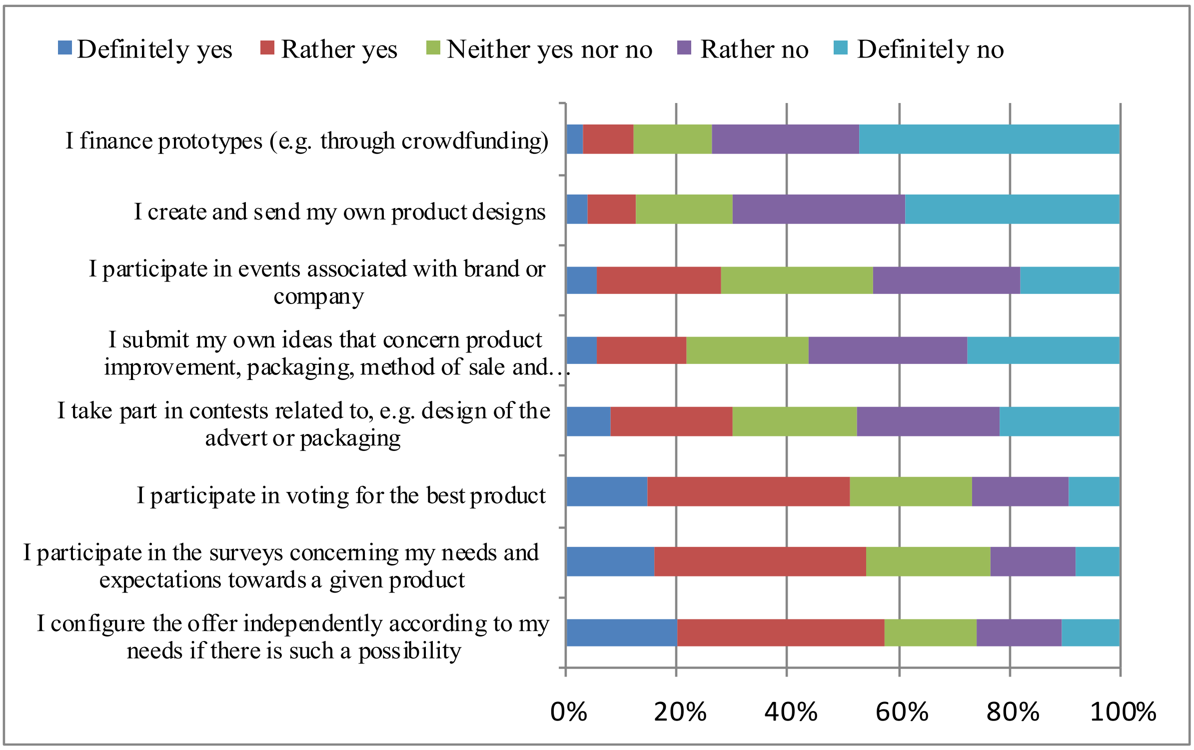

Figure 8. Respondents' activities in the sphere of cooperation with company at development of specific solutions related to mobile phones.

Source: own study.

The smallest rate of respondents purchasing mobile phones finance product prototypes, develop and send own product designs to the companies. Around every tenth respondent describes their engagement as "definitely yes" or "rather yes" (12.0% and 12.4% respectively).

Chi-squared test results in relation to the respondents' activities in the sphere of cooperation with company at development of specific solutions do not show statistically significant relationships between banking products and mobile phones (Table 4). Therefore, the respondents' activities in this area do not depend on the product category.

Table 4.
Chi-squared test results for respondents' activities in the sphere of cooperation with company at development of specific solutions related to banking products and mobile phones

Forms of activities	Chi-squared test value	Statistical significance
I participate in the surveys concerning my needs and expectations towards a given product	6.863	0.143
I create and send my own product designs	3.939	0.414
I submit my own ideas that concern product improvement, packaging, method of sale and promotion	7.199	0.126
I participate in voting for the best product	0.541	0.969
I configure the offer independently according to my needs if there is such a possibility	6.381	0.172
I take part in contests related to, e.g. design of the advert or packaging	0.737	0.947
I participate in events associated with brand or company	4.031	0.402
I finance prototypes (e.g. through crowdfunding)	5.420	0.247

Source: own study.

4.3. Discussion

The research assumed that the studied customers of banking products and mobile phones on Polish market engage in contacts with brands in the sphere of communication and value co-creation, even though the level of their engagement is diversified. This was confirmed by research results. They proved that in the sphere of communication, consumers of both product categories mainly engage in exchange of opinions about products/brands. This especially concerns giving advice to other people and personal encouragement to buy them. On the other hand, respondents' activities in the sphere of claims and complaints regarding both indicated product categories focus on answering questions when dealing with claims/complaints and providing feedback at purchase.

Another research (Ziemba, Eisenbardt, 2016, 2019; Kucia, 2019) confirms our results, while showing that customers are actively transferring their knowledge by evaluating, commenting, proposing improvements to products or adjusting them to own expectations, as well as by designing new products. But prosumers use different online communication channels to share knowledge with enterprises. They use e-mails, social networking sites, and enterprise web pages to share knowledge with enterprises. However, they seldom use blogs, mobile applications, and file sharing portals. This could depend on the sector (a scope of many studies is general).

Such results are consistent with the position of Bijmolt et al. (2010) and Gandhi et al. (2012), who claim that the expressions of customer engagement include word-of-mouth, customer co-creation and complaining behaviour. An extended list of activities proving engagement can also be found in other researchers. For example, van Doorn et al. (2010) supplement the list with recommendations, help for other clients, blogging, writing reviews, and even taking legal action. Even though these activities are diverse in terms of intensity, they appear in the results of the research presented in this study.

It can be noticed that in both spheres of the research results on consumer activity (communication and value co-creation) presented in the article, a special role is performed by the development of the Internet, Web 2.0 functions and social media, which have dramatically changed the nature of interactions between brands and customers. Many studies confirm that they enable building close, bilateral relationships with clients and facilitate their ongoing engagement (Ashley, Noble, Donthu, Lemon, 2011; Sashi, 2012; Pandey, 2018; Darunday et al., 2024).

The developing digital space and, social networking sites, e.g. Facebook, are an important premise for emphasising the significance of behavioural perspective in consumer engagement (Carter, 2008; Porter, Donthu, MacElroy, Wydra, 2011; Bailey et al., 2020). Some studies show that a higher level of engagement in the brand community leads to a higher level of customer engagement, which translates into a greater propensity to exchange opinions and communication, especially on-line, but also activities aimed at improving the offer (Kaplan, Haenlein, 2010; Kozinets, de Valck, Wojnicki, Wilner, 2010; Javornik, Mandelli, 2012; Islam, Rahman, 2016; Chi et al., 2021; Li et al., 2022).

According to Sashi (2012), the customer engagement cycle includes: connection, interaction, satisfaction, retention, commitment, advocacy and engagement. This means that emotional and relational bonds are important elements of customer engagement, yet various behavioural elements must precede them and are necessary to trigger engagement. This is also emphasized by Roberts, Alpert (2010) and Tuti, Sulistia (2022), who claim that effective initiation of oral message and active brand recommendation to others are manifestations of customer engagement. Positive experiences with a product or service can result in liking of the brand, and in time even encourage the consumer to be its supporter.

In the sphere of co-creation, a predominant form of activity of customers of banking products is participation in studies of needs related to offer, and then independent offer configuration, whereas in the case of mobile phones, this functions inversely.

Another research (Ziemba, Eisenbardt, 2015, 2019) also shows that prosumers participate in many areas supporting enterprises. Their activities are connected with development and management of products and services. Literature analyses show that customers want to influence quality, utility and projects concerning products and services but would also like to have impact on promotional and marketing activities of the enterprise (they want to participate actively in market).

At the same time, it should be noticed that even though consumers' participation in product improvement or service development has the characteristics of engagement, it is sometimes perceived as an autonomous trend of research called customer involvement (Carbonell, Rodriguez-Escudero, Pujari, 2009; Svendsen et al., 2011; Cui, Wu, 2018). There is also no agreement among the researchers on the issue of conceptualizing customer engagement with behavioral perspective taken into consideration. Grönroos's approach (2011) that criticizes the overlap of customer engagement and the creation and co-creation of value can be an example here. As a result, this represents the need to conduct further research on this subject.

The research described in the paper is one of the few studies in Poland focusing on customer engagement. Implementation of the research on the one hand allows for comparison of the forms of customer engagement which is predominant in the case of studied product categories, and on the other hand for showing the relationships occurring between these two categories in the area of specific CE forms. It provides valuable knowledge about the intensity of the CE phenomenon among the surveyed Polish consumers in two different product categories (sectoral approach). The original results of the research make a significant contribution to the subject literature as well as they broaden the managerial perspective.

5. Conclusions

Presented research results allow for referring to adopted assumption. They confirm that the studied customers of both product categories engage in specific contacts with brands, although some differences can be observed with reference to banking products and mobile phones. Participation in studies of needs and expectations associated with the offer, and then individual configuration of the offer while focussing on own needs, are predominant form of respondents' activities that concern banking services. In the case of mobile phones, the results are inverse. This is explained by specific character of both product groups, because banking products, in comparison with mobile phones are clearly less adjusted to being co-created with customers (Kieżel, 2015). The third activity, most frequently indicated by respondents in both studied cases is associated with participation in voting for the best product. This confirms that consumer engagement also concerns communication with enterprises.

Major respondents' activities in the sphere of claims and complaints focus on two corresponding areas in the case of banking products and mobile phones. They include in particular providing answers to additional questions either when dealing with claims/complaints or during a conversation with customer service worker focussed on informing about dissatisfaction, and also providing feedback information when a purchase is made or afterwards.

Customer engagement in the sphere of communication is also clear in the area of exchange of opinions about products and brands and/or companies. Both in the case of banking products and mobile phones, the respondents especially indicated providing help and advice to family members and friends when buying decisions are made, and personal encouragement to buy a product they use. This proves high importance of exchange of private information that has its sources in own experiences and thus being appreciated by other consumers (Wiechoczek, Kieżel, 2018). This is because in the case of both studied product categories we can speak about high cognitive engagement (according to the engagement model by Foote, Cone and Belding).

The analysis of the relationships between banking products and mobile phones with reference to the forms of activities performed by respondents in the three studied areas (determined with the use of the chi-square test) proves that the strongest relationship occurs in the case of some activities towards brands. The respondents provide advice on product choice to family and friends, and they personally encourage family and friends to buy the product they use in the case of mobile phones more often, than in the case of banking products. As regards activities in the sphere of making claims and complaints, the strongest relationship was observed for the return of product without giving a reason. The respondents do it more often in the case of banking products. However, in relation to activities in the sphere of cooperation with the company, no significant differences are observed between the studied product categories.

In the light of described research results, it is interesting that general attitude of the studied customers both towards banking products and mobile phones is expressed in indication that they are “necessary” and “important” on the one hand, and on the other hand in statements that they are rather low “absorbing”.

While analysing obtained research results, some limitations can be noticed. They result from the nature of the products with reference to which customer attitudes and forms of engagement are identified. Banking products, especially in the basic scope of offer, satisfy the needs associated with current settlement of liabilities, reasonable and effective management of free financial resources and securing the future. A remarkable part of these products is offered in the same form to many customers, and some characteristics, for example product rules, time and method of implementation are unchangeable. We can speak about the possibility of change in the offer elements and customer engagement in establishment of some of its terms mainly in the case of price, which highly depends on the segment of customer. Identification of the main forms of activities undertaken by customers from various segments, and regarding specific groups of banking products offered to them is an interesting trend of further research.

Specific character of mobile phones results from the fact that without complementary services, these devices are practically useless for customers. Therefore, in their case, it would be appropriate to link future research with research of mobile telephony services and their providers (i.e. mobile phone should be approached as a system product, i.e. a multifunctional device integrated with diverse services). Because of their specific character, the respondents’ attitude towards these devices and their producers/brands, as well as forms of their engagement in various activities can be determined not only by their physical features, characteristics and functions, but also services (their set and/or possibilities of its configuration, quality, price, etc.) provided to customers by network operators. Furthermore, purchase of a specific brand and a model of a mobile phone by customer often depends on attractiveness of the offer presented by network operator within a given subscription. In this situation services offered by the operator can determine the choice of a specific device by customers and the form of their activity.

References

1. Appelbaum, A. (2001). The Constant Customer. *Business Journal*. June 17. Retrieved from: https://news.gallup.com/businessjournal/745/constant-customer.aspx, 14.11.2023.
2. Ashley, C., Noble, S.M., Donthu, N., Lemon, K.N. (2011). Why customers won’t relate: Obstacles to relationship marketing engagement. *Journal of Business Research*, *Vol. 64, Iss. 7,* pp. 749-756, doi: 10.1016/j.jbusres.2010.07.006

3. Bailey, A.A., Bonifield, C., Elhai, J.D. (2020). Modeling consumer engagement on social networking sites: Roles of attitudinal and motivational factors. *Journal of Retailing and Consumer Services, Vol. 59, Iss. 1,* p. 102348, doi: 10.1016/j.jretconser.2020.102348
4. Beckers, S.F.M, van Doorn, J., Verhoef, P.C. (2017). Good, better, engaged? The effect of company-initiated customer engagement behaviour on shareholder value. *Journal of the Academy of Marketing Science, Vol. 46, No. 3,* pp. 1-18, doi: 10.1007/s11747-017-0539-4
5. Bijmolt, T.H.A., Leeflang, P., Block, F., Saffert, P., Eisenbeiss, M., Hardie, B.G.S., Lemmens, A. (2010). Analytics for customer engagement. *Journal of Service Research*, *Vol. 13, Iss. 3,* pp. 341-356, doi: 10.1177/1094670510375603
6. Bowden, J.J. (2009). The Process of Customer Engagement – A Conceptual Framework, *Journal of Marketing Theory, Vol. 17, Iss. 1,* pp. 63-74, doi: DOI:10.2753/MTP1069-6679170105
7. Brennan, R., Canning, L., McDowell, R. (2010). *Business-to-Business Marketing*. Los Angeles/London: SAGE.
8. Brodie, R.J., Hollebeek, L.D., Juric, B., Ilic, A. (2011). Customer Engagement – Conceptual Domain, Fundamental Propositions, and Implications for Research. *Journal of Service Research*, *Vol. 14, Iss. 3,* pp. 1-20, doi: 10.1177/1094670511411
9. Carbonell, P., Rodriguez-Escudero, A.I., Pujari, D. (2009). Customer involvement in service development: An examination of antecedents and outcomes. *Journal of Product Innovation Management*, *Vol. 26, Iss. 5,* pp. 536-550, doi: 10.1111/j.1540-5885.2009.00679.x
10. Carter, T. (2008). Customer engagement and behavioral considerations. *Journal of Strategic Marketing*, *Vol. 16, Iss. 1,* pp. 21-26, doi: 10.1080/09652540701794387
11. Chesbrough, H.W. (2003). *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business Press.
12. Chi, M., Harrigan, P., Xu, Y. (2021), Customer engagement in online service brand communities. *Journal of Services Marketing*, *Vol. 36, Iss. 2,* pp. 201-216, doi: 10.1108/JSM-09-2020-0392
13. Cui, A., Wu, F. (2018). Customer Involvement in Innovation: A Review of Literature and Future Research Directions. *Review of Marketing Research*, *July*, pp. 63-98, doi: 10.1108/S1548-643520180000015005
14. Darunday, R., Dejarme, A., Opalla, J.M.G., Bacatan, J. (2024). The Influence of Social Media Marketing on Customer Engagement: The Case of Zynergia. *International Journal of Research Publication and Reviews*, *Vol. 5, Iss. 6,* pp. 7091-7099, doi: 10.5281/zenodo.12608094
15. Doyle, P. (2008). *Value-based Marketing: Marketing Strategies for Corporate Growth and Shareholder Value*. 2nd Edition, Chichester: John Wiley&Sons.
16. GALLUP (2018). *Customer Engagement*. Retrieved from: http://www.gallup.com/services/169331/customer-engagement.aspx, 9.11.2023.

17. Gandhi, S., Beatty, S., Morgan, R.M. (2012). Customer Engagement: Exploring Customer Relationships Beyond Purchase. *The Journal of Marketing Theory and Practice*, *Vol. 20, Iss. 2,* pp. 127-145, doi: 10.2307/23243811
18. Grönroos, C. (2006). Adopting a service logic for marketing. *Marketing Theory*, *Vol. 6, Iss. 3,* pp. 317-333, 10.1177/1470593106066794
19. Grönroos, C. (2011). Value co-creation in service logic: A critical analysis. *Marketing Theory, Vol. 11, Iss. 3,* pp. 279-301, doi: 10.1177/1470593111408177
20. Hao. F. (2020). The landscape of customer engagement in hospitality and tourism: a systematic review. *International Journal of Contemporary Hospitality Management*, *Vol. 32, Iss. 5,* pp. 1837-1850, doi: 10.1108/IJCHM-09-2019-0765
21. Harmeling, c., Moffett, J., Arnold, M., Carlson, B.D. (2016). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science, Vol. 45, Iss. 3,* pp. 312-335, doi: 10.1007/s11747-016-0509-2
22. Hollebeek, L.D. (2011). Exploring customer brand management – definition and themes. *Journal of Strategic Marketing*, *Vol. 19, Iss. 7,* pp. 555-573, doi: 10.1080/0965254X.2011.599493
23. Hollebeek, L.D., Sprott, D.E., Brady, M.K. (2021). Rise of the Machines? Customer Engagement in Automated Service Interactions. *Journal of Service Research*, *Vol. 24, Iss. 1,* pp. 3-8, doi: 10.1177/1094670520975110
24. Islam, J.U., Rahman, Z. (2016). Linking Customer Engagement to Trust and Word-of-Mouth on Facebook Brand Communities: An Empirical Study. *Journal of Internet Commerce*, *Vol. 15, Iss. 1,* pp. 40-58, doi: 10.1080/153_32861.2015.1124008
25. Jaakkola, E., Alexander, M. (2014). The Role of Customer Engagement behaviour in value co-creation: a service system perspective. *Journal of Service Research*, *Vol. 17, Iss. 3,* pp. 247-261, doi: 10.1177/1094670514529187
26. Javornik, A., Mandelli, A.J. (2012). Behavioral perspectives of customer engagement: An exploratory study of customer engagement with three Swiss FMCG brands. *Journal of Database Marketing & Customer Strategy Management*, *Vol. 19, Iss. 4*, pp. 300-310, doi: 10.1057/dbm.2012.29
27. Kaplan, A.M., Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons*, *Vol. 53, Iss. 1,* pp. 59-68, doi: 10.1016/j.bushor.2009.09.003
28. Karpen, I., Conduit, J. (2020). Engaging in times of COVID-19 and beyond: Theorizing customer engagement through different paradigmatic lenses. *Journal of Service Management*, *Vol. 31, Iss. 6,* pp. 1163-1174, doi: 10.1108/JOSM-05-2020-0156
29. Kieżel, M. (2015). Role of individual customers in development of banking products in the context of open innovation concept and demand approach to innovations. *Journal of Economics and Management*, *Vol. 22, Iss. 4,* pp. 96-106.

30. Kieżel, M., Wiechoczek, J. (2016). Aktywności online konsumentów w kontekście Customer Brand Engagement [Online consumer activity in the context of customer brand engagement]. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, No. 459*. Badania marketingowe - zmiany w metodologii i technikach badawczych, pp. 130-141. doi:10.15611/pn.2016.459.12
31. Kotler, Ph. (2018). Customer Value Management. *Journal of Creating Value*, *Management Review*, *Vol. 6,* pp. 9-12, doi: 10.1177/2394964317706879
32. Kozinets, R.V., de Valck, K., Wojnicki, A.C., Wilner, S.J.S. (2010). Networked narratives: Understanding word-of-mouth marketing in online communities. *Journal of Marketing*, *Vol. 74, Iss. 2,* pp. 71-89, doi: 10.1509/jmkg.74.2.71
33. Kucia, M. (2019). *Wykorzystanie zaangażowania klientów w działalności marketingowej przedsiębiorstwa*. Katowice: Wydawnictwo UE w Katowicach.
34. Kumar, V. (2020). Building Customer-Brand Relationships through Customer Brand Engagement. *Journal of Promotion Management, Vol. 26, Iss. 1*, pp. 1-27, doi: 10.1080/10496491.2020.1746466
35. Li, X., Yang, C., Wang, S. (2022). Research on the Impact of Intercustomer Social Support on Customer Engagement Behaviors in Virtual Brand Communities. *Behavioral Sciences*, *Vol. 13, Iss. 1,* pp. 13-31, doi: 10.3390/bs13010031
36. Mollen, A., Wilson, H. (2010). Engagement, telepresence and interactivity in online consumer experience: Reconciling scholastic and managerial perspectives. *Journal of Business Research*, Vol. 63, Iss. 9, pp. 919-925, doi: 10.1016/j.jbusres.2009.05.014
37. Muntinga, D., Moorman, M., Smit, E.G. (2011). Introducing COBRAs: Exploring motivations for Brand-Related social media use. *International Journal of Advertising, Vol. 30, Iss. 1,* pp. 13-46, doi: 10.2501/IJA-30-1-013-046
38. Pandey, S., Pandey, M. (2018). Enhancing Consumer Brand Engagement through Social Media. *Journal of Management Research and Analysis*, *Vol. 5, Iss. 2(1),* pp. 126-131.
39. Pansari, A., Kumar, V. (2017). Customer Engagement - The Construct, Antecedents and Consequences. *Journal of the Academy of Marketing Science*, *Vol. 45, Iss. 3,* pp. 294-311, doi: 10.1007/s11747-016-0485-6
40. Patterson, P., Yu, T., de Ruyer, K. (2006). *Understanding customer engagement in services, Advancing theory, maintaining relevance*. Proceedings of ANZMAC 2006 conference, Brisbane. Retrieved from: https://studylib.net/doc/18335381/understanding-customer-engagement-in-services-paul-patterson, 02.12.2023
41. Porter, C.E., Donthu, N., MacElroy, W.H., Wydra, D. (2011). How to foster and sustain engagement in virtual communities. *California Management Review*, *Vol. 53, Iss. 4,* pp. 80-110, doi: 10.1525/cmr.2011.53.4.80
42. Rather, R., Hollebeek, L., Islam, J. (2019). Tourism-Based Customer Engagement: The Construct, Antecedents, and Consequences. *The Service Industries Journal, Vol. 39, Iss. 7-8*, pp. 519-540, doi: 10.1080/02642069.2019.1570154

43. Roberts, C., Alpert, F. (2010). Total customer engagement: Designing and aligning key strategic elements to achieve growth. *Journal of Product and Brand Management*, *Vol. 19, Iss. 3,* pp. 198-209, doi: 10.1108/10610421011046175
44. Sashi, C.M. (2012). Customer engagement, buyer-seller relationships and social media. *Management Decision*, *Vol. 50, No. 2*, pp. 253-272, doi: 10.1108/00251741211203551
45. So, K.K.F, King, C., Sparks, B.A, King, C., Wang, Y. (2014). The Role of Customer Engagement in Building Consumer Loyalty to Tourism Brands. *Journal of Travel Research*, *Vol. 55, Iss. 1*, pp. 1-15, doi: 10.1177/0047287514541008
46. Stauss, B., Seidel, W. (2014). *Beschwerdemanagement: unzufriedene Kunden als profitable Zielgruppe*. München: Carl Hanser Verlag.
47. Svendsen, M.F., Haugland, S.A., Grønhaug, K., Hammervoll, T. (2011). Marketing strategy and customer involvement in product development. *European Journal of Marketing*, *Vol. 45, Iss. 4*, pp. 513-530, doi: 10.1108/03090561111111316
48. Thomke, S., von Hippel, E. (2002). Customers As Innovators: A New Way to Create Value. *Harvard Business Review, Vol. 80, Iss. 4*. Retrieved from: https://hbr.org/2002/04/customers-as-innovators-a-new-way-to-create-value, 27.11.2023
49. Tuti, M. Sulistia, V. (2022). The Customer Engagement Effect on Customer Satisfaction and Brand Trust and Its Impact on Brand Loyalty. *Jurnal Manajemen Bisnis, Vol. 13, Iss. 1,* pp. 1-15, doi: 10.18196/mb.v13i1.12518
50. van Doorn, J., Lemon, K.N., Mittal, V., Nass, S., Pick, D., Pirner, P., Verhoef, P.C. (2010). Customer engagement behaviour: theoretical foundations and research directions. *Journal of Service Research*, *Vol. 13, Iss. 3,* pp. 253-266, doi: 10.1177/1094670510375599
51. Vargo, S.L., Lusch, R. (2004). Evolving to a New Dominant Logic. *Journal of Marketing*, *Vol. 68, Iss. 1*, pp. 1-17, doi: 10.1509/jmkg.68.1.1.24036
52. Verhoef, P.C., Reinartz, W.J., Krafft, M. (2010). Customer engagement as a New perspective in customer management. *Journal of Service Research*, *Vol. 13, Iss. 3,* pp. 247-252, doi: 10.1177/1094670510375461
53. Vivek, S.D., Beatty, S.E., Morgan, R.M. (2012). Customer Engagement – Exploring Customer Relationships Beyond Purchase. *Journal of Marketing Theory and Practice*, *Vol. 20, Iss. 2,* pp. 127-145, doi:10.2753/MTP1069-6679200201
54. Weinstein, A. (2020). Creating Superior Customer Value in the Now Economy. *Journal of Creating Value*, *Vol. 6, Iss. 5*, pp. 1-14, doi: 10.1177/2394964319898962
55. Wiechoczek, J. (2016). Creating value for customer in business networks of high-tech goods manufacturers. *Journal of Economics and Management, Vol. 23, Iss. 1,* pp. 76-90.
56. Wiechoczek, J., Kieżel, M. (2018). Zaangażowanie (się) konsumentów a kształtowanie innowacji w sferze produktu i komunikacji marketingowej [Consumer engagement and its influence on innovations in product and marketing communications]. *Studia Ekonomiczne, No. 357.* Katowice: Uniwersytet Ekonomiczny w Katowicach, pp. 165-182.

57. Wiggins, C. (2022). Online customer engagement: a practical exploration of antecedents and metrics for new content marketers. *SN Business&Economics*, *Vol. 2, Iss. 2*, pp. 2-18, doi: 10.1007/s43546-021-00186-y
58. Ziemba, E., Eisenbardt, M. (2015). Examining prosumers' participation in business processes. *Polish Journal of Management Studies*, *Vol. 12, Iss. 1,* pp. 219-229.
59. Ziemba, E., Eisenbardt, M. (2016). Analiza wykorzystania kanałów komunikacji online w dzieleniu się wiedzą prosumentów [Analysis of online communication channels application in prosumer knowledge sharing]. *Przegląd Organizacji*, *Vol. 11*, pp. 42-50, doi: 10.33141/po.2016.11.07
60. Ziemba, E., Eisenbardt, M. (2019). Consumer Engagement in Business Process Innovation: Cases of the Firms Operating in the ICT Sector. *Problemy Zarządzania*, *Vol. 5, Iss. 85,* pp. 24-39, doi: 10.7172/1644-9584.85.2
61. Żyminkowska, K., Wiechoczek, J., Kieżel, M., Żyminkowski, T. (2018). *Zjawisko customer engagement wśród polskich konsumentów* [*The phenomenon of customer engagement among Polish consumers*]. Warszawa: PWN.

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THE ART OF PERSUASION – THE IMPACT OF PERSUASIVE TECHNIQUES IN CLOTHING BRAND ADVERTISEMENTS ON CONSUMERS

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Purpose: The article aims to evaluate the impact of persuasive techniques in clothing brand advertisements on consumers. The study aims to identify the advertisement elements that most effectively capture consumers' attention and strengthen their trust in the brand.
Methodology: The study surveyed consumer opinions on the impact of various persuasive techniques used in clothing advertisements. The collected data was analyzed using a straightforward structure to assess response distribution across categories and to identify the most common preferences and attitudes toward specific advertising elements.
Findings: The study revealed that clothing brand advertisements significantly shape consumers' brand perceptions and purchasing decisions. Key advertising elements that captured consumer attention included brand logos, product presentation, colors, graphics, and promotional offers.
Research implications: The findings suggest that visual appeal, message authenticity, and emotional impact are crucial factors in attracting attention and building consumer trust. The study highlights the particular importance of colors and imagery, indicating that brands should invest in well-designed aesthetics that align with their identity and help them stand out in the competitive market.
Practical implications: The results underscore the need for companies to focus on visual elements, such as colors and overall aesthetics, to enhance advertising appeal and brand recognition. Investing in design that reflects the brand identity can effectively capture consumer attention, which is essential in the highly competitive fashion industry.
Social implications: Advertisements that evoke positive emotions, such as happiness, prestige, or aspiration, can shape societal expectations and contribute to idealized images of life or appearance. This, in turn, can impact the audience self-esteem and societal norms.
Value: Understanding the preferences of specific consumer groups can enable brands to create more responsible and targeted campaigns, fostering stronger customer relationships and positively influencing consumer perceptions.
Keywords: Persuasion, clothing brands, advertising, consumer behaviour, visual appeal.
Category of the paper: Research Paper.

1. Introduction

In 2022, over 22,000 entities operated in Poland's clothing and textile sector (Makosz, 2023), encompassing both large corporations and smaller, local enterprises. Accurately estimating the number of fashion brands in the Polish market is challenging due to its dynamic nature (GEMIUS, 2024; KPMG, 2019; McKinsey, 2023), which includes both domestic and international brands (Deloitte, 2023; Euromonitor International, 2023; Żurek, 2024). The value of the clothing market in Poland was estimated at approximately 65 billion PLN in 2023 (Euromonitor International, 2023; Makosz, 2023). Forecasts for 2024 indicate further growth, highlighting the sustained dynamism of the fashion and apparel sector in Poland (mBank, 2024). In the context of increasing competition in the clothing industry (Cazin, 2021), persuasive techniques have become crucial for capturing consumer attention and building brand loyalty.

The Polish clothing market is characterized by significant demographic diversity among consumers, presenting numerous challenges for businesses in adapting marketing strategies to diverse needs (Grewal, Levy, 2019). Younger consumer groups (Johnstone, Lindh, 2022), particularly Generation Z and Millennials, exhibit high expectations regarding innovation, sustainability, and brand authenticity, often basing their choices on values related to ecology and corporate ethics (Fromm Jeff, 2018; Kim, Ko, 2010). Purchasing preferences among these groups are heavily influenced by social media and trends promoted by influencers, compelling brands to increase their activity on platforms such as Instagram and TikTok to effectively engage with this audience segment (Alalwan et al., 2017; De Veirman et al., 2017; Djafarova, Rushworth, 2017; Lou, Yuan, 2019; Smith, 2011).

It is also important to note the aging of Polish society. The median age in Poland was 42.3 years as of June 30, 2024 (GUS, 2024). Over the past decades, the median age has steadily increased—from approximately 35 years in 2000 to around 38 years in 2010 (Business Insider, 2023; GUS, 2024). This trend results from declining birth rates and increasing life expectancy. An aging population (Jarzebski et al., 2021) poses challenges for businesses, requiring them to adapt marketing strategies to trends driven by demographic aging (Mothersbaugh David et al., 2024). The demographic shift, marked by a growing number of older consumers, challenges fashion companies to tailor their offerings to the aesthetic and functional demands of this group (Marks, 2020; Twigg, 2013).

In light of demographic changes and the expectations of various consumer groups, the Polish clothing market demands flexibility and the ability to adapt marketing messages to diverse audience needs. The dynamic growth of social media, evolving trends in sustainability, and the increasing importance of social responsibility require brands to create advertising campaigns that are not only visually appealing but also resonate with consumers' emotional needs and values.

This article focuses on the impact of persuasive techniques used in clothing brand advertisements on consumer perception and purchasing decisions in the Polish market. The study aims to identify the elements of advertisements that most effectively capture consumers' attention and strengthen their trust in the brand. In light of dynamic demographic changes and diverse consumer expectations, the research focuses on addressing the following research question:

1. Which persuasive, visual, and emotional elements attract the audience's attention and contribute to building the brand image?
2. Which media are most preferred by consumers for clothing advertisements?
3. How do media preferences and the reception of persuasive techniques differ between men and women?

2. Research Methods and Profile of Respondents

The subject of the study was clothing brand advertisements, while the object of the study was their recipients. The research began with a literature review, which facilitated the formulation of research questions and the selection of an appropriate research method—in this case, an online survey. The data collection process took place between May 26 and June 19, 2024. The survey was prepared using the Google Forms platform, allowing for the collection of responses anonymously without recording participants' identities. The questionnaire consisted of three sections, comprising a total of nineteen questions. The introductory section included information about the purpose of the study, an estimated completion time, and a note of thanks for participation, aiming to increase respondents' motivation to provide answers.

The first section of the questionnaire included a question consisting of nineteen statements, to which respondents expressed their opinions by selecting one of five possible responses. Each statement required an answer, enabling the collection of a comprehensive view of respondents' attitudes and opinions regarding selected aspects of clothing advertisements.

The second section focused on the perception of advertisements and consisted of eleven questions. The first question was a single-choice question with five available options. The next question included a list of fifteen media channels, where respondents were asked to select one of five responses for each medium. This section also featured an open-ended question, allowing respondents to freely express their opinions on a specific topic, which provided more qualitative data. The following two questions were single-choice questions, after which another two questions referred again to the fifteen advertising media, requiring respondents to select one of three response options for each medium. The subsequent question addressed fifteen aspects of advertisements, with respondents evaluating each aspect by choosing one of two available responses. The next question involved two types of stores, where respondents could select one of two responses for each type. In the next multiple-choice question, respondents were allowed to select up to three out of nineteen possible options. The final question in this section consisted of six statements, each requiring a choice of one of three responses.

The third and final section of the questionnaire served as a demographic profile, allowing the collection of information about the respondents' demographic characteristics, which facilitated data analysis in the context of participants' socio-demographic profiles.

To achieve the research objectives, an online survey was conducted using a questionnaire created with Google Forms and distributed via the social media platform Facebook. Online surveys, particularly in digital form, are an effective tool for gathering a large number of responses in a short amount of time and at a relatively low cost (Siuda, 2016). Given the nature of the study, which focuses on the subjective attitudes and preferences of consumers toward clothing brand advertisements, the survey method enables the direct collection of opinions and evaluations from a wide range of respondents. The online format of the survey allowed access to individuals actively engaged with social media, which is particularly relevant in the context of advertising clothing brands that frequently communicate with their audiences through platforms such as Facebook and Instagram. This approach also enabled the study to reach respondents regardless of their location.

The study employed the convenience sampling method, which involves recruiting participants from among those readily available and willing to participate. This method was chosen due to the time and financial constraints of the research and because the survey was distributed online, enabling quick access to an adequate number of respondents. Ultimately, 201 individuals participated in the study. While this sampling method was convenient, certain demographic and socio-economic criteria were considered, such as age, gender, and interest in clothing advertisements. The survey was directed at several thematic groups on Facebook, including communities interested in fashion, advertising, online shopping, and various purchasing preferences, such as eco-friendly or premium clothing brands. This targeted approach facilitated the collection of diverse opinions, enriching the analysis.

The results were presented in the form of tables and charts. To interpret the data, a structural analysis was conducted, allowing the identification of the most common attitudes, preferences, and reactions of respondents toward clothing advertisements. This analysis enabled the identification of recurring behavioral patterns and preferences and formed the basis for interpreting the results. Cluster analysis was also applied to group respondents with similar preferences and attitudes toward clothing advertisements. This technique made it possible to distinguish segments of respondents characterized by similar purchasing behaviors and approaches to advertising. As part of the analysis, clustering using the k-means method was applied, which allowed for grouping respondents with similar preferences and attitudes toward clothing advertisements. The k-means method is one of the most commonly used clustering techniques, enabling the division of a dataset into a specified number of groups (clusters).

Its goal is to minimize differences within clusters while maximizing differences between them. The algorithm iteratively assigns observations to groups based on their distance from centroids (appropriate initialization of centroids minimizes the impact of outlier observations), which allows for the creation of compact and homogeneous clusters (Awawdeh, Edinat, Sleit, 2019).

The advantages of the method include its computational efficiency and the intuitive interpretation of results, making it widely used in fields such as customer segmentation, market analysis, and studies of consumer behavior. However, it requires prior determination of the number of clusters and is sensitive to the presence of outlier observations, which can affect the quality of the results (Alfiansyah Hasibuan et al., 2023).

In the context of this study, the goal was to identify groups of participants who responded similarly to questions regarding the impact of clothing brand advertisements on their purchasing decisions. The division into three clusters was adopted based on the specifics of the study, which aimed to understand the diverse attitudes of consumers toward clothing brand advertisements. Three groups capture the most significant differences in participants' approaches while avoiding excessive fragmentation of the data, which could complicate the interpretation of the results.

Preliminary analysis of respondents' answers revealed that their attitudes could be divided into three distinct groups, which was confirmed by the clustering results. The selection of three clusters ensured sufficient diversity while maintaining the stability of centroids (group centers) and minimizing within-group distances. Additionally, it was considered that consumers might differ in their preferences toward various aspects of advertisements—visual, emotional, and pragmatic (e.g., price and promotions). Transforming the data into numerical values and its moderate size (201 observations) provided suitable conditions for applying the algorithm. The method allowed for the quick and efficient assignment of observations to clusters, which was important in the context of the study's objective.

The study included 201 respondents who represented a diverse group in terms of demographic characteristics, such as gender, age, education, place of residence, family size, employment status, and average monthly clothing expenditures. This profile helps provide a better understanding of the participants and serves as a reference point for analyzing their responses regarding the impact of persuasive techniques used in clothing brand advertisements. These data allow for an assessment of how different social groups perceive clothing advertisements and what factors may influence their purchasing decisions. The demographic results are presented in Table 1.

Tabela 1.
Demographic Characteristics of Survey Participants

Age	**Number of Responses**	**% of Responses**	**Education**	**Number of Responses**	**% of Responses**
<19 years	5	2	Primary	3	1,5
19-30 years	164	82	Middle School	3	1,5
31-40 years	12	6	Vocational	20	10
41-50 years	14	7	Secondary	122	61
>51 years	6	3	Higher Education	53	26
Gender			**Number of Family Members**		
Female	109	54	1	28	14
Male	92	46	2	27	13,5
Place of Residence			3	49	25
Village	49	24	4	57	28
Town (<50,000 residents)	17	8,5	5	31	15,5
Town (51,000-100,000 residents)	14	7	>5	8	4
Town (101,000-300,000 residents)	26	13	**Employment Status**		
Town (300,000-500,000 residents)	55	27,5	Unemployed	2	1
	40	20	Self-employed	14	7
			Part-time employment	20	10
			Full-time employment	92	46
			Student	70	35
			Retired/Pensioner	3	1,4

Source: Own work.

As indicated by the data presented in Table 1, the respondents were predominantly young individuals aged 19-30, comprising 82% of the sample (164 participants). This group is particularly significant from the perspective of marketing analysis in the clothing industry, as younger individuals are often more susceptible to advertising influences and new fashion trends. Among the respondents, the majority had a secondary education (61%, or 122 individuals), which may reflect their relatively young age and the completion or ongoing phase of general education. A significant portion of the respondents held higher education degrees (26%), suggesting that the audience for clothing advertisements also includes individuals with higher levels of education, who may adopt a more conscious approach to consumption and purchasing decisions. In terms of gender, the respondent structure was nearly balanced, with a slight predominance of women (54%, or 109 participants) over men (46%, or 92 participants). This may indicate greater interest in the study among women, who traditionally demonstrate higher activity in clothing consumption and a greater interest in fashion and clothing advertisements. The respondents came from various places of residence, with the largest proportion residing in medium-sized cities. The highest number of respondents lived in cities with populations between 300,000 and 500,000 (27.5%). The analysis of family size revealed that the most common group was respondents living in four-person households (28%). This was followed by three-person families (25%) and five-person families (15.5%). Respondents from one- and two-person households accounted for 14% and 13.5%, respectively, suggesting a diversity in family structures among the participants and, consequently, their purchasing needs and preferences. The largest group consisted of full-time employees (46%, or 92 participants), indicating that many respondents have stable incomes, which may influence their purchasing power. The second-largest group was students (35%, or 70 participants), further emphasizing the dominance of the younger age group.

The collected data indicate that the respondents were primarily young, professionally active individuals with secondary and higher education, residing in medium- to large-sized cities. This sample profile suggests that the study results may reflect the purchasing preferences and responses to persuasive techniques used in clothing advertisements among young adults, representing an important segment of the fashion and advertising market.

3. Results and discussion

3.1. Evaluation of Persuasive Elements in Advertising

The analysis of persuasive techniques used in clothing brand advertisements provides a deeper understanding of their impact on consumers as well as their role in shaping attitudes and purchasing decisions. This article focuses on identifying which elements of advertisements—both visual and emotional—capture the most attention from audiences and how they translate into trust in the brand. This section aims to present the results of the study, which sought to answer questions about the most commonly used persuasive techniques and their effectiveness within the context of the Polish clothing market. The analysis includes aspects related to consumers' perception of advertisements, their reactions to various persuasive elements, and preferences for advertising media.

In the study on the perception of clothing brand advertisements by consumers, a series of questions were posed to analyze the influence of these advertisements on respondents' purchasing decisions. One question required respondents to evaluate various statements regarding clothing brand advertisements using a scale ranging from "Strongly Agree" to "Strongly Disagree." The responses provide insights into specific advertisement elements and their impact on brand perception and consumer decisions. The results of the analysis are presented in Figure 1.

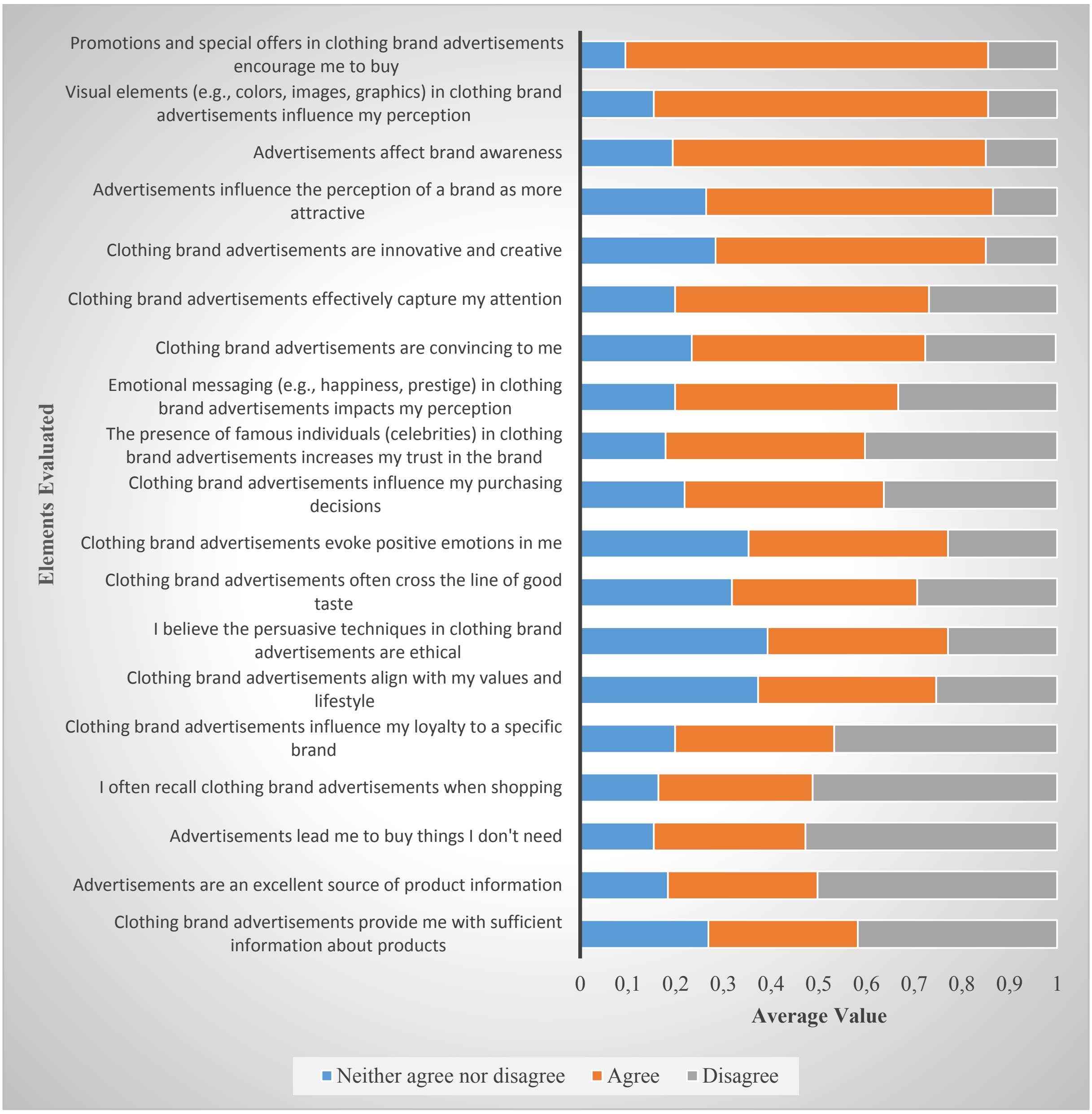

Figure 1. The Impact of Advertisement Elements on Brand Perception and Consumer Decisions.
Source: Own work.

The analysis of the data presented in Figure 1 indicates that the vast majority of respondents positively evaluated the impact of advertisements on the perception of a brand as more attractive and on increasing brand recognition. The high level of agreement (combining "somewhat agree" and "strongly agree") in these categories suggests that clothing advertisements effectively serve as a tool for building brand awareness and shaping a positive image in the eyes of consumers.

The informational value of advertisements, on the other hand, received more varied assessments. While a significant group of respondents acknowledged that advertisements provide them with the necessary information about products, some individuals disagreed with this statement. This may indicate certain shortcomings in delivering specific and detailed information, which could limit the effectiveness of advertisements among more conscious consumers who expect comprehensive details about the products being offered.

A critical perspective among consumers can be observed in the responses to questions addressing the negative aspects of advertisements. A significant number of respondents agree that clothing advertisements sometimes cross the boundaries of good taste and may encourage the purchase of unnecessary products. This suggests that advertisements can be perceived as overly intrusive or aggressive, which may create resistance or detachment among consumers and negatively impact their overall perception of advertising campaigns.

Well-designed advertising campaigns play a crucial role in building a strong connection between the consumer and the brand, which directly translates into customer loyalty and increased purchase frequency. Research indicates that personalized and authentic advertising messages effectively engage audiences, leading to deeper involvement and trust in the brand. Studies by Lemon and Verhoef (2016) emphasize that consumer loyalty is a result of positive experiences stemming from interactions with the brand, and carefully designed advertising campaigns can enhance these experiences, resulting in greater customer engagement. The researchers observed that positive customer experiences at every stage of interaction with the brand increase the likelihood of recommendations, contributing to the organic growth of the brand's reach. Furthermore, loyal customers are more inclined to recommend the brand to others, which can lead to the natural expansion of the customer base. According to the report *Omnichannel in the Communication Strategy of Loyalty Programs*, over 90% of surveyed consumers participate in loyalty programs on average, highlighting the immense popularity and utility of such initiatives (Mazur, Niedobecka, 2024). The report *6 Innovative Strategies to Build Loyalty in 2023* further reveals that as many as 26% of consumers ceased using services from certain businesses over the past year, underscoring the importance of effective loyalty strategies (Mikołajczyk, 2023). Consequently, investing in well-thought-out advertising campaigns and loyalty programs is essential for the long-term success of a brand in a competitive market.

A high level of agreement was also noted in the category of the emotional impact of advertisements. Clothing brand advertisements effectively evoke positive emotions, such as happiness and prestige, indicating their effectiveness in creating pleasant associations with the brand. However, these emotions do not always translate into long-term consumer engagement—a smaller number of respondents admitted that advertisements influence their loyalty to the brand. This suggests that while advertisements can attract attention and build a positive image, additional actions are needed to transform these emotions into loyalty.

When it comes to the alignment of advertising messages with personal values and lifestyles, opinions are varied. Not all respondents identify with the image promoted by clothing brands, which may limit their engagement or purchasing motivation if the advertisements fail to reflect their values or preferences.

Visual aspects of advertisements, such as colors, images, and graphics, were highly rated for their effectiveness in capturing attention. The aesthetics of an advertisement appear to be crucial for consumers, who appreciate its visual appeal. Lou and Yuan (2019) emphasize that the value of the message and credibility are key to building consumer trust. The presence of celebrities can enhance the credibility of an advertisement, but its effectiveness depends on the alignment of the celebrity with the brand's values. If a celebrity is not adequately associated with the brand, the impact on perception may be limited. Celebrities serve as symbols, transferring their qualities to the product, but the visual appeal of the advertisement remains the primary element that attracts consumer attention. As noted by research from Barta and Belanche (2023), the effectiveness of influencer activities increases when they include humorous and visually engaging elements. Consumers are more likely to interact with content that is both aesthetically appealing and entertaining. These findings highlight that, while the presence of celebrities can amplify the impact of an advertisement, the key success factors are well-designed visual elements that directly capture attention and strengthen brand identity.

The high level of agreement regarding promotions and special offers is also noteworthy. Consumers acknowledge that such activities effectively encourage them to make purchases, indicating that economic factors play a significant role in purchasing decisions. Research (Kumar, Madhuri, Shireesha, 2024) shows that consumers value offers tailored to their preferences, which translates into higher engagement and loyalty toward the brand. Personalization allows businesses not only to increase the effectiveness of promotions but also to stand out in a competitive market. Literature (Anderson, Fox, 2019) also emphasizes that economic factors, such as discounts or "buy one, get one free" promotions, significantly influence purchasing decisions. These promotions reduce the perceived financial risk for consumers and increase the perceived value of the product, often leading to impulsive purchasing decisions.

Research indicates that positive emotions triggered by advertisements alone may not be sufficient to build lasting loyalty. Delivering consistent and authentic experiences at every stage of interaction with the brand is crucial. Lemon and Verhoef (2016) emphasize that managing the customer experience throughout their journey is essential for building loyalty, while Berman (2006) suggests that loyalty programs can effectively support the development of lasting customer relationships. Therefore, for the emotions evoked by advertisements to translate into loyalty, brands should invest in authenticity, consistency in communication, and well-designed loyalty programs.

In summary, clothing advertisements are effective in capturing attention, evoking positive emotions, and building an attractive brand image. At the same time, the critical perspective of some consumers regarding certain aspects of advertising—such as crossing the boundaries of good taste or lacking comprehensive information—highlights areas where the effectiveness of advertisements can be improved by tailoring the message to meet the expectations and values of the audience.

In the following question, respondents were allowed to select up to three elements from a range of available options. This question aimed to identify the elements most noticeable to consumers, providing insights into the aspects of advertisements that attract attention and influence purchasing decisions. The results of the analysis are presented in Figure 2.

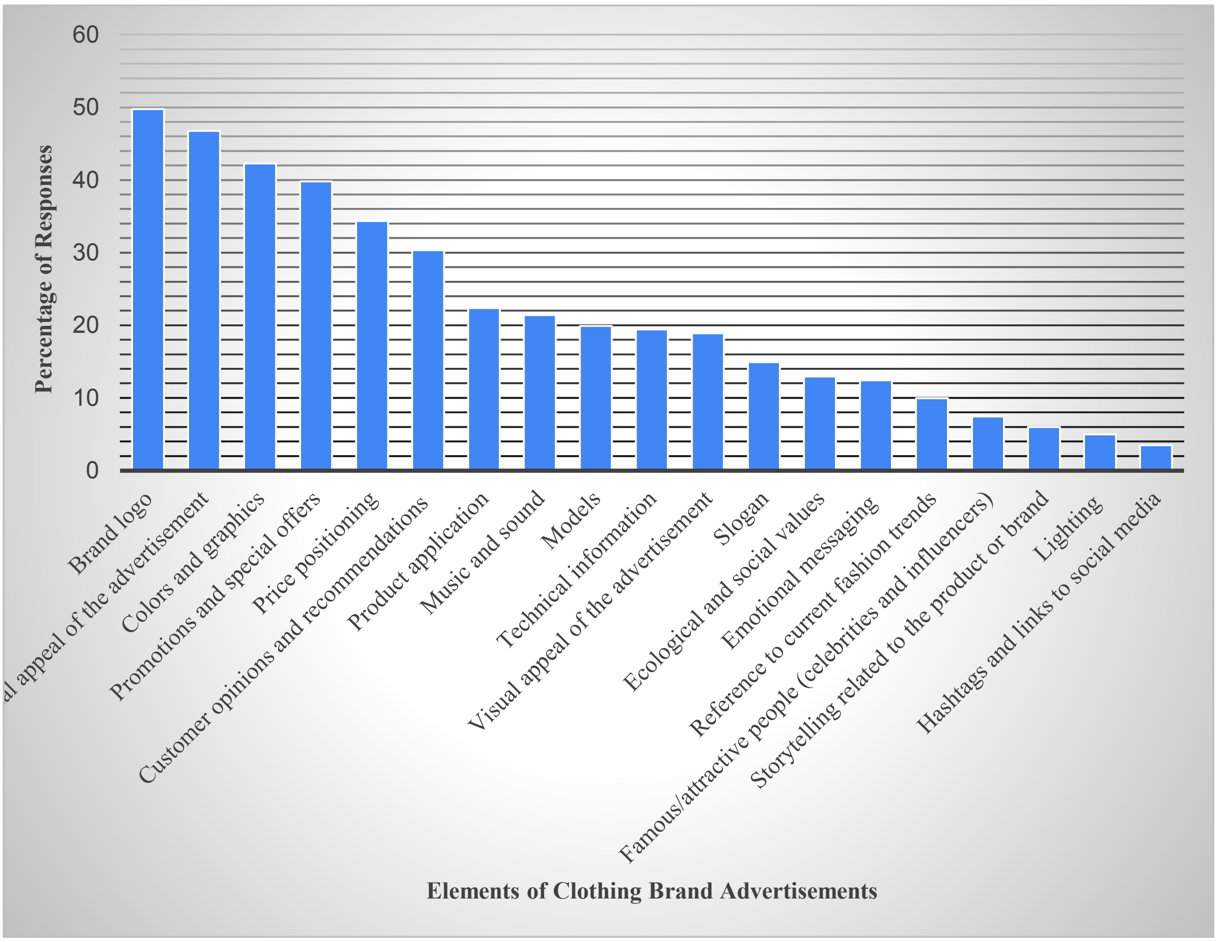

Figure 2. Elements of Clothing Brand Advertisement.

Source: Own work.

As shown in the data presented in Figure 2, the brand logo, indicated by 100 respondents, is the most attention-grabbing element in advertisements. This underscores its importance for brand recognition and representation of brand values. Respondents also highlighted the visual aspects of product presentation (94 mentions), emphasizing the significance of product presentation in advertising messages, which influences consumer purchasing decisions.

Colors and graphics, mentioned by 85 participants, are key to conveying the brand's emotions and values, while promotions and special offers, chosen by 80 respondents, capture attention by providing opportunities for savings and triggering impulsive purchasing decisions. Price, considered important by 69 respondents, remains a crucial decision-making factor, and customer reviews, indicated by 61 participants, enhance trust in the brand. Elements such as music and sound (43 mentions) play a significant role in the emotional reception of advertisements, while models (40 mentions) attract attention through their appeal, contributing to the aesthetic quality of the message. Technical information, preferred by 39 respondents, highlights the need for clarity and reliability in advertising. The visual aesthetics of advertisements, highlighted by 38 respondents, are essential for capturing attention, while slogans (30 mentions) play a lesser role, suggesting that audiences prefer more specific messaging. Ecological and social values (26 mentions) are becoming increasingly important, especially for younger generations. Emotional messaging (25 mentions) can create a deeper connection with the audience, influencing the perceived value of the product. References to current fashion trends, noted by 20 respondents, add modernity to advertisements, while celebrities and influencers (15 mentions) have less significance, indicating the growing value of authenticity. Less important elements include storytelling (12 mentions), lighting (10 mentions), and hashtags and links to social media (7 mentions), suggesting that consumers are more interested in direct information and authentic messaging rather than engagement tools alone.

Consumers pay the most attention to logos, visual elements, pricing, and reviews, indicating the need for well-thought-out aesthetics, pricing transparency, and authenticity in advertisements. At the same time, the emotional and aesthetic aspects of the message help enhance brand perception, making it more memorable and appealing to potential customers. The results of the analysis of persuasive elements in clothing advertisements suggest that visual and emotional aspects of the message play a key role in capturing consumers' attention and reinforcing a positive brand image. These findings align with research on the impact of colors and visual stimuli in advertising. Studies (Romeh et al., 2024) show that well-chosen colors can not only attract attention but also build trust in the brand through their emotional impact on the audience. Similar conclusions are drawn by Ebrahim (2020), who emphasizes the importance of visual elements in engaging consumers, which is also reflected in the observations of survey participants who paid particular attention to colors and imagery in clothing advertisements.

Respondents were also asked which aspects of advertisements they pay particular attention to, with the results presented in Figure 3.

In the study on advertising elements that attract consumer attention, respondents highlighted several key aspects that play a significant role in the purchasing decision-making process. The analysis of responses from 174 participants revealed that price information is the most attention-grabbing element of advertisements (Figure 3). The importance of pricing underscores the value of financial information for consumers. The price of a product or service often determines purchasing decisions, and its prominence in advertisements allows consumers to quickly assess whether the product fits within their budget.

Equally important were the visual aspects of advertisements, such as images, graphics, and colors, indicated by 173 respondents. The aesthetics and design of advertisements play a crucial role in capturing viewers' attention and making the message memorable. Visual elements enable the rapid conveyance of emotions and moods, while well-chosen colors influence consumers' moods and subconscious perceptions of the advertisement.

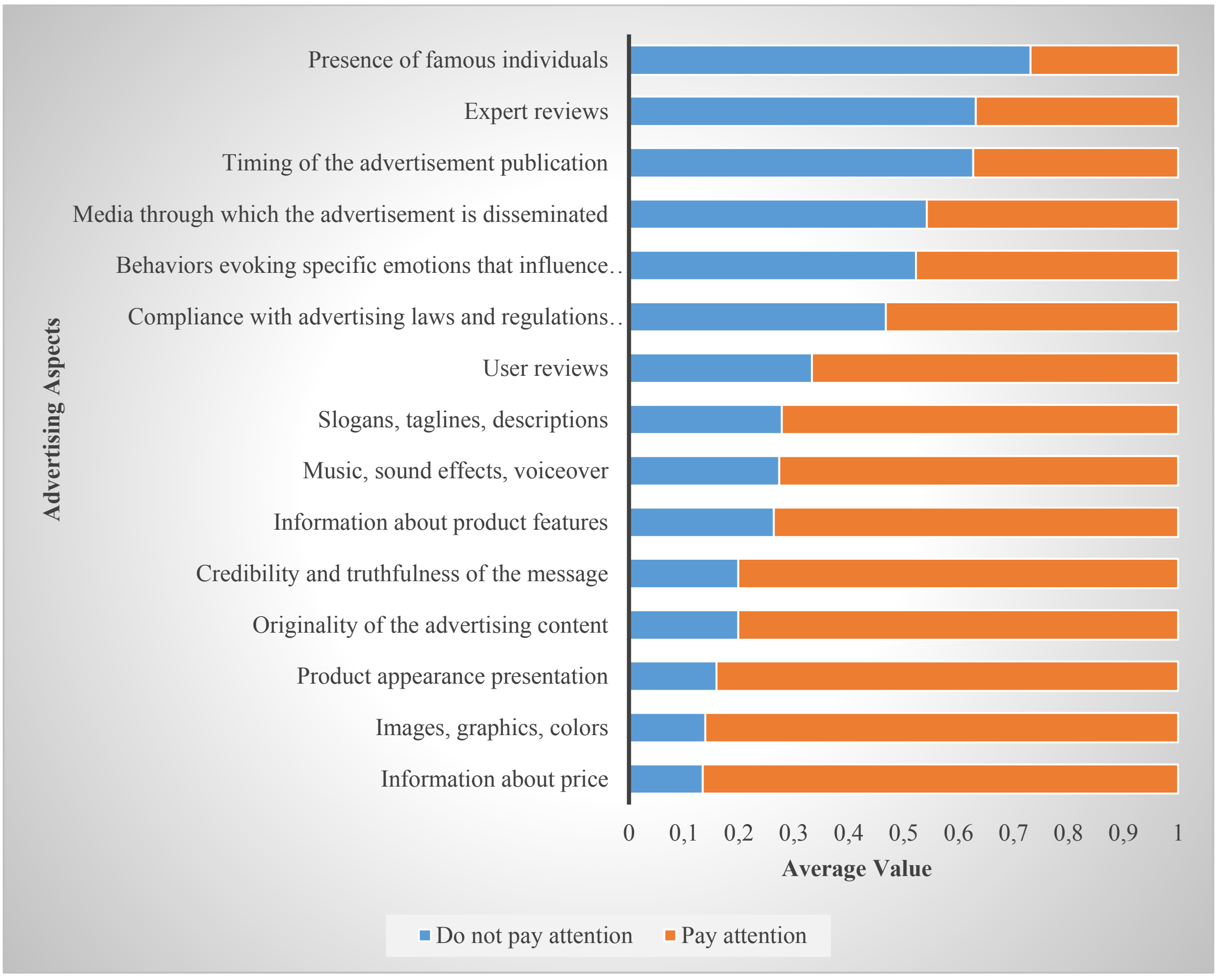

Figure 3. Aspects of Advertising That Respondents Pay/Do Not Pay Attention To.

Source: Own work.

The appearance and presentation of the product attracted the attention of 169 respondents, confirming the importance of visual appeal in the consumer decision-making process. The first impression a product creates through an advertisement can determine its attractiveness in the eyes of consumers. Another significant factor is the originality of the advertising message (161 respondents) and the credibility and truthfulness of the content, which address consumers' needs for authenticity and reliability. A creative and distinctive message allows brands to stand out from other advertisements, building positive associations with the brand.

Next, 148 respondents highlighted the importance of information about product features, emphasizing the role of detailed and substantive messaging. For many consumers, understanding the functions and features of a product is crucial for making an informed purchasing decision. Enriching advertisements with detailed information not only supports consumers in their decision-making process but also builds the brand's image as professional and transparent.

Another significant element of advertisements is sound, including music, sound effects, and voiceovers (146 respondents). Audio elements enhance the advertising message, adding emotional depth, which can capture attention and remain memorable. Music and sounds can strengthen the message, while a well-chosen voiceover influences the perceived credibility and tone of the communication.

Short slogans, taglines, and descriptions are also important for consumers (145 respondents) as they encapsulate the essence of the marketing message. Simple, easy-to-remember slogans can become brand identifiers and attract viewers' attention. Descriptions provide more detailed information about the product, supporting consumers in making informed purchasing decisions.

User reviews, indicated by 134 respondents, are increasingly important in evaluating product authenticity, as they are perceived as more trustworthy than information provided by the brand itself. On the other hand, the presence of famous individuals in advertisements did not prove to be significant, suggesting that consumers focus more on the substantive aspects of advertisements.

The study results, highlighting the importance of authenticity, detailed messaging, and emotional consumer engagement, align with trends in the literature. Lou and Yuan (Lou, Yuan, 2019) demonstrated that the value of advertising messages, particularly in the context of influencer marketing, is largely dependent on their authenticity and credibility, which strengthen consumers' trust in the brand. Research shows that the emotional engagement of the audience can be a key factor in building brand loyalty and a positive perception of products. Similar conclusions are presented by researchers (Awasthi et al., 2024; Kaushik, Choudhary, Choudhary, 2024), who indicate that carefully designed advertisements that incorporate emotional aspects, such as happiness or curiosity, influence long-term consumer attitudes and purchasing decisions.

3.2. Preferences and Advertisement Reception

In a world dominated by media, clothing brand advertisements not only promote products but also shape perceptions and values associated with the brand. Emotions in advertisements, such as joy, nostalgia, or a sense of belonging, can evoke strong emotional reactions in audiences, influencing their purchasing preferences and loyalty to the brand. A question posed to the respondents aimed to determine in which media channels, such as television, social media, or the Internet, they most often encounter advertisements from the clothing industry.

The collected responses provide insights into which media are the most effective in reaching consumers and may also suggest preferences among different demographic groups. Respondents were presented with five response options to indicate frequency: Never, Rarely – once per month, Occasionally – 2-3 times per month, Often – 7-15 times per month, and Very Often – more than 15 times per month. The survey results are presented in Figures 4 and 5, which illustrate the level of exposure to advertisements across various media and highlight where clothing brands most frequently engage their audiences.

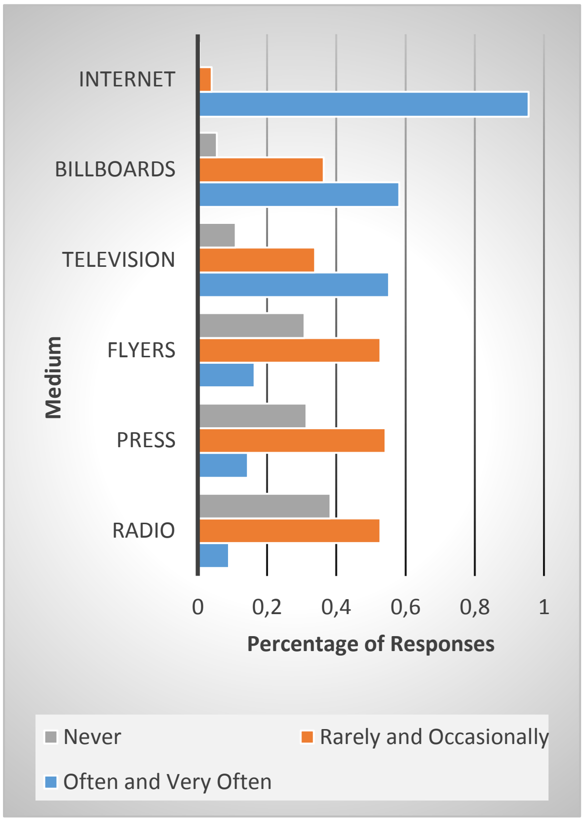

Figure 4. Level of Exposure to Advertisements in Media.

Source: Own work.

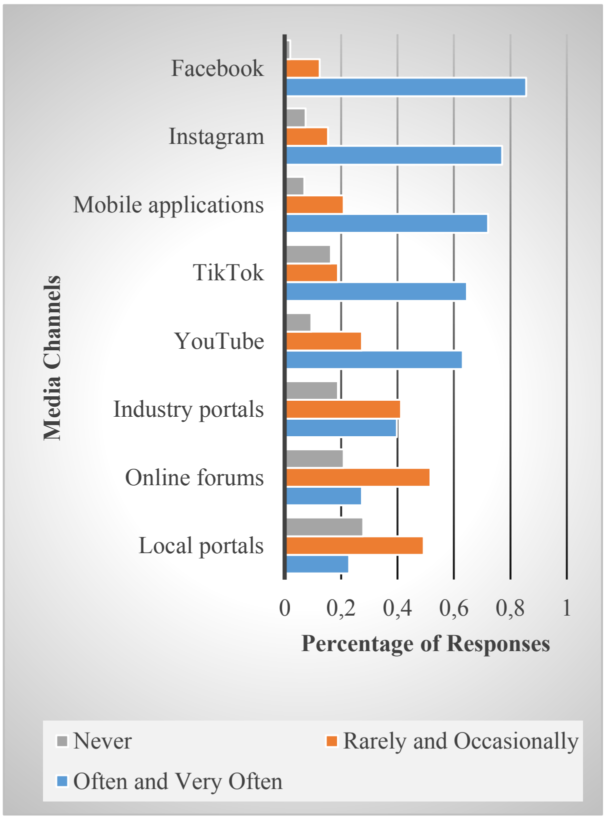

Figure 5. Level of Exposure to Advertisements on the Internet.

Source: Own work.

The study results indicate that online advertisements have a significant impact on the purchasing decisions of Internet users, which is consistent with other research on the role of advertising in the digital space (Słupska, Andrzejewska, 2024). They also demonstrate that dominant advertising channels, such as Facebook, Instagram, YouTube, and television, have a strong emotional impact on audiences. Social media, particularly Instagram, which captured the attention of 108 respondents, is especially effective in showcasing clothing in a way that evokes positive emotions, such as aspiration, prestige, and a sense of luxury. The visual aspects of advertisements on Instagram, which present products in an aesthetic and inspiring format, foster emotions related to happiness, authenticity, and exclusivity, directly influencing brand perception and building an emotional connection with consumers.

Video advertisements on YouTube and television also have a significant emotional impact, with 69 and 50 respondents, respectively, reporting frequent exposure to clothing advertisements. Video, through its combination of sound, visuals, and storytelling, allows brands to effectively shape audience emotions—from excitement about new trends to a sense of belonging to a community of brand users. These emotions enhance consumer engagement and encourage brand loyalty, as positive associations with the brand are reinforced through the emotional narratives presented in video advertisements.

Traditional print media, such as newspapers and flyers, have a limited emotional impact on audiences. Only 13 respondents reported frequent exposure to clothing brand advertisements in these media, suggesting that the lack of visual stimuli and multimedia elements weakens the emotional effect of these channels. Similarly, radio, cited by only 5 respondents, has limited ability to evoke emotions that are critical for clothing brands—fashion, as a highly visual product, requires a message that engages the audience's emotions through imagery.

Billboards and mobile applications, with 47 and 77 mentions by respondents respectively, evoke emotions at a moderate level. Publicly displayed billboards can create a sense of aspiration through aesthetic imagery, while mobile applications enable personalized messaging, increasing emotional impact by tailoring advertising content to audience preferences.

The survey results highlight that dominant advertising channels, such as Facebook, Instagram, YouTube, and television, play a crucial role in building emotional connections between brands and consumers. Social media, especially Instagram, stands out for its effectiveness due to the aesthetic presentation of products, which evokes positive emotions such as aspiration, prestige, and exclusivity. As research by Lou and Yuan (2019) suggests, visual appeal and personalized content on social media increase consumer trust and engagement, which are key to building long-term brand loyalty.

Advertisements on YouTube and television also effectively influence audience emotions through the ability to combine visuals, sound, and storytelling into an engaging format. According to research by Weibel et al. (2019), video formats are particularly effective in generating emotions such as excitement or a sense of belonging, reinforcing positive brand associations and encouraging loyalty. Combining these elements allows brands to not only capture consumer attention but also build their emotional engagement.

Conversely, traditional media, such as newspapers and radio, have limited capabilities in evoking emotions due to the lack of multimedia elements and reduced visual appeal. These limitations decrease the effectiveness of these channels in promoting products that require visual representation, such as clothing (Ahmetoglu, Furnham, Fagan, 2014). Billboards and mobile applications, due to their visual format and potential for personalization, occupy a mid-level position in terms of emotional impact, making them valuable complementary advertising channels.

3.3. Reception of Persuasive Techniques by Women and Men

As part of the study, respondents were asked about the frequency of clothing advertisement visibility, the usefulness of media in decision-making, the credibility of media as sources of information, and the attention paid to advertising aspects. Table 2 summarizes the responses, providing insights into respondents' media preferences and emotional reception of advertisements. The tabular representation of the results is a starting point for analyzing how different factors, such as frequency of use or credibility assessment, influence how audiences perceive advertising content.

Tabela 2.
Evaluation of Usefulness, Credibility, and Visibility of Clothing Advertisements in Media by Gender

Medium	Przydatność medium w podejmowaniu decyzji			Credibility of Medium in Decision-Making			Visibility of Clothing Advertisements (Often and Very Often)		
	F [%] (Women)	M [%] (Men)	Total [%]	F [%] (Women)	M [%] (Men)	Total [%]	F [%] (Women)	M [%] (Men)	Total [%]
Internet	49	**40**	89	31	34	65	53	43	96
Radio	**2,5**	**2,5**	5	4	5	9	4	4	8
Television	**16**	**13**	29	8	10	18	34	21	55
Press	**7**	**5**	12	9	6	15	10	4	14
Flyers	**11**	**6**	17	10	5	15	13	3	16
Billboards	**14**	**15**	29	8	9	17	35	23	58
Industry Portals	**18**	**19**	37	13	16	29	21	19	40
Mobile Apps	**37**	**25**	62	22	19	41	41	31	72
Facebook	**34**	**28**	62	25	16	41	47	39	86
Instagram	**33**	**26**	59	23	15	38	44	33	77
TikTok	**29**	**21**	50	22	12	34	38	26	64
YouTube	**30**	**23**	53	21	17	38	36	27	63
Local Portals	**11**	**11**	22	9	11	20	14	9	23
Online Forums	**22**	**17**	39	23	15	38	18	9	26

Source: Own work.

The study results show that dominant advertising channels such as Facebook, Instagram, YouTube, and television have a strong emotional impact on audiences. The Internet, which received the highest number of mentions in both groups (98 and 81 for usefulness and 106 and 86 for ad visibility), stands out as the dominant medium. The usefulness of the Internet can translate into increased credibility of advertisements, which, in turn, intensifies the emotional reception of advertising messages. From a marketing perspective, this suggests that Internet-based advertisements perceived as helpful can evoke stronger emotional reactions and influence consumer attitudes. Research (Kumar, Madhuri, Shireesha, 2024) shows that personalized advertising content on the Internet, especially in e-commerce, increases consumer trust in advertisements and strengthens positive emotions toward the brand. Consumers value content tailored to their needs and expectations, leading to more engaged reception and a willingness to interact with the advertised brand.

Social media platforms, particularly Facebook, Instagram, and TikTok, show high ad visibility (94, 88, and 77 mentions among female respondents, respectively), demonstrating their effectiveness in capturing user attention. However, their credibility is moderate. Similarly, mobile applications are frequently cited as visible advertising sources (83 and 62 mentions), likely due to their personalized nature.

Traditional media, such as print (press, flyers) and radio, received relatively low mentions across all categories, indicating their diminishing role in clothing advertising strategies. Billboards, on the other hand, demonstrated higher ad visibility (71 and 46 mentions), suggesting their potential effectiveness in public spaces, despite lower usefulness in purchasing decisions.

Data analysis shows that digital media are critical in clothing advertising strategies, while traditional media are losing significance in the face of more interactive and accessible digital channels. More frequent exposure to media leads to greater familiarity with advertising messages, potentially amplifying positive reception. Research (Lou, Yuan, 2019) indicates that personalized advertising content increases credibility and emotional engagement among audiences. Consumers are more likely to trust advertisements that seem relevant and aligned with their expectations, leading to higher interaction levels with the brand.

Analysis of Internet credibility reveals that 130 respondents perceive it as a credible source of information (while 46 rated it as not credible). The dominance of positive credibility assessments suggests that respondents are inclined to trust media content. This trust can significantly influence the emotional reception of advertisements, particularly if audiences perceive the ads as extensions of reliable information. Studies (Ghanbarpour, Sahabeh, Gustafsson, 2022; Google, 2022; QUALID, 2023) show that media credibility is one of the key factors affecting advertising effectiveness, as audiences are more likely to accept an advertising message when it is associated with a trustworthy source. Research (Sriram, Namitha, Kamath, 2021) indicates that social media advertisements leveraging credible sources and personalized messages effectively build trust and positive emotions in audiences. Recommendations and content from credible social media profiles intensify consumer emotional reactions, such as trust and affinity, thereby enhancing brand loyalty. Furthermore, a study (Mofokeng, 2021) found that the interactivity of social media strengthens audience engagement, with message credibility being a critical element of effective advertising communication. Consumers who perceive a medium as trustworthy are more likely to interact with advertisements, leading to deeper engagement and stronger brand relationships. Thus, media credibility not only enhances advertising effectiveness but also intensifies emotional reactions, such as trust and loyalty to the brand.

Clothing advertisements, particularly those presented in digital media, utilize visual, emotional, and diverse content elements to build customer loyalty. However, the effectiveness of these techniques may vary depending on the gender of the audience, making it crucial to study reactions to different aspects of advertising for marketing strategies. Table 3 presents consumer preferences divided into women (F) and men (M), identifying advertising elements that capture the attention of each group.

Table 3.
Advertising Aspects That Capture the Attention of Women and Men

Advertising Aspects	Gender		
	F [%] (Women)	M [%] (Men)	Total [%]
Originality of the advertising content	44	36	80
Medium through which the advertisement is disseminated	26	19	46
Images, graphics, colors	47	39	86
Music, sound effects, voiceover	39	34	73
Slogans, taglines, descriptions	39	33	72

Cont. table 3.

Specific emotions influencing consumer attitudes and behaviors	30	18	48
Credibility and truthfulness of the message	44	36	80
Time of advertisement publication	20	17	37
Price information	46	40	87
Information about product features	40	34	74
Presentation of the product's appearance	45	39	84
Presence of famous individuals	15	11	27
Expert opinions	23	14	37
User reviews	39	27	67
Compliance with advertising laws and regulations (including copyrights and consumer rights)	29	24	53

Source: Own work.

The data in Table 3 reveal that both segments of respondents pay particular attention to several key aspects of advertising, though the intensity of these preferences varies. The most attention-grabbing aspect for both genders is price information (174 mentions: 93 women, 81 men), emphasizing the importance of clearly communicating price benefits in clothing campaigns. The second most significant aspect for both groups is images, graphics, and colors (173 mentions), with slightly greater importance for women (95 mentions), suggesting their higher sensitivity to visual elements in advertising.

Originality of the message and the credibility and truthfulness of the content are also highly valued (161 mentions each). This indicates that authenticity and innovation in advertising are critical for both genders, although women tend to pay more attention to these aspects. This suggests that audiences are highly aware of advertising content and actively engage with it—the greater the attention paid to an advertisement, the higher the likelihood of eliciting an emotional response, such as curiosity, affinity, or identification with the advertising message. Such engagement suggests that advertising content serves not only an informational but also an emotional function, impacting audiences on a personal level. This finding underscores the importance of carefully designed advertisements that can evoke positive emotions and influence consumer attitudes.

For elements such as music, sound effects, and voiceover (146 mentions), and slogans, taglines, and descriptions (145 mentions), the results also indicate a slight preference among women (78 mentions each). This may suggest their greater receptiveness to content designed to evoke emotions.

The presence of famous individuals was a less important factor for both groups (54 mentions), which may indicate a growing demand for authenticity and valuable information rather than just popular brand ambassadors. Men placed greater importance on expert opinions (74 mentions), which could suggest their stronger tendency to evaluate the functionality and reliability of products.

Price information and visual elements, such as images and colors, are key aspects of clothing advertisements for both genders. This aligns with Kumar, Madhuri, and Shireesha (2024) research, which highlights that attractive visual aesthetics and clear pricing messages enhance consumer engagement and trust in advertising campaigns. Women more frequently focus on emotional elements, such as music and slogans, as confirmed by findings from Chen Lou and Yuan (2019), which suggest that ads tailored to evoke emotions are more effective in building a connection with the brand.

The value placed on authenticity and originality by both genders underscores the growing need to create credible and creative advertising content. As noted by Sriram, Namitha, and Kamath (2021) and Ahmetoglu, Furnham, and Fagan (2014), advertisements with high credibility and substantial content generate stronger emotions, such as trust and affinity, leading to greater brand loyalty. Meanwhile, the low impact of celebrities in clothing advertisements reflects shifting consumer preferences, with a greater emphasis on authenticity over the popularity of brand ambassadors, in line with research by Mofokeng (2021).

4. Summary

The collected data allowed for the clustering of customers into three groups. The clustering process considered a range of variables that might influence customers' purchasing tendencies and reactions to advertising elements. The selected variables included persuasive aspects, advertising preferences, and gender. These variables were first numerically encoded and standardized during clustering to enable the k-means algorithm to form groups based on similarities in the respondents' answers. As a result of the analysis, the algorithm assigned respondents to three clusters that differed in terms of their responses to advertisements and their purchasing tendencies.

For the purposes of the study, it was assumed that the number of clusters would be 3, which corresponded to an intuitive division of respondents into groups with different approaches to advertisements. Next, the algorithm randomly selected 3 initial centroids (points representing the center of each cluster) in the multidimensional space (the space of responses to the questions). Each respondent was assigned to the nearest centroid based on the Euclidean distance (geometric distance in the multidimensional space). Then, the centroid of each cluster was recalculated as the arithmetic mean of all points (participants) assigned to that cluster. The process of assigning participants to clusters and updating the centroids was repeated until the clusters reached stability, meaning the centroids stopped changing.

As a result of the analysis, the algorithm assigned respondents to three clusters, which differ in terms of their reactions to advertisements and their purchasing tendencies, with the results presented in Figure 6.

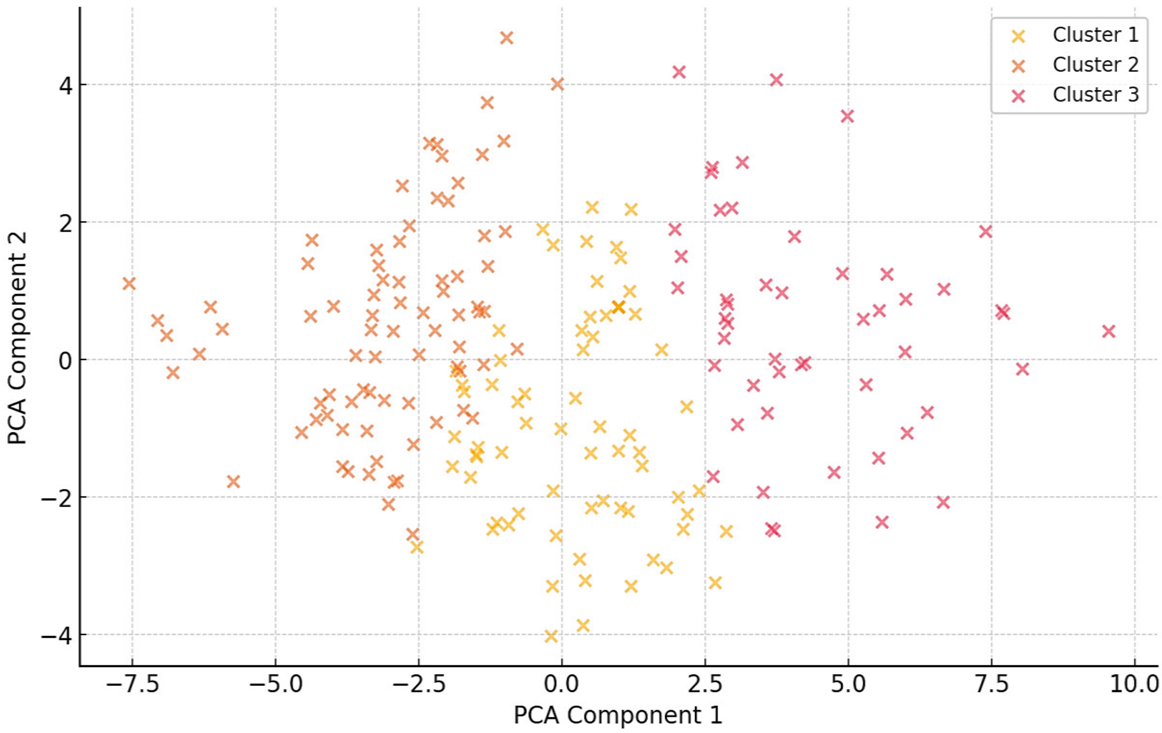

Figure 6. K-means Clustering Visualization.

Source: Own work.

Figure 6 contains axes described as the main dimensions of variability in the responses of the study participants. The values on the axes represent differences in the approach to the issues examined in the survey. Principal Component Analysis is a dimensionality reduction technique that transforms data into new axes, called "principal components". PCA Component 1 and PCA Component 2 are the two most important axes that explain the greatest variability in the data in the study. They include all variables considered in the analysis (i.e., the answers to the survey questions), but with different weights. Each component is a linear combination of the original variables. The weights (so-called "PCA loadings") determine how strongly each variable influences a given component – the higher the absolute value of the weight (i.e., the more distant from zero, either positively or negatively), the greater the influence of the variable on that component. PCA Component 1 is the axis that presents the largest possible level of variability in the responses in the study, while PCA Component 2 presents the next, smaller level of variability, independent of the first component. Questions with the greatest influence (i.e., PCA Component 1) included: "Clothing brand advertisements are persuasive to me"; "Clothing brand advertisements influence my purchasing decisions"; "Clothing brand advertisements effectively capture my attention"; "Visual elements (colors, images, graphics) in clothing advertisements influence my interest in the product"; "The involvement of well-known individuals (celebrities) in clothing advertisements increases my trust in the brand". For PCA Component 2, the questions were: "Promotions and special offers in clothing brand advertisements encourage me to purchase"; "Clothing brand advertisements align with my values and lifestyle"; "Clothing brand advertisements provide me with sufficient information about products"; "Clothing brand advertisements evoke positive emotions in me"; "I often recall clothing brand advertisements during shopping". The values on the axes, from -7.5 to 10, indicate the positions of individual points concerning these two main dimensions. These values are a measure of how much a given respondent differs from others in terms of the key traits identified by PCA.

The three clusters enabled conclusions useful in practice, such as tailoring marketing strategies to specific consumer groups. Each of the clusters represents a consumer profile, which facilitates translating the results into concrete business actions.

Cluster 1, referred as *Pragmatists with Low Purchasing Motivation* includes 36 men and 35 women. Customers in this group exhibit limited susceptibility to clothing advertisements. They are less influenced by persuasive advertising elements, such as emotional messaging or visual appeal, and place little importance on the presence of celebrities. However, they value specific product information and occasionally respond to promotions, although these are not their primary purchasing motivators. Their trust in brands and loyalty are moderate. The nearly equal number of men and women in this cluster suggests that both genders may adopt a similar pragmatic approach to advertisements, where rational arguments play a central role.

Cluster 2, referred as *Visual and Emotional Enthusiasts* includes 23 men and 21 women. Customers in this group are highly sensitive to the aesthetic and emotional elements of advertisements. They respond strongly to visually appealing campaigns that build positive associations with the brand. The presence of celebrities enhances their trust in the brand, while emotional messaging, such as feelings of prestige or happiness, effectively captures their attention. Promotions additionally motivate them to make purchases. The almost equal gender balance in this cluster indicates that both men and women are equally influenced by emotional and aesthetic advertising elements. This suggests that visual and emotional campaigns are equally effective in reaching both genders within this group.

Cluster 3, referred as *Cautious Price-Oriented Shoppers*, includes 50 men and 36 women. Consumers in this group adopt a pragmatic approach to advertising and shopping. They value transparent product information and place significant emphasis on price and promotions. Emotional and visual aspects of advertisements are not crucial to them, and they typically make purchases in response to specific, practical information. Brand loyalty is less important to this group than the value and benefits derived from the purchase. The higher number of men in this cluster suggests that male respondents are more likely than female respondents to prefer an analytical approach to advertisements, focusing on concrete product information and pricing rather than emotional or aesthetic aspects.

The study found that persuasive techniques used in clothing advertisements have a significant impact on different consumer groups, which was thoroughly analyzed by clustering respondents into three groups. Pragmatists are less susceptible to visual and emotional aspects of advertisements, focusing their attention on practical information such as price and product functionality. This group treats advertisements mainly as a source of information rather than inspiration, meaning their purchasing decisions are more dependent on economic factors.

Visual and emotional enthusiasts are represented by consumers who strongly respond to visual and emotional elements of advertisements, such as colors, images, or positive emotions. Sensitivity to these aspects is evenly distributed between genders, indicating the universal effectiveness of visual campaigns. Social media platforms, such as Instagram and TikTok, are key channels for reaching this group.

Price-conscious and cautious shoppers are a group particularly sensitive to promotions, discounts, and special offers. Their purchasing decisions are strongly influenced by economic factors, with online advertisements and mobile applications being their most important sources of shopping inspiration. Pragmatic attitudes are more visible in this group among men.

The article focuses on assessing the impact of persuasive techniques used in advertisements for clothing brands on consumers, and the study's goal was to identify the advertising elements that attract consumers' attention the most and enhance their trust in the brand. The study's results showed that this impact is a significant force shaping attitudes and purchasing decisions across the population, with noticeable differences resulting from the demographics and preferences of specific consumer groups.

Visual aspects, such as colors, images, and graphics, play a key role in attracting consumers' attention. They help advertisements effectively build a positive brand image. Consumers particularly appreciate the authenticity of the advertisement and its alignment with their values, which increases trust in the brand. The impact of these actions is visible in every group, although they have the strongest effect on visual enthusiasts.

Platforms like Instagram, TikTok, and Facebook dominate in capturing the attention of younger consumers, who are more susceptible to dynamic and engaging visual content. Video advertisements, especially on YouTube, effectively enhance the emotional perception of the brand, combining visuals, sound, and narrative into a coherent, inspiring whole. These media influence various segments of the population but are particularly effective in reaching younger audiences.

Promotions and discounts remain a key factor influencing the purchasing decisions of most consumers. Clear communication of economic benefits in advertisements significantly increases their effectiveness, especially among cautious shoppers who are primarily guided by product prices. This highlights the importance of adapting the advertising message to the pragmatic expectations of this group.

Therefore, clothing brands should tailor their advertising messages to the specifics of individual groups: for pragmatists, focus on functionality; for visual enthusiasts, on aesthetics and emotions; and for cautious shoppers, on economic benefits. Younger consumer groups are more susceptible to dynamic and emotional content that engages them in digital media. In contrast, older consumer groups expect more practical information that supports their rational purchasing decisions. The diversity of preferences between groups requires brands to be flexible in designing advertising campaigns.

Furthermore, to effectively engage modern consumers, clothing brands should create personalized messages using the potential of social media and mobile applications. It is important to remember that 21st-century clothing buyers primarily appreciate authenticity, consistency, and alignment with their values, which strengthens trust and loyalty to the brand.

References

1. Ahmetoglu, G., Furnham, A., Fagan, P. (2014). Pricing practices: A critical review of their effects on consumer perceptions and behaviour. *Journal of Retailing and Consumer Services*, *21(5),* pp. 696-707.
2. Alalwan, A.A., Rana, N.P., Dwivedi, Y.K., Algharabat, R. (2017). Social media in marketing: A review and analysis of the existing literature. *Telematics and Informatics*, *34*(7), 1177-1190. https://doi.org/10.1016/j.tele.2017.05.008
3. Hasibuan, A., Kembuan, D.R.E., Rantung, V.P., Tinambunan, M.H. (2023). Optimizing K-Means Clustering: A Comparative Study of Optimization Algorithms For Convergence And Efficiency. *Romanian Journal of Applied Sciences and Technology, 16*, pp. 70-75.
4. Anderson, E., Fox, E. (2019). How price promotions work: A review of practice and theory. In: *Economics of Marketing* (pp. 497-552). Available at: https://doi.org/10.1016/bs.hem.2019.04.006.
5. Awasthi, A. et al. (2024). The Role of Emotions in Consumer Brand Loyalty: A Neuromarketing Approach. *International Journal of Tourism & Hospitality in Asia Pacific*, *7(1),* pp. 104-116.
6. Barta, S. et al. (2023). Influencer marketing on TikTok: The effectiveness of humor and followers' hedonic experience. *Journal of Retailing and Consumer Services*, *70*. Available at: https://doi.org/10.1016/j.jretconser.2022.103149.
7. Berman, B. (2006). Developing an Effective Customer Loyalty Program. *California Management Review*, *49(1),* pp. 123-148. Available at: https://doi.org/10.2307/41166.
8. Business Insider (2023). *Wyludnienie, starzenie i brak dzieci. Tak wygląda bilans 30 lat w polskiej demografii,* 11.11.2024.
9. Cazin, N. (2021). Five Themes for the Progression of Fashion in 2021 and Beyond. *Euromonitor,* 21.11.2024.
10. De Veirman, M., Cauberghe, V., Hudders, L. (2017). Marketing through instagram influencers: The impact of number of followers and product divergence on brand attitude. *International Journal of Advertising*, *36*(5), 798-828. https://doi.org/10.1080/02650487.2017.1348035

11. Deloitte (2023). *Global Powers of Retailing 2023. Revenue growth and continued focus on sustainability,* 4.11.2024.
12. Djafarova, E., Rushworth, C. (2017). Exploring the credibility of online celebrities' Instagram profiles in influencing the purchase decisions of young female users. *Computers in Human Behavior*, *68*, 1-7. https://doi.org/10.1016/j.chb.2016.11.009
13. Ebrahim, R.S. (2020). The Role of Trust in Understanding the Impact of Social Media Marketing on Brand Equity and Brand Loyalty. *Journal of Relationship Marketing*, *19(4),* pp. 287-308. Available at: https://doi.org/10.1080/15332667.2019.1705742.
14. Euromonitor International (2023). *Apparel and Footwear in Poland,* 4.11.2024.
15. Fromm Jeff, R.A. (2018). *Marketing to Gen Z: The Rules for Reaching This Vast-and Very Different--Generation of Influencers*. Amacom.
16. GEMIUS (2024). *E-commerce w Polsce,* 4.11.2024.
17. Ghanbarpour, T., Sahabeh, E., Gustafsson, A. (2022). Consumer response to online behavioral advertising in a social media context: The role of perceived ad complicity. *Psychology & Marketing*, *39(10),* pp. 1853-1870.
18. Google (2022). *Ads Safety Report*. Available at: https://services.google.com/fh/files/misc/2022_google_ads_safety_report.pdf, 17.11.2024.
19. Grewal, D., Levy, M. (2019). *M: Marketing*. McGraw Hill.
20. GUS (2024). *Ludność. Stan i Struktura oraz ruch naturalny w przekroju terytorialnym w 2024 r. Stan w dniu 30 czerwca,* 4.11.2024.
21. Jarzebski, M.P., Elmqvist, T., Gasparatos, A., Fukushi, K., Eckersten, S., Haase, D., Goodness, J., Khoshkar, S., Saito, O., Takeuchi, K., Theorell, T., Dong, N., Kasuga, F., Watanabe, R., Sioen, G.B., Yokohari, M., Pu, J. (2021). Ageing and population shrinking: implications for sustainability in the urban century. *Npj Urban Sustainability*, *1*(1), 17. https://doi.org/10.1038/s42949-021-00023-z
22. Johnstone, L., Lindh, C. (2022). Sustainably sustaining (online) fashion consumption: Using influencers to promote sustainable (un)planned behaviour in Europe's millennials. *Journal of Retailing and Consumer Services*, *64*, 102775. https://doi.org/10.1016/j.jretconser.2021.102775
23. Kaushik, M., Choudhary, S., Choudhary, M. (2024). Impact of Emotional Marketing on Consumer Decision Making: A Review. *International Journal for Multidisciplinary Research*, *6(2).* Available at: https://doi.org/10.54254/2753-7048/38/20240636
24. Kim, A.J., Ko, E. (2010). Impacts of Luxury Fashion Brand's Social Media Marketing on Customer Relationship and Purchase Intention. *Journal of Global Fashion Marketing*, *1*(3), 164-171. https://doi.org/10.1080/20932685.2010.10593068
25. KPMG (2019). *Rynek mody w Polsce. Wyzwania,* 4.11.2024.
26. Kumar, B.R., Madhuri, A., Shireesha, M. (2024). Exploring the Role of Personalization in E-commerce: Impacts on Consumer Trust and Purchase Intentions. *European Economics Letters*, *14(3),* pp. 907-919.

27. Lemon, K., Verhoef, P. (2016). Understanding Customer Experience Throughout the Customer Journey. *Journal of Marketing*, *80(6),* pp. 69-96. Available at: https://doi.org/10.1509/jm.15.0420.
28. Lou, C., Yuan, S. (2019). Influencer Marketing: How Message Value and Credibility Affect Consumer Trust of Branded Content on Social Media. *Journal of Interactive Advertising*, *19*(1), 58-73. https://doi.org/10.1080/15252019.2018.1533501
29. Makosz, P. (2023). *Wartość rynku odzieżowego w Polsce w 2023 roku*. https://fashionbiznes.pl/wartosc-rynku-odziezowego-polska-2023/, 4.11.2024.
30. Marks, T. (2020, June 30). Fashion, Ageing and Sustainability: A Capsule Collection Addressing the Wardrobe Desires of the Over Fifty Female. *Sustainability in Fashion*. https://doi.org/10.31274/susfashion.11539
31. Mazur, W., Niedobecka, M. (2024). *Omnichannel w strategii komunikacji programów lojalnościowych*. Available at: https://sare.pl/wp-content/uploads/2024/09/SARE-XX-Badanie-Omnichannel-w-strategii-komunikacji-programow-lojalnosciowych_2.pdf, 17.11.2024.
32. mBank (2024). *Rynek handlu odzieżą damską w Polsce,* 4.11.2024.
33. Mc Kinsey (2023). *Business of Fashion (2023). The state of Fashion 2024,* 4.11.2024.
34. Mikołajczyk, Z. (2023). *Raport: 6 innowacyjnych strategii, jak budować lojalność w 2023,* 17.11.2024.
35. Mofokeng, T. (2021). The impact of online shopping attributes on customer satisfaction and loyalty: Moderating effects of e-commerce experience. *Cogent Business & Management*, *8(1).* Available at: https://doi.org/10.1080/23311975.2021.1968206.
36. Mothersbaugh, D., Bardi Kleiser, S., Hawkins, D. (2024). *Consumer Behavior: Building Marketing Strategy*. McGraw Hill.
37. QUALID (2023). *Jakośc reklamy cyfrowej. Raport z badania*, 17.11.2024.
38. Romeh, R. et al. (2024). Psychology of the color of advertising in marketing and consumer psychology. *Journal of Textiles, Coloration and Polymer Science.* Available at: https://doi.org/10.21608/jtcps.2024.259025.1272.
39. Siuda, P. (2016). Ankieta internetowa: zalety i wady – rekapitulacja. In: *Metody badań online*.
40. Słupska, U., Andrzejewska, N. (2024). Odziaływanie reklam internetowych na decyzje zakupowe internautów. In: *Współczesne problemy gospodarcze ekonomiczne i zarządcze wyzwania w obliczu szoków zewnętrznych i wewnętrznych*, pp. 230-247.
41. Sriram, K., Namitha, K., Kamath, G. (2021). Social media advertisements and their influence on consumer purchase intention. *Cogent Business & Management*, *8(1).*
42. Smith, K.T. (2011). Digital marketing strategies that Millennials find appealing, motivating, or just annoying. *Journal of Strategic Marketing*, *19*(6), 489-499. https://doi.org/10.1080/0965254X.2011.581383

43. Twigg, J. (2013). *Fashion and Age*. Bloomsbury Publishing Plc. https://doi.org/10.2752/9781474290340
44. Weibel, D. et al. (2019). TV vs. YouTube: TV Advertisements Capture More Visual Attention, Create More Positive Emotions and Have a Stronger Impact on Implicit Long-Term Memory. *Frontiers in Psychology* [Preprint]. Available at: https://doi.org/10.3389/fpsyg.2019.00626.
45. Żurek, J. (2024). *Branża odzieżowa w Polsce*. https://blog.arvato.pl/branza-odziezowa-w-polsce/, 4.11.2024.

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EDUCATION FOR SUSTAINABLE BUSINESS – AN ANALYSIS OF ESG POSTGRADUATE STUDIES OFFERINGS IN POLAND

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Purpose: The purpose of this paper is to identify opportunities for competence development and managerial education in corporate sustainability activities in an ESG (Environmental, Social and Governance) perspective.

Design/methodology/approach: The paper has been prepared based on a review of literature and online sources. An analysis of 30 ESG education programmes offered by universities in 15 cities across Poland was conducted. Data sourced directly from university websites, including programme duration, teaching hours, available learning formats and tuition fees, were utilised. Additionally, short telephone interviews were conducted with selected HR staff members of postgraduate programmes as part of the research process.

Findings: A wide selection of postgraduate studies covering various aspects of ESG is available in Poland. Results of the analysis reveal that the highest number of programmes are offered by universities in Warsaw (14) and Poznań (5). The average cost of ESG courses in Warsaw is EUR 2,163.28, while in Poznań it is EUR 1,647.83. In the remaining 13 locations, the average fee is EUR 1,581.03. The offer is dominated by programmes administered in a hybrid format, accounting for 47% of all courses.

Research limitations/implications: The list of examples of postgraduate ESG studies provides a general overview that may not be exhaustive. However, it raises awareness of available educational offerings and opportunities for education for sustainable business in Poland.

Practical implications: This paper can serve as a valuable source of information, particularly for prospective postgraduate students, by offering an overview of available programmes in the field of ESG.

Originality/value: By reviewing postgraduate educational programmes, analysing their content and learning formats, this paper provides insights into available opportunities in Poland for developing competencies in the ESG area, which are essential for effective implementation of sustainable development strategies within organisations.

Keywords: ESG, managerial education, postgraduate studies, sustainable development.

Category of the paper: Research paper.

1. Introduction

Environmental, social and internal governance factors, defined in the literature by the acronym ESG *(Environmental, Social and Governance)*, are becoming an integral part of enterprise management. This stems not only from necessity but also from broad changes in the legal and regulatory environment being established at the international level, particularly at the European level (Gemra et al., 2024, pp. 24-25).

Climate change and the consequent need to adapt to it necessitate legislative and institutional efforts to find solutions that mitigate or counteract environmental degradation with consideration for and balanced continuation of fulfilling societal needs. Consequently, enterprises and entrepreneurs face the challenge of adapting their operations and thinking about business in terms of *sustainability*, as measured by the three-pronged concept of ESG (Gemra et al., 2024). Viewed in this context, it can be stated that companies should strive to incorporate measures of *sustainability* into their business strategies, considering how their business activities impact the natural environment (environmental aspect), the social environment (social aspect) and internal governance principles (internal aspect).

To properly identify these measures, it is crucial not only to deepen existing knowledge but, above all, to acquire it in new areas. This is because ESG is an interdisciplinary "product" representing the convergence of exact, natural and social science disciplines. On the one hand, there is regulatory growth, synthetically embracing quantitative and qualitative methods for measuring compliance. On the other hand, there are environmental standards and indicators defining the characteristics of environmentally sustainable activity. This combination requires deepening knowledge in new areas, previously unrelated to business activities, and learning to analyse the enterprise-environment-society relationship in a multifaceted way. Understanding this correlation of factors, which jointly overlap and exert a reciprocal influence, requires building a workforce capable of appropriately managing the transformation process. This requires statutorily established educational institutions to develop courses and curricula that address the need to develop competencies and skills in the area of ESG (Grygiel-Tomaszewska et al., 2023).

2. The Role of Education for Sustainable Business

ESG is not a young concept in the market, having been known in the literature on the subject for 20 years (Łudzińska, 2024, p. 117). Nevertheless, its business consolidation in the Polish market has occurred over the last six years. This is a direct result of changes in the legal environment and, consequently, the business environment in the perception of how businesses operate. While lawmakers impose the need to manage ESG aspects on market actors (Gemra et al., 2024), consumers of goods and services themselves, through their consumer preferences, force businesses to adopt a transformational approach in which ESG factors begin to play a key role (Ślażyńska-Kluczek, Brzezek, 2023, p. 74). As a result, ESG is increasingly influencing internal management of this area in terms of compliance and the long-term impact on competitiveness and profits of companies (Ślażyńska-Kluczek, Brzezek, 2023, p. 74). In order to address these challenges, a proper understanding of the ESG issue and its impact on the future fate of individual sectors and businesses within them becomes crucial. Holistic training of personnel, who embody the change and understand the ongoing legal, regulatory and consumer breakthrough, is essential from this point of view.

3. Review of Postgraduate Studies in the Field of ESG in Poland

Polish universities are introducing and integrating ESG topics into their curricula at various levels and across multiple disciplines. Individuals seeking to build and develop businesses sustainably and responsibly require the expertise, practical skills and competencies necessary to implement sustainable practices in their organisations in an environmental, social and corporate governance perspective and to influence their development strategy (Studia Podyplomowe Strategiczna Transformacja ESG w Przedsiębiorstwie, n.d.; Zrównoważony rozwój przedsiębiorstwa – wdrażanie i raportowanie ESG, n.d.). Boards of directors and management executives of various types of organisations – companies, central and local government units, non-profit sector entities; business owners; employees responsible for preparing and implementing ESG strategies; those involved in ESG reporting in line with the CSR directive; employees dealing with communication, marketing, human resources management, investor relations, environmental protection (Kształcimy liderów przyszłości. Prowadzimy badania naukowe ważne dla sukcesu gospodarki, n.d.; Studia Podyplomowe ESG compliance w przedsiębiorstwie, n.d.) as well as those wishing to pursue a career in environmental management, sustainable supply chains, life cycle analysis and circular economy (Menedżer ESG. Studia podyplomowe WSIiZ, n.d.) are increasingly seeking ways to enhance their qualifications, develop their competencies and pursue managerial education in these areas. In response to the growing interest and demand, many Polish higher education institutions offer two-semester postgraduate studies focused on sustainable development and ESG issues.

The study analysed 30 ESG education programmes offered by universities in 15 cities in Poland. The data used was directly from the universities' websites. Additionally, short telephone interviews were conducted with selected HR staff members of postgraduate programmes as part of the research process. The criteria used to assess the potential of these programmes included the reputation and prestige of universities, measured by their position in national educational rankings (Ranking Szkół Wyższych Perspektywy, 2024) and the degree of recognition of Polish universities internationally. The analysis of the websites was conducted between September 20, 2024 and October 5, 2024. Table 1 presents a summary of these 30 programmes. It contains detailed information regarding location, names of the programmes, their duration, number of course hours, form of delivery, cost of attendance, and also includes a list of partners and patrons of the postgraduate study programmes.

Table 1.
Overview of selected postgraduate programmes in the field of ESG (figures as of September/October 2024)

No.	Location	Educational institution	Programme name	Duration		Mode of education (Form of study)	Tuition fee** [EUR]	Partner of the programme/Patronage
				Semesters [N]	Hours taught [N]			
1.	Bydgoszcz Łódź Toruń	WSB Merito University	Sustainable Development (ESG) for the Financial Sector	2	160	Hybrid – in-person and online classes. The curriculum includes 10 sessions	1,382.96	
2.	Dąbrowa Górnicza	WSB Academy	Sustainable Development and ESG	2	176	Distance education. Classes taught online	1,617.36	Partner of the programme: TÜV NORD Polska
3.	Gdańsk	University of Gdańsk	ESG Manager	2	168	Hybrid. First and last session are in-person. Remaining classes are online	1,265.76	
4.	Gdynia Gdańsk	WSB Merito University	Sustainable Development and ESG – Company Growth Strategy in the Age of the Latest EU Reporting Regulations	2	160	Distance education. Classes taught online	1,511.88	Partners of the programme: SGS Poland, FSD for sustainable development
5.	Gliwice	Silesian University of Technology	Sustainable Development and ESG in Industry	2	200*	In-person	1,758.00	
6.	Katowice	University of Economics in Katowice	Green Transformation Manager – ESG Reporting	2	190	Distance education. Classes taught online	1,336.08	Partners of the programme: EcoGreen, Polska Agencja Ewaluacji Sektora Publicznego S.A.
7.	Kielce	Świętokrzyskie University	ESG Reporting	2	No data	Hybrid – in-person and online classes	1,640.80	Partners of the programme: Teaching Academy in Malbork, Non-Public Teacher Training Centre NODN Progresfera, JLDA Institute, Świętokrzyskie University in Kielce, New Consulting Group, Kraków Institute for Education Development

Cont. table 1.

8.	Kraków	Kraków Business School at the Kraków University of Economics	ESG Manager	2	180	Group 1: Distance education Group 2: In-person education	1,875.20	Partner of the programme: WSE
9.	Poznań	Poznań University of Economics and Business	ESG Manager	2	160	Distance education – using distance learning methods and techniques (in the form of videoconferencing with synchronous interaction)	1,476.72	Programme administered in collaboration with TÜV NORD Polska
10.	Poznań	Poznań University of Economics and Business	Sustainable Development in Organisation Strategy and Non-Financial Reporting (ESG)	2	160	Distance education – using distance learning methods and techniques (in the form of videoconferencing with synchronous interaction)	1,476.72	
11.	Poznań	Adam Mickiewicz University in Poznań	ESG Compliance in Enterprises	2	120	Hybrid – in-person and online classes	1,828.32	
12.	Poznań	Collegium Da Vinci	ESG Management	2	180	Hybrid: 70% in-person 30% remote	1,933.80	Partner of the programme: KMPG
13.	Poznań	Poznań University of Technology	Sustainable Business Development – ESG Implementation and Reporting	2	190	Hybrid – in-person and online classes. Studies are administered during a maximum of 9 sessions per semester	1,523.60	
14.	Rzeszów	University of Information Technology and Management in Rzeszów	ESG Manager	2	180	Hybrid: ca. 80% online classes	1,593.92	Programme patronage: TÜV NORD Polska

Cont. table 1.

15.	Sopot	Sopot Academy of Applied Sciences	ESG in Practice	2	180	Distance education (80%), except for the first and last session, which are held on campus	1,992.40	Partners of the programme: ESO AUDIT, ARETE AUDIT Olga Petelczyc Programme patronage: SITO Strategy, Growth Through Diversity, Polish Institute for Human Rights and Business.
16.	Warsaw	Kozminski University	Sustainable Finance and ESG	2	192*	Hybrid. First and last classes in each semester are held on the Kozminski University campus (approximately 30% of contact hours), the rest are taught online	2,906.56	Partners of the programme: Bank Gospodarstwa Krajowego, CFA Society Poland, e-Mission, WM Advisory Poland Patronage: Chapter Zero Poland, UN Global Compact Network Poland
17.	Warsaw	Warsaw University of Life Sciences (SGGW)	ESG and Climate Transformation	2	160	Distance education – using distance learning methods and techniques, except for the first session, which is held in-person on the SGGW campus. The curriculum includes 10 sessions	1,359.52	The postgraduate studies are administered in collaboration with and under patronage of: National Chamber of Commerce, Rymarz Zdort Maruta, ESG Impact Network, TÜV SÜD Poland, ESG Consulting, SGGW Institute of Economics and Finance, ZGWRP, Go Green Community
18.	Warsaw	University of Warsaw, Faculty of Management	ESG Academy	2	150	In-person	2,203.36	Partners of the programme: pwc, IBM
19.	Warsaw	Warsaw University of Technology	ESG in Construction	2	192	In-person. A total of 12 sessions are planned. The university provides the option to attend in a hybrid format.	2,578.40	Programme created in consortium by the Faculty of Civil Engineering, Warsaw University of Technology, in collaboration with CMS law firm and ARCADIS sp. z o.o.

Cont. table 1.

20.	Warsaw	SWPS University	ESG Change Manager Managing Change for Sustainable Development	2	192	Hybrid: 60% in-person 40% remote	2,203.36	Partner of the programme: GPM Driving Sustainable Change
21.	Warsaw	Łazarski University	Compliance & ESG Officer	2	177	In-person	1,828.32	Partner of the programme: ICC Poland
22.	Warsaw	University of Warsaw, Faculty of Management	Sustainable Finance	2	200	Hybrid	2,062.72	
23.	Warsaw	Kozminski University	ESG Perspective. Responsible and Sustainable Management	2	188*	Hybrid. The curriculum includes 15 sessions (of which 5-6 are conducted online)	2,390.88	Partner of the programme: Deloitte
24.	Warsaw	Institute of Environmental Protection – National Research Institute	Sustainable Development and ESG Economy	2	240	In-person, hybrid or remote (student's choice). The curriculum includes 16 sessions	1,406.40	
25.	Warsaw	SGH Warsaw School of Economics	Strategic ESG Transformation in Enterprises	2	180	Hybrid. The first and last session are held in-person on campus. The rest are held online	2,320.56	Content partner of the programme: Studies administered in collaboration with KPMG
26.	Warsaw	SGH Warsaw School of Economics	ESG Business Models. Sustainable Development Reporting	2	160	In-person	2,273.68	
27.	Warsaw	SGH Warsaw School of Economics	Corporate Governance and ESG for Supervisory Board Members	2	160	Hybrid – in-person and online classes	2,086.16	Studies co-organised by SGH and the NadzórKorporacyjny.pl portal
28.	Warsaw	SGH Warsaw School of Economics	ESG Fundamentals for Business***	2	164	In-person. The curriculum includes 13 sessions	2,109.60	Partner of the programme: pwc

Cont. table 1.

29.	Wrocław	WSB Merito University	Sustainable Development and ESG Manager	2	176	Distance education – using distance learning methods and techniques. The curriculum includes 11 sessions	1,418.12	Partner of the programme: EY Academy of Business, Fairtrade Polska Foundation
30.	Warsaw	Managerial Academy of Applied Sciences	ESG in Business	2	160	Hybrid. Classes are taught online and in-person. Lectures and laboratory classes at KEZO Research Centre of the Polish Academy of Sciences are held in-person on selected Saturdays and Sundays.	2,554.96	Partners of the programme: Polish Academy of Sciences Research Centre for Energy Conversion and Renewable Sources (PAN KEZO), EY Academy of Business

* Number of hours taught, including examinations.
** Tuition fee for postgraduate studies, assuming a one-time payment. The tuition fee indicated in Polish zloty (PLN) has been converted into the international currency euro (EUR) based on the average exchange rate of the National Bank of Poland (NBP) as of January 10, 2025, where PLN 1.00 = EUR 0.2344.
*** English is the language of instruction for this programme.

Source: own work based on a review of online sources.

The ESG postgraduate studies offerings presented, while sharing some similarities, also exhibit significant differences. The programmes offer a wide range of specialisations covering various aspects of ESG, such as ESG Reporting, ESG Manager, ESG in Construction, ESG in Business, Responsible and Sustainable Management, Sustainable Finance, ESG Compliance in Business, and others.

The highest number of such courses are available in Warsaw, where universities offer a total of 14 programmes. These include programmes offered by the SGH Warsaw School of Economics (4), Kozminski University (2), University of Warsaw (2), Institute of Environmental Protection (1), Warsaw University of Life Sciences – SGGW (1), SWPS University (1), Managerial Academy of Applied Sciences (1), Łazarski University (1) and Warsaw University of Technology (1). Poznań ranks second in terms of the number of ESG postgraduate programmes, with 5 courses available. Studies there can be undertaken at the Poznań University of Economics and Business, which offers 2 courses, as well as at the Adam Mickiewicz University, Collegium Da Vinci and Poznań University of Technology. Postgraduate programmes are also offered in other cities such as Bydgoszcz, Łódź, Toruń, Dąbrowa Górnicza, Gdynia, Gdańsk, Sopot, Gliwice, Katowice, Kielce, Kraków, Wrocław and Rzeszów, although their number is significantly lower.

All postgraduate study programmes span 2 semesters, but the number of teaching hours varies depending on the course. The shortest course, "ESG Compliance in Enterprises", administered by the Adam Mickiewicz University in Poznań, comprises a total of 120 teaching hours, including 28 lecture hours and 92 hours of exercises and workshops. More intensive, longer programmes include "Sustainable Development and ESG Economy" offered by the Institute of Environmental Protection – National Research Institute in Warsaw, encompassing 240 hours, of which 165 are lectures and 75 are exercises, and "Sustainable Finance" at the University of Warsaw, comprising 200 hours of lectures and workshops. Most postgraduate programmes include 160 teaching hours (7 programmes) or 180 hours (5 programmes).

Among the listed study programmes, the language of lecture in 29 of them is Polish. The exception is the "ESG Fundamentals for Business" programme offered by the SGH Warsaw School of Economics, which is taught in English.

Tuition fees for postgraduate studies in ESG vary, reflecting the diversity of educational programmes. The most expensive postgraduate studies in ESG are "Sustainable Finance and ESG" administered by the Kozminski University, priced at EUR 2,906.56. The next highest fees are for "ESG in Construction" at the Warsaw University of Technology (EUR 2,578.40) and "ESG in Business" at the Managerial Academy of Applied Sciences in Warsaw (EUR 2,554.96). The least expensive programme, "ESG Manager", is offered by the University of Gdańsk at EUR 1,265.76. These studies are conducted in a hybrid mode, with the first and last sessions held in-person and the remaining classes taught online. Other cost-effective options include "ESG and Climate Transformation" at the Warsaw University of Life Sciences – SGGW (EUR 1,359.52) and "Green Transformation Manager – ESG Reporting"

(EUR 1,336.08) at the University of Economics in Katowice. Both programmes are delivered online, which likely contributes to their lower cost. In Warsaw, fees for postgraduate studies in ESG range from EUR 1,359.52 to EUR 2,906.56, while in Poznań they range from EUR 1,476.72 to EUR 1,933.80. The average cost for such studies in the remaining 13 locations is EUR 1,581.03.

Postgraduate instruction is delivered in in-person, hybrid (classes are held both online and in-person) and remote modes (classes are conducted entirely online using distance learning methods and techniques). The majority of programmes, as many as fourteen (47%), are delivered in a hybrid format. Nine courses offer remote curricula (30%), while the smallest number, six courses (20%), are administered in-person, five of which in Warsaw. The Institute of Environmental Protection – National Research Institute is the only institution that allows students to choose their learning format, offering studies in in-person, hybrid or remote modes, depending on participant preference.

Out of the thirty available postgraduate programmes, the vast majority (70%) were created or are administered in collaboration with industry partners, including international advisory firms, research institutes, consulting firms and non-governmental organisations. Among the partners of ESG postgraduate programmes are TÜV NORD Polska, EY Academy of Business, KPMG, Deloitte, pwc, IBM, the Warsaw Stock Exchange (WSE), Fairtrade Poland Foundation, GPM Driving Sustainable Change, Foundation for Sustainable Development (FSD), Bank Gospodarstwa Krajowego (BGK) and Chapter Zero Poland. These partners provide additional content support, enriching the programmes with practical knowledge and helping to ensure the currency of curricular content, aligning it with current trends and market needs.

4. Summary

The range of postgraduate studies in ESG in Poland is diverse in terms of programmes, locations, teaching hours, costs and learning modes. All postgraduate programmes last 2 semesters, encompassing between 120 and 240 teaching hours, with almost half of the courses comprising 160 or 180 hours. Tuition fees range from EUR 1,265.76 (University of Gdańsk) to EUR 2,906.56 (Kozminski University). In Warsaw, the average fee for postgraduate studies in ESG is EUR 2,163.28, while in Poznań it is EUR 1,647.83. In the remaining 13 cities, the average tuition fee is EUR 1,581.03. Study programmes are administered in in-person, hybrid or remote modes, with the hybrid mode being the most frequently available option (47%). It is worth emphasising that the vast majority of the courses are conducted in collaboration with industry partners. Programme partners include well-known industry organisations, scientific and research institutions, international consulting and advisory firms and institutions supporting sustainable development. This ensures that participants gain not only theoretical knowledge but also practical skills aligned with contemporary standards and addressing the growing labour market demand for specialists in this field.

Education in the field of ESG is important from the point of view of market attractiveness, not only for the employees themselves, but especially for companies. Study programmes offered on the Polish didactic market are characterized by a range of topics and the degree of sophistication of the knowledge transferred. Such differentiation allows not only to acquire new knowledge and skills, but also to deepen the knowledge already possessed. A key aspect of the analysed programmes is their interdisciplinary nature and close cooperation between academia and business. This allows for duality in meeting needs by adjusting the programmes during their duration. Objectively, the close cooperation of business and academia in the ESG field makes it possible to combine theoretical knowledge with market practice. This provides an opportunity for students to properly understand the concept of ESG and put the knowledge gained into practice.

References

1. *Akademia ESG – kompleksowe podejście do strategii zrównoważonego rozwoju.* Retrieved from: *https://wz.uw.edu.pl/kandydat/projekty-wspolne/akademia-esg/,* 24.09.2024.
2. *Compliance & ESG Officer.* Retrieved from: https://ckp.lazarski.pl/studia-podyplomowe/akademia-compliance/compliance-esg-officer/#pick-2, 2.10.2024.
3. Dwojak, Ł. (2023). Rola banków we wdrażaniu przez podmioty gospodarcze strategii ESG. *Zeszyty Naukowe Wyższej Szkoły Bankowej w Poznaniu*, *102*(3), 65-80. Retrieved from: https://doi.org/10.58683/dnswsb.1933.
4. *ESG Change Manager. Zarządzanie zmianami na rzecz zrównoważonego rozwoju*. Retrieved from: https://swps.pl/oferta/krakow/podyplomowe/biznes-zarzadzanie/esg-change-manager-zarzadzanie-zmianami-na-rzecz-zrownowazonego-rozwoju, 2.10.2024.
5. *ESG Management*. Retrieved from: https://cdv.pl/studia-podyplomowe/hr-zrzadzanie/esg-management/, 24.09.2024.
6. *ESG w biznesie*. Retrieved from: https://podyplomowe.mans.org.pl/esg/, 2.10.2024.
7. *ESG w budownictwie*. Retrieved from: https://www.pw.edu.pl/studia/studia-podyplomowe/esg-w-budownictwie, 2.10.2024.
8. *ESG w praktyce – online. Program studiów.* Retrieved from: https://sopocka.edu.pl/wp-content/uploads/2024/05/Program-ESG-w-praktyce-online-2024-25.pdf, 24.09.2024.
9. *ESG w praktyce*. Retrieved from: https://sopocka.edu.pl/kierunki/esg-w-praktyce/, 23.09.2024.

10. Gemra, K., Grygiel-Tomaszewska, A., Ocicka, B., Panas, J., Rudzka, I., Turek, J. (2024). Zarządzanie aspektami ESG–wyzwania i szanse dla zrównoważonej transformacji. *Kwartalnik Nauk o Przedsiębiorstwie*, *71*(1), 23-39.
11. Grygiel-Tomaszewska, A., Trawińska-Konador, K., Budzewski, M., Mikołajek-Gocejna, M., Sienkiewicz, Ł. (2023). Kompetencje sektorowe wspierające zrównoważone finanse i inwestycje ESG. *Sektorowa Rada Ds. Kompetencji Finanse*. Retrieved from: https://rada.wib.org.pl/wp-content/uploads/2023/09/Raport_koncowy_ESG_20230918.pdf
12. Jędrzejka, D. (2014). Ujawnienia ESG polskich spółek giełdowych w świetle wyników badań. *Studia Ekonomiczne*, *186, cz 2*, 13-26.
13. *Kształcimy liderów przyszłości. Prowadzimy badania naukowe ważne dla sukcesu gospodarki.* Retrieved from: https://ue.poznan.pl/kandydaci/studia-podyplomowe/?section-id=icon-boxes-studies-1&ibs-type=&ibs-area=2573&gad_source=1&gclid=EAIaIQobChMIzPOA6OLuhwMV0ZmDBx1H-g6wEAAYASAAEgK42vD_BwE#scroll-to=icon-boxes-studies-1, 20.10.2024.
14. Łudzińska, K. (2024). *Od społecznej odpowiedzialności do ESG w zarządzaniu. Wybrane aspekty.* Wydawnictwa Uniwersytetu Warszawskiego. Retrieved from: https://doi.org/10.7172/978-83-235-6498-0.swwz.22.
15. *Menedżer ESG Studia podyplomowe*. Retrieved from: https://ksb.uek.krakow.pl/studia-podyplomowe/menedzer-esg/, 23.09.2024.
16. *Menedżer ESG*. Retrieved from: https://ue.poznan.pl/kandydaci/studia-podyplomowe/menedzer-esg/, 20.10.2024.
17. *Menedżer ESG. Studia podyplomowe WSIiZ*. Retrieved from: https://podyplomowe.wsiz.edu.pl/studia-podyplomowe/menedzer-esg/, 02.10.2024.
18. *Menedżer zielonej transformacji—Raportowanie ESG (online)*. Retrieved from: https://www.ue.katowice.pl/studia-podyplomowe/kierunki-studiow-podyplomowych/menedzer-zielonej-transformacji-raportowanie-esg-online.html, 24.09.2024.
19. *Menedżer zrównoważonego rozwoju i ESG*. Retrieved from: https://www.merito.pl/wroclaw/studia-i-szkolenia/studia-podyplomowe/kierunki/menedzer-zrownowazonego-rozwoju-i-esg/program-studiow, 23.09.2024.
20. *Menedżer zrównoważonego rozwoju i ESG*. Retrieved from: https://www.merito.pl/wroclaw/studia-i-szkolenia/studia-podyplomowe/kierunki/menedzer-zrownowazonego-rozwoju-i-esg, 22.09.2024.
21. *Perspektywa ESG. Odpowiedzialne i zrównoważone zarządzanie*. Retrieved from: https://www.kozminski.edu.pl/pl/oferta-edukacyjna/studia-podyplomowe/perspektywa-esg-odpowiedzialne-i-zrownowazone-zarzadzanie-poprzednia-nazwa-csr-cele-zrownowazonego-rozwoju-w-strategii-firmy, 20.09.2024.
22. *Plan i program studiów podyplomowych. Zrównoważony Rozwój i Gospodarka ESG: Studia podyplomowe w Nowoczesnych Modelach Biznesowych*. Retrieved from:

https://ios.edu.pl/wp-content/uploads/2023/05/program-studiow-podyplomowych-esg-aktualizacja.pdf, 23.09.2024.
23. *Plan studiów podyplomowych „ESG compliance w przedsiębiorstwie”.* Retrieved from: https://prawo.amu.edu.pl/wp-content/uploads/2024/05/Plan-StPd-ESG.pdf, 23.09.2024.
24. *Postgraduate Studies in ESG Fundamentals for Business*. Retrieved from: https://www.sgh.waw.pl/all/postgraduate-and-mba-studies/postgraduate-studies-esg-fundamentals-business, 22.09.2024.
25. *Program - Akademia ESG - 2024/2025.* Retrieved from: https://wz.uw.edu.pl/wp-content/uploads/2024/07/program-2024_2025.pdf, 24.09.2024.
26. *Program studiów podyplomowych ESG Management rok akademicki 2024/2025.* Retrieved from: https://cdv.pl/wp-content/uploads/2023/12/ESG_Management_-rok-akademicki_2024_2025-1.pdf, 24.09.2024.
27. *Ranking Szkół Wyższych Perspektywy 2024*. Retrieved from: https://2024.ranking.perspektywy.pl/, 02.09.2024.
28. *Raportowanie ESG.* Retrieved from: https://sswkielce.edu.pl/raportowanie-esg/, 2.10.2024.
29. Smoleńska, A.P. (2023). Zrównoważone banki? Czynniki ESG w unijnych regulacjach mikroostrożnościowych. *Studia BAS*, *2*, 67-88. Retrieved from: https://doi.org/10.31268/StudiaBAS.2023.12.
30. *SP Menedżer ESG*. Retrieved from: https://old.ug.edu.pl/oferta_ksztalcenia/studia_podyplomowe/115370/sp_menedzer_esg, 22.09.2024.
31. *Studia Podyplomowe ESG compliance w przedsiębiorstwie*. Retrieved from: https://usosirk.amu.edu.pl/pl/offer/PODYPL2024/program/NP-ESG/?from=registration:PODYPL2024, 23.09.2024.
32. *Studia podyplomowe ESG compliance w przedsiębiorstwie—Wydział Prawa i Administracji UAM*. Retrieved from: https://prawo.amu.edu.pl/studia-doktoranckie-podyplomowe-i-kursy/studia-podyplomowe-esg-compliance-w-przedsiebiorstwie/, 23.09.2024.
33. *Studia Podyplomowe ESG i transformacja klimatyczna*. *Program studiów.* Retrieved from: https://spesg.sggw.edu.pl/, 23.09.2024.
34. *Studia Podyplomowe ESG i transformacja klimatyczna*. *Program studiów.* Retrieved from: https://spesg.sggw.edu.pl/program-studiow/, 23.09.2024.
35. *Studia Podyplomowe ESG w Budownictwie*. Retrieved from: https://spesg.il.pw.edu.pl/, 2.10.2024.
36. *Studia Podyplomowe Ład Korporacyjny i ESG dla Członków Rad Nadzorczych*. Retrieved from: https://www.sgh.waw.pl/studia-podyplomowe-i-mba/studia-podyplomowe-lad-korporacyjny-i-esg-dla-czlonkow-rad-nadzorczych, 22.09.2024.
37. *Studia podyplomowe Menedżer ESG*. Retrieved from: https://uslugirozwojowe.parp.gov.pl/wyszukiwarka/uslugi/podglad?id=2183434, 2.10.2024.

38. *Studia Podyplomowe Modele Biznesu ESG. Raportowanie Zrównoważonego Rozwoju*. Retrieved from: https://www.sgh.waw.pl/studia-podyplomowe-i-mba/modele-biznesu-esg-raportowanie-zrownowazonego-rozwoju, 22.09.2024.
39. *Studia Podyplomowe Strategiczna Transformacja ESG w Przedsiębiorstwie*. Retrieved from: https://www.sgh.waw.pl/studia-podyplomowe-i-mba/studia-podyplomowe-strategiczna-transformacja-esg-w-przedsiebiorstwie, 20.09.2024.
40. Ślażyńska-Kluczek, D., Brzezek, M. (2023). Czynniki ESG jako elementy zrównoważonego rozwoju wpływające na postrzeganie przedsiębiorstw przez konsumentów. *Kwartalnik Nauk o Przedsiębiorstwie*, *70*(4), 73-90.
41. Wróbel, P., Kowalski, S. (2022). Wymogi ESG a konkurencyjność przedsiębiorstw. *Fundacja Warszawski Instytut Studiów Ekonomicznych i Europejskich*. Retrieved from: https://resourcepoland.pl/images/pdf/RE-SOURCE_online.pdf.
42. Zabawa, J., Łosiewicz-Dniestrzańska, E. (2023). GRI (Global Reporting Initiative) jako standard raportowania informacji niefinansowych w obszarze ESG (Environmental, Social, Corporate Governance). Przypadek banków notowanych na Giełdzie Papierów Wartościowych w Warszawie. *Finanse i Prawo Finansowe*, *2*, 7-25. Retrieved from: https://doi.org/10.18778/2391-6478.S2.2023.01.
43. *Zrównoważone finanse i ESG.* Retrieved from: https://www.kozminski.edu.pl/pl/oferta-edukacyjna/studia-podyplomowe/zrownowazone-finanse-i-esg, 20.09.2024.
44. *Zrównoważone finanse—Podyplomowe Studium Prawno-Finansowe*. Retrieved from: https://wpia.uw.edu.pl/pl/studia/studia-podyplomowe/studia-podyplomowe-zrownowazone-finanse-podyplomowe-studium-prawno-finansowe, 2.10.2024.
45. *Zrównoważony rozwój (ESG) dla sektora finansowego.* Studia podyplomowe. Toruń: Uniwersytet WSB Merito. Retrieved from: https://www.merito.pl/torun/studia-i-szkolenia/studia-podyplomowe/kierunki/zrownowazony-rozwoj-esg-dla-sektora-finansowego, 2.10.2024.
46. *Zrównoważony rozwój (ESG) dla sektora finansowego.* Studia podyplomowe. Łódź: Uniwersytet WSB Merito. Retrieved from: https://www.merito.pl/lodz/studia-i-szkolenia/studia-podyplomowe/kierunki/zrownowazony-rozwoj-esg-dla-sektora-finansowego, 2.10.2024.
47. *Zrównoważony rozwój (ESG) dla sektora finansowego.* Studia podyplomowe. Bydgoszcz: Uniwersytet WSB Merito. Retrieved from: https://www.merito.pl/bydgoszcz/studia-i-szkolenia/studia-podyplomowe/kierunki/zrownowazony-rozwoj-esg-dla-sektora-finansowego, 2.10.2024.
48. *Zrównoważony rozwój i ESG – strategia rozwoju firmy w dobie najnowszych regulacji UE w zakresie raportowania.* Gdynia: Uniwersytet WSB Merito. Retrieved from: https://www.merito.pl/gdynia/studia-i-szkolenia/studia-podyplomowe/kierunki/zrownowazony-rozwoj-i-esg-strategia-rozwoju-firmy-w-dobie-najnowszych-regulacji-ue-w-zakresie-0, 2.10.2024.

49. *Zrównoważony rozwój i ESG – strategia rozwoju firmy w dobie najnowszych regulacji UE w zakresie raportowania.* Gdańsk: Uniwersytet WSB Merito. Retrieved from: https://www.merito.pl/gdansk/studia-i-szkolenia/studia-podyplomowe/kierunki/zrownowazony-rozwoj-i-esg-strategia-rozwoju-firmy-w-dobie-najnowszych-regulacji-ue-w-zakresie-0, 2.10.2024.
50. *Zrównoważony rozwój i ESG – strategia rozwoju firmy w dobie najnowszych regulacji UE w zakresie raportowania. Program studiów.* Retrieved from: https://www.merito.pl/gdansk/node/3387/study-program/pdf, 2.10.2024.
51. *Zrównoważony rozwój i ESG w przemyśle.* Retrieved from: https://irk.polsl.pl/pl/offer/REK2024_2025Z_POD/program/RM-ZRESGP/?from=org-unit:PS, 2.10.2024.
52. *Zrównoważony rozwój i ESG w przemyśle.* Retrieved from: https://rekrutacja.polsl.pl/kierunek/spd-zrowrozesg/, 2.10.2024.
53. *Zrównoważony rozwój i ESG*. Retrieved from: https://wsb.edu.pl/kierunki/studia-podyplomowe/studia-z-zakresu-zarzadzania/zrownowazony-rozwoj-i-esg.html, 2.10.2024.
54. *Zrównoważony Rozwój i Gospodarka ESG: Studia podyplomowe w Nowoczesnych Modelach Biznesowych*. Retrieved from: https://ios.edu.pl/studia-podyplomowe/zrownowazony-rozwoj-i-gospodarka-esg-studia-podyplomowe-w-nowoczesnych-modelach-biznesowych/, 20.09.2024.
55. *Zrównoważony rozwój przedsiębiorstwa – wdrażanie i raportowanie ESG*. Retrieved from: https://put.poznan.pl/zrownowazony-rozwoj-przedsiebiorstwa-wdrazanie-i-raportowanie-esg, 2.10.2024.
56. *Zrównoważony rozwój w strategii organizacji i raportowanie niefinansowe (ESG)*. Retrieved from: https://ue.poznan.pl/kandydaci/studia-podyplomowe/zrownowazony-rozwoj-w-strategii-organizacji-i-raportowanie-niefinansowe-esg/, 20.09.2024.

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DEVELOPMENT OF DECISION-MAKING SKILLS IN THE EDUCATIONAL PROCESS ACCORDING TO THE TEACHERS

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Purpose: The purpose of this paper is to comprehensively assess the level of skills acquired by school leavers, particularly in the areas of decision making, making decisions under conditions of uncertainty and risk, taking responsibility for one's decisions, making choices, setting goals, striving to achieve them and solving problems. The paper presents the results of a survey that have allowed us to determine the extent to which the pupils have acquired these skills during their education, according to the teachers who assess their development in these areas at different stages of their education.

Design/methodology/approach: In order to achieve this purpose, a quantitative method was used, based on a survey of 1472 primary and post-primary school teachers employed by educational institutions, including primary schools, vocational schools, high schools and technical secondary schools, located in one of 16 regions of Poland – the Kuyavia-Pomerania Province.

Findings: The findings of the conducted research indicate that the level of decision-making, goal-setting and goal-achieving as well as problem-solving skills among school leavers is most often assessed by teachers as average, which is dominant in all types of schools. Detailed analysis shows that better results in development of these skills are observed in high schools and vocational schools rather than among primary school and technical secondary school pupils. Extreme scores, both very high and very low, were rare in all types of schools.

Research limitations/implications: The survey was conducted among teachers from schools in the Kuyavia-Pomerania Province, making the results obtained representative for this region of Poland. At the same time, these results cannot be generalized to pupils from other provinces. Therefore, any conclusions apply exclusively to the surveyed group and region and their usage in a wider context may be limited.

Practical implications: The results of this study can provide valuable insights into the level of decision-making skills of school leavers in the Kuyavia and Pomerania region, which can help to adapt teaching methods to their developmental needs in this area.

Originality/value: This study can make an important contribution to the discussion on developing decision-making skills in the educational process of pupils at various stages of their education.

Keywords: decision making, education system, decision-making skills, level of education, primary and post-primary school pupils.
Category of the paper: Research paper.

1. Introduction

Decision-making is an essential part of management and its processes. There can be no proper management when the decision-making process is flawed. The absence of a properly and adequately defined decision-making process constitutes a significant constraint on operations, entailing exposure to an increase in the level of risks present and their materialization. Decision making is vital not only for taking specific actions but also for their successful completion. In decision making, the leader entrusted with decision-making powers assumes a pivotal role. They must possess a set of traits – both innate and acquired – that allow them to exercise correct judgement of the situation at hand and to develop an appropriate response. Decisiveness in this behavioral sense is undoubtedly a skill that one may or may not possess. In case of decisiveness, we are talking about coincidence of internal and external factors influencing the entire process.

Above all, a certain strength of character, independence of judgement and resistance to external influences that may be used to covertly pursue other agendas are essential. From the perspective of maintaining independence of judgement, proper prioritization and grading of existing and received information and data are crucial. To conduct an effective analysis, a decision maker must possess not only knowledge but also experience, collectively and colloquially known as intuition, which is not a phenomenon beyond the realm of scientific understanding but in fact one based upon it. Appropriate concurrence of these two factors – knowledge and experience – allows the decision-making process to be carried out correctly. Knowledge guarantees a proper analysis of the facts, while experience ensures their correct evaluation – both in terms of the present status and its impact on the future. Complexity of the decision-making process, particularly in situations involving a wide range of stakeholders, requires the consideration of numerous varying perspectives. It is essential for decisions not to be made solely by one individual but also to be based on the knowledge and experience of experts from various fields, opinions of teams and other groups involved in the process (Prorok, 2015, p. 83). Leveraging knowledge and experience plays a crucial part in minimizing the risk of making poor decisions.

This raises the question of where to acquire knowledge and where to gain experience. As a rule, knowledge is acquired through the process of education provided by legally recognized institutions that are constituent parts of general, vocational and academic education systems. Experience, on the other hand, is gained through daily life in various environments (home, school, work) where the degree of interdependence and interrelations shapes the patterns of our behavior and reactions to specific events. All these elements contribute to the decision-making process, the proper execution of which constitutes a significant factor in our successes and failures.

2. Meaning of Decision-Making Skills

Problem solving and decision making are key skills that play an important role in an effective teaching and learning process (Greenbank, 2010; Beyth-Marom et al., 2012). In education, considerable emphasis is placed on development of these competencies among pupils (Yurtseven et al., 2021, p. 2118; Ratcliffe, 1997; Majeed, 2021). As emphasized by Yurtseven et al. (Yurtseven et al., 2021, p. 2119), pupils assume an active role in the teaching and learning process, achieving results through effective utilization of decision-making skills. Decision making is considered to be one of the stages of problem solving. It is a process wherein the objective is to choose the best solution (Malewska, 2014, p. 127). Decision making is the process of choosing between two or more options (Greenbank, 2010) which can either be easy or difficult for the decision maker to select (Sever, Ersoy, 2019).

The art of decision making is a skill of particular import to pupils (Whitty, Wisby, 2007). It is recognized as one of the key higher-order thinking skills, essential for the academic as well as personal lives of pupils. It allows them to assess the validity of various outcomes and to choose the best alternative from among several available options (Majeed, 2021, p. 78). As they transition into adulthood, young people face the challenge of making complex decisions regarding their future (Zaleszczyk, Kot, 2016, 2019). Among these are choices related to education and career planning (Klementowska, 2016, p. 127; Eriksson et al., 2018; Brzezińska et al., 2016). The decision to choose a future profession constitutes one of the most consequential life choices and is subject to the same decision-making processes as other choices (Zaleszczyk, Kot, 2019). Therefore, it is essential for pupils to be cognizant of the available options and the consequences entailed by the decisions they make (Jaracz, Borkowska, 2010).

In this process, career counselors and teachers play a pivotal role in helping young people navigate this complex reality and supporting them in making choices about their future (Eriksson et al., 2018, p. 1900; Townsend, 2012, p. 114; Fischer, Taylor, 2012). As Townsend points out, the collaboration between teachers and pupils is fundamental for effective acquisition of knowledge, which translates into pupil success (Townsend, 2012, p. 114). In the educational process, teachers should enable pupils to make independent decisions as frequently as possible (Wilsz, 2018, pp. 176-177). Teachers' awareness in terms of the choice of teaching methods and the manner in which they are applied has a great impact on the quality of their work (Sterna, Strzemieczny, 2012, p. 127).

In addition, an important function in developing decision-making skills is played by curricula (Sever, Ersoy, 2019). Consequently, these skills should be conveyed at all stages of education and in all curricula in a coherent, direct and comprehensible manner (Sever, Ersoy, 2019, p. 167).

3. Methodology of Empirical Research

The objective of the study was to assess the impact of education on development of pupils' skills in the areas of decision making, making decisions under conditions of uncertainty and risk, taking responsibility for one's decisions, making choices, setting goals, achieving them and solving problems, as judged by the teachers, according to the type of school in which the respondents taught, namely high school, vocational school, primary school or technical secondary school.

The survey was conducted as part of a study of social attitudes towards transplantation, which included an additional module on development of decision-making skills in youth education. A total of 1,472 primary and post-primary school teachers in one of 16 regions of Poland, the Kuyavia-Pomerania Province, took part in the study. The research instrument was a survey questionnaire. The method of data collection from primary sources was an online survey. The survey was conducted electronically using the Google Forms tool in the month of February 2024.

This paper presents selected aspects of the conducted study which, among others, include answers to the following research questions: what is your assessment of the level of skills acquired in the educational process by school leavers in the following areas: (1) decision-making skill, (2) decision-making skill under conditions of uncertainty and risk, (3) ability to take responsibility for one's decisions, (4) choice-making skill, (5) goal-setting skill, (6) goal pursuit skill, (7) problem-solving skill.

4. Research Results

The subject of the study was a group of teachers working in schools and educational institutions, including primary schools, vocational schools, high schools and technical secondary schools. A total of 1472 teachers, including 1274 women (86.55%) and 198 men (13.45%), directly participated in the survey. The predominant group (600 respondents, 40.76%) were teachers aged 40-49 and the second largest group (491 persons) were teachers aged 50-59 (33.36%). The smaller age groups were teachers aged 30-39 (247 persons, 16.78%)

and the least numerous group – teachers aged 18-29 (35 persons, 2.38%). The group of teachers aged 60 and above included 99 persons, which accounted for 6.73% of the sample under study. It can therefore be assumed that all schools and institutions are dominated by teachers in the age bracket of 40 to 59, accounting for approx. 74.00% of all teachers (Table 1).

Table 1.
Respondents grouped by age and school type [%]

Breakdown	Groups				
	18-29 y.o.	30-39 y.o.	40-49 y.o.	50-59 y.o.	60+ y.o.
High school	0.61%	1.49%	4.48%	4.96%	0.75%
Vocational school	0.00%	0.41%	1.97%	1.02%	0.14%
Primary school	1.29%	11.55%	27.11%	23.78%	4.55%
Technical secondary school	0.48%	3.33%	7.20%	3.60%	1.29%
TOTAL	**2.38%**	**16.78%**	**40.76%**	**33.36%**	**6.73%**

Source: own work based on conducted research.

The second question of the demographic section aimed to determine the type of school in which the teachers work and teach. The largest group in the survey comprises primary school teachers, who constitute 68.27% of the total number of participants (1005 persons). The second largest group consists of teachers from technical secondary schools, representing 15.90% of the respondents (234 respondents). High school teachers make up 12.30% of the study participants (181 persons) and the smallest group is vocational school teachers, who account for 3.53% (52 persons) (Figure 1).

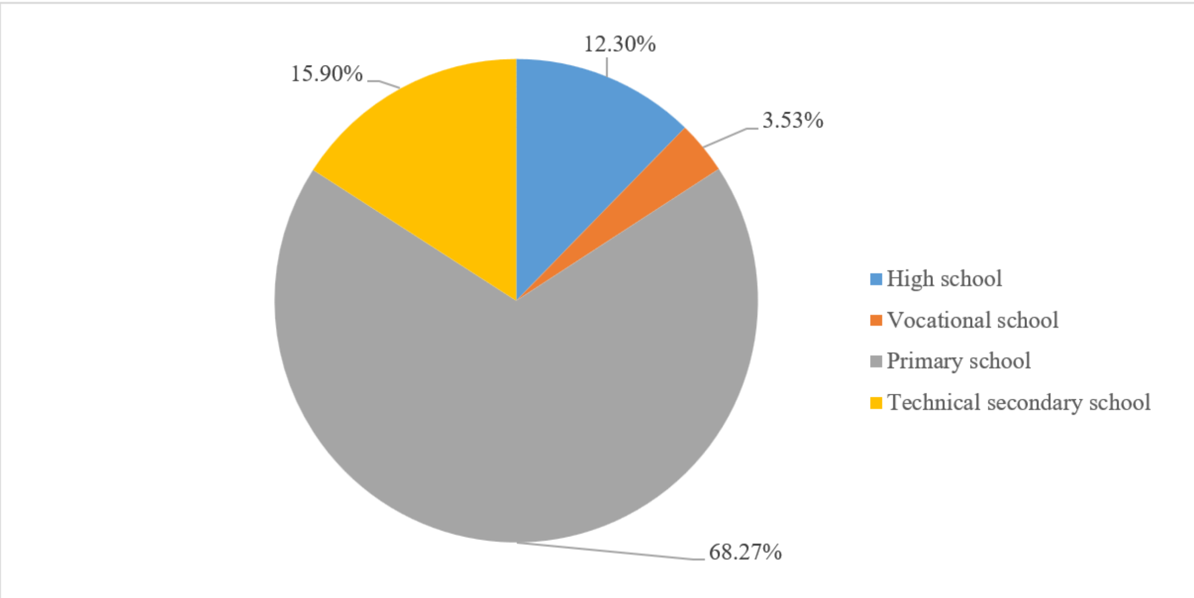

Figure 1. Type of school in which the respondents work [%].

Source: own work based on conducted research.

The first question that the teachers were asked allowed for an assessment of the decision-making skills among school leavers. A vast majority of the teachers (65.06%) rated pupils' decision-making skills as average. In turn, 15.57% of the teachers rated pupils' decision-making skills as low and 14.89% as high. Extreme ratings, both very low (2.31%) and very high (2.18%), were rare (Figure 2).

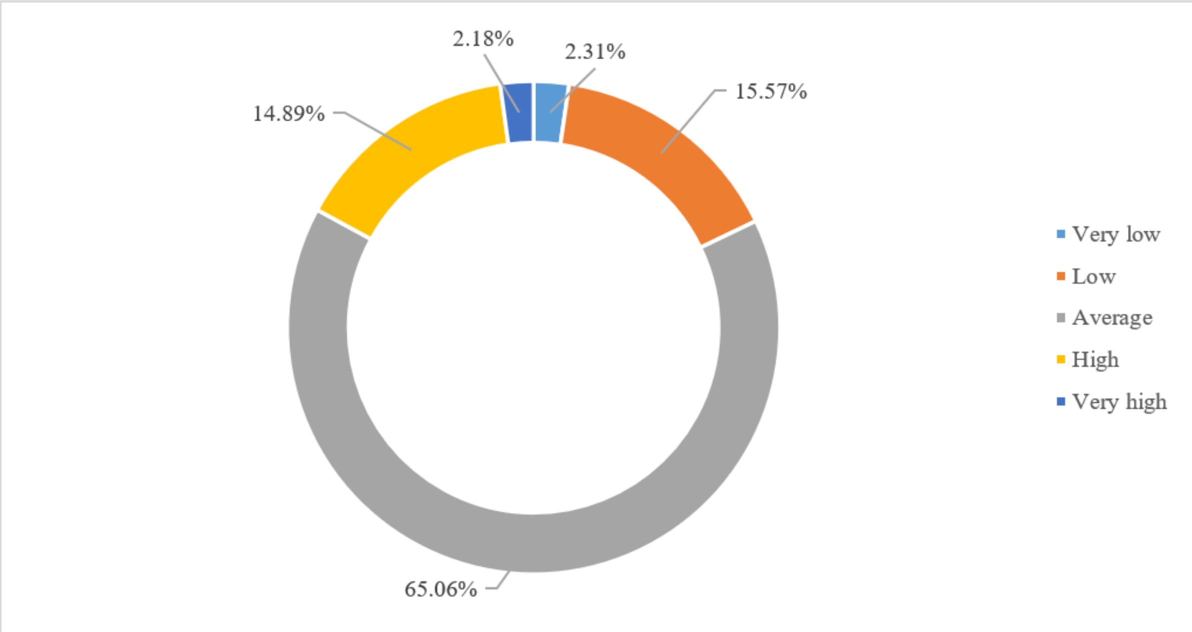

Figure 2. Level of development of the decision-making skill in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

The results for the pupils' decision-making skill in the different types of schools show some similarities as well as differences. In each of the schools under analysis, most pupils scored average. In high schools, 58.89% of pupils were rated average and 23.33% were rated high, which is a relatively high result. A low rating was awarded to 13.89% and a very high rating – to only 3.89% of pupils. In vocational schools, 65.38% of pupils received an average rating, 19.23% – high and 9.62% – low. Very low ratings were absent and very high ratings were given to 5.77%. In primary schools, 67.16% of pupils received an average rating, 17.31% – low and only 10.95% – high. Very low ratings accounted for 3.08% and very high ratings – for only 1.49%. In technical secondary schools, 60.68% of pupils scored average, 24.36% scored high, the highest of all types of schools, 10.68% scored low and as few as 2.99% scored very high. High schools and technical secondary schools had a higher percentage of pupils with high ratings, while primary and vocational schools were more likely to have teachers giving low ratings. Extreme ratings (very low and very high) were rare in all types of schools (Figure 3).

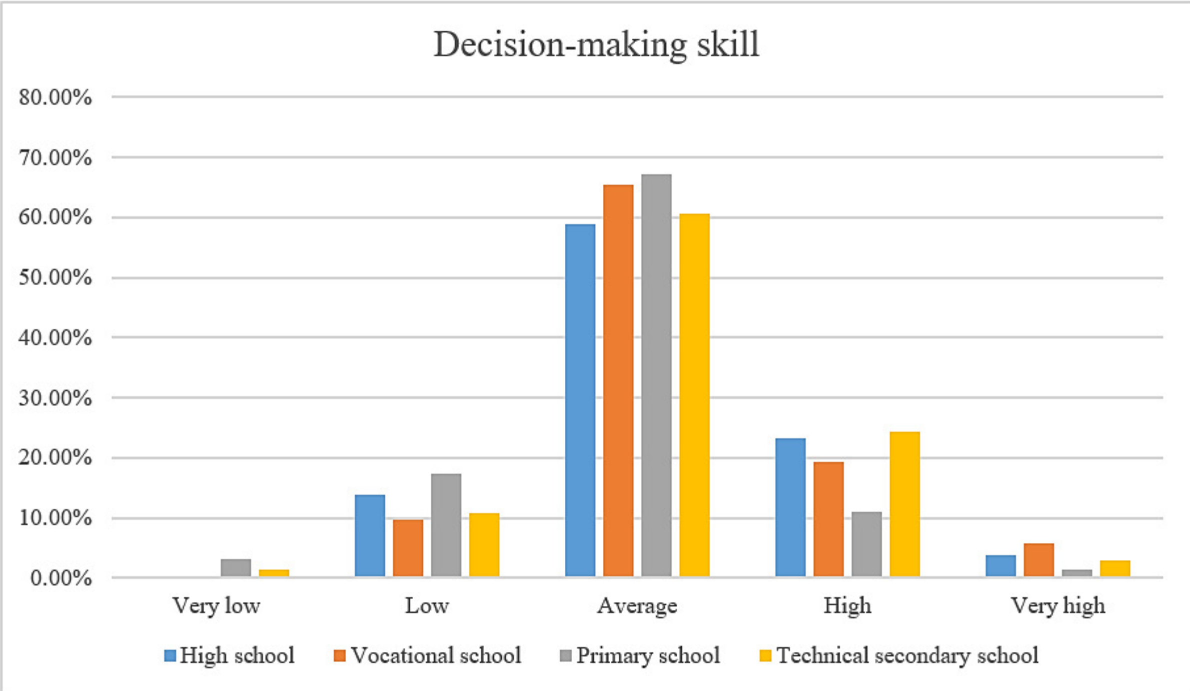

Figure 3. Level of development of the decision-making skill in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

The next question was about assessment of decision-making skills under conditions of uncertainty and risk. Considering the answers provided by the respondents as a whole, the results reveal that most teachers (46.23%) rated these skills as average. Over one-third of the pupils (36.57%) had a low rating and 8.02% – a high rating (Figure 4).

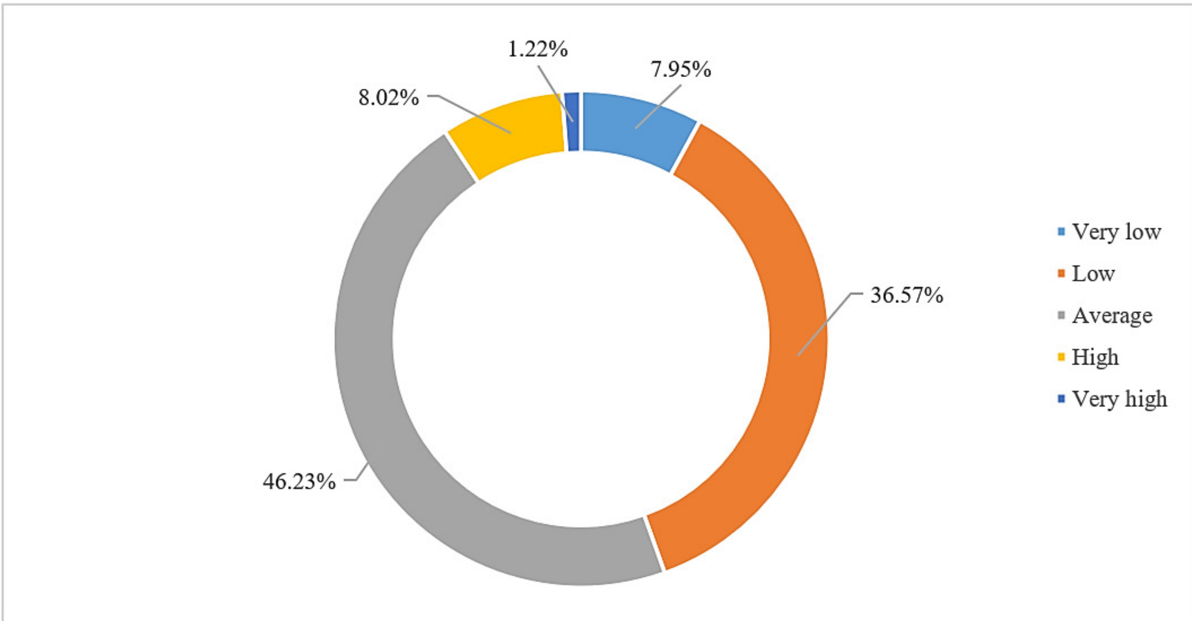

Figure 4. Level of development of the decision-making skill under conditions of uncertainty and risk in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

An investigation into acquisition of decision-making skills under conditions of uncertainty and risk shows differences between pupils from different types of school. Primary school pupils demonstrated the lowest levels of these skills, with as many as 46.67% falling into the very low and low categories, as rated by the respondents. High school teachers ranked the level of decision-making skills under uncertainty and risk as low and very low in 43.89% of pupils. Better results were noted in technical secondary schools and vocational schools. In technical secondary schools, as many as 50.43% of pupils achieve an average level of these skills, and in vocational schools this percentage is 48.08%. High and very high levels of competence in decision making are generally less frequent. They are primarily seen in high schools (15.00%) and vocational schools (13.46%), which may reflect favorable conditions in these institutions. In primary schools, on the other hand, only 7.27% of pupils were rated at this level by their teachers (Figure 5).

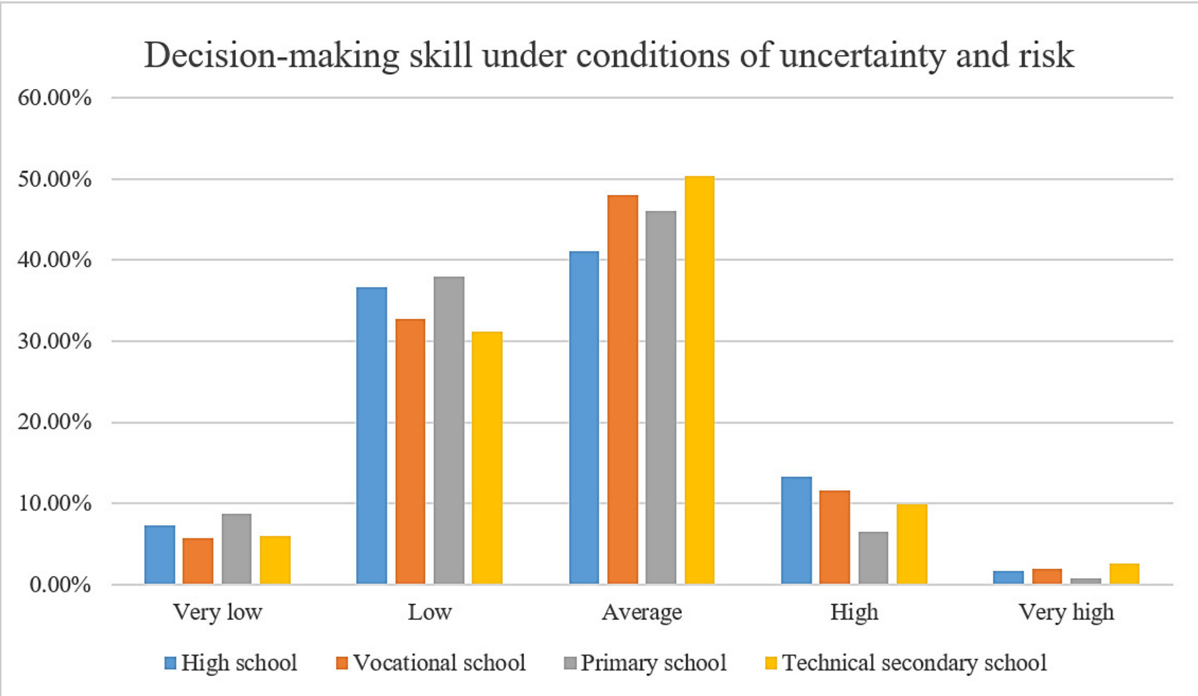

Figure 5. Level of development of the decision-making skill under conditions of uncertainty and risk in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

It is the opinion of half of the teachers (49.01%) that the level of school leavers' ability to take responsibility for their own decisions can be described as average. Every third teacher (32.77%) believes that the level of these abilities developed during education is low, while only one in ten respondents (10.06%) views them as high or very high (Figure 6).

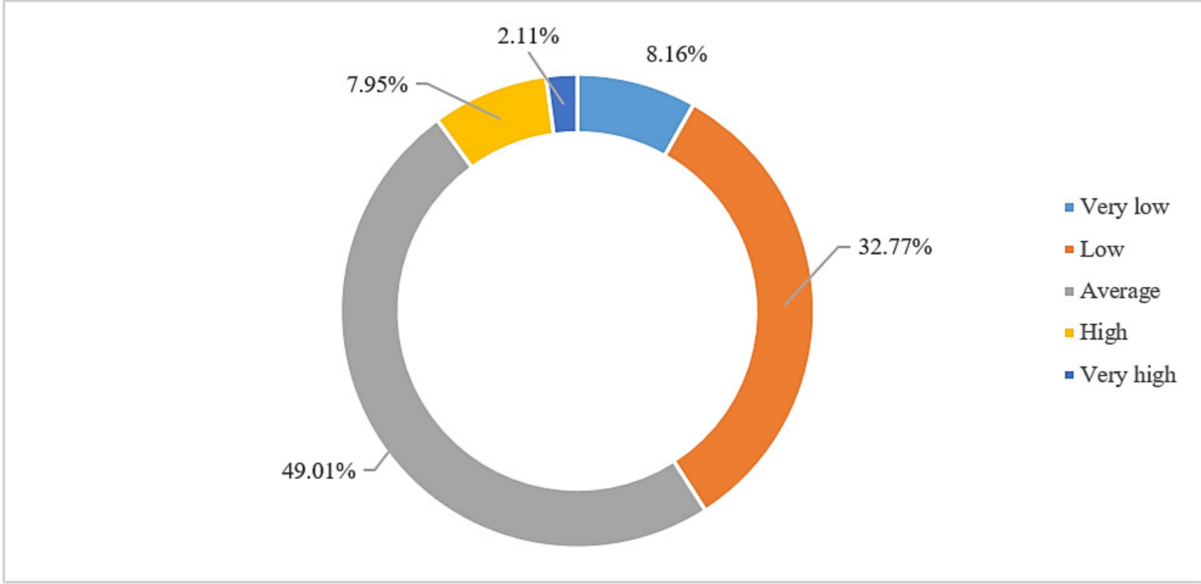

Figure 6. Level of development of the ability to take responsibility for one's decisions in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

When analyzed according to the type of school where the teachers work, the survey results demonstrate that the level of pupils' ability to take responsibility for their own decisions varies from one institution to another. In primary schools, teachers tend to rank these skills as average (49.65%) or low (33.23%). A similar tendency can be observed in high schools, where average ratings prevail as well (46.67%), and low levels of acquisition of these skills apply to 30.56% of pupils. In technical secondary schools, the average level of responsibility for decisions is reached by the highest percentage of pupils (50.43%), while low ratings appear less frequently (29.91%). In contrast, low ratings are predominant among teachers working in vocational schools (44.23%), and 38.46% of pupils show an average level of ability in this area. In all types of schools high and very high ratings are relatively rare; nevertheless, the highest levels of skills in respect of responsibility for one's own decisions acquired in the educational process by school leavers was recorded in high schools (11.67% – high and 3.33% – very high) (Figure 7).

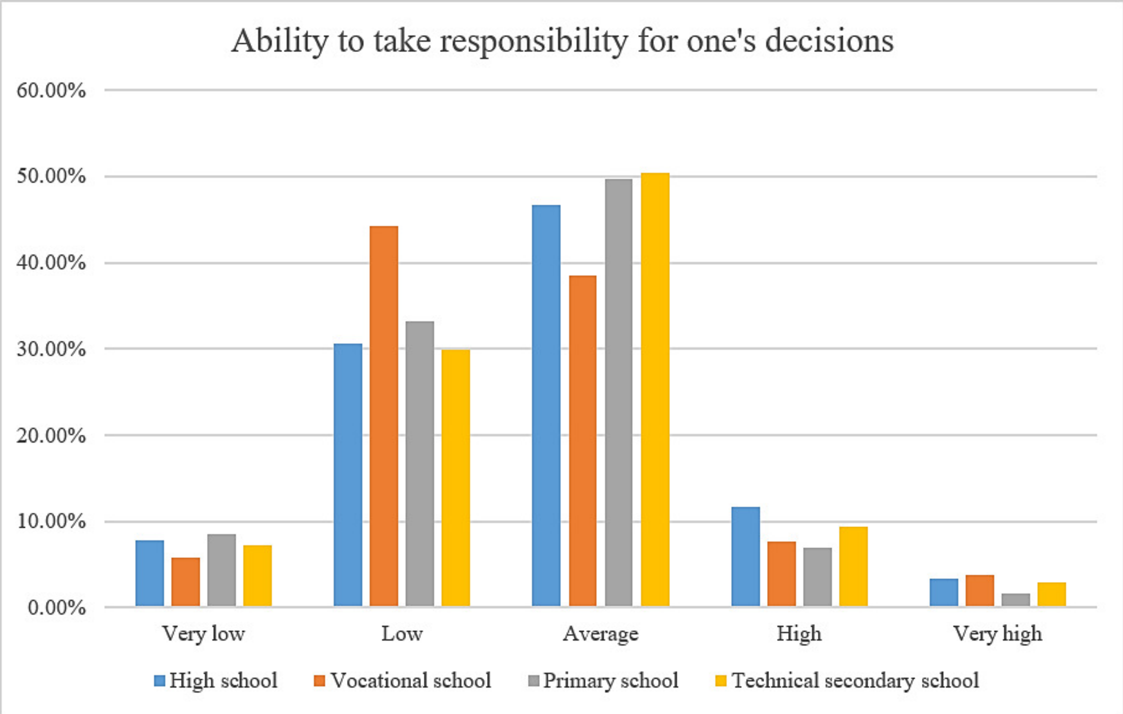

Figure 7. Level of development of the ability to take responsibility for one's decisions in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

According to the respondents, the level of development of choice-making skills among school leavers is most often rated as average (61.73%). A high level of these competencies was observed in 15.57% of pupils, while a very high level represented the smallest percentage, at only 1.97% (Figure 8).

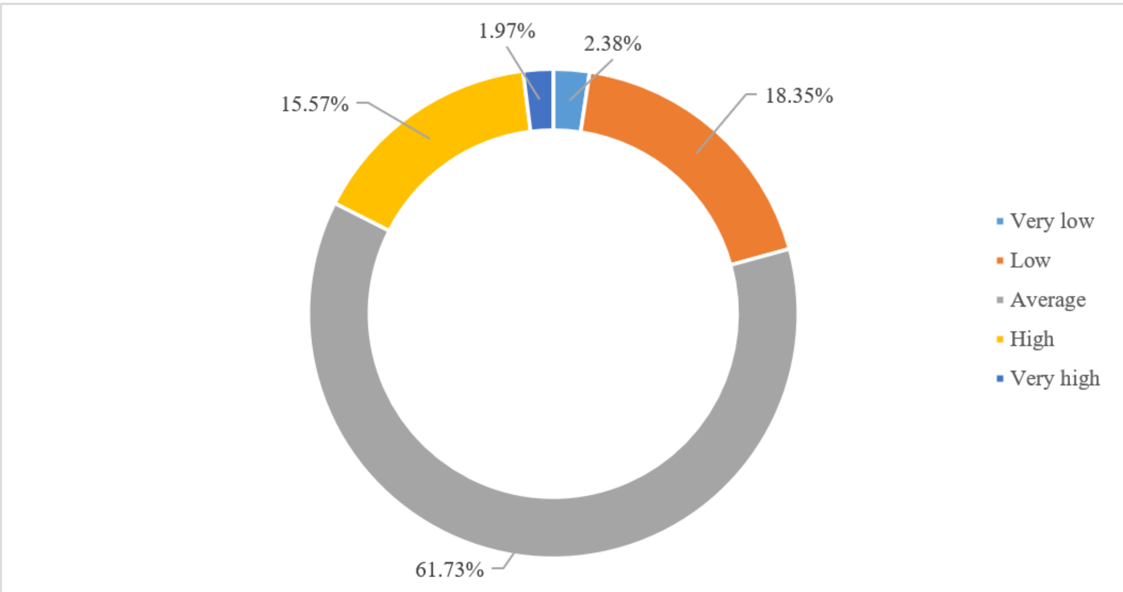

Figure 8. Level of development of the choice-making skill in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

The research findings for pupils' decision-making skills show clear tendencies across school types. In each type of institution, average ratings are prevalent, suggesting that pupils are generally reaching a sufficient level in terms of these skills. In primary schools, as many as 63.18% of pupils received an average rating, and in high schools the percentage was 58.89%. In vocational schools, apart from the average rating, there was a noticeably higher percentage of pupils who were assessed at a high level (21.15%). In turn, in high schools there was a clear predominance of high (19.44%) and very high (3.33%) scores, which may indicate that pupils at these schools are better prepared to make responsible decisions in the future. In contrast, average and low ratings prevailed in primary and vocational schools, suggesting a need for greater support for developing these skills in pupils of these types of schools (Figure 9).

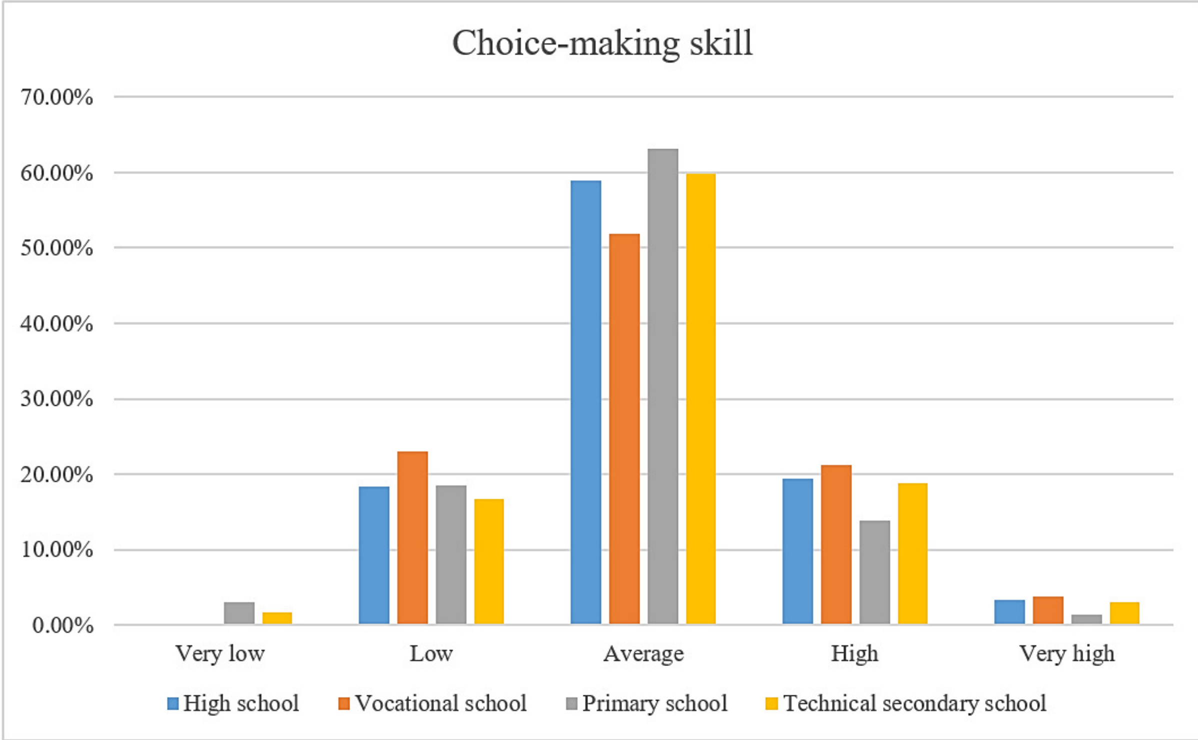

Figure 9. Level of development of the choice-making skill in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

The next item of the conducted survey was assessment of the level of development of the goal-setting skill in the educational process among school leavers, as perceived by the teachers. A majority of the teachers (56.49%) have assessed these skills as average, with 23.66% of the teachers assessing them as low, which indicates the need for more intensive work on development of goal-planning and goal-setting skills among pupils. Only 14.07% of teachers have rated the pupils' skills as high, and mere 1.97% have rated them as very high (Figure 10).

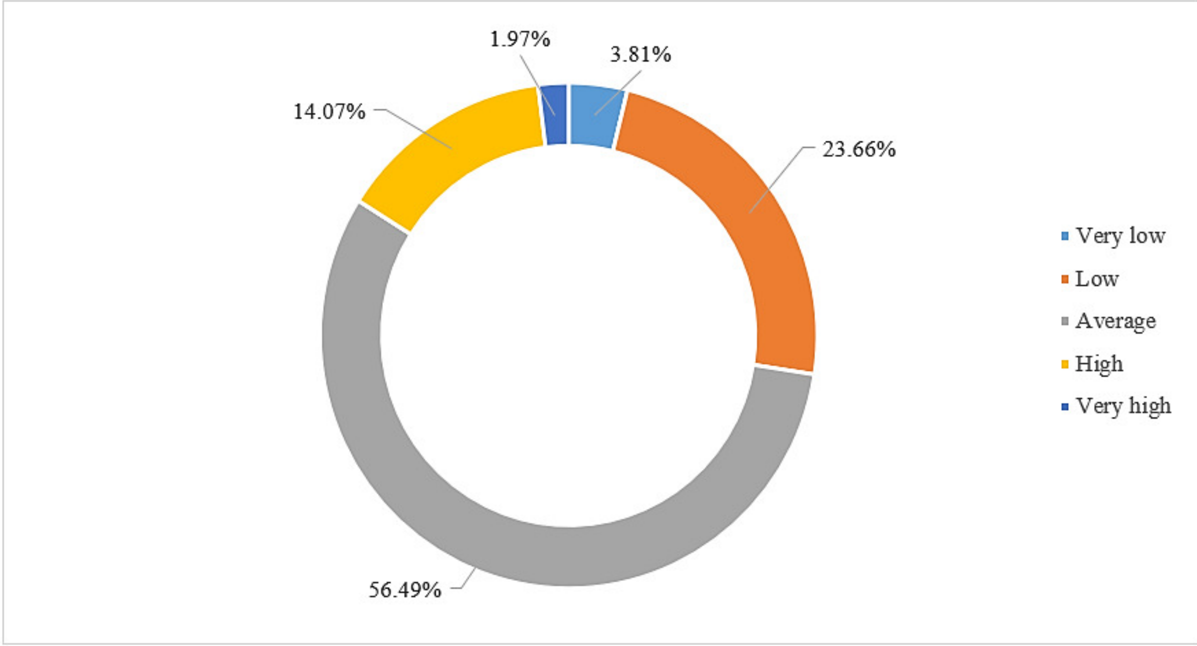

Figure 10. Level of development of the goal-setting skill in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

The results of evaluation of the level of goal-setting skills of pupils graduating from different types of schools, as perceived by their teachers, show that average and low ratings prevail. In high schools, 58.33% of teachers have rated these skills as average and 16.67% as low. In vocational schools, 48.08% of teachers have assessed the level of pupils' goal-setting skills as average and 26.92% as low. In primary schools, 57.31% of teachers have rated the skills as average and 24.78% as low. In technical secondary schools, 53.42% of teachers have reported an average level and 23.50% a low level. Further analysis of the findings reveals that pupils graduating from high schools and vocational schools are more likely to achieve high and very high levels of goal-setting skills, compared to pupils from schools of other types. In high schools, 19.44% of teachers have rated these skills as high and 4.44% as very high. In vocational schools, 21.15% of teachers have found the skill level to be high and 1.92% found it to be very high. In comparison, in primary schools only 12.34% of teachers evaluated them as high and 1.39% as very high, and in technical secondary schools 15.81% of teachers reported a high level and 2.56% a very high level. This means that high schools and vocational schools are more effective in supporting the development of goal-setting skills in their pupils (Figure 11).

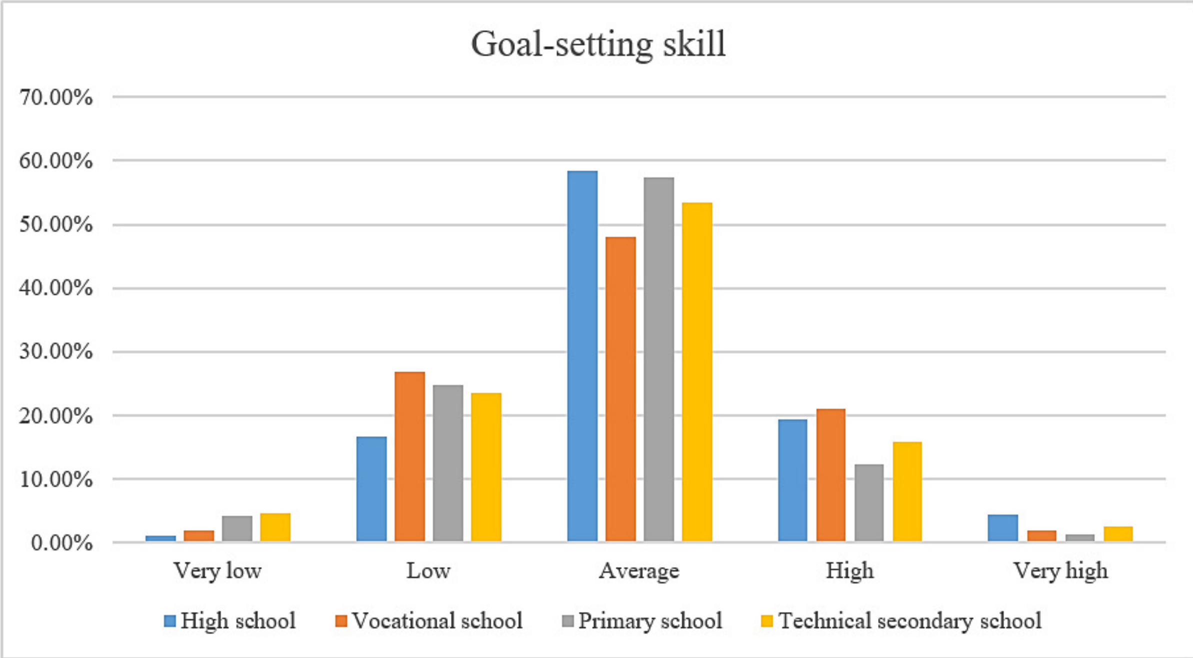

Figure 11. Level of development of the goal-setting skill in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

An analysis conducted among teachers surveying the level of goal pursuit skills of school leavers shows that there is a majority group of pupils (58.26%) who, according to the respondents, achieve an average level of these competencies. A lower level is exhibited by 23.05% of the pupils, indicating that almost one in four pupils has difficulties in effectively pursuing their goals. In contrast, 12.64% of the pupils achieve a high level of these competencies, with only 2.24% standing out as being at a very high level (Figure 12).

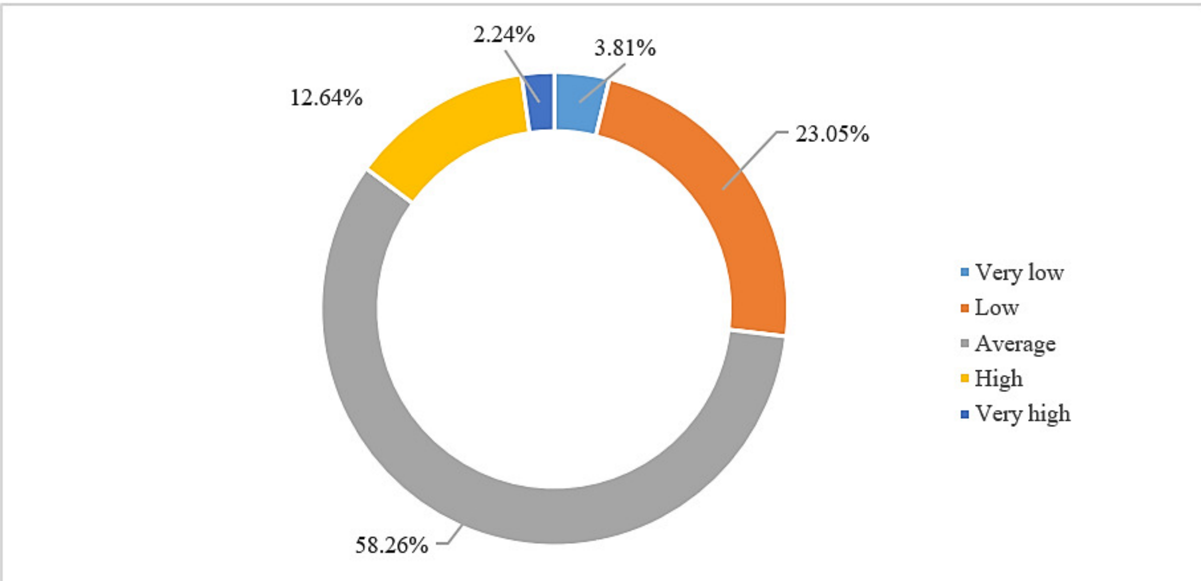

Figure 12. Level of development of the goal pursuit skill in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

An analysis of the results concerning the level of goal pursuit skills taking into account the type of school shows that in all institutions the highest percentage of pupils achieve an average level of these competencies. However, according to the respondents, pupils graduating from high schools and vocational schools are more likely to achieve a high or very high level of goal pursuit skills compared to pupils from other school types. In high schools, 22.78% of teachers rated these skills as high or very high, while in vocational schools the percentage was 21.15%. By comparison, in primary schools, only 10.85% of teachers rated these skills as high and only 1.89% as very high. In technical secondary schools, 14.10% of teachers reported a high level and 2.56% a very high level. These results reveal that high schools and vocational schools are more conducive to developing pupils' goal pursuit skills in the educational process compared to primary schools and technical secondary schools (Figure 13).

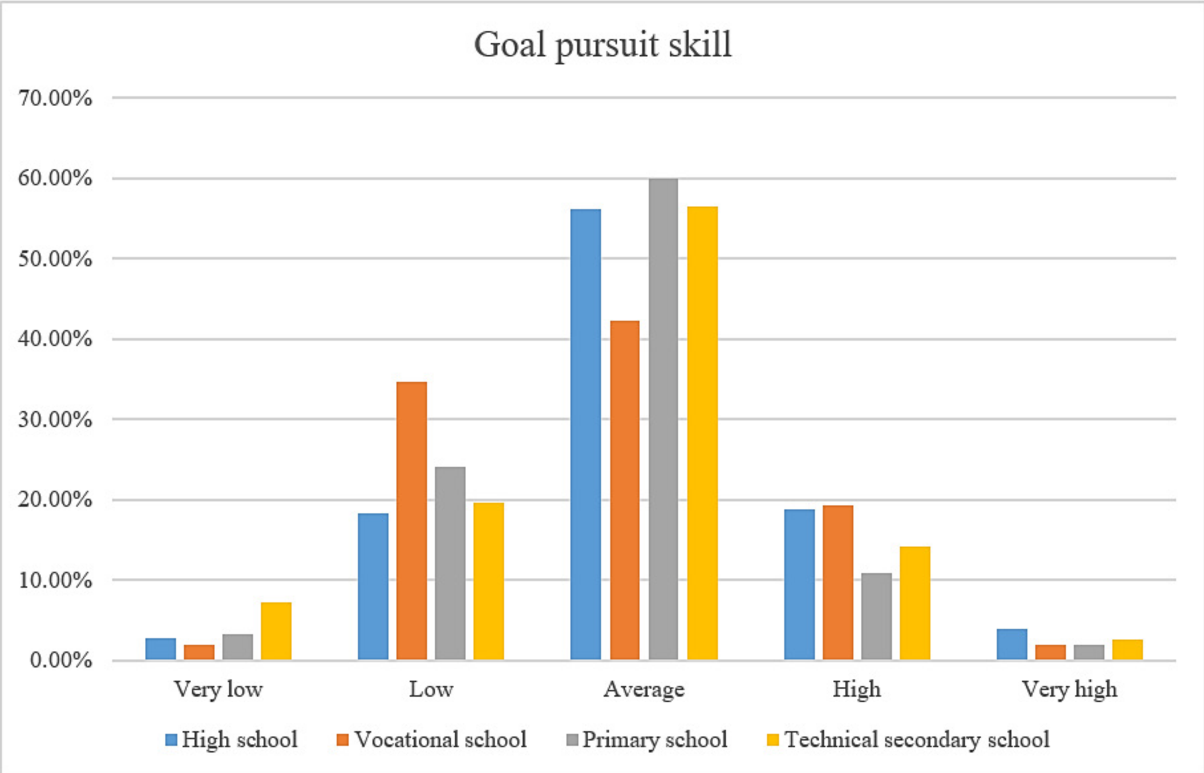

Figure 13. Level of development of the goal pursuit skill in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

The last part of the survey focused on assessing the level of problem-solving skills that the school graduates had developed throughout the educational process. According to the assessment of the teachers as a whole, the largest number of pupils (55.74%) achieve an average level of these skills. However, one in three teachers (33.31%) believes that pupils have a low or very low level of problem-solving skills (Figure 14).

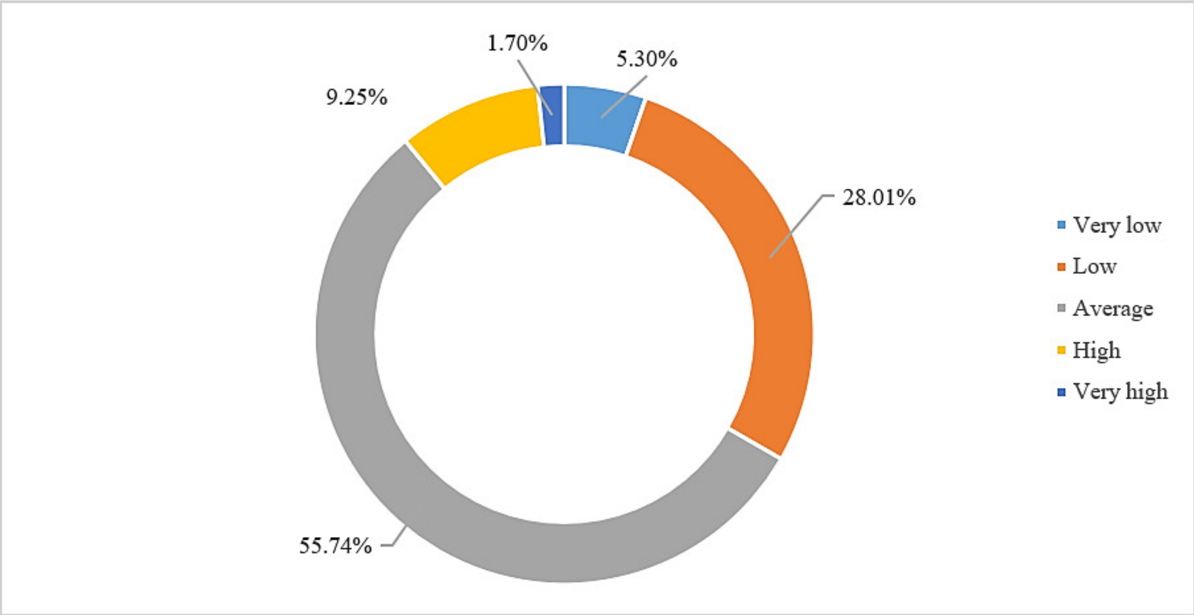

Figure 14. Level of development of the problem-solving skill in the educational process among school leavers as rated by all teachers [%].

Source: own work based on conducted research.

Further in-depth analysis shows that, according to the survey results, acquisition of problem-solving skills by school leavers exhibits comparable levels across all the types of educational institutions. The findings show a similar distribution (Figure 15).

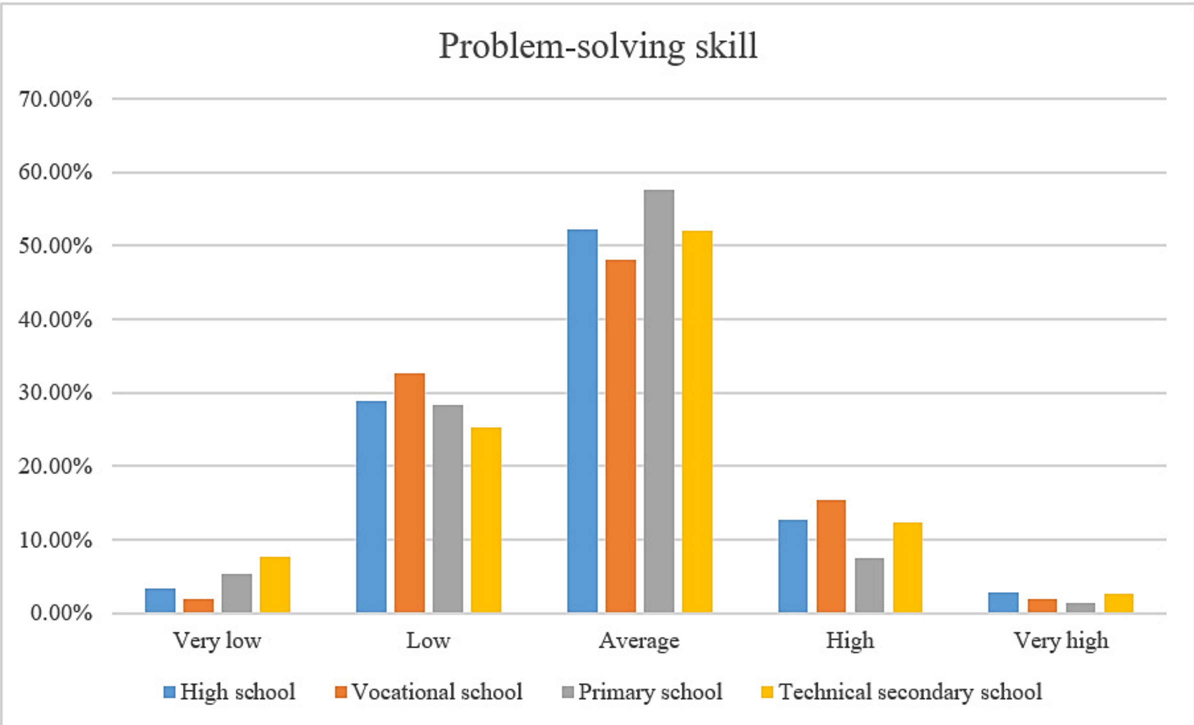

Figure 15. Level of development of the problem-solving skill in the educational process among school leavers as rated by teachers, broken down by type of school in which the teachers work [%].

Source: own work based on conducted research.

5. Summary

The study surveying the assessment of school leavers' skills shows that they are mostly rated as average. Decision-making skills were rated as average by 65.06% of teachers, with high school and technical secondary school pupils more often receiving the highest ratings from teachers. In primary and vocational schools, teachers were more likely to assign low ratings. As far as development of decision-making skills under conditions of uncertainty and risk was concerned, pupils performed worse, with 46.23% of teachers rating the skills at an average level and 36.57% at a low level. The lowest scores were recorded in primary schools and the highest in high schools and vocational schools. As for responsibility for decisions made, 49.01% of teachers considered this skill to be average, one in three teachers (32.77%) believed that the level of this skill developed during education was low, while only one in ten respondents (10.06%) rated it as high or very high. Higher results were reported in high schools and technical secondary schools, where pupils are more likely to score high. Similar conclusions apply to goal-setting – average scores prevail (56.49%), but high schools and vocational schools are more effective in supporting the development of these skills. In terms of problem-solving skills, 55.74% of teachers rated pupils at an average level, but as many as 33.31% of teachers believe that the problem-solving skills of school leavers developed poorly or very poorly during their education.

The research results indicate that, according to teachers, pupils from different types of schools achieve an average level in key skills, such as making decisions, making decisions under conditions of uncertainty and risk, responsibility for one's own decisions, making choices, setting goals, striving to achieve them and problem solving, throughout their educational process. Even though many pupils demonstrate satisfactory performance in these skills, these results suggest that there still is a need for more intensive support and further development of these competencies. Greater commitment to improving pupils' skills is particularly necessary in primary and vocational schools so that learners can achieve a higher level of independence, responsibility and ability to solve problems in everyday life. Further work on developing these competencies in these types of schools is crucial so that young people are better prepared to make informed and responsible decisions in the future, both in their professional and personal lives. These skills are vital in most professions; therefore, it is essential that schools place greater emphasis on developing them from the early stages of education.

References

1. Beyth-Marom, R., Fischoff, B., Quadrel, M.J., Furby, L. (2012). Teaching decision making to adolescents: A critical review. *Teaching Decision Making to Adolescents*, pp. 19-59.
2. Brzezińska, A.I., Rękosiewicz, M., Piotrowski, K. (2016). Plany edukacyjne i zawodowe uczniów ostatnich klas szkół ponadgimnazjalnych a wymiary rozwoju ich tożsamości. *EDUKACJA Quarterly*, *136*(1), pp. 74-88.
3. Eriksson, H., Högdin, S., Isaksson, A. (2018). Education and Career Choices: How the School Can Support Young People to Develop Knowledge and Decision-Making Skills. *Universal Journal of Educational Research*, *6*(9), pp. 1900-1908.
4. Fischer, J.M., Taylor, J. (2012). Wspieranie zespołów nauczycieli w procesie podejmowania decyzji. In: *Jakość w edukacji. Różnorodne perspektywy* (I, pp. 235-250). Wydawnictwo Uniwersytetu Jagiellońskiego.
5. Gelderblom, G., Schildkamp, K., Pieters, J., Ehren, M. (2016). Data-based decision making for instructional improvement in primary education. *International Journal of Educational Research*, *80*, pp. 1-14.
6. Greenbank, P. (2010). Developing Decision-making Skills in Students: An active learning approach. *Edge Hill University*, pp. 1-36.
7. Jaracz, M., Borkowska, A. (2010). Podejmowanie decyzji w świetle badań neurobiologicznych i teorii psychologicznych. *Psychiatria*, *7(2),* pp. 68-73.
8. Klementowska, A. (2016). Czynniki warunkujące podejmowanie decyzji edukacyjno-zawodowych przez gimnazjalistów (analiza wyników badań). *Problemy Profesjologii*, *1*, pp. 125-132.
9. Majeed, B. (2021). The skill of making a decision and its relationship with academic achievement among students. *International Journal of Recent Contributions from Engineering Science & IT (iJES)*, *9*(4), pp. 77-89.
10. Malewska, K. (2014). Ewolucja modeli procesów podejmowania decyzji. *Marketing i Rynek*, *5*, pp. 127-135.
11. Prorok, M. (2015). Podejmowanie decyzji w sytuacjach kryzysowych. Część II: Praktyczny wymiar procesu decyzyjnego. *Bezpieczeństwo. Teoria i Praktyka*, *21*(4), pp. 83-92.
12. Ratcliffe, M. (1997). Pupil decision- making about socio- scientific issues within the science curriculum. *International Journal of Science Education*, *19*(2), pp. 167-182.
13. Sadowska, M. (2016). Edukacja w zakresie przedsiębiorczości w polskim systemie kształcenia oraz w państwach europejskich. *International Entrepreneurship Review*, *2*(1), pp. 149-164.
14. Sever, I., Ersoy, A. (2019). Investigation of decision-making skills of fourth grade students according to student and teacher opinions. *International Electronic Journal of Elementary Education*, *12*(2), pp. 167-182.

15. Sterna, D., Strzemieczny, J. (2012). Organizacja procesów edukacyjnych dla wspierania uczenia się. In: *Jakość w edukacji. Różnorodne perspektywy* (I, pp. 126-140). Wydawnictwo Uniwersytetu Jagiellońskiego.
16. Townsend, A. (2012). Nauczyciele jako „przewodnicy w uczeniu się". In: *Jakość w edukacji. Różnorodne perspektywy* (I, pp. 113-126). Wydawnictwo Uniwersytetu Jagiellońskiego.
17. Walther, A., Warth, A., Ule, M., Du Bois-Reymond, M. (2015). 'Me, my education and I': Constellations of decision-making in young people's educational trajectories. *International Journal of Qualitative Studies in Education*, *28*(3), pp. 349-371.
18. Whitty, G., Wisby, E. (2007). Whose voice? An exploration of the current policy interest in pupil involvement in school decision- making. *International Studies in Sociology of Education*, *17*(3), pp. 303-319.
19. Wilsz, J. (2018). Umiejętność podejmowania decyzji przez uczniów, jako warunek ich efektywnego funkcjonowania. *Edukacja-Technika-Informatyka*, *9*(3), pp. 172-177.
20. Yurtseven, R., Akkas Baysal, Ö., Emine, Ü., Ocak, G. (2021). Analysis of the Relationship between Decision Making Skills and Problem Solving Skills of Primary School Students. *International Online Journal of Education and Teaching*, *8*(3), pp. 2117-2130.
21. Zaleszczyk, A.K., Kot, P. (2016). Poziom lęku a trudności w podejmowaniu decyzji zawodowych u uczniów szkół średnich. *Acta Universitatis Lodziensis. Folia Psychologica*, *20*, pp. 71-88.
22. Zaleszczyk, A.K., Kot, P. (2019). Nadzieja na sukces a trudności w podejmowaniu decyzji zawodowych. *Roczniki Psychologiczne*, *18*(4), pp. 599-609.

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PROJECT MANAGEMENT OFFICE AND PROJECT IMPLEMENTATION EFFICIENCY IN THE CONTEXT OF ORGANIZATIONAL ENTREPRENEURSHIP

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Purpose: The article aims to review the role of Project Management Office (PMO), in the context of organizational entrepreneurship, with a particular focus on its impact on effective project management. An assumption was made that PMOs contribute to business objective realization, improved competitiveness and fostered innovation in organizations.
Design/methodology/approach: The study employed the method of critical literature analysis, to present a theoretical approach to the analyzed problem.
Findings: The analysis shows that PMOs play a key role, covering such areas as method development and provision of standards, training and development of competencies, project performance monitoring and reporting, as well as selection and implementation of IT tools and software. PMOs serve to support project teams and ensure successful implementation of projects in organizations. Project Management Offices not only provide the necessary tools and resources, but also promote standards and best practices to improve the efficiency, quality and timeliness of ongoing projects.
Originality/value: The study highlights the rationale for creating Project Management Offices, which, in collecting and presenting data on various areas of their activities, should, inter alia, report on company successes and implementations, as well as on what projects the company should undertake. Knowledge of the most relevant and useful PMO functions can be useful in achieving and implementing effective projects.
Keywords: project management, Project Management Office, project portfolio.
Category of the paper: Literature review, general review.

1. Introduction

The role of project managers becomes particularly vital not only in companies operating in the IT industry, as effective management of technology and information technology projects entails knowledge of both the specifics of technical processes as well as the ability to work with diverse teams of specialists. Project Manager is a key figure in project management, responsible for the planning, organization and supervision of project implementation. He/she is tasked not only with the coordination of teamwork, but also with risk management, progress monitoring and maintaining stakeholder communication.

According to the definition presented in project-management literature, a project is a temporary endeavor of a unique nature, with a specific purpose, carried out within an organization or consortium, or conducted by one or more individuals. A project consists of a sequence of unique, complex and interrelated tasks which must be completed in a specific order, with a specific deadline and in accordance with a set budget and requirements. It entails the commitment of significant but limited physical, human, financial and informational resources, delivered by a team of highly skilled implementers from various disciplines, relatively independently of repetitive activity. Projects are associated with a high level of technical, organizational and economic risk, and therefore necessitate special methods of preparation and implementation (Dziedziak, 2020; Klatka, 1973; PMI, A guide to the project, 2017; Wysocki, 2005; Pawlak, 2006).

According to M. Trotsky, based on a study by B.J. Madauss, comprehensively, the concept of a project can be defined as an undertaking of high complexity, specific as to the period of its execution - with a specific beginning and end - involving significant but limited resources (material, human, financial, information), carried out by a team of highly qualified implementers from various fields (interdisciplinary), relatively independently of repetitive activities, subject to high levels of technical, organizational and economic risk and, therefore, necessitating special methods of preparation and implementation (Trocki, 2013).

Project managers play a key and multifaceted role in the organizational structures of information technology (IT) companies. Their function is centered on effective planning, organization, monitoring and implementation of IT projects, which often determine the direction of organization development. Analysis of the issue from the perspective of project-management theory and practice enables a thorough understanding of the essence of project manager's role and its relevance within the specific context of the IT industry.

What should be noted, nevertheless, is that in an established project environment, the unit which not only standardizes project processes, but also facilitates the coordination and prioritization of activities is the PMO (Project Management Office).

Worth mentioning is that an organization's entrepreneurial spirit refers to its ability in effective project management, use of innovative approaches and flexible adaptation to the changing market environment. This means that the enterprise not only implements parallel projects, but also effectively coordinates them, takes initiatives, introduces innovations, and is able to optimally utilize the available resources. Entrepreneurship in this case also involves risk-taking and the pursuit of increased operational efficiency, which can be facilitated by a well-functioning Project Management Office (PMO).

2. Research methodology

The methodology employed in the article involved a review of the scientific literature on Project Management Offices. The analysis was carried out based on the publications available in such databases as the Scopus, Web of Science and Google Scholar, using relevant keywords and search criteria. Articles published between 2002 and 2024 have been factored in, with a focus on peer-reviewed works relevant to the topic under study. Publications of a popular science nature with incomplete data were excluded. The results of the review allowed for identification of major trends, research gaps and formulation of conclusions.

The article aims to review the role of Project Management Office (PMO) in the context of organizational entrepreneurship, with a particular focus on its impact on effective project management. The premise was that PMOs contribute to the achievement of business goals, improve competitiveness and foster innovation in organizations.

3. Project Management Office (PMO) in light of the literature on the subject

Effective project management is largely contingent on an appropriate project team structure and a multi-team structure. Organization of a team structure within a project poses a challenge for many companies, but businesses can benefit from proven approaches and organizational methods. A well-designed team structure allows for more effective collaboration, faster decision-making and better management of resources, which consequently contributes to the success of implemented projects.

Much like organizational structures, these structures most commonly entail a certain mix of structures. This is because (Katzenach, Smith, 2001) members of the teams vary in competence, projects vary in type, organizations differ in their habits, and various requirements arise. Therefore, for the team structure applied in an enterprise to be effective, knowledge of the models is essential, along with the ability to creatively adapt them. When multiple projects are implemented in an enterprise, a dedicated unit ensuring consistency and efficiency is crucial.

Project Management Office (PMO) fulfills this role, serving as the structure responsible for defining, implementing and maintaining the standards and best practices of project management.

PMOs are established either permanently or for a designated period of time. They seek to standardize and introduce repeatability in project execution, to enable much simpler and more efficient project implementation. They are also involved in assisting the project team members assigned to given project portfolios. PMOs also serve as central hubs for project documentation, consulting and success metrics (Wysocki, 2018).

The genesis of PMOs (Project Management Offices) can be traced back to the period from the 1950s to the 1990s, when units of this type were focused primarily on the management of programs - multi-year, complex projects of high financial value, often financed by government funds. Accordingly, a more appropriate term for such structures at the time would have been Program Management Office.

The characteristics of PMOs at that time differed from contemporary standards, especially in terms of organization. The key problem those units were faced with was overstaffing, which led to reduced efficiency and generated high costs of maintenance. Such an organizational model, although enabling coordination of extensive programs, was characterized by limited flexibility, which became an obstacle in the dynamically changing environment.

In the years that followed, with the development of project management methodology, PMOs evolved into smaller, more agile units focused on executing shorter and more goal-differentiated projects. These structures thereby adapted to the new business requirements, moving from program management support offices to multi-task centers of competence for projects and project portfolios.

Most PMOs were established between the mid-1990s and 2000. New definitions of PMO and its implementations also began to emerge. Enterprises at the time were also implementing a much larger number of projects, which presented a new problem of reporting on project progress. It was during this period when the concept of Project Management Office (PMO) as an organizational unit emerged to standardize project-related procedures and select those most relevant to the business needs of organizations (Salamah, Alnaji, 2014).

Present-day companies have been introducing project management more widely, in view of the benefits and the orderliness of project-related processes, documentation and activities. According to Harold Kerzner, Project Management Offices have evolved into integral elements in the hierarchy of numerous companies (Kerzner, 2005). For a PMO to bring positive results, however, strategic planning is required, defining clearly the structure and competencies affecting a given Office's ability to achieve its potential (Kerzner, 2005).

Introduced into the structures of organizations Project Management Offices often face enormous demands as to how they should operate. PMOs are assumed (Spalek, 2012) to create, implement and enforce standards, produce comprehensive reports, build knowledge bases, prioritize projects, manage resources (including human resources), manage budgets, resolve conflicts and handle all other project-management issues.

Offices which fail to efficiently manage the above areas and thereby fail to increase the percentage of projects completed on time, with a set budget and a defined scope of work to be carried out, end up being shut down (Spałek, 2012). According to the Association of Project Management, more than 50% of PMOs get shut down within the first three years of functioning (VanHoeck, 2016). It can therefore be concluded that proper introduction and continued operation of a project management office, despite its suitability in the area of project management, is not an easy endeavor.

According to S. Spałek, PMO failures are caused by inadequate assignment of competencies and establishment of authority. The obvious predicament in such a case is the lack of added value generated by the PMO. Proper investment in and planning of a PMO is therefore crucial in effective project management (Spałek, Bodych, 2012).

The expectations regarding the quality of a PMO's performance should be closely linked with the assigned qualifications, its resources and hierarchy within the company, with a balance between of authority and competence with expectations. According to the author, a simple rule of thumb is involved here - the more a company requires of a PMO, the more control and leeway it must delegate to the Office (Spełek, Bodych, 2012).

4. The functions and position of Project Management Office in an organization

The literature is full of various descriptions, and functions to be performed by Project Management Offices, which continually evolve. Studies indicate that PMOs greatly facilitate project work, acting as a sort of liaison between project managers and top management. According to B. Hobbs, once the functions have been systematized, currently as many as 27 areas can be identified in which PMOs become directly involved. Nevertheless, new PMO functions should be introduced carefully, as offices which from the outset are assigned a large number of functions are frequently prone to failure (Rad, Levin, 2002).

One of the key PMO functions is to run the organization's project management system and provide project teams with clear project execution rules and guidelines. Furthermore, PMOs act as facilitators in project process standardization, which ensures consistency and efficiency of activities across all projects within an organization. By this, PMOs can ensure the use of the same methodology and tools by all departments and project teams in an organization. As such, PMOs support project managers in their operational work. Worth noting is that consistent standards across all projects in an organization greatly facilitate work, and represent the first step toward high project-management maturity, which in turn constitutes one of the most important factors in project success (Hill, 2007).

The basic processes the standards and methods must cover are: collaborative development of project management processes; development, monitoring and improvement of standards; selection of portfolio projects; development of a work breakdown structure; project network diagraming; maintenance of a library of tools and processes; drafting of bidding process documentation; risk assessment; project status reporting; scope change management; documentation and handling of project change requests (Wysocki, 2018). What must be factored in, however, is that over-standardization can be disadvantageous, and the principles and procedures mandated to cover every conceivable situation and project type may prove somewhat cost-prohibitive. The number of resources needed to establish these rules and procedures would be enormous, and still they would certainly be far from ideal, as they would span an overly broad area (Kerzner, 2005).

One important function of PMOs entails implementation of training policies and acting as the main project-management knowledge centers, responsible for continuous development of project teams' competencies. PMOs can hold kick-off meetings for new projects and, if needed, offer specialized training in project management and the use of relevant software.

Project Management Office staff are project management specialists with both practical experience and solid theoretical knowledge. They are thus able to provide valuable information and support to project team members as well as program, portfolio and project managers, improving the quality of project implementation in organizations. In the context of PMOs, the training function often serves as a key factor behind employee development in the area of project management. A Project Management Office can significantly improve the efficiency of project management, especially where numerous projects are carried out by managers lacking adequate project-management training.

Certification programs such as Project Management Professional or PRINCE2 can be of helpful value; nevertheless, a PMO's knowledge base is company-specific in terms of experience, and this type of knowledge should be passed on (http://pmoflashmob.org, 2014).

Project progress monitoring and the subsequent reporting are frequently part of the core functions of a PMO. Most Offices are established at least partly in response to management's pursuit of uniform and reliable monitoring and reporting. There are many solutions PMOs can employ, which should first and foremost meet company management's satisfaction. Modern technologies and metrics also ensure high levels of project status monitoring, and PMOs opt solutions most suited to ongoing projects. What is of importance, however, is that project managers and project team members are not made to feel controlled by the Office.

The centralization of information, and its reporting to management, is intended to enable appropriate and timely decisions by project managers, to ensure project effectiveness. PMO reports can include a wide range of information, such as analysis of project progress, current status of implementation, assessment of risks and problems, resource utilization, as well as lessons learned and recommendations for future actions. They can also include a summary of key project performance indicators, financial statements, and assessments of compliance with the organization's strategic goals (http://www.saviom.com, 2020). Project Management Offices should strive to maximize the efficiency of projects, and thus their role should involve introduction of modern IT solutions. The matching of adequate IT tools to the type of enterprise and projects is crucial, thus it requires considerable time and attention on the part of PMOs (Wysocki, 2018).

Under the current operating conditions of many organizations, the management of a project portfolio, entailing a collection of projects and programs involving investment decisions, is becoming a crucial task. The portfolio management function should only apply to mature

PMOs, and involve advising the management on whether the investment funds available are being spent in the best feasible manner.

In effect, mature PMOs become key elements in supporting the effectiveness of investment decisions and the achievement of business objectives.

One important aspect is the proper placement of the Office within the company's organizational structure, i.e., its position in relation to other parts of the organization. The positioning of a PMO, however, is determined by two factors: the level of competence, and the company type and size. It turns out that PMOs with greater scope of competence and set goals to be achieved should be positioned higher in corporate hierarchy. This is essential for Office effectiveness and realistic achievement of the goals established, as without proper competencies the achievement of goals could take a very long time or ultimately prove to be unfeasible. Therefore, PMOs situated directly at the boards of directors are not uncommon, indicating the strategic dimension of the project management function in such companies (Spałek, Bodych, 2012).

Project Management Offices happen, however, to be situated within the structure of a particular department, with focus on supporting the initiatives carried out by that unit (Ajam, 2023).

The phenomenon of outsourcing is also applicable to the operation of PMOs (Binder, 2007). In such a case, the Office operates outside the company, and the PMO’s employees provide their support as a service to the company's projects that require assistance. This solution is used rarely, due to the limitations involved (Spałek, Bodych, 2012).

5. Research results

The analysis of the role Project Management Offices play in organizations shows that PMOs are instrumental in effective project management and organizational entrepreneurship support. The main conclusions drawn with respect the issues discussed are as follows:

1. The growing relevance of PMOs in organizations - PMOs are becoming an indispensable part of corporate organizational structure, especially in companies implementing numerous and complex projects. A well-designed Project Management Office significantly improves the efficiency of project management, supports process standardization and ensures consistency of ongoing activities.
2. The role of PMOs in enhancing competitiveness - PMOs contribute to the achievement of corporate strategic goals by improving project coordination, managing risks and implementing innovative solutions. This enables organizations to adapt more effectively to the changing market environment.

3. Process standardization is of key significance. One of the core PMO functions is to define and implement project management standards. This standardization not only contributes to efficient communication and resource management, but also enables effective implementation of projects, in accordance with the budget, time and scope assumed.
4. PMO placement within the organizational structure bears significance. A PMO's level of competence and responsibilities should be aligned with its position within the company's structure. PMOs with strategic roles and broad competencies should be positioned at a high management level, which affords them with adequate authority and influence over decisions critical to the organization.
5. PMO management challenges - despite its numerous benefits, effective PMO operation calls for proper planning, appropriate resource allocation and clearly defined competencies. A lack of adequate authority or an overload of functions can lead to PMO failure. Statistics, indicating a high rate of Project Management Office shutdowns, highlight the need for well thought out PMO implementation and management.
6. Innovation support and development of competencies - PMOs play an important role as centers of knowledge and competence development in the area of project management. The training, mentoring and knowledge transfer under PMOs foster the development of project teams and contribute to organizations' success in implementing innovative projects.
7. Technological and organizational alignment - an effective PMO entails implementation of appropriate IT tools, tailored to the company's needs and project specifics. Today's Project Management Offices must be flexible, in order to be responsive to the technological changes and dynamic market conditions.

6. Conclusion

Summing up the foregoing considerations, emphasis should be placed on the merits of establishing a Project Management Office (PMO), playing a key role in integrating and reporting data on various areas of an organization’s operations, implementation successes and ongoing projects. In this context, PMOs should equally support the process of strategic decision-making, by identifying and recommending projects of the highest value potential for the company.

Knowledge of the key PMO functions and tools lays the foundation for effective project management, provided that these functions are implemented gradually, in a manner tailored to the specific needs of the organization. Crucially, the scope of a PMO should be aligned with the requirements of project teams, the expectations of executives and the strategic priorities of the board. Proper alignment of a PMO's functions with an organization's requirements is a key determinant of its effectiveness and longevity within the enterprise structure.

References

1. Ajam, M. (2023). *Should organizations have a PMO or a PMD?* Retrieved from: http://blog.sukad.com/should-organizations-have-a-pmo-or-a-pmd/, 20.07.2023.
2. Binder, J. (2007). *Global Project Management: Communication, Collaboration and Management Across Borders*. UK: Gower Publishing.
3. Dziedziak, J. (2020). *Projekt*. Retrieved from: https://mfiles.pl/pl/index.php/Projekt, 21.05.2020.
4. Hill, G.M. (2007). *The Complete Project Management Office Handbook*. CRC Press, pp. 87-88.
5. Katzenach, J., Smith, D. (2001). *Siła zespołów. Wpływ pracy zespołowej na efektywność organizacji.* Oficyna Ekonomiczna, p. 26.
6. Kerzner, H. (2005). *Advanced Project Management Edycja Polska.* Helion, pp. 324, 367.
7. Klatka, N. (1973). *Przedsięwzięcie. Mały słownik cybernetyczny*. Warszawa: PWN, p. 346.
8. Pawlak, M. (2006). *Zarządzanie projektami.* Warsaw: PWN, p. 17.
9. PMI (2017). *A guide to the project management body of knowledge, Vol. I. Sixth edition*. Newtown Square: Project Management Institute, p. 13.
10. *PMO flashmob* (2020). Retrieved from: http://pmoflashmob.org/wp-content/uploads/2014/08/ESI-pmo-ereport-2013.pdf, 1.11.2020.
11. Rad, P., Levin, G. (2002). *The Advanced Project Management Office: A Comprehensive Look at Function and Implementation*. CRC Press, p. 125.
12. Salamah, H., Alnaji, L. (2014). *Challenges in Establishing, Managing, and Operating Project Management Office.* International Conference on Economics, Management and Development, p. 193.
13. *Saviom* (2020). Retrieved from: https://www.saviom.com/blog/pmo-roles-responsibilities-organization/, 2.11.2020.
14. Spałek, S., Bodych, M. (2012). PMO. *Praktyka zarządzania projektami i portfelem projektów w organizacji.* Helion, pp. 74-76, 80-83.
15. Trocki, M. (2013). *Nowoczesne zarządzanie projektami*. Warsaw: PWE, p. 17.
16. VanHoeck, C. (2016). WHY PMOS FAIL:… and How to Ensure Their Succes. *ISG White Paper*, p. 2.
17. Wysocki, R.K. (2018). *Efektywne zarządzanie projektami*. Helion, pp. 574-584.
18. Wysocki, R.K., McGary, R. (2005). *Efektywne zarządzanie projektami. 3rd Edition*. Gliwice: Onepress, p. 47.

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CUSTOMER VALUES OFFERED BY RETAIL STORE CHAINS IN TODAY'S MARKETPLACE

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Purpose: This article aims to identify the customer value offered in today's market by retail chains.
Design/methodology/approach: The aim of the article is based on an analysis of the topic of customer value as described in current source material and on the use of a research technique such as the author's participatory observation of consumer behaviour in response to offers from retail chains.
Results: In today's competitive market, retail shop chains are faced with the necessity of resolutely meeting increasingly demanding customer expectations. The results of the author's market observation confirm that issues related to the creation of customer value are becoming crucial for every retail shop as they determine its development and sometimes also its survival on the market, and definitely play an important role in the competitive struggle.
Practical application: The customer values described in the article can provide retail chains with a guideline for creating a retail offering that takes into account the proposition of a comprehensive package of the most valued and expected values by customers.
Social application: The topics described in the article can be a source of valuable inspiration not only for retail chains, but also for other retailers with a particular interest in creating customer value through the best possible mix and match.
Originality/value: This article is an attempt to organise the literature's consideration of customer value and to highlight the role it plays in the retail chain's offer to dedicated customers and in building competitive advantage in today's market.
Keywords: Value for the customer, value categories, retail.
Category of the paper: Theoretical article.

1. Introduction

Creating customer value is one of the key elements of the strategy of today's businesses, regardless of the industry in which they operate. In the context of a dynamically changing market environment and increasing customer expectations, companies are challenged not only to meet these demands, but also to exceed them in order to gain and maintain customer loyalty. The orientation of retail operations in today's market is clearly towards increasing the importance of the customer and targeting all activities towards the customer in order to ensure maximum satisfaction and complete satisfaction. Nowadays, customers‘ needs, tastes and also desires largely determine not only the companies’ offers, but also the selection and delivery of appropriate values in line with customer expectations. ‘Product’ alone often no longer guarantees market success.

The relationship between the processes of identifying, creating and delivering value to customers determines the customer relationship management skills, the internal resources of the company and the relationships with business partners.

The modern customer, is not only educated, aware or well-informed about the market, but is increasingly making rational and well-considered decisions and has strongly defined expectations of the products he or she decides to buy. As a result, retail chains strive not only to design positive experiences for their customers, given their increasing importance in their market choices, but also to offer customers a comprehensive package of values designed to best meet their needs.

2. The concept of value

In today's turbulent and increasingly unpredictable market environment, it is extremely important to correctly define customer value and then develop the offer according to customers' expected preferences, requirements, values, etc.

The customer value concept takes into account the comparison between what the customer receives and what the product provider gives in return. This concept furthermore assumes that the basis for building competitive advantage lies in the processes of delivering customer value (Beliczyński, 2009, p. 39).

Table 1 shows the different approaches of selected authors to defining the concept of ‘customer value’ in evolutionary terms.

Table 1.
Defining ‘customer value’ according to selected authors - an evolutionary approach

Year – author	Definition
1985 – Michael Porter	Customer value is the excess of the benefits that the customer received as a result of acquiring and using a product over the price he paid to acquire the product. The author links the category of customer value to the added value for the purchaser and for the company.
1988 – Valerie A. Zeithaml	Value is the consumer's overall assessment of the utility of a product based on their perception of what is received versus what is given.
1990 – Kent B. Monroe	Perceived benefits are a combination of physical product features, features related to accompanying services, technical support in the process of using the product, price and quality. Perceived costs include the costs that the purchaser incurs at the time of purchase, such as purchase price, acquisition costs, transport, installation, operation, repair.

Cont. table 1.

1994 – Bradley Gare	Customer value is the perceived quality in the markets in relation to the price of a product.
1994 – Philip Kotler	The value delivered to the customer is the difference between the total value of the product to the customer and the cost to the customer of obtaining it, where the total value of the product to the customer is the sum of the benefits the customer expects from the product or service.
1996 – Howard E. Butz, Leonard D. Goodstein	Customer value is the emotional connection created between the customer and the producer after the customer has used a particular product or service produced by the supplier and found that it provides them with added value.
1996 – Annika Ravald, Christopher Gronroos	The value to the customer derives not only from the product itself, but from the relationship between the transacting parties. Total episodic value is the ratio between the sum of the episodic and relationship benefits and the sum of the episodic and relationship costs.
1997 – Robert B. Woodruff	Customer value is the customer's perceived and assessed preference for the attributes of the product, the attributes of its performance and the consequence of its use, which enable (or prevent) the customer to achieve its goals and objectives in the process of use.
1997 – Philip Kotler	Customer delivered value is the difference between the total value to the customer and the total cost to the customer. Total customer value is the bundle of benefits expected by the customer in relation to a product or service. Total cost to the customer is the bundle of costs that customers expect to incur in evaluating, acquiring and using a product or service.
1998 – James C. Anderson, Jim A. Naurus	Customer value refers to the benefits received minus costs other than price. In this view of value, raising or lowering the price of an offer does not change the value of the offer to the buyer, it only changes the intention to purchase such an offer.
2000 – Stanley F. Slater	Customer value is created when the customer's benefits associated with the product or services exceed the life cycle costs of the product/service to the customer.
2001 – Robert Kaplan, David Norton	Customer value is understood as the benefit to the customer created during the use of the product [...] and as the benefit that the organisation proposes in the form of products and services to ensure customer loyalty and satisfaction in the target market segments.
2003 – Maja Szymura-Tyc	The value to the customer is the difference between the benefits the customer achieves and the price the customer has to pay to purchase the product on offer.
2004 – Barbara Dobiegała-Korona	Customer value is the sum of the benefits to the customer when purchasing and using products and services.

Source: Compiled from: Beliczyński, 2009, pp. 36-45.

Value plays a very important role. Customers, faced with a large number of competing offers, choose only those products and services and shopping destinations that they consider to be of the highest value.

3. Retail chains

Retail is, in the simplest terms, the sale of goods or services to the final purchaser, usually in smaller quantities known as retail. The basis is direct contact with the customer to provide a wide range of products according to individual demand.

The segmentation of the retail market in Poland developed by the Nielsen IQ Research Agency distinguishes nine channels that dominate sales in the FMCG industry. They comprise:

1) hypermarkets - area above 2500 m^2,
2) Supermarkets - area above 300 m^2 and below 2500 m^2, excluding discounters,
3) discount shops - Biedronka, Lidl, Netto and Aldi chain shops,
4) large grocery shops - shops with an area between 100 and 300 m^2,
5) medium grocery shops - shops with an area between 40 and 100 m^2,
6) small grocery shops - shops with a floor area of less than 40 m^2,
7) kiosks,
8) shops in petrol stations,
9) drugstores.

According to the survey results presented in the report (Figure 1), there were around 98,000 grocery and cosmetics/chemical shops in 2021, which was 1800 fewer shops than in the previous year. Kiosks and small grocery shops were most responsible for the decline, with a decrease of around 1.6 thousand establishments and drugstores with a decrease of 3%. From 2020 to 2021, 13 hypermarkets also closed. On the other hand, medium-sized grocery shops developed most strongly, with an increase of around 500 outlets and supermarkets, of which as many as 300 were opened. Large grocery shops also contributed positively, with 200 openings and discount shops, of which around 130 were opened. Żabka shops numbered as many as 7954 in 2021. They were located in the small and medium-sized grocery shop channels, accounting for 14.7% of the total (Nielsen IQ, 2021).

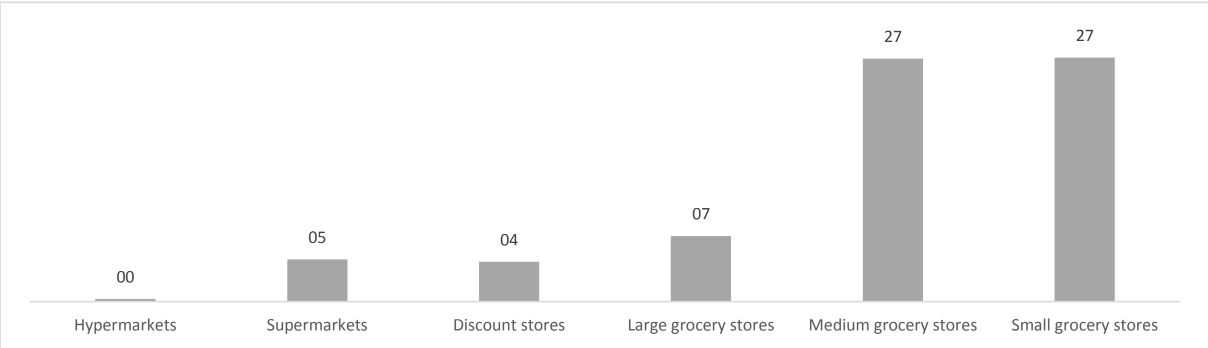

Figure 1. Number of shops in each retail channel [in thousands].

Source: Report. Nielsen IQ, (24.10.2024), https://wirtualnekosmetyki.pl/-badania-rynkowe/nielsen:-rynek-detaliczny-2021---struktura,-liczebnosc-placowek,-trendy#:~:text=NielsenIQ%20opublikowa%C5%82%20wyniki%20badania%20liczebno%C5%9Bci,szacowana%20jest%20na%2098%20tys.

An intrinsic process of any market operator, the course of which is illustrated in Figure 2, is the creation of its own unique range of values for customers, containing a set of priorities arranged hierarchically.

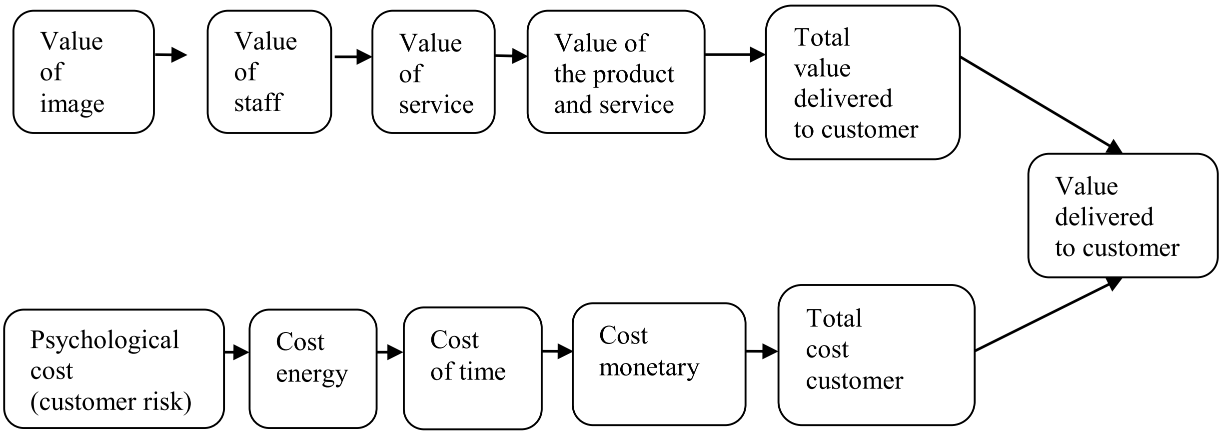

Figure 2. The process of delivering value to the customer.

Source: Own elaboration based on: Kaplan, R., S., Norton, D., P., (2002), *Strategiczna karta wyników. Jak przełożyć strategię na działanie,* Warsaw: PWN.

This enables a personalised approach to customers, whose requirements are growing ever faster and are increasingly difficult to satisfy. For this reason, the values offered by the products must be differentiated, developed, improved, exchanged for new ones and adapted to the changing needs of individual buyers or their specific segments.

4. Value proposition for customers of retail chains

Undoubtedly, players in the trade sector play an important role in value creation, coordinating, as it were, the flows of goods between the production and consumption spheres. They are also a link in the supply chain of goods to final purchasers. The place and role of traders in value chain analysis is important insofar as traders have specific resources and skills, the application of which usually brings incremental value creation along the supply chain.

According to B. Dobiegała-Korona, the catalogue of values that a company can offer to the customer is very extensive and includes diverse value categories (Dobiegała-Korona, 2010, p. 26): value of function, value of form, value of time, value of place, value of experience, value of possession, value of education, value of communication, value of trust, value of security.

The aforementioned values are offered by retail shop chains operating in today's market. They are characterised in Table 2.

Table 2.
Customer value categories offered by retail shop chains

Values	Characteristics
Value of form	Enabling the customer to choose the form of the product (e.g. through a large variety of assortments, different sizes, shapes, rich colours, additional equipment, convenience of use) - a large variety allows a wide range of customers to choose.
Value of function	Adapting the product or service to the customer's needs and expectations, e.g. the introduction of mobile applications, differentiated forms of payment, simplification of the shopping process in addition to shopping convenience (baskets, trolleys).
Value of time	Making the offer available at a time that suits the customer best. The chains are focusing on broad accessibility by extending opening hours (especially at weekends), increasing the number of outlets or introducing self-service checkouts.
Value of place	Enabling the purchase of the product through an extensive network of outlets (Lidl, Biedronka, Netto). Convenient locations for customers, easy access, parking (sometimes for a fee, e.g. Lidl).
Value of experience • *The customer experience is a kind of summation of the customer's subjective feelings that have been created as a result of the interaction with the company, as well as its proposed offer (Doroszewicz, 2021, p.146).* • *According to phenomenology, an individual's everyday experiences form the basis of his or her determination of cognitive and affective goals towards the objects with which he or she comes into contact (Mazurek-Łopacińska, 2006, p. 304).*	Using customers' experiences in shaping an offer allows you to give it the qualities they want, not only in material terms, but also in symbolic terms. The professional, competent service that most chains strive to guarantee customers builds a positive experience and contributes to trust, satisfaction and referrals. Building an emotional connection with the service (sometimes important in smaller outlets and among an older generation of customers). Personal salespeople can provide recommendations, advice and information about products that meet individual preferences and needs.
Value of possession	Enabling the transfer of ownership in various ways (e.g. through sale, rent, credit). Offering standard and premium products gives customers the added benefit of owning a so-called 'top shelf' product often at an attractive price (price rewards through participation in loyalty programmes).
Value of education	Educating the customer on the correct use, handling or effectiveness of the offer (promotional offers, combined offers).
Value of communication	Adaptation of information about the offer, how and under what conditions it is purchased to individual customer channels and knowledge. Simple advertising and promotional messages. The use of social media to communicate with customers and the ability to showcase products and encourage purchase (promotion by influencers) is also increasing.
Value of trust	Trust in the shop - reputation, credibility, brand. Trust is a value that supports other values. Trust is important because it leads to increased referrals and satisfaction. It also manifests itself in a sense of security (conformity of products to standards).
Value of cooperation	Co-creating value together with the customer - being open to customer ideas on how to improve or enhance products (surveying), rewarding customers for innovation ideas (in collaboration with manufacturers). Organising in-store workshops, events can further engage customers and build a sense of community around the brand.

Source: Own elaboration based on participatory observation in selected outlets of retail chains: Żabka, Dino, Netto, Biedronka, Lidl, Auchan.

With regard to the presented categories of customer value, it is also worth pointing out some of its basic characteristics. The first of these is the subjectivity of customer value, resulting from the fact that it does not depend solely on the product itself, but also on the individual needs and preferences of the customer and his ability to bear certain costs associated with the purchase and use of a given product. Secondly, it is important to note the situational nature of customer value because the costs and benefits associated with the purchase and use of a product depend on the situation in which the product is purchased and used. The benefits received and costs incurred may be perceived quite differently by the same customer in different situations. Thirdly, the value to the customer is perceived value which means that what matters to the customer is the benefits and costs perceived by the customer, not the benefits actually received and incurred. All this makes customer value a category that cannot be measured. Its measurement is based solely on customer satisfaction. Customer value is also dynamic in nature, as it changes over time throughout the entire purchasing, use and disposal process. Therefore, when offering value to their customers, retail chains should take into account not only the benefits and costs associated with the purchase and use of the product, but also the entire life cycle of the product with the customer. The last important characteristic of customer value is its universality, as it applies to all types of buyers who make decisions to purchase a product or service, i.e. individual customers, households, businesses, etc. Despite the differences in the benefits sought by each, the very concept of customer value, i.e. the excess of benefits over costs, remains the same (Szymura-Tyc, 2005, pp. 76-77).

In conclusion, customer value is crucial to the success of any company, as it influences customers' purchasing decisions, loyalty or brand perception. Companies that deliver customer value are far more likely to succeed in the market, build lasting relationships with customers and achieve competitive advantage.

5. Summary

Creating value for the customer means achieving a level of relationship in which the products of a given company give the customer significantly greater satisfaction than those of its competitors. This is because the modern customer chooses those offers which, in his/her opinion, are the most valuable to him/her and, from his/her point of view, provide him/her with the greatest value. The total value provided to the customer is in fact the tangible monetary value of the social, economic, ergonomic and psychological benefits expected by the customer from a particular good. The total cost to the purchaser includes the costs he expects to incur in penetrating, acquiring, using and disposing of a given market offer.

The author's observation confirms that the selected (outlet) retail chains offer customer values such as the value of form, the value of function, the value of time, the value of experience the value of communication, the value of education, the value of possession and trust or the value of cooperation.

It is worth emphasising that not only at each stage of building customer relationships, but also at each stage of their life path, customers will value different values. Therefore, retail chains should offer unique value to customers, modify the values currently provided and adapt them to changing shopper expectations.

In addition to these values, important elements that constitute customer value and at the same time enable retail companies to gain a competitive advantage include the best price, the best product and a customised solution.

Retail chains currently operating in the market that offer value to their customers include Żabka, Dino, Netto, Lidl, Biedronka, Auchan and Carrefour.

References

1. Beliczyński, J. (2009). Kategoria "wartość dla klienta" w naukach o zarządzaniu. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Poznaniu, No. 129,* pp. 36-45.
2. Dobiegała-Korona, B. (2010). Istota i pomiar wartości klienta. In: B. Dobiegała-Korona, T. Doligalski (Eds.), *Zarządzanie wartością klienta. Pomiar i strategie* (p. 26). Warszawa: Poltext.
3. Doroszewicz, S. (2021). *W jaki sposób ocena jakości produktu może wpłynąć na wybory konsumentów.* Warszawa: Oficyna Wydawnicza SGH.
4. Garbarski, L. (2004). Koszty a efekty pozyskiwania i utrzymywania nabywców. In: B. Gregor (Ed.), Marketing – Handel – Konsument w globalnym społeczeństwie informacyjnym (p. 241). *Folia Oeconomica, No. 179*. Łódź.
5. Kaplan, R.S., Norton, D.P. (2002). *Strategiczna karta wyników. Jak przełożyć strategię na działanie.* Warszawa: PWN.
6. Kotler, Ph. (2005). *Marketing*. Warszawa: Rebis.
7. Kotler, Ph., Armstrong, G., Saunders, J., Wong, V. (2002). *Marketing*. Warszawa: PWE.
8. Mazurek-Łopacińska, K. (2006). Rola klienta w kreowaniu wartości. In: A. Czubała (Ed.), *Marketingowe strategie budowania wartości przedsiębiorstwa* (pp. 304-305). Kraków: Wydział Zarządzania Akademii Ekonomicznej.
9. Otto, J. (2004). *Marketing relacji: koncepcja i stosowanie*. Warszawa: C.H. Beck.
10. Raport Nielsen IQ. (24.10.2024). *Shopper Trends 2021*. Retrieved from: https://wirtualnekosmetyki.pl/-badania-rynkowe/nielsen:-rynek-detaliczny-2021struktura,

liczebnoscplacowek,trendy#:~:text=NielsenIQ%20opublikowa%C5%82%20wyniki%20badania%20liczebno%C5%9Bci,szacowana%20jest%20na%2098%20tys

11. Raport Nielsen IQ. (24.10.2024). *Shopper Trends 2021.* Retrieved from: https://www.handelextra.pl/handel/inne/handel-nielsen-od-dwoch-lat-maleje-liczba-sklepow-w-polsce-246619
12. Rust, R., Zeithaml, V., Lemon, K. (2000). *Driving Customer Equity. How customer lifetime value is reshaping corporate strategy*. New York: The Free Press, p. 9.
13. Szymura-Tyc, M. (2003). Wartość dla klienta jako źródło przewagi konkurencyjnej. *Organizacja i Kierowanie, no. 4*, pp. 17-18.
14. Szymura-Tyc, M. (2005). *Marketing we współczesnych procesach tworzenia wartości dla klienta i przedsiębiorstwa.* Katowice: Wydawnictwo Akademii Ekonomicznej.

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DIVIDEND POLICY OF LISTED, STATE-OWNED ENTERPRISES FROM THE POWER SECTOR

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Purpose: The article aims to answer whether the failure to pay dividends by state-owned enterprises (SOEs) from the power sector listed on the Warsaw Stock Exchange is an action to the detriment of minority shareholders. These companies are PGE Polska Grupa Elektroenergetyczna S.A., Enea S.A., Energa S.A., and TAURON Polska Energia S.A.
Design/methodology/approach: Analysis of the literature on the dividend policy of companies and its impact on the company's value. Analysis and assessment of selected financial and non-financial indicators of the companies in 2019-2023 from the point of view of the justification for withholding dividend payments in these years.
Findings: The analysis of selected financial and non-financial indicators showed that the analysed 4 Polish companies could and should have paid dividends in the analysed years, and not allocated retained profits to unprofitable investments. In addition, a comparison of the values of these companies' indicators with the indicators of the German company selected for comparative analysis, whose significant shareholder is the German federal state, showed that it is necessary to improve the ownership supervision over them.
Research limitation/implications: Differences in the reporting rules for calculating some indicators, e.g. net debt may cause slight differences in the values of the calculated indicators, and thus limit their comparability between companies. The analysis is useful for all stakeholders of state-owned enterprises, especially politicians who are responsible for corporate governance.
Originality/value: The decision of the majority or dominant shareholder, i.e. the State Treasury, not to pay dividends required the assessment of the dividend policy of the State Treasury from the point of view of minority shareholders. In turn, the comparison of financial and non-financial indicators of the 4 Polish SOEs with the German SOE selected for comparative analysis allowed for the assessment of their performance and thus the assessment of corporate governance exercised by politicians.
Keywords: state-owned enterprises, SOEs, corporate governance, dividend policy, power, ROCE.
Category of the paper: research paper.

1. Introduction

The article aims to answer whether the non-payment of dividends by state-owned enterprises (SOEs) from the power sector listed on the Warsaw Stock Exchange is an action to the detriment of their shareholders.

The shares of the State Treasury in the analysed companies, are presented in Table 1. At the same time, in analysed companies at the end of 2024, there were from several to a dozen or so institutional shareholders representing pension funds and investment funds. For example, PGE Polska Grupa Elektroenergetyczna S.A. at the end of 2024 had 19 institutional shareholders holding 19.92% of shares and the same number of votes (Biznesradar.pl, 2.03.2025). Since the State Treasury's share in the company was 60.86% and the same number of votes, the remaining minority shareholders, having approximately, 20% shares were probably natural persons who had the right to participate in General Meetings, but due to the small number of shares held, they for sure never participated in them.

In connection with the fact that resolutions taken at General Shareholders' Meetings concerning non-payment of dividends were taken by the majority or dominant shareholder, which is the State Treasury, and by some minority shareholders, the so-called institutional shareholders, shareholders in this article are understood as Polish society represented by the State Treasury, individual participants of pension funds and investment fund management companies, and all other minority shareholders.

In the first quarter of 2023, the 4 analysed Polish companies produced about 63% of gross electricity in Poland. The largest share in production (39%) was held by PGE Polska Grupa Elektroenergetyczna S.A. The next company was Enea S.A. with a 13% market share. The third place with a 9% share in the production market was taken by TAURON Polska Energia S.A. The smallest production of the analysed companies was by Energa S.A., which had a 2% share in the gross electricity production market (TAURON Polska Energia S.A., 2023). The total gross electricity production in Poland in 2023 amounted to 163.6 TWh (Urząd Regulacji Energetyki, 11.02.2025).

The analysed companies have not paid dividends in the analysed years 2019-2023 and in 3 earlier years. Every year, their management boards submitted recommendations to the General Meetings of Shareholders not to pay dividends for a given year and to allocate all profits to reserve capital to increase investment expenditure. For example, the dividend policy of PGE Polska Grupa Elektroenergetyczna S.A. included in the financial report for 2023 is presented below.

"In May 2017, the company's management board recommended suspending the payment of dividends from profits for 2016, 2017, and 2018 due to the need to finance an ambitious development program and limit the growth of the debt level. After this period, the management board intended to recommend the payment of a dividend to shareholders at the level of 40-50%

of the consolidated net profit attributable to the shareholders of the parent company, adjusted by the amount of write-offs revaluing the value of tangible fixed assets and intangible assets. The dividend policy contains a provision that the payment of each dividend will depend in particular on the total amount of the company's debt, expected capital expenditures, and potential acquisitions. The dividend policy, in particular as a result of the analysis of the company's debt in the context of the implementation of the investment program (by the assumptions of the PGE Group Strategy until 2030) and planned acquisitions (including the acquisition of PKPE Holding sp. z o. o. completed in April 2023), as well as taking into account the prolonged market instability and uncertainty (including as a result of the recession caused by the COVID 19 pandemic and the war in Ukraine), the management board of PGE Polska Grupa Elektroenergetyczna S.A. recommended not to pay dividend for the years 2019-2022. The Annual General Meetings (AGM) in the years 2020-2023 adopted resolutions by the recommendations of the management board of PGE Polska Grupa Elektroenergetyczna S.A." (PGE Polska Grupa Elektroenergetyczna S.A., 2019-2023).

The dividend policy consisting of in not paying dividends, regardless of the reported financial results, required in-depth analysis. In particular, it was necessary to analyse the profitability of allocating all profits to reserve capital in order to implement the investment policy instead of paying them profits in the form of dividends.

Both the purpose of the article and the applied research method are fresh solutions, previously undescribed by anyone.

To achieve the aim of this article, two research hypotheses were put forward.

H1 - the lack of dividend payments by the 4 Polish analysed companies in 2019-2023 and allocating all profits to reserve capital to finance investments was detrimental to their shareholders.

H2 - the lack of dividend payments by the 4 Polish analysed companies in 2019-2023 and the allocation of all profits to reserve capital to finance investments was the result of the poor financial performance of these companies and, consequently, a low level of cash and poor creditworthiness.

To test hypothesis H1, the Value spread indicator was analysed. It was calculated by deducting the Weighted Average Costs of Capital (WACC) from the Return on Capital Employed (ROCE). A positive value of the Value spread indicator means that the profitability of Capital Employed was higher than the WACC, which is beneficial for shareholders. A negative value shows that the company has not used invested capital effectively (Corporate Finance Institute, 15.02.2025). In summary, accepting or rejecting hypothesis H1 will allow for an assessment of the company's investment policy from the perspective of all shareholders. Not paying dividends and allocating the held cash assets to value-increasing investments would be beneficial for them. On the other hand, not paying dividends and allocating their cash to investments that did not bring an appropriate rate of return would not be beneficial for them.

Such a measure of the profitability of an investment using debt and equity capital is the Value spread indicator, which is the difference between ROCE and WACC.

To test the validity of hypothesis H2, the analysis of financial indicators was carried out, i.e. profitability indicators (Return on Sales - ROS, Return on Equity - ROE, and Return on Assets - ROA), debt indicators (Debt/Equity and Net debt/EBITDA), and non-financial indicators (sales/employee, EBITDA/employee, carbon intensity, and the cost of CO_2 per MWh of electricity produced). In addition, the Total Shareholder Return (TSR) indicator was calculated, indicating the profitability of investing in shares of the 5 analysed companies in 2019-2023. In turn, accepting or rejecting hypothesis H2 will allow to answer the question of whether the analysed companies had sufficient credit capacity, i.e., whether their financial situation allowed for financing both investments and the payment of potential dividends.

In order to make the testing of both hypotheses more reliable, a foreign state-owned enterprises (SOE), with similar parameters, i.e., sales revenue, asset value, number of employees, amount of electricity produced or amount of CO_2 emitted, was added to the analysis of 4 Polish companies (Table 2).

2. Literature review

A dividend is a share in the profit generated by the company and is a payment due to the shareholder for the capital provided by him (Sierpińska-Sawicz, 2019, p. 251).

The literature on dividend policy and its impact on the value of a company indicates that there is no uniform position among researchers on this issue. Some authors claim that an increase in the value of dividends paid increases the value of the company, while others claim that paying dividends decreases this value. Still, other authors argue that dividend policy is irrelevant to the value of the company.

In 1961, Miller and Modigliani published an article on the influence of capital structure and the value of dividends paid on the value of a company. According to the authors, capital structure and the value of dividends paid do not affect the value of a company. Dividends are only a way of distributing profits, and the value of a company depends on the profit earned. Unfortunately, the authors assumed that companies operate in a perfect market (no transaction costs, no difference in dividend and capital gains tax, no bankruptcy costs, sellers and buyers of shares have the same and free access to information and the same bargaining power), and investors can borrow money at the cost of the risk-free rate (Miller, Modigliani, 1961).

The authors who claim that dividends are good for shareholders include M.J. Gordon. He believed that retained earnings are associated with higher risk for shareholders. In the case of dividend payment, shareholders have money faster than in the case of retaining earnings and not paying dividends. He claimed that the lack of dividends increases risk for shareholders and thus an increase in their expected rate of return, i.e. an increase in the cost of equity capital. This approach to dividend policy is the so-called bird in hand theory (Gordon, 1963).

Other authors argue that paying dividends is disadvantageous to shareholders when the tax rate on dividends paid is higher than the tax rate on capital gains (Al.-Malkawi, Rafferty, Pillai, 2010). In the US, the tax rate on capital gains is lower than the tax rate on dividends paid (Damodaran, 2017). This approach to dividend policy means that more and more companies, instead of or in addition to paying dividends, buy back their shares, i.e. carry out so-called buyback transactions. In 2022, global share buybacks surged to a record $ 1.3 trillion, which was 94% of dividends paid. In 2012, the value of buybacks was 52% of dividends paid (Hanus Henderson Investors, 18.02.2025). In Poland, the tax rate on dividends paid is equal to the tax rate on capital gains (Ustawa…, 1992).

A company's dividend policy and related investment policy are also explained by the pecking order theory. It assumes that managers prefer the following sources of financing investment opportunities: first, through the company's retained earnings, followed by debt, and choosing equity financing as a last resort (Myers, Majluf, 1984).

Other researchers are proponents of the signaling theory, which is based on the agency theory and the information asymmetry. Since managers have better knowledge of the company's financial situation, their decisions regarding the amount of dividend payout are a signal to the market. An increase in the level of dividends is interpreted as a credible signal that the company will be able to maintain this level of dividends in the future and this usually causes an increase in demand for the company's shares and an increase in its share price. Discontinuing or reducing the level of dividend payout is in turn perceived by investors as a negative signal, which results in a decrease in the share price (Brycz, Pauka, 2013). The Signaling theory was studied by, among others, Stephan Roos (Ross, 1997), M. Miller, and K. Rock (Miller, Rock, 1985).

Yet another theory related to dividend policy, the dividend smoothing theory, concerns the amount of dividends paid and was presented by J. Linthner in 1958. According to him, managers try to maintain a constant level of dividends paid in relation to the profits achieved. Linthner's research showed that managers believe that the market values companies with a stable dividend policy (Lintner, 1956).

In practice, the dividend policy depends on the investment possibilities and the availability of funds with which the company can finance new investments. This is the so-called residual dividend policy, which assumes that new investments are primarily financed from retained earnings, and dividends are paid only when profits are greater than planned investment expenditures. The residual dividend policy assumes that investors prefer not to pay dividends if the company can allocate retained earnings to investments that bring an appropriate return on investment (Brigham, 1997, p. 229).

3. Methods

Economic analysis, particularly ratio analysis, was used as a research method to analyse the company's dividend policy.

The applied research method consisted of selecting appropriate financial and non-financial data of the analysed companies for the last 5 years, using this data in the ratio analysis of individual companies, and comparing the obtained ratios of the analysed companies with each other.

Four foreign SOEs were selected for comparative analysis: from France, Finland, Sweden and Germany (Tab. 1). However, for the comparative analysis to be useful, it was assumed that the foreign state-owned enterprises (SOEs) selected for comparative analysis should have similar business parameters to the 4 Polish companies, i.e. sales revenue, asset value, number of employees, and CO_2 emission intensity indicator per MWh of electricity produced. In addition, the selected companies should be listed on the stock exchange (Tab. 2).

The German company EnBW reported PLN 199,987 million in revenue in 2023 and PLN 199,987 million in asset value. In addition, EnBW, employing 26,043 people in 2023, produced 26.6 TWh of electricity. Another company, the Swedish Vattenfall, produced more electricity in 2023 (100.9 TWh) than 4 Polish companies combined, which limited its comparability with Polish companies. In addition, it was not a listed company. The shares of the third company, the French EDF, have not been listed on the stock exchange since 18.05.2023. In addition, the huge values of its revenue (PLN 634,725 million), assets (PLN 1,657,341 million), number of employees (175,550), and TWh of electricity produced (467.64 TWh) meant that it was not a good company for comparative analysis. The last company proposed for comparative analysis, the Finnish Fortum, had sales revenue and asset value comparable to Polish companies. At the same time, it had a very low carbon intensity indicator (32 gCO_2/kWh), and most of its employees and sales revenues were related to foreign operations. Due to the last two features, this company was not suitable for comparative analysis with Polish companies.

Table 1.
Selected Western European power companies - shares held by the State or other local government bodies

Company	Country	Shareholders	Interests in the share capital	Nr of votes	Remarks
TAURON	Poland	State Treasury (direct & indirect holdings)	40.45%	40.45%	30.06% directly held by the State Treasury; 10.39% indirectly held by KGHM S.A., a company in which the State Treasury holds 31.79% shares

Cont. table 1.

PGE	Poland	State Treasury	60.86%	60.86%	
ENEA	Poland	State Treasury	52.29%	52.29%	
ENERGA	Poland	State Treasury (indirect holdings)	90.92%	93.28%	Indirectly held by ORLEN S.A., a company whose 49.89% shares are held by the State Treasury.
EnBW	Germany	State of Baden-Württemberg (indirect holdings)	46.75%	46.75%	Indirectly held by NECKARPRI-Beteiligungsgesellschaft mbH, which is a wholly-owned subsidiary of NECKARPRI GmbH, which in turn is wholly owned by the state of Baden-Württemberg
		OEW Energie-Beteiligungs GmbH (OEW)*	46.75%	46.75%	The association of 9 regional authorities in southern Baden-Württemberg
EDF	France	State Treasury (indirect holdings)	100.00%	100.00%	Not listed from 18.05.2023
VATTENFALL	Sweden	State Treasury (indirect holdings)	100.00%	100.00%	Not listed.
FORTUM	Finland	State Treasury (indirect holdings)	51.26%	51.26%	Indirectly held by Solidium Oy, a company whose 100% shares are held by the State Treasury.

Source: Companies' financial statements for 2023.

Of the 4 well-known European state-owned enterprises (SOEs), and selected for comparative analysis (Tab. 1), only the German company EnBW was chosen. It has similar financial and non-financial parameters to the 4 analysed Polish companies and was listed on the stock exchange (Tab. 2).

Table 2.
Selected Western European power companies – financial and non-financial data

Company	Country	Sales (PLN million)	Assets (PLN million)	Nr of employees	Electricity production (TWh)	Carbon intensity gCO2/kWh
TAURON	Poland	50 715	49,798	18 728	10.1	909
PGE	Poland	95 964	113 443	42 552	56.8	1003
ENEA	Poland	44 021	39 111	18 227	21.3	768
ENERGA	Poland	26 087	31 679	8 732	3.2	552
EnBW*	Germany	199 987	177 680	26 943	26.6	366
EDF*	France	634 725	1 657 341	175,550	467.64	37
VATTENFALL**	Sweden	114 965	233 200	20,995 (10,509 in Sweden)	100.9	69
FORTUM*	Finland	30 488	85 131	5225 (2682 in Finland)	47.0	32

* Values in € changed into PLN using the exchange rate - PLN/EUR – 4.5430 (NBP, 9.02.2025).
** Values in € changed into PLN using the exchange rate - PLN/SEK – 0.3962 (NBP, 9.02.2025).

Source: Companies' financial statements for 2023.

4. Presentation of the analysed SOE'S

Financial and non-financial data of the analysed companies are presented in Appendix (Tables 3, 4, 5, 6, and 7).

5. Results

5.1. Testing hypothesis H1

Hypothesis H1 assumed that the lack of dividend payments by the analysed companies in 2019-2023 and allocating all profits to reserve capital to finance investments was detrimental to its shareholders.

To test hypothesis H1, the Value spread indicator was analysed. It was calculated by deducting WACC from ROCE.

Return on Capital Employed (ROCE)

Return on Capital Employed (ROCE), a profitability ratio, measures how efficiently a company is using its capital to generate profits. The return on capital employed metric is considered one of the best profitability ratios and is commonly used by investors to determine whether a company is suitable to invest in or not. ROCE can only be used to benchmark companies in the same industry. To calculate ROCE, divide EBIT (earnings before interest and tax) by Capital Employed. Capital Employed is the difference between the value of assets and the value of current liabilities (Corporate Finance Institute (CFI), 15.02.2025).

$$\boldsymbol{ROCE} = \frac{\textbf{EBIT}}{\textbf{Capital Employed}} = \frac{\textbf{EBIT}}{\textbf{Total assets} - \textbf{current liabilities}}$$

Capital employed can be also calculated by adding non-current assets to shareholders' equity (Wall Street Prep., 15.02.2025):

$$\textbf{Capital Employed} = \textbf{Shareholders' Equity} + \textbf{Non} - \textbf{Current Liabilities}$$

Therefore, the ROCE value indicates the profitability of invested capital, both own and external. This results from the fact that usually non-current assets are financed with external capital.

Figure 1 presents the ROCE indicators for the 5 analysed companies. The ROCE value for EnBW was presented in its financial statements, for the other companies it was calculated based on the formula:

$$\boldsymbol{ROCE} = \frac{\textbf{EBIT}}{\textbf{Average total assets} - \textbf{average current liabilities}}$$

The data presented in Figure 1 shows that the order of companies with the highest average ROCE value was as follows:

- EnBW – 9.4%,
- Energa S.A. – 6.3%,
- Enea S.A. – 3.0%,
- TAURON Polska Energia S.A. – 1.1% and
- PGE Polska Grupa Elektroenergetyczna S.A. – 0.5%.

Weighted Average Cost of Capital (WACC)

A firm's Weighted Average Cost of Capital (WACC) represents its blended cost of capital across all sources, including common shares, preferred shares, and debt. WACC can be calculated using the following formula (Corporate Finance Institute (CFI), 16.02.2025):

$$\mathbf{WACC = (E/V \times Re) + ((D/V \times Rd) \times (1 - T))}$$

where:

E = market value of the firm's equity (market cap),
D = market value of the firm's debt,
V = total value of capital (equity plus debt),
E/V = percentage of capital that is equity,
D/V = percentage of capital that is debt,
Re = cost of equity (required rate of return),
Rd = cost of debt (yield to maturity on existing debt),
T = tax rate.

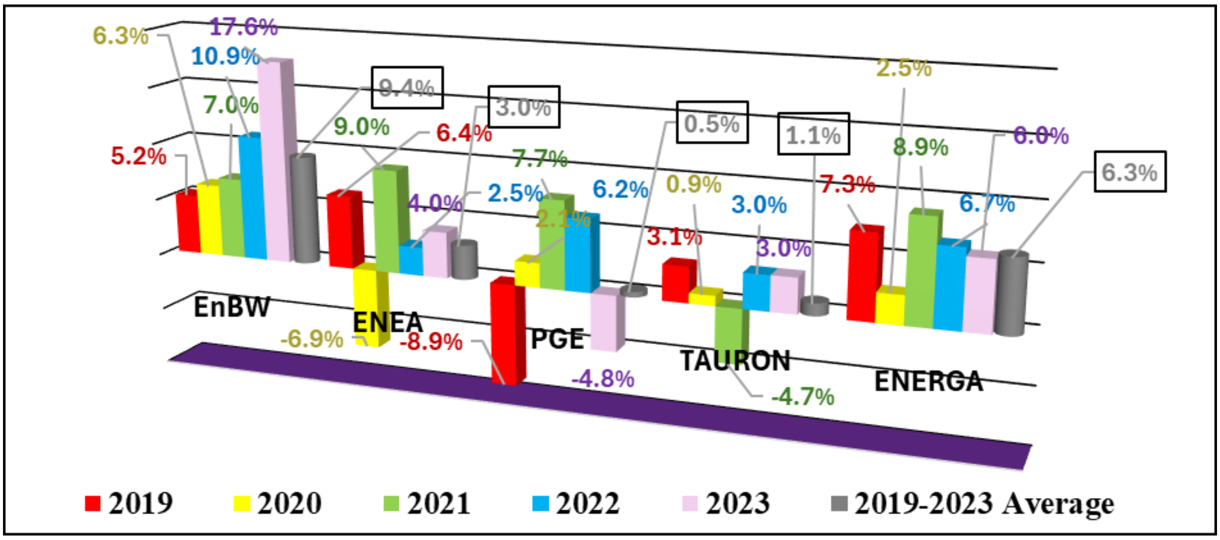

Figure 1. ROCE ratios in 2019-2023.

Source: Tables 3, 4, 5, 6, and 7; own calculations.

Value spread

Value spread, i.e. the difference between the ROCE and the WACC, shows whether the profitability of employed capital was greater than the WACC. Figure 2 presents value spreads for analysed companies in 2019-2023. Adopted for calculations WACC values are averages calculated by dividing by 2 the sums of the lowest and highest WACC values used by the companies for impairment tests. The Value spread for EnBW was presented in its financial statements, for the other companies it was calculated based on the formula: ROCE – WACC.

The data presented in Figure 2 shows that the order of companies with the highest Value spread was as follows:

- EnBW -3.5%,
- Energa S.A. – minus 2.0%,
- Enea S.A. – minus 4.7%,
- PGE Polska Grupa Elektroenergetyczna S.A. – minus 7.1% and
- TAURON Polska Energia S.A. – minus 7.5%.

Value spread below zero means that the ROCE was lower than WACC, which means that these companies did not create value for their shareholders. It can be said that allocating all profits to the reserve capital and then using them for investment expenses was disadvantageous for their shareholders, which confirms hypothesis H1.

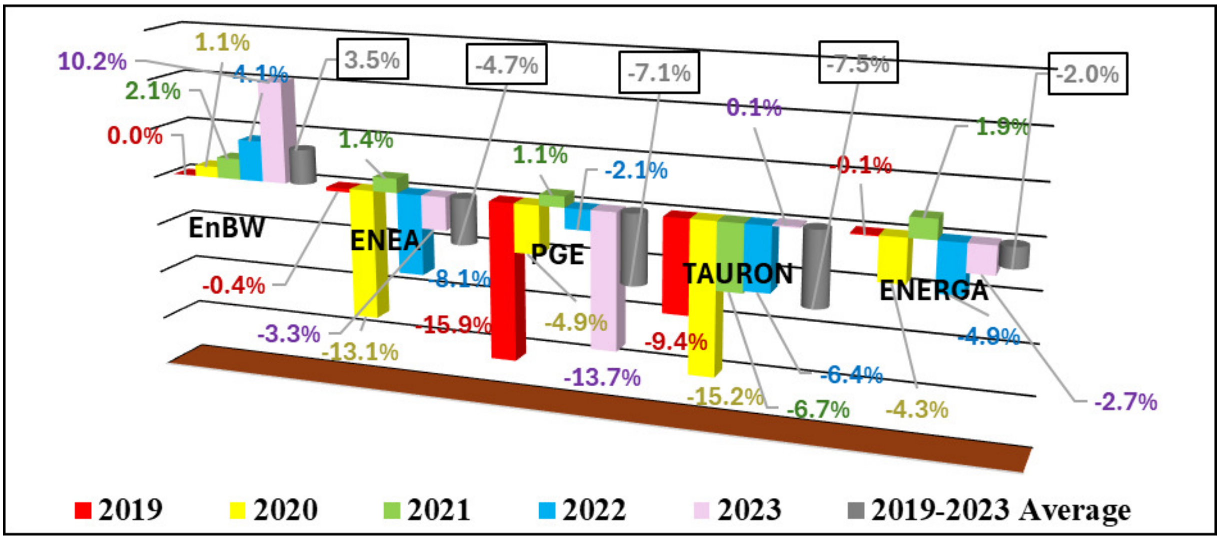

Figure 2. Value spreads ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

5.2 Testing hypothesis H2

Hypothesis H2 assumed that the lack of dividend payments by the 4 Polish analysed companies in 2019-2023 and the allocation of all profits to reserve capital to finance investments was the result of the poor financial performance of these companies and, consequently, a low level of cash and poor creditworthiness.

Financial and non-financial indicators were analysed to test the validity of hypothesis H2. The financial ratios used in the analysis are:

- profitability indicators (ROS, ROE, and ROA),
- debt indicators (Debt/Equity, and Net debt/EBITDA),
- CAPEX/revenue,
- impairment costs/revenue, and
- Total Shareholder Return (TSR).

In turn, the non-financial indicators used in the analysis are:

- sales/employee,
- EBITDA/employee,
- carbon intensity, and
- the cost of CO2 emissions.

Figures 3, 4 and 5 present the profitability indicators of the analysed companies in 2019-2023, i.e. ROS, ROA, and ROE. These indicators are a supplement to the ROCE indicator.

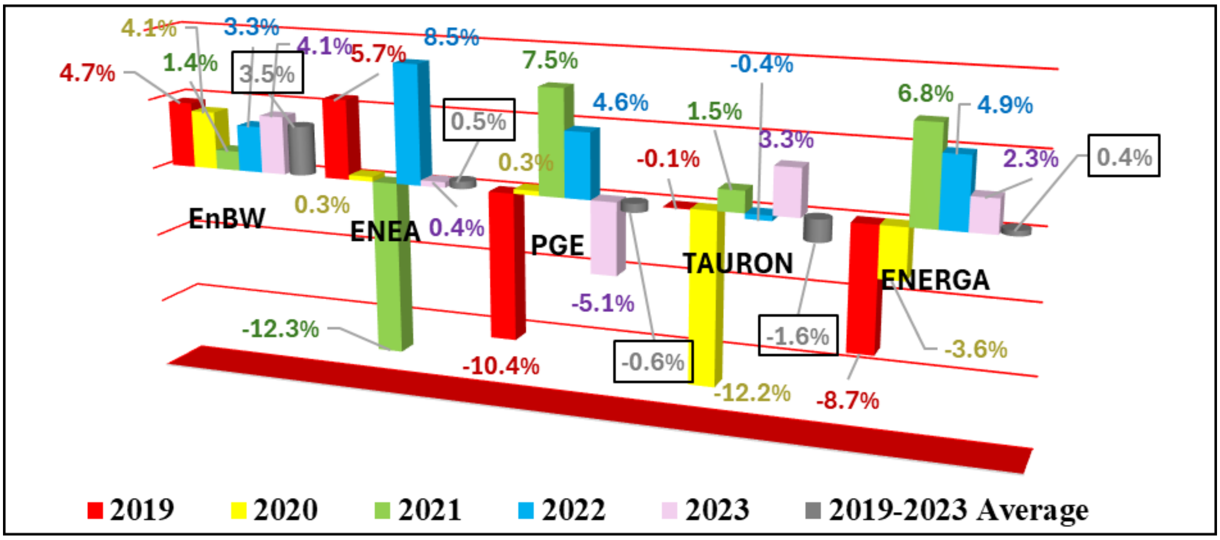

Figure 3. Return on Sales (ROS) ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

EnBW had an average net profit of PLN 0.35 per PLN of sales in the analysed period. The next 2 companies, i.e. Enea S.A. and Energa S.A., generated an average net profit of PLN 0.005 and PLN 0.004 per PLN of sales. The last 2 companies, i.e. PGE Polska Grupa Elektroenergetyczna S.A. and TAURON Polska Energia S.A. reported sales losses of PLN 0.006 and PLN 0.016 per PLN of sales, respectively (Figure 3).

The data presented in Figure 4 shows that EnBW recorded the highest average return on assets (ROA) in the analysed years (2%). Among Polish companies, the highest average ROA value was recorded by Energa S.A. (0.8%), and the lowest by Enea S.A. (minus 0.5%).

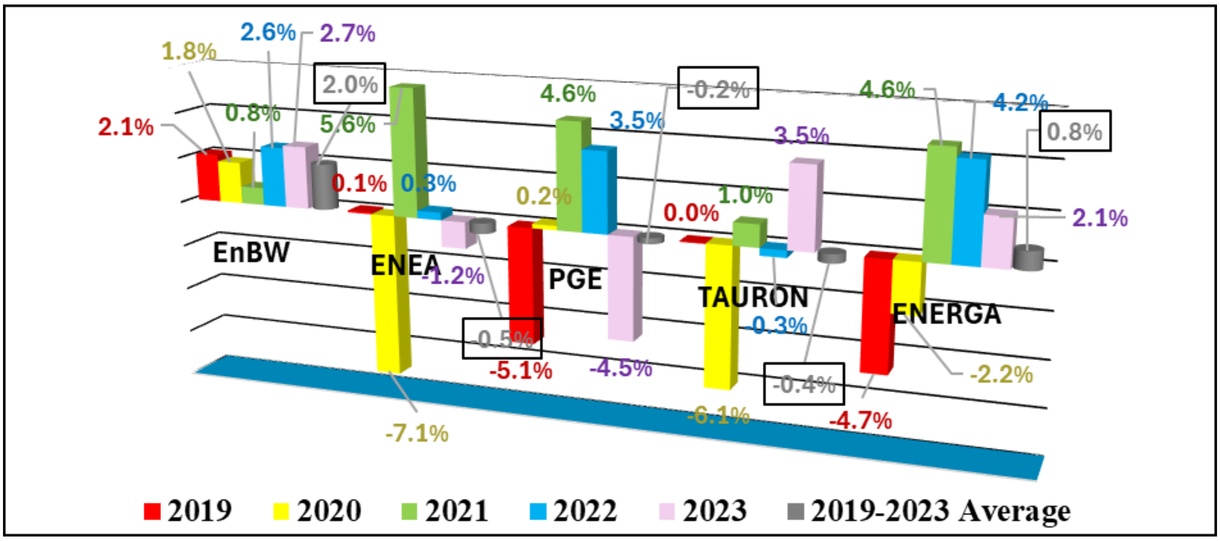

Figure 4. Return on Assets (ROA) ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

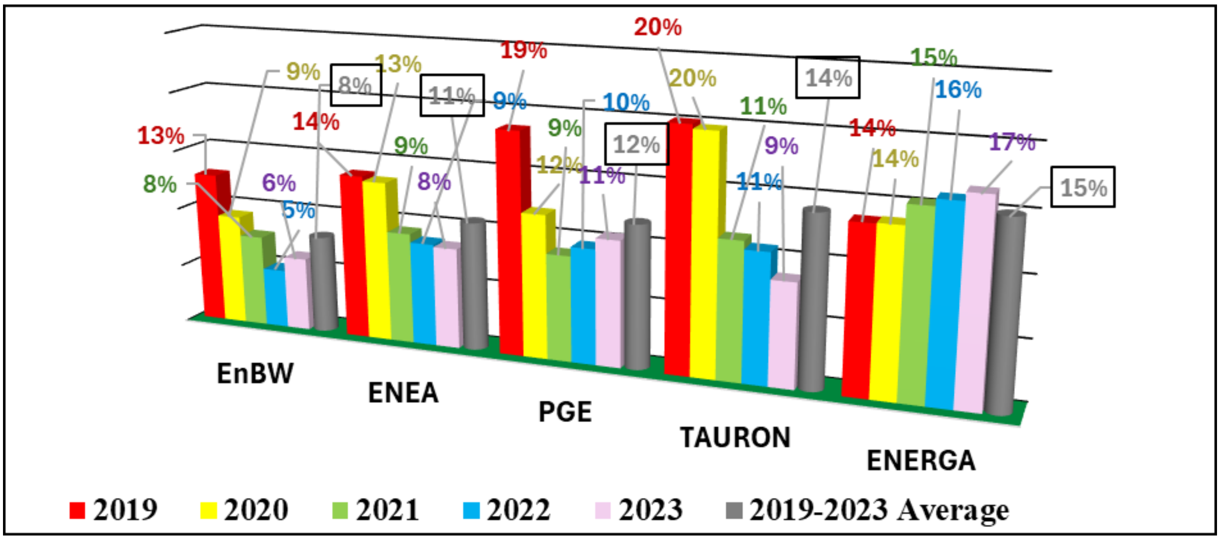

Figure 5. CAPEX/revenue ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

Despite the extremely poor value of ROA indicators of Polish companies, they invested much more than the German company (Figure 5). The average investment expenditure of the profitable EnBW company amounted to 8% of its revenue. Among Polish companies, the highest average CAPEX/revenue ratio was reported by Energa S.A. (15%), and the lowest by Enea S.A. (11%).

The data presented in the next Figure, 6, shows that EnBW recorded the highest average return on equity (ROE) in the analysed years (13.9%). Among Polish companies, the highest average ROE was reported by Energa S.A. (1.9%), and the lowest by TAURON Polska Energia S.A. (minus 0.9%).

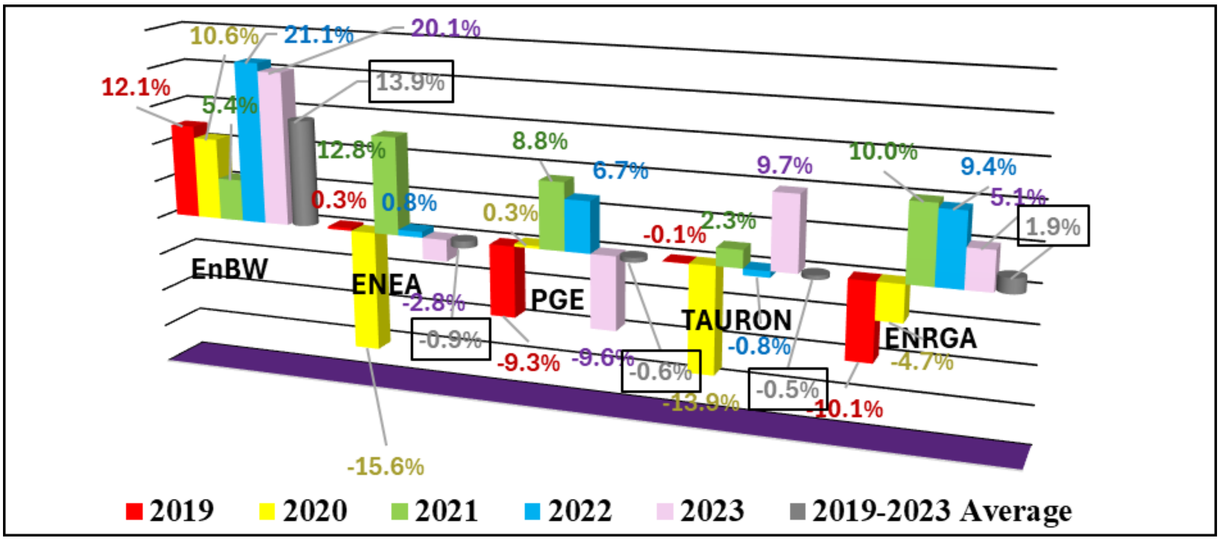

Figure 6. Return on Equity (ROE) ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

To sum up, the highest values of all profitability indicators (ROCE, ROS, ROA, and ROE) for the period 2019-2023 were reported by EnBW.

Figures 7 and 8 present debt ratios in 2019-2023 and the average values for this period.

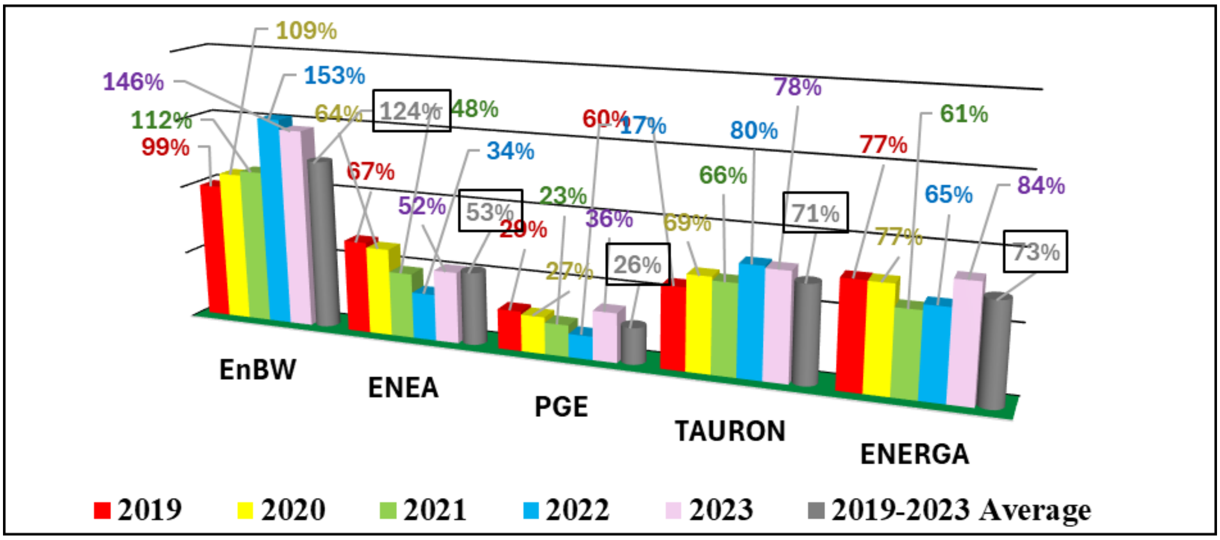

Figure 7. Debt/Equity (D/E) ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

The data from Figure 7 show that the most indebted company was EnBW, whose average debt amounted to over 100% of the equity in 2019-2023. In turn, the least indebted company was PGE Polska Grupa Elektroenergetyczna S.A., whose average debt in these years amounted to 26% of equity.

Figure 8 presents the Net debt/EBITDA ratios in 2019-2023. The data from Figure 8 shows that the most indebted company in relation to EBITDA was TAURON Polska Energia S.A., whose average Net debt/EBITDA ratio was 2.6. In turn, PGE Polska Grupa Elektroenergetyczna S.A. reported the lowest value of this ratio and it amounted to 0.8.

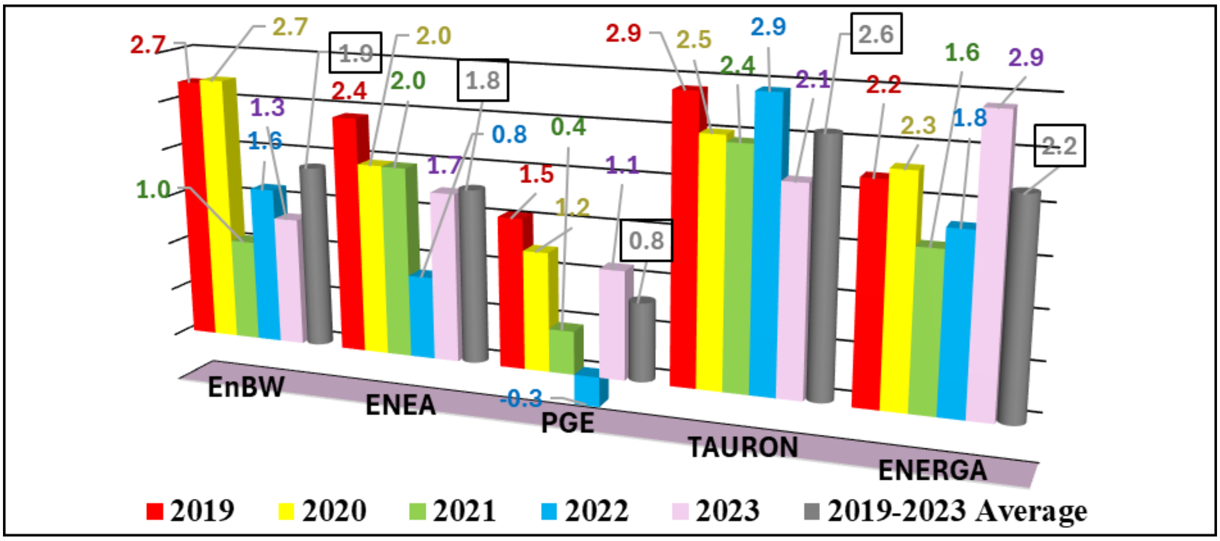

Figure 8. Net debt/EBITDA ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

The next Figure,9, presents the ratio of investment expenditures (CAPEX/revenue). EnBW recorded the lowest value of the ratio (8%), and the highest value recorded Energa S.A. (15%).

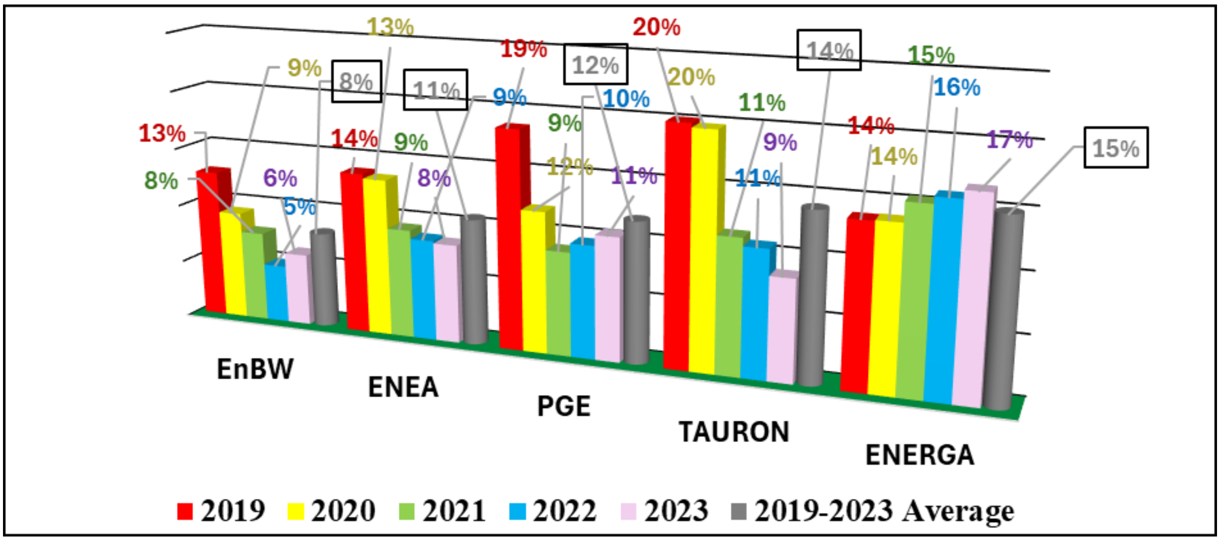

Figure 9. CAPEX/revenue ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

Figure 10 presents EBITDA per employee in 2019. The highest average value of the ratio (PLN 0.65 million per employee) was reported by EnBW, and the lowest (PLN 0.19 million per employee) by TAURON Polska Energia S.A.

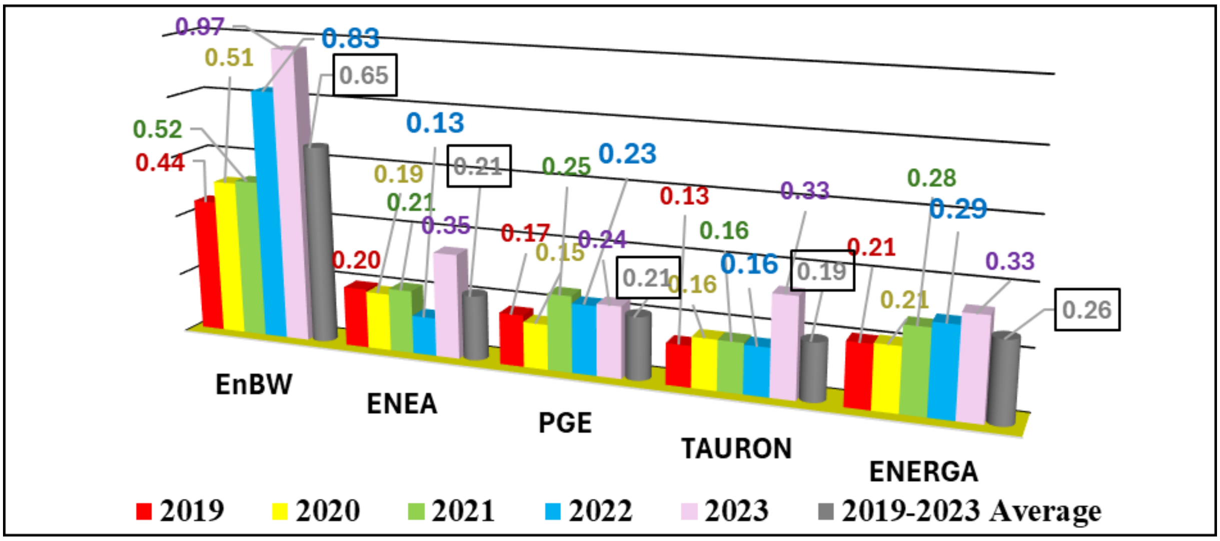

Figure 10. EBITDA per employee ratios in 2019-2023 (in PLN million per employee).

Source: Tables 4, 5, 6, 7 and 8; own calculations.

The next Figure, 11, presents the carbon intensity indicator showing how many kg of CO_2 was emitted during the production of 1 MWh of electricity. The data in Figure 11 shows that in the analysed years the lowest average carbon intensity indicator (413 kg CO_2/MWh) reported EnBW, and the highest (1032 kg CO_2/MWh) reported PGE Polska Grupa Elektroenergetyczna S.A.

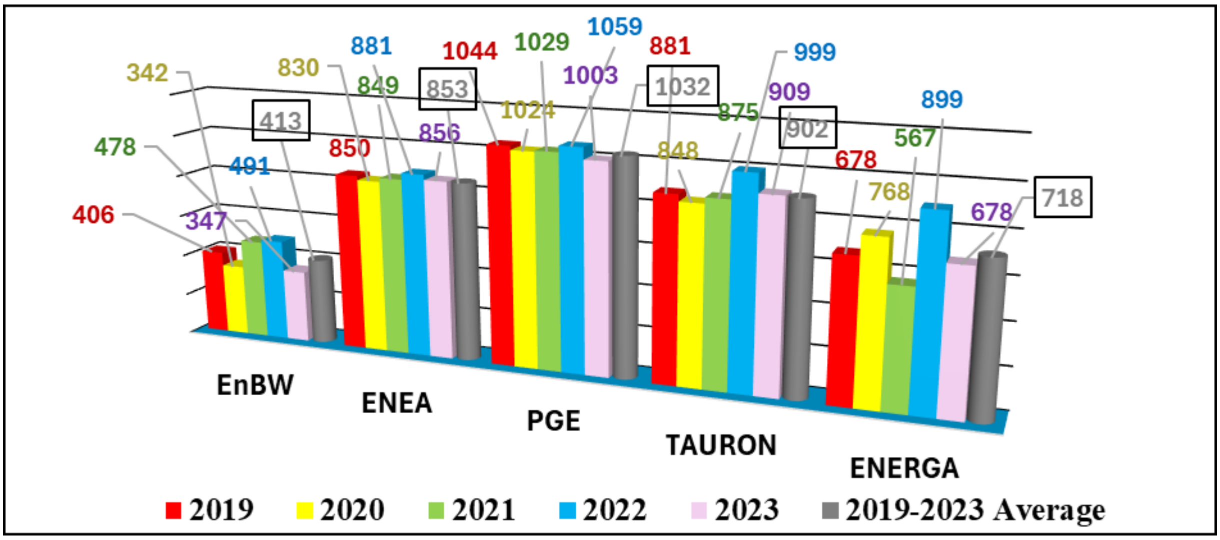

Figure 11. Carbon intensity ratios in 2019-2023, (kgCO_2/MWh).

Source: Tables 4, 5, 6, 7 and 8; own calculations.

According to Directive 2003/87/EC (Directive 2003/87/EC, 2023), power plants emitting CO_2 must settle their emissions by redeeming an appropriate number of allowances. The number of redeemed EU Allowances (EUAs) should be equal to the amount of CO_2 emitted.

The average annual EU Allowances prices in €/t CO_2 on the ICE exchange in 2019-2023 were (PGE Polska Grupa Elektroenergetyczna S.A., 2021 and 2023):

- 24.66 in 2019,
- 24.14 in 2020,
- 53.87 in 2021,
- 80.85 in 2022,
- 83.16 in 2023.

To convert the value in € to PLN, the average annual €/PLN exchange rate provided by the National Bank of Poland was used, which had the following values (NBP, 9.02.2025):

- 4.2980 in 2019,
- 4.4448 in 2020,
- 4.5674 in 2021,
- 4.6869 in 2022,
- 4.5430 in 2023.

The data presented in Figure 12 shows that the highest, average cost of EU Allowances per 1 MWh of electricity produced was reported by PGE Polska Grupa Elektroenergetyczna S.A., which amounted to PLN 251/MWh of electricity. In turn, the lowest cost was reported by EnBW, which amounted to PLN 103/MWh of electricity. The total cost of EU Allowances for EnBW due to difficulties with their description in the financial statements was calculated as the product of emitted tons of CO_2 and the average price of EU Allowances in a given year (PGE Polska Grupa Elektroenergetyczna S.A., 2022-2023). The cost of EU Allowances per MWh of electricity was calculated by dividing the total EU Allowance costs by the number of MWh of electricity produced.

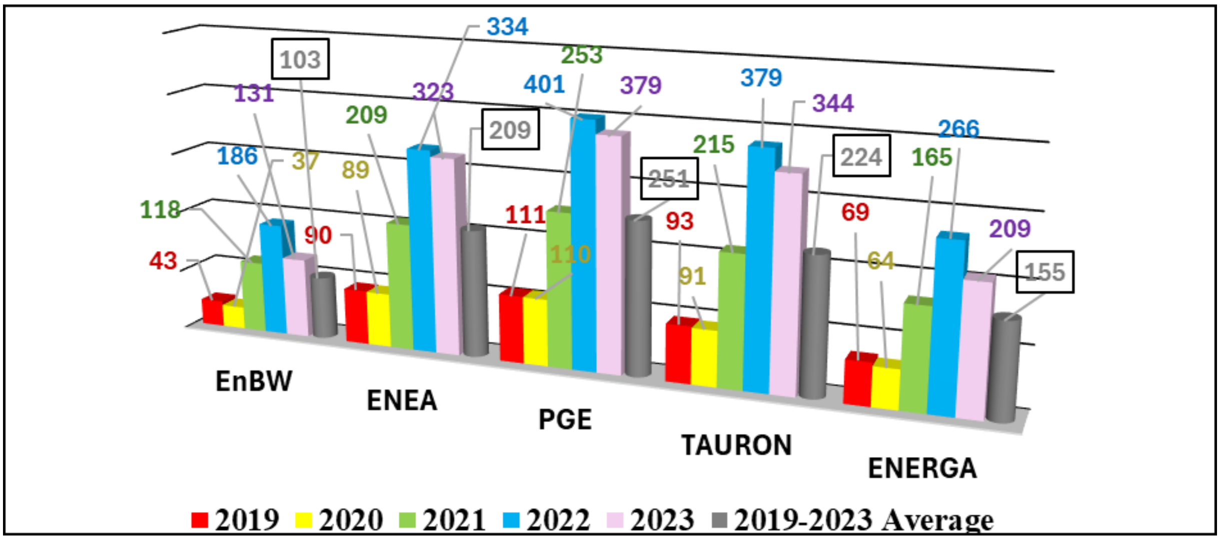

Figure 12. Carbon cost ratios in 2019-2023, (PLN/MWh).

Source: Tables 4, 5, 6, 7 and 8; own calculations.

The share of coal assets in the generation assets of the analysed companies resulted in the need to make write-offs based on the results of impairment tests. In addition, the companies made write-offs of intangible assets, but their amount was insignificant compared to the value of coal assets (Tab. 3, 4, 5, 6, and 7). Figure 13 presents impairment costs in relation to sales revenues. PGE Polska Grupa Elektroenergetyczna S.A. recorded the highest average value of the impairment costs/revenue ratio and it amounted to 6.2%. EnBW company recorded the lowest average value of this ratio and it amounted to 1.6%. A similar average value of this ratio, 1.8%, was recorded by Energa S.A., which resulted from a lower share of electricity production from fossil fuels compared to the other analysed Polish companies.

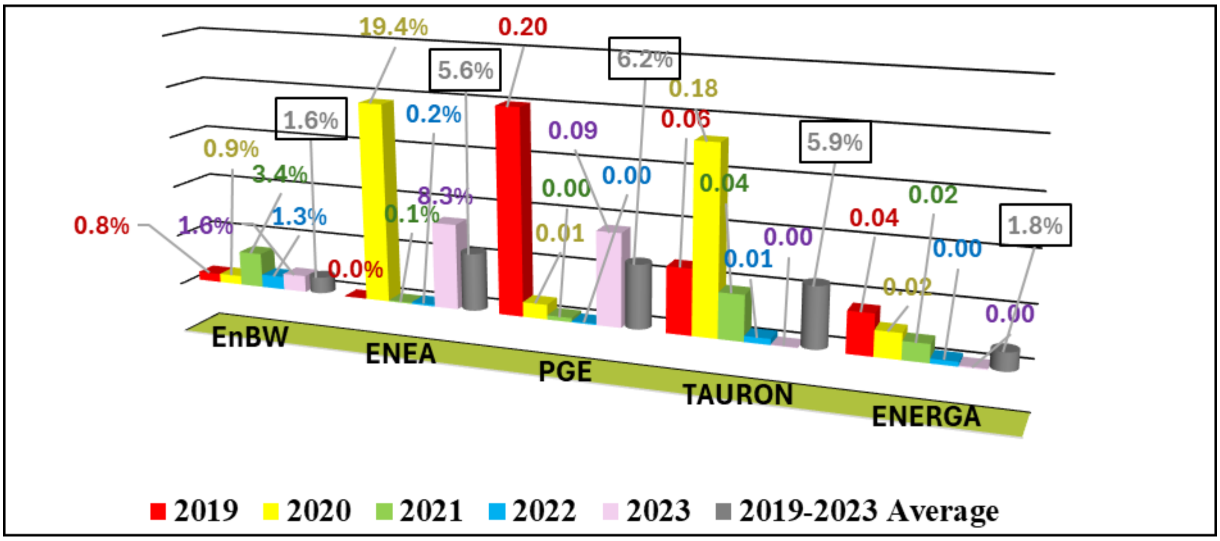

Figure 13. Impairment costs/revenue ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

High impairment cost result from the large share of electricity production from fossil fuels in the production mix of these companies (Figure 14). Almost all impairment costs related to non-financial assets in the operating segments "Conventional Generation" and "Mining". In addition, the large share of electricity production from fossil fuels resulted in higher CO_2 emissions and thus higher cost of producing 1 MWh of electricity. The data presented in Figure 14 shows that the highest average share of renewable energy in total electricity production (40.6%) was held by Energa S.A. Such a high value of this indicator resulted from the small electricity production by Energa S.A. in comparison to the other companies (Tab. 3, 4, 5, 6, and 7). An equally high average share of electricity production from renewable sources in the total production was recorded by the German company and amounted to 31.3%. The values of these indicators for the remaining 3 companies were lower than 10%.

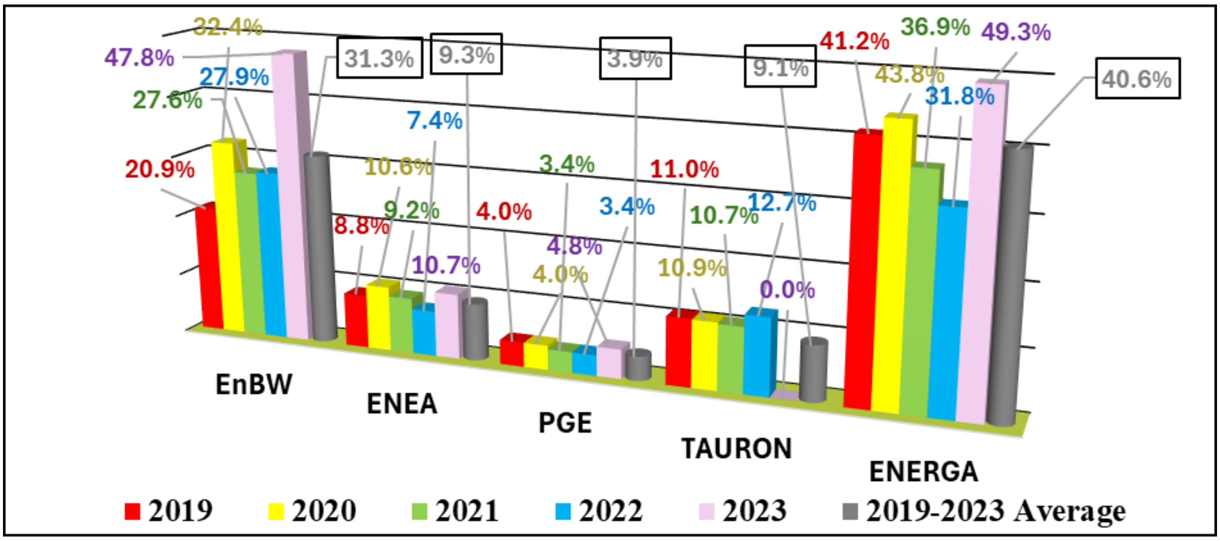

Figure 14. Electricity from renewable resources/total produced net electricity ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

The next indicator, TSR, indicates the profitability of investing in shares of the analysed companies in 2019-2023 (Figure 15). In the analysed period, the most, 27%, could be earned by EnBW shareholders, and the least by PGE shareholders, minus 1%. Among Polish companies, the highest return on capital was generated by TAURON Polska Energia S.A. and amounted to 19%. The high value of this indicator results from the fact that at the end of 2022, the company sold the "Mining" operating segment to the State Treasury, which basically reported losses every year (TAURON, 23.02.2025).

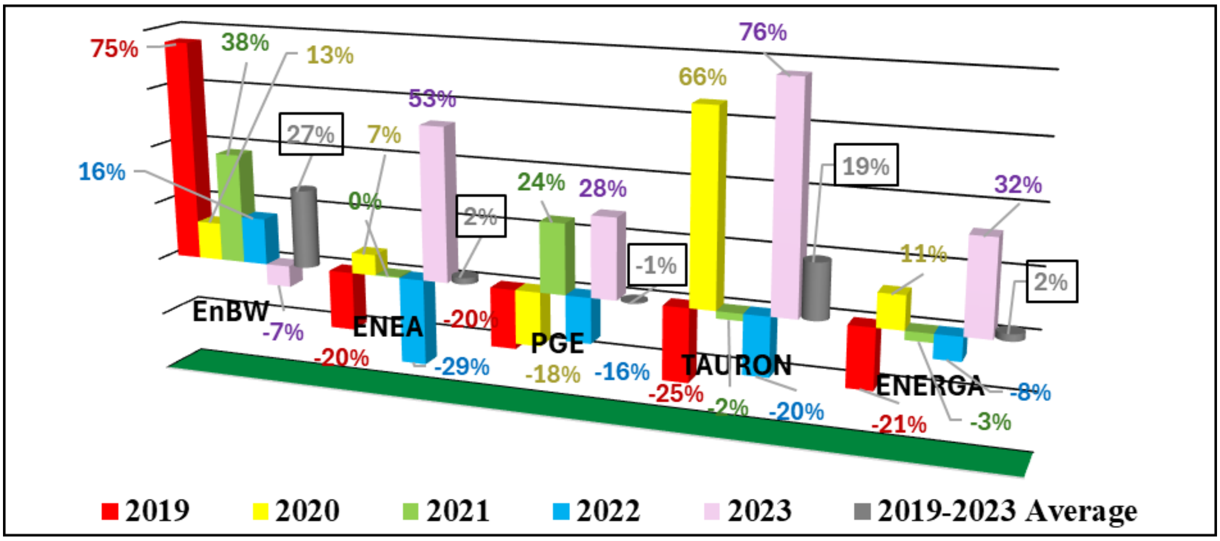

Figure 15. Total Shareholder Return (TRS) ratios in 2019-2023.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

Hypothesis H2 assumed that the lack of dividend payment by the 4 analysed Polish companies in 2019-2023 and the allocation of all profits to reserve capital to finance investments resulted from the weak financial results of these companies and, consequently, a low level of cash and poor creditworthiness.

To test hypothesis H2, financial and non-financial indicators of the 4 Polish SOEs and the German SOE were used. The average values of profitability indicators (ROS, ROA, and ROE) reported by the German company were the highest among the 5 analysed companies. EnBW spent the least on investments in relation to revenue out of all companies, which may indicate a better selection of investment projects. EnBW's better profitability results can be explained, among others, by values of the following indicators:

- electricity production from renewable resources /total electricity production,
- impairment costs/revenue,
- carbon intensity,
- cost of CO_2 emissions,
- sales/employee,
- EBITDA /employee.

Particular attention should be paid to the impairment costs of non-financial assets calculated after performing impairment tests following IFRS 36. According to this standard, the impairment cost ate not a cash expense but only an entry in the account. The aforementioned IFRS 36 allows these entries to be reversed in the future. Table 3 presents the share of impairment costs in the net financial result for the 5 analysed companies. After adding these costs to the financial result, the adjusted net financial result is significantly higher. In the case of EnBW for the period of 5 years, i.e., from 2019 to 2023, impairment costs amounted to EUR 2,843 million, and the net profit of EUR 5,830 million. In PGE Polska Grupa Elektroenergetyczna S.A., impairment costs amounted to PLN 17,165 million, and the net loss was PLN 1,347 million. In turn, Enea recorded a total net loss of PLN 699 million over 5 years, and impairment costs amounted to PLN 7.254 million.

Another company, Energa S.A., reported a net profit of PLN 1107 million and PLN 1126 million impairment costs over 5 years.

The last of the analysed companies, TAURON Polska Energia S.A. reported a net loss of PLN 571 million and PLN 6,374 million impairment costs.

Adding impairment costs to the net result was necessary to show that the financial situation of the analysed companies differed significantly after taking into account those costs that are not cash cost. High CAPEX expenses (Figure and Tab. 3) were possible because the adjusted financial results of these companies were different.

The German company had better financial results (excluding impairment costs), invested less, and paid dividends. Polish companies had worse financial results, invested a lot, and did not pay dividends. The analysis shows that the profitability of their investments was low or negative, and they did not pay dividends, but they could increase debt to pay such dividends.

In turn, the analysis of debt ratios (Figure 7) showed that the most indebted company was EnBW with an average D/E ratio of 124%. In turn, the least indebted company was PGE Polska Grupa Elektroenergetyczna S.A. with an average D/E ratio of 24%. The values of this ratio indicate that despite the much worse financial results of Polish companies and much higher investment expenditures compared to the German company, their debt was lower than that of the German company. This means that they were able to pay dividends (the German company paid dividends every year) at the expense of increasing debt, but they did not do so. This is confirmed by the Net debt/EBITDA ratio, which indicates whether the company generates an appropriate level of operating profit to pay off its debt. The value of this ratio above 4 or 5 is considered high, although there is a difference in the interpretation of its value depending on the industry. In credit agreements, banks often require that the company does not exceed a specific Net debt/EBITDA ratio (covenants). For example, for Energa S.A., according to the Bond Issue Terms, the Net debt/EBITDA ratio could not be higher than 3.5x (Obligacje.pl, 22.02.2025). The values of this indicator for the Polish companies in 2019-2023 (Figure 8) were lower than 3.5.

To sum up, the suspension of dividend payments by Polish companies in 2021-2023 was not justified by the poor financial results of these companies resulting from the lack of financial liquidity for these payments. Therefore, the H2 hypothesis should be rejected as the financial situation of the analysed 4 Polish SOEs was good enough to spend money on investments and to pay dividends by increasing their debts. Of course, a better solution, supported by the acceptance of hypothesis H1, would be to limit investment expenditure only to profitable projects, which could increase the value of dividends paid.

Table 3.
Analysed companies - financial and non -financial data in 2019-2023

Company	Data	2019	2020	2021	2022	2023	Total
EnBW	Net profit/loss	904	808	441	1 844	1 833	5 830
	Impairment cost	161	171	1 088	712	711	2 843
	Adjusted Net profit/loss	1 065	979	1 530	2 556	2 543	8 673
	CAPEX	2 481	1 827	2 471	2 768	2 740	12 287
	Dividends paid	362	323	159	572	275	1 690
	D/E ratio	99%	109%	112%	153%	146%	n.a.
PGE	Net profit/loss	-3 928	148	3 945	3 390	-4 902	-1 347
	Impairment cost	7 528	654	215	93	8 675	17 165
	Adjusted Net profit/loss	3 600	802	4 160	3 483	3 773	15 818
	CAPEX	7 009	5 495	4 662	7 053	10 088	34 307
	Dividends paid	0	0	0	0	0	0
	D/E ratio	29%	27%	23%	17%	36%	n.a.
ENEA	Net profit/loss	54	-2 234	1 805	119	-443	-699
	Impairment cost	-1	3 521	24	49	3 661	7 254
	Adjusted Net profit/loss	53	1 287	1 829	168	3 219	6 556
	CAPEX	2 181	2 441	1 980	2 591	3 711	12 904
	Dividends paid	0	0	0	0	0	0
	D/E ratio	67%	64%	48%	34%	52%	n.a.
ENERGA	Net profit/loss	-1 001	-444	937	1 009	606	1 107
	Impairment cost	457	309	241	90	29	1 126
	Impairment cost/Net profit/loss	-46%	-70%	26%	9%	5%	102%
	CAPEX	1 574	1 721	2 107	3 260	4 334	12 996
	Dividends paid	0	0	0	0	0	0
	D/E ratio	77%	77%	61%	65%	84%	n.a.

Cont. table 3.

TAURON	Net profit/loss	-12	-2 488	385	-134	1 678	-571
	Impairment cost	1 303	3 700	1 133	214	24	6 374
	Adjusted Net profit/loss	1 292	1 212	1 518	80	1 702	5 804
	CAPEX	4 128	4 039	2 932	3 962	4 364	19 425
	Dividends paid	0	0	0	0	0	0
	D/E ratio	60%	69%	66%	80%	78%	n.a.

Source: Tables 4, 5, 6, 7 and 8; own calculations.

6. Summary

Hypothesis H1 assumed that the lack of dividend payments by the analysed companies in 2019-2023 and allocating all profits to reserve capital to finance investments was detrimental to their shareholders. The Value spread of the 4 Polish SOEs in almost all year was below zero (Figure 2). This means that the ROCE was lower than WACC. One of the main reasons for this, apart from having many coal assets and making write-offs of non-financial assets (Tables 4, 5, 6 and 7), was the investment policy. For example, in 2017, PGE Polska Grupa Energetyczna S.A. purchased coal assets from the French energy group EDF for PLN 4.3 billion, i.e., 5 companies that owned 1 conventional power plant and 8 CHP plants (PGE Polska Grupa Elektroenergetyczna S.A., 2017). Also in 2017, the French company ENGIE sold a coal-fired power plant in Połaniec with a capacity of 1,882 MW to the Enea Group for PLN 1.26 billion (Enea, 14.03.2017). In December 2016, the Energa and Enea Groups signed an agreement for the construction (each with a 50% share in the investment) of the so-called Ostrołęka C Power Plant for over PLN 6 billion. In February 2020, these groups decided to suspend the work. The Energa Group reported that the estimated impact of discontinuing the investment in the so-called Ostrołęka C Power Plant on the consolidated net result of the Energa Group for 2019 amounted to PLN 443 million (Energa S.A., 2020). In turn, Enea S.A. reported that the estimated impact of the decision to discontinue its implementation, as a result of write-offs, on the consolidated net profit for 2019 will amount to approx. PLN 500.9 million (Enea S.A., 2020).

Thus, the companies in the study were buying coal assets while other companies were selling them. Another example of selling coal assets is the Swedish company Vattenfall mentioned in Table 2. The purchases of coal and nuclear assets, mainly in Germany, resulted in a total net loss (mainly due to asset and goodwill write-downs) of SEK 67.6 billion in 2013-2016 (SEK 13.5 billion in 2013; SEK 8.3 billion in 2014; SEK 19.8 billion in 2015 and SEK 26.0 billion in 2016). Thanks to selling these assets (mainly using lignite as an energy source), the company started reporting profits in the following years, including PLN 9.5 billion in 2017 (Vattenfall, 2013-2017).

It was not only investments in conventional energy that were disadvantageous for minority shareholders. Investing in renewable energy is generally quite profitable when a wind or solar farm is built from scratch. In a situation where a company buys an already built and operating unit, the seller realizes the profit, i.e., the price of the farm includes its costs and the added profit. Therefore, the profitability of the investment for the buyer is small, if any. The revenue from wind farms in PLN/MWh of electricity is determined on the basis of the auction price and is indexed annually to the inflation rate with certain restrictions. A small increase in costs or slightly lower wind can result in a decrease in profitability or even losses. Below are 2 examples of the purchase of wind farms by PGE Polska Grupa Elektroenergetyczna S.A.

In June 2022, PGE Polska Grupa Elektroenergetyczna S.A. finalized the purchase of three onshore wind farms (Polska Grupa Elektroenergetyczna S.A., 2022) with a total capacity of 84.2 MW (Radzyń Wind Farm with a capacity of 36.9 MW, Ścieki Wind Farm with a capacity of 22 MW and Jóźwin Wind Farm with a capacity of 25.3 MW). In September 2023, PGE Polska Grupa Elektroenergetyczna S.A., acquired 100% of the shares in LongWing Polska sp. z o.o., the owner of the Zalesie wind farm with a capacity of 24.9 MW (Polska Grupa Elektroenergetyczna S.A., 2023).

To sum up, the investment policy of the analysed 4 Polish power groups was disadvantageous for their shareholders, as they could have better invested the cash from the received dividends. The calculated Value spread ratio below zero confirms hypothesis H1.

The next hypothesis, H2, assumed that the lack of dividend payments by the 4 analysed Polish companies in the years 2019-2023 and the allocation of all profits to reserve capital to finance investments resulted from the poor financial results of these companies and, consequently, low cash levels and poor creditworthiness. The analysed 4 Polish companies reported weaker financial results, e.g., ROS, ROA, and ROE compared to the German company, but had sufficient creditworthiness to increase debt to pay dividends. Their Debt/Equity ratios were lower than those of the German company. In addition, Enea S.A. and PGE Polska Grupa Elektroenergetczna S.A. had a lower Net debt/EBITDA ratio than the German company. At the same time, the value of these indicators were lower than 3.5, i.e., lower than the limit value assumed in the credit agreements of these companies. These facts do not confirm hypothesis H2 as their financial situation was good enough for spending money on investments, and for paying dividends.

In the document "Good Practices of GPW Listed Companies 2021," it is stated that a company should strive to distribute profits by paying dividends. Leaving the entire profit in the company is possible if any of the following reasons apply (GPW, 2021):

a) the amount of this profit is minimal, and as a consequence, the dividend would be insignificant in relation to the value of the shares;
b) the company shows uncovered losses from previous years, and the profit is intended to reduce them;

c) the company justifies that allocating the profit to investments will bring tangible benefits to shareholders;
d) the company has not generated cash to pay the dividend;
e) paying the dividend would significantly increase the risk of violating the covenants resulting from the company's loan agreements or the terms of the bond issue;
f) leaving the profit in the company is in line with the recommendation of the supervising institution.

The residual dividend policy, mentioned at the beginning of the article, assumes that investors prefer not to pay dividends if the company can allocate retained earnings to investments that bring an appropriate return on investment (Brigham, 1997, p. 229). The results of testing hypothesis H1 showed that the retained earnings for investments did not bring an appropriate return on investment. Therefore, point c mentioned above, which states that a company may not pay dividends if it justifies that allocating the profit to investments will bring tangible benefits to shareholders, has not been met.

To sum up, the rejection of the H1 hypotheses and acceptance of the H2 hypotheses leads to the conclusion that the lack of dividend payments by the 4 analysed Polish companies in 2019-2023 was an action to the detriment of their shareholders. State Treasury companies must pay dividends to Polish society, and situations when they do not do so may be exceptional and not drag on for many years. Confirmation of such a conclusion was dividends paid by the German company EnBW.

The poor financial results of the analyzed power groups result from insufficient ownership supervision by state authorities. This resulted in the consent of shareholders representing the State Treasury not to pay dividends. It can be assumed that both the bodies of the analyzed companies and the representatives of the shareholders counted on the establishment by 2022 of a State Treasury company, i.e. the National Agency for National Security (NABE), which was to take over the so-called coal assets from these companies, i.e. the operating segments "Mining" and "Conventional Energy" (GOV.PL, 19.08.2023). After the transfer of these unprofitable assets, the financial situation of these companies would improve significantly, as evidenced by the financial results and share prices from the end of 2023 of TAURON Polska Energia S.A., which sold the "Mining" segment to the State Treasury for PLN 1 at the end of 2022. In Chart 7, the TRS indicator for Tauron Polska Energia S.A. in 2022 was negative and amounted to minus 20%, and in 2023 it was positive - 76%. This was possible because the company's financial result of PLN 134 million in 2022 turned into a profit of PLN 1,678 million. Therefore, for the companies, the creation of NABE meant getting rid of unprofitable assets and improving their final results. At the same time, someone would have to cover these losses and it would be the Polish society. Unfortunately, the hope for the creation of NABE meant that the analyzed companies did little to improve their financial situation and did not pay dividends. Allocating financial resources, among others, to operating segments that were to go to NABE had no substantive justification.

References

1. Al.-Malkawi, H., Rafferty, N., Pillai, R. (2010). Dividend Policy of Theories and Empirical Evidence. *International Bulletin of Business Administration, No. 9*, pp. 171-200.
2. Biznesradar.pl. *Akcjonariat: akcjonariusze PGE*. Retrieved from: https://www.biznesradar.pl/akcjonariat/PGE, 2.03.2025.
3. Brigham, E.F. (1997). *Podstawy zarządzania finansami, 2.* PWN.
4. Brycz, B., Pauka, M. (2013). Analiza polityki dywidend w polskich przedsiębiorstwach notowanych na Giełdzie Papierów Wartościowych w Warszawie. *Zeszyty Naukowe Uniwersytetu Szczecińskiego, no. 768, Finanse, Rynki Finansowe, Ubezpieczenia, no. 63,* pp. 31-50.
5. Corporate Finance Institute (CFI). *Return on Capital Employed* (ROCE). Retrieved from: https://corporatefinanceinstitute.com/resources/accounting/return-on-capital-employed-roce/, 15.02.2025.
6. Corporate Finance Institute (CFI), *WACC.* Retrieved from: https://corporatefinanceinstitute.com/resources/valuation/what-is-wacc-formula/, 16.02.2025.
7. Damodaran, A. (2017). *Finanse korporacyjne. Teoria i praktyka*. Helion.
8. Directive 2003/87/EC of The European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (Official Journal of the European Union, L275, 25.10.2023).
9. EDF. *Consolidated financial statements at 31 December 2023*.
10. Enea S.A. (14.03.2017). *Enea właścicielem Elektrowni Połaniec – transakcja z ENGIE zakończona sukcesem*. Retrieved from: https://media.enea.pl/pr/348024/enea-wlascicielem-elektrowni-polaniec-transakcja-z-engie-zakonczona-sukcesem, 1.03.2025.
11. Enea S.A. *Financial statements 2019-2023*.
12. Enea S.A. *Raport bieżący, no. 18/2020*.
13. Energa S.A. *Financial statements 2019-2023.*
14. Energa S.A. *Raport bieżący, no. 42/2020.*
15. Fortum. *Financial statements and operating and financial review 2023.*
16. Gordon, M. (1963). Optimal investment and financing policy. *Journal of Finance, Vol. 18, Iss. 2,* pp. 264-272.
17. Gov.pl. *Utworzenie Narodowej Agencji Bezpieczeństwa Energetycznego wchodzi na ostatnią prostą, Ministerstwo Aktywów Państwowych*, Retrieved from: https://www.gov.pl/web/aktywa-panstwowe/utworzenie-narodowej-agencji-energetycznej-wchodzi-na-ostatnia-prosta, 19. 08.2023.
18. GPW. *Good Practices of GPW Listed Companies 2021*. Retrieved from: https://www.gpw.pl/dobre-praktyki2021, 14.02.2025.

19. Hanus Henderson Investors. *Global share buybacks surge to a record $1.31 trillion almost equalling dividends*. Retrieved from: https://www.janushenderson.com/en-us/advisor/press-releases/global-share-buybacks-surge-to-a-record-1-31-trillion-almost-equalling-dividends/, 18.02.2025.
20. Lintner, J. (1956). Distribution of Incomes of Corporations Among Dividends. Retained Earnings, and Taxes. *The American Economic Review, Vol. 46, No. 2,* pp. 97-113.
21. Miller, M., Modigliani, F. (1961). Dividend Policy, Growth, and the Valuation of Shares. *The Journal of Business, Vol. 34, No. 4,* pp. 411-433.
22. Miller, M.H., Rock, K. (1985). The Dividend Policy under Asymmetric Information. *The Journal of Finance, Vol. 40, No. 4*, pp. 1031-1051.
23. Myers, S.C., Majluf, N.S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, Vol. 13, No. 2,* pp. 187-221.
24. NPB. *NBP Archiwum kursów średnich – tabela A (CSV, XLS).* Retrieved from: https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/, 9.02.2025.
25. Obligacje.pl. *Energa porozumiała się z obligatariuszami*. Retrieved from: https://obligacje.pl/pl/a/energa-porozumiala-sie-z-obligatariuszami, 22.02.2025.
26. PGE Polska grupa Elektroenergetyczna S.A. *Financial statements 2019-2023.*
27. Ross, S.A. (1997). The Determination of Financial Structure: The Incentive-Signalling Approach. *The Bell Journal of Economics, Vol. 8, No. 1,* pp. 23-40.
28. Sierpińska-Sawicz, A. (2019). Korporacyjna polityka dywidend. In: M. Sierpińska, A. Sierpińska-Sawicz, R. Węgrzyn, *Controlling finansowy w przedsiębiorstwie.* PWN.
29. TAURON Polska Energia S.A. *Financial statements 2019-2023.*
30. TAURON Polska Energia S.A. *TAURON sprzedaje kopalnie. Jest umowa ze Skarbem Państwa*. Retrieved from: https://media.tauron.pl/pr/773749/tauron-sprzedaje-kopalnie-jest-umowa-ze-skarbem-panstwa#:~:text=TAURON%20zawar%C5%82%20z%20Ministerstwem%20Aktyw%C3%B3w%20Pa%C5%84stwowych%20warunkow%C4%85%20umow%C4%99,kt%C3%B3rej%20wchodz%C4%85%20zak%C5%82ady%20g%C3%B3rnicze%20Sobieski%2C%20Janina%20i%20Brzeszcze, 23.02.2025.
31. Urząd Regulacji Energetyki. Retrieved from: https://www.ure.gov.pl/pl/energia-elektryczna/charakterystyka-rynku/12095,2023.html, 11.02.2025.
32. Ustawa z dnia 15 lutego 1992 r. o podatku dochodowym od osób prawnych (Dz.U. 1992, nr 21, poz. 86).
33. Vattenfall. *Annual and Sustainability Report 2023.*
34. Vattenfall. *Financial statements 2013-2017.*
35. Wall Street Prep. *Return on Capital Employed (ROCE)*. Retrieved from: https://www.wallstreetprep.com/knowledge/roce-return-on-capital-employed/, 15.02.2025.

Appendix

Table 4.
PGE Polska Grupa Elektroenergetyczna S.A. - financial and non -financial data

DATA		2019	2020	2021	2022	2023
PROFIT & LOSS STATEMENT						
Revenue	PLN million	37 627	45 766	52 772	73 435	95 964
EBITDA	PLN million	7 141	5 966	9535	8 657	10 028
Impairment costs	PLN million	-7 528	-654	-215	-93	-8 675
Intangibles	PLN million	-4	0	-28	11	8
PPE	PLN million	-7 524	-654	-187	-104	-8 683
Amortization & Depreciation	PLN million	3 840	3 858	4 143	4 205	4 675
EBIT	PLN million	-4 175	1 408	5 123	4 299	-3 431
Nett profit/loss	PLN million	-3 928	148	3 945	3 390	-4 902
BALANCE SHEET						
Non-current assets	PLN million	65 055	66 239	66 498	71 732	78 340
Current assets	PLN million	12 593	15 089	22 714	34 046	35 103
Cash and cash equivalents	PLN million	1 313	4 198	6 733	11 887	6 033
Total assets	PLN million	77 650	81 594	88 966	105 778	113 443
Equity	PLN million	42 289	42 518	47 494	54 383	47 855
Current liabilities	PLN million	11 826	15 018	21 797	35 296	42 210
Debt	PLN million	12 308	11 465	10 961	9 231	17 154
Net debt	PLN million	10 995	7 267	4 228	-2 656	11 121
OTHER DATA						
CAPEX	PLN million	7 009	5 495	4 662	7 053	10 088
WACC (average)	%	7.0%	7.0%	6.6%	8.3%	8.9%
Share price (at the last trading day)	PLN/share	7.97	6.50	8.06	6.80	8.68
Dividend per share	PLN/share	0	0	0	0	0
EPS - net profit attributable to shareholders of the Parent	PLN/share	-2.12	0.06	2.12	-2.23	1.56
Installed capacity	GW	17 780	17 957	17 791	17 888	17 912
Net generation of electricity, of which	GWh	58 134	58 130	68 771	66 130	56 770
from conventional sources	GWh	55 799	55 803	66 441	63 890	54 040
from renevables sources	GWh	2 335	2 327	2 330	2 240	2 730
CO_2 emissions	(in million t CO_2 eq.)	60.66	59.52	70.75	70.01	56.95
Cost of CO_2	PLN million	3 414	6 200	11 553	20 325	23 714
Number of employees (as of 31.12)	number	41 934	40 141	38 001	38 013	42 552

Source: PGE Polska Grupa Elektroenergetyczna S.A, Financial statements for 2019-2023.

Table 5.
Enea S.A. - financial and non -financial data

DATA		2019	2020	2021	2022	2023
PROFIT & LOSS STATEMENT						
Revenue	PLN million	15 796	18 177	21 275	30 076	44 021
EBITDA (adjusted)	PLN million	3 410	3 302	3 637	2 220	6 298
Impairment costs	PLN million	1	-3 521	-24	-49	-3 661
Intangibles	PLN million	0.2	-130	-4	0	-8
PPE	PLN million	1	-3 391	-20	-49	-3 653
Amortization & Depreciation	PLN million	1 548	1 598	1 539	1 585	1 652
EBIT	PLN million	1 784	-1 706	1 973	578	956
Nett profit/loss	PLN million	54	-2 234	1 805	119	-443
BALANCE SHEET						
Non-current assets	PLN million	23 972	21 768	22 367	23 162	21 637
Current assets	PLN million	9 052	8 122	12 290	14 273	17 474
Cash and cash equivalents	PLN million	3 762	1 942	4 154	1 564	3 026
Total assets	PLN million	32 844	29 890	34 658	37 435	39 111
Equity	PLN million	15 480	13 094	15 202	16 146	15 440
Current liabilities	PLN million	6 509	6 786	11 579	13 589	14 968
Debt	PLN million	10 438	8 386	7 231	5 494	8 073
Net debt	PLN million	6 676	6 445	3 078	3 839	5 338
OTHER DATA						
CAPEX	PLN million	2 181	2 441	1 980	2 591	3 711
WACC (average)	%	6.7%	6.2%	7.5%	10.6%	7.3%
Share price (at last trading day)	PLN/share	7.92	8.48	8.51	6.00	9.17
Dividend per share	PLN/share	0	0	0	0	0
EPS - net profit attributable to shareholders of the Parent	PLN/share	0.96	-5.14	3.83	0.09	-1.33
Installed capacity	GW	6 257	6 257	6 307	6 315	6 368
Net generation of electricity, of which	GWh	25 931	22 482	26 393	26 214	21 344
from conventional sources	GWh	23 653	20 090	23 978	24 265	19 060
from renewables sources	GWh	2 278	2 392	2 415	1 949	2 284
CO_2 emissions	(in million t CO_2 eq.)	22.0	18.7	22.4	23.1	18.3
Cost of CO_2	PLN million	546	1 282	1 926	2 941	5619
Number of employees (as of 31.12)	number	17 291	17 452	17 442	17 571	18 227

Source: Enea S.A., Financial statements for 2019-2023.

Table 6.
TAURON Polska Energia S.A. - financial and non -financial data

DATA		2019	2020	2021	2022	2023
PROFIT & LOSS STATEMENT						
Revenue	PLN million	20 510	20 434	25 605	36 795	50 715
EBITDA	PLN million	3 492	4 226	4152	4 016	6 145
Impairment costs	PLN million	-1 303	-3 700	-1 133	-214	-24
Intangibles	PLN million	1	-7	-6		
PPE	PLN million	-1 305	-3 733	-1 121	-214	-24
Amortization & Depreciation	PLN million	1 992	2 017	2 101	2 216	2 228
EBIT	PLN million	295	-1 537	916	1 069	3 394
Nett profit/loss	PLN million	-12	-2 488	385	-134	1 678
BALANCE SHEET						
Non-current assets	PLN million	35 052	33 585	33 855	35 053	37 353
Current assets	PLN million	6 866	6 111	6 220	10 267	12 445
Cash and cash equivalents	PLN million	1 238	921	815	1 678	1 064
Total assets	PLN million	41 918	39 696	40 075	45 320	49 798
Equity	PLN million	19 093	16 727	16 524	16 614	17 953
Current liabilities	PLN million	7 862	7 102	9 916	10 195	14 269
Debt	PLN million	11 368	11 516	10 944	13 266	14 057
Net debt	PLN million	10 130	10 595	10 129	11 775	12 973
OTHER DATA						
CAPEX	PLN million	4 128	4 039	2 932	3 962	4 364
WACC (average)	%	10.27%	11.08%	9.71%	9.46%	9.42%
Share price (at the last trading day)	PLN/share	1.64	2.72	2.65	2.12	3.73
Dividend per share	PLN/share	0	0	0	0	0
EPS - net profit attributable to shareholders of the Parent	PLN/share	-0.01	-1.24	0.19	-0.08	0.95
Installed capacity	GW	7 374	8 486	8 364	7 257	7 265
Net generation of electricity, of which	GWh	12 604	11 377	14 257	12 738	10 078
from conventional sources	GWh	11 213	10 133	12 731	11 124	10 078
from renevables sources	GWh	1 092	1 391	1 244	1 526	1 6140
CO_2 emissions (electricity production)	(in million t CO_2 eq.)	11.1	9.6	12.5	12.7	9.2
Cost of CO_2	PLN million	671	986	2 147	3 096	3 461
Number of employees (as of 31.12)	number	25 916	25 719	25 333	25 378	18 728

Source: TAURON Polska Energia S.A., Financial statements for 2019-2023.

Table 7.
Energa S.A. - financial and non -financial data

DATA		2019	2020	2021	2022	2023
PROFIT & LOSS STATEMENT						
Revenue	PLN million	11 479	12 496	13 692	20 444	26 087
EBITDA	PLN million	2 039	2 038	2449	2 573	2 885
Impairment costs	PLN million	-457	-309	-241	-90	-29
Intangibles	PLN million	2	-1	0	0	0
PPE	PLN million	-459	-308	-241	-90	-29
Amortization & Depreciation	PLN million	1 079	1 044	1 079	1 134	1 194
EBIT	PLN million	1 203	399	1 463	1 177	1 098
Nett profit/loss	PLN million	-1 001	-444	937	1 009	606
BALANCE SHEET						
Non-current assets	PLN million	18 226	16 939	18 226	21 386	23 329
Current assets	PLN million	2 963	2 729	2 963	5 804	8 350
Cash and cash equivalents	PLN million	340	221	340	1 100	521
Total assets	PLN million	21 238	19 668	21 238	27 248	31 679
Equity	PLN million	9 942	8 779	10 008	11 540	12 442
Current liabilities	PLN million	4 665	4 064	4 065	9 403	12 939
Debt	PLN million	7 661	6 736	6 113	7 504	10 418
Net debt	PLN million	6 200	6 515	5 773	6 404	9 897
OTHER DATA						
CAPEX	PLN million	1 574	1 721	2 107	3 260	4 334
WACC (average)	%	7.4%	6.8%	7.0%	11.6%	8.7%
Share price (at the last trading day)	PLN/share	7.08	7.88	7.65	7.04	9.28
Dividend per share	PLN/share	0	0	0	0	0
EPS - net profit attributable to shareholders of the Parent	PLN/share	-2.30	-0.95	2.34	2.34	1.49
Installed capacity	GW	1.34	1.37	1.37	1.37	1.40
Net generation of electricity, of which	GWh	3.3	3.0	3.9	4.2	3.2
from conventional sources	GWh	2.0	1.7	2.4	2.9	1.6
from renevables sources	GWh	1.4	1.3	1.4	1.3	1.6
CO2 emissions	(in million t CO_2 eq.)	2.2	1.8	2.6	3.0	1.8
Cost of CO_2	PLN million	175	197	584	977	689
Number of employees (as of 31.12)	number	9 883	9 731	8 888	8 781	8 732

Source: Energa S.A., Financial statements for 2019-2023.

Table 8.

EnBW. - financial and non -financial data

DATA		2019	2020	2021	2022	2023
PROFIT & LOSS STATEMENT						
Revenues	€ million	19 436	19 694	32 148	56 003	44 431
EBITDA	€ million	2 245	2 663	2803.5	4 473	5 738
Impairment costs	€ million	-161	-171	-1 088	-712	-711
Intangibles	€ million	0	-3	-118	-336	-102
PPE	€ million	-161	-168	-971	-376	-609
Amortization & Depreciation	€ million	1 649	1 390	1 557	1 615	1 686
EBIT	€ million	597	1 103	159	2 141	3 341
Nett profit/loss	€ million	904	808	441	1 844	1 833
BALANCE SHEET						
Non-current assets	€ million	31 623	33 285	35 233	36 984	39 512
Current assets	€ million	11 645	12 645	35 987	32 512	25 207
Cash and cash equivalents	€ million	1 364	1 253	6 653	6 476	5 995
Total assets	€ million	43 288	45 965	71 273	69 504	64 719
Equity	€ million	7 445	7 769	8 499	8 963	9 309
Current liabilities	€ million	11 103	11 745	34 243	28 670	18 153
Debt	€ million	7 386	8 485	9 554	13 690	13 553
Net financial debt	€ million	6 022	7 232	2 901	7 214	7 558
OTHER DATA						
CAPEX (net cash investments)	€ million	2 481	1 827	2 471	2 768	2 740
WACC (average)	%	5.2%	5.2%	4.9%	6.8%	6.0%
Share price (at the last trading day)	€/share	50.50	56.00	76.00	87.00	79.20
Dividend per share	€/share	0.70	1.00	1.10	1.10	1.50
EPS - net profit attributable to shareholders of the Parent	€/share	0.70	2.20	1.34	6.42	5.68
Installed capacity	GW	13.85	12.49	12.72	13.07	12.23
Net generation of electricity, of which	GWh	47 807	36 629	42 399	42 084	26 552
from conventional sources	GWh	37 819	24 779	30 707	30 340	13 872
from renewables sources	GWh	9 988	11 850	11 692	11 744	12 680
CO_2 emissions (electricity production)	(in million t CO_2 eq.)	10.8	9.5	16.3	17.5	10.9
Cost of CO_2 (own calculations)	€ million	266	230	879	1 419	907
Number of employees (as of 31.12)	number	21 843	23 078	24 519	25 339	26 943

Source: Financial report for 2023.

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FAÇADE GRAPHICS IN ACADEMIC ARCHITECTURE WITH THE MISSION OF CREATING MESSAGES

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Purpose: The purpose of the study is to determine the importance of academic centres for local marketing activities. Academic centres are often used as a showpiece for a town or region, connecting the town with the European academic community, contribute to a town's development. It is common for academic centres to be supported by the town or region to ensure modern research facilities or libraries are being built. Cutting-edge technologies are used in such buildings, including façade graphics. One of the main aims of this study is to establish the significance and scope of the information and messaging included in façade graphics in the context of social integration and identification.
Design/methodology/approach: The material was analysed and grouped according to separate topics to be further examined: demonstration of innovative solutions; demonstration of environmental policies; references to history and heritage; emphasising the multi-cultural character of the building.
Findings: The research defines new meanings of academic buildings and the facade graphics used there. The scientific material examined indicates the significant role of higher education facilities in social communication and creating the identification of the place.
Research limitations/implications: The below research is of preliminary character. It might be continued in order to look at other aspects. More visual elements as well as means of expression and image structures might be added, which are related to the effectiveness of the message being created.
Practical implications: The article showcases the possibilities provided by façade graphics as far as producing social messaging is concerned, which might be used to create or reinforce social integration or marketing activities.
Social implications: The article discusses two aspects of the role that art and façade graphics play in architecture as one of the local marketing tools. It examines the influence of the messaging contained in images linked to social identification.
Originality/value: The article may provide investors, architects, artists and decision-makers with inspiration. The research has demonstrated a broad reach of façade graphics and that it can be used in regional marketing.
Keywords: glass façade; façade graphics; communication in architecture; building brand of region; contemporary architecture.
Category of the paper: Research paper.

1. Introduction

The objective of the research is to determine the marketing potential of higher education buildings and the role of university architecture and façade graphics in creating the image and building the brand of a region. The issue shall be analysed based on example academic buildings and complexes, where the glass façade is covered with graphics. Based on example academic buildings, the author analysed the features that enable measuring the importance of art linked with architecture. Each of the buildings was examined in terms of its usefulness for shaping social awareness; all in connection with creating the image of a region as well as building its brand.

A look at the coexistence between architecture and art brings up several questions. To what extent can the content and graphic shapes included in a glass façade be used to create social identity? To what extent can university architecture be used to create the image and build the brand of a region? The analysis included 13 different buildings. The material has been divided into separate topics to be further examined: demonstration of innovative solutions (abstract components linked to state-of-the-art technology, geometric patterns); demonstration of environmental policies (organic images, organic textures, plant motifs); references to history and heritage (figurative motifs); emphasising the multi-cultural character of the building (lettering motifs).

Selection criterion for the buildings referenced in the paper:

- Each of the buildings is an example of either higher or secondary education.
- **Buildings were selected** whose glass façade was covered with graphics.
- All of the buildings have been put up in the last three decades.
- The research focuses on buildings in Europe.
- Most the buildings have been examined in situ.

The research material includes documentation in the form of photographs, observation notes, sketches, measurements, analyses.

In earlier research it was observed that the messaging in buildings with façade graphics is not created in a direct way, but rather based on the relationship between the image and the building's form and function. A semantic link results in a metaphorical message (Lipowicz-Budzyńska, 2023), which is present in the urban space within the context of the town and estate and the context of the architectural space.

For each of the referenced buildings, the predominant factors that take part in creating the information were taken into consideration:

- Those related to façade graphics: form, size of the composition, meaning, colour.
- Those related to the building's form: shape, function, scale of the building.

2. Façade graphics in modern academic architecture in the social and environmental context

The referenced material and the projects described below provide an insight into the diversity of the styles and forms used in the buildings. Each of the listed examples has different objectives, relationship with the surroundings, or form of expression, and utilises different artistic means, which can be used in marketing.

Image on glass, through its scale and properties is seen in three contexts: the urban context, the building's façade, and from the interior (Lipowicz-Budzyńska, 2019). Messaging intended for the users and the surroundings may be utilised in the process of building or reinforcing social identity. Façade graphics spotlight high social status; are consistent with the latest trends in innovation and environment protection; and showcase the unique history, cultural heritage, and multicultural character of a building. These aspects make façade graphics useful in marketing activities.

2.1. Demonstration of innovative solutions

A. Abstract components linked to state-of-the-art technology

Digital Innovations Centre (ZDI) in Würzburg, Germant [Henne Sch'nau Architekten; Completed: 2018; screen printing, argon glass] is a typical example of cooperation between the municipality and the university in creating innovative spaces that showcase the region. The project is a continuation of CUBITY „Plus Energy and Modular Future Student Living", a multi-stage research project. Its purpose is to provide a stimulating environment, which will enable implementation and further development of innovative IT ideas. The building provides an optimally designed space for start-up companies. The original external shape of the building has been visually enriched using graphics with minimalist articulation (Figure 1). The building, 9.50 metres high, is set on a square plan with the edge length of 16 m, and is finished off with a flat roof. The lower part of the external layer consists of a post-and-beam façade with three-layer glazing, the very high storey is surrounded by semi-transparent multi-wall panels made of polycarbonate. A dark grid is printed over them, in which several graphic elements are visible: a large paper plane on the western side, parts of folding instructions on the northern and eastern sides of the elevation, and large letters indicating the address on the southern side. The graphics make up a unique message, and with a reference to the airport that used to operate in the building's vicinity, and a metaphorical reference to ambitious objectives accomplished by those working inside, the graphics show the function of the building perfectly.

Figure 1. The Digital Innovation Centre (ZDI), the northern and eastern façades, Würzburg, Germany (Henne Sch'nau Architekten, 2018); A — the view of the northern and eastern part of the building, source: photos by author.

Sensor City (Figure 2A) [IBI Group; Completed: 2017; graphic area: 825 m², screen printing, laminated glass (Sensor City Liverpool, 2017)], which is the result of cooperation between the University of Liverpool and Liverpool John Moores University, and is one of the four flagship academic zones, has been designed and erected as a technology centre to support the innovative business community. The importance of the building is emphasised by the glass façade that displays computer chips representing state-of-the-art technology and data transfer. Its aesthetics are dominated by decorative graphics (Figure 2B), which utilise a three-colour palette: white, black and yellow — the last one is a reference to gold, a highly valued material in electronics. The glass has been designed with both day and night viewing in mind. This results in a changed appearance of the elevation, depending on the time of day. The building has been named one of the most popular in Liverpool (Sensor City Liverpool, 2022).

A B

Figure 2. A building demonstrating the city's pro-innovation policy; A — Sensor-city building (IBI Group, 2017), Liverpool, UK; B — Glazing detail; source: photos by author.

2.2. Geometric patterns

Another important example of academic architecture, which is one of the key points in the town, is the Student Learning Centre, a part of Toronto Metropolitan University, Toronto, Canada [Zeidler, Snøhetta; Completed: 2014; graphic area: 14,400 m², digital printing (TMU, 2024)]. The building was inspired by historical stoas and Agoras meeting spaces in Ancient Greece, where learning was part of the social processes. The centre has been placed on eight storeys of open space adopted for meetings, studying and exchanging ideas. The project was designed to provide environment that encourages users to interact, and also offers spaces for research; a place that students can make their own (Sheldon & Tracy Levy Student Learning Centre, 2024). Upon its opening, the building immediately became a landmark of the campus and a popular space, open from 7am until midnight everyday. There are graphics on the building (Figure 3A) in the form of irregular shapes of various sizes, either fully or partly filled with enamel (Figure 3A). Most of the graphics are constituted by arrangements encircled with lines of different widths and their insides not filled. The form of these elements is a reference to clouds, as they too fully or partially obstruct the sunlight filtering into the building (Sheldon & Tracy Levy Student Learning Centre, 2024), and thus improving user comfort. The shapes are meant to be consistent with the body of the building. A pattern consisting of multiple elements provides visual unity to the façade, losing the rectangular divisions of the panels. Both the size and form of the building as well as the graphics on the glazing constitute a prominent artistic element. They are key for the style of the building and its standing out from the surrounding development.

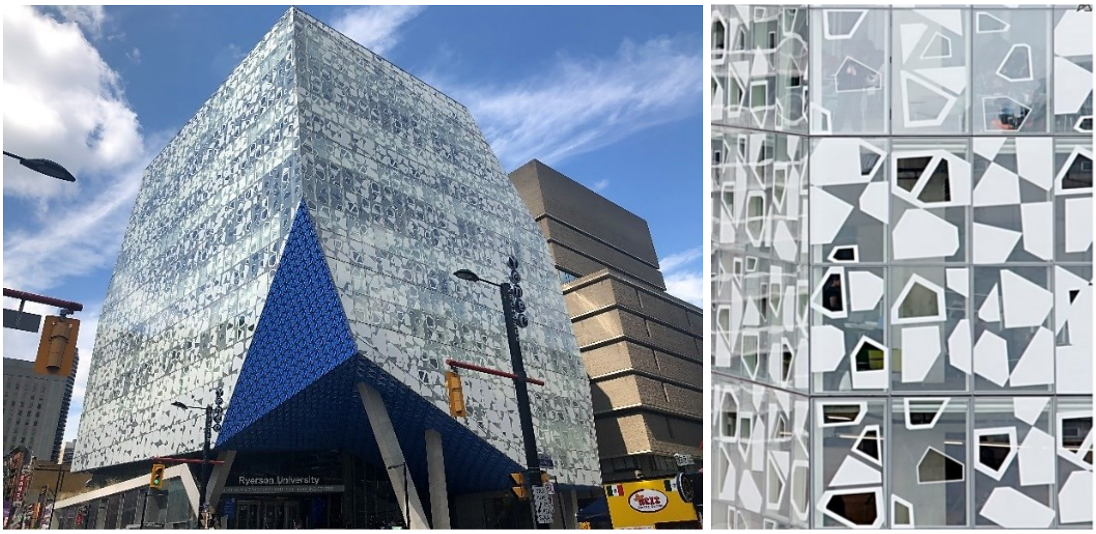
A  B

Figure 3. Toronto Metropolitan University, The Student Learning Centre, Toronto, Canada (Zeidler, Snøhetta, 2014); A — view of the building body, B — close-up view, source: By Richard Eriksson from Toronto, Canada - Ryerson Student Learning Centre, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=110175571, B – Façade from up close.

CityLabs 2.0 [Sheppard Robson Bruntwood, in partnership with Manchester Science Partnerships, Central Manchester Foundation Trust; Completed: 2021; graphic area: 3500 m², digital print, laminated glass (CityLabs 2.0, Manchester, 2022)] is a collaboration between Manchester University NHS Foundation Trust (MFT) — the largest NHS Trust in the UK — and the Manchester Science Partnerships (MSP). The building offers grade-A office area as well as state-of-the-art lab facilities. The space will enable biomedical companies to pursue development and working on new health products together with the academic community. The building is fully glazed (Figure 4A) and covered with digital print, with a pattern composed of 8 similar circular elements (Figure 4B). The pattern also protects against sunlight and helps prevent excessive heat inside the building. CityLabs 2.0 is the second building in the complex. CityLabs 1.0 was built in 2015. The CityLabs campus is now an important landmark in the city and a world's leading innovation centre for health and precision medicine.

A  B

Figure 4. A building demonstrating the city's pro-innovation policy; CityLabs 2.0 building (Sheppard Robson Bruntwood, Manchester Science Partnerships and Central Manchester Foundation Trust, 2021), Manchester, UK; A — view of the building body, B — close-up view, source: photos by author.

2.3. Demonstration of environmental policies

One of the methods for marketing a region is to present progressive policies in key strategic areas around the town. One of such areas is environment protection. Environmental aspects may be invoked using organic images, organic textures, as well as plant or other nature-related motifs.

A. Organic images

Organic graphics may be found on the following buildings: The Spine in Liverpool, the United Kingdom, or Inholland University in Rotterdam, the Netherlands.

The Spine building, used as the seat for the Royal College of Physicians in Liverpool, UK [AHR, Completed: 2021; graphic area: 9400 m², digital print (Kucharek, 2022)] is a landmark in the city (Figure 5A). It has gained this status not only thanks to its height, but also unique graphics that make it stand out among other high-rise buildings found in the

Liverpool's 'Knowledge District'. The building expresses the popular wellness trend that focuses on well-being and ensuring users' health. The glazing graphics are based on the Voronoi diagrams (Figure 5B). Similar pattern already exists in nature, e.g. on the skin of fruit, giraffes or humans. The glazing provides protection against sunlight and overheating in the rooms, improving user comfort. With the graphics the façade is covered with enamel in 25% from the northern side, 32% to the east and west, and 39% on the southern wall of the building. Referencing nature in the graphics is symbolic. It reflects the environmentally-friendly policies implemented in the town and region.

Another example is found in the Inholland University building in Rotterdam, the Netherlands [Erick van Egeraat; Stage II completed: 2008; graphic area: 15,000 m² (entire stage II glazing area), digital print]. The building was completed in two stages. Extending the building has resulted in a complex with a loose structure that now reaches as far as the halls of residence on the opposite side of the quarter. Each of the stages involved adding graphics on the façade in the form of screen print on glass. The extension included a building that became home to the student support centre, library, student canteen, as well as the computer and copying centre. At stage two, the main building was extended by the addition of a three-storey block with a rectangular cuboid shape (Figure 5C). The façade is composed of horizontally-oriented rectangular panes. The surface of the glazing is covered with a yellow screen print layer. The image was created by processing, multiplying and gentle displacement of an organic pattern with a structure resembling a leaf.

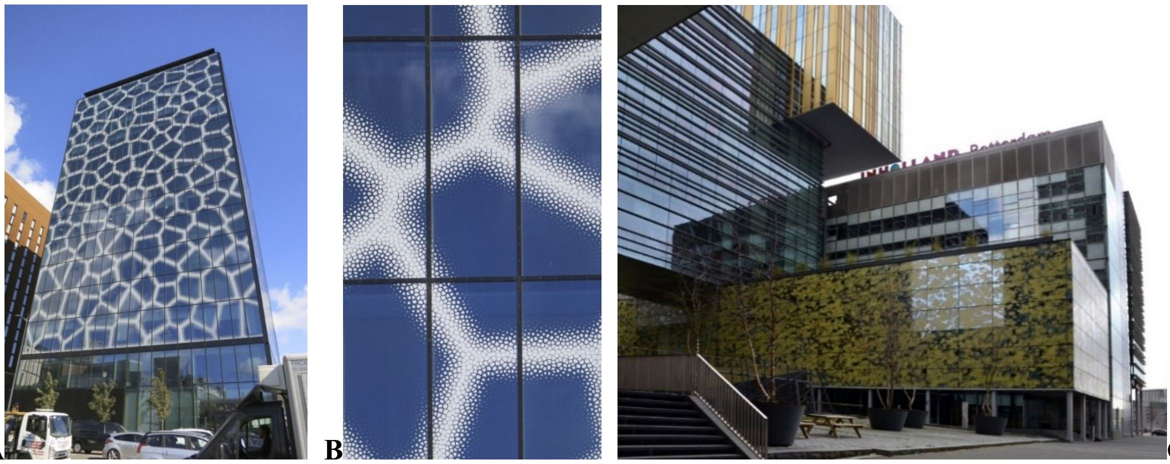


Figure 5. The façade contains quotes from nature being a manifestation of the pro-ecological policy of the local authorities; A — The Spine building The Royal College of Physicians (AHR, 2021), Liverpool, UK, B — Inholland University, Rotterdam, the Netherlands (Erick van Egeraat, 2008); view from the north-eastern side; buildings belonging to the second extension stage, source: photos by author.

B. Organic textures

An example of organic texture used in a façade can be found in the library belonging to the Folkwang Universität der Künste in Essen, Germany [Max Dudler Architekten; Completed: 2011; 600 glass sheets, digital print (Folkwang Bibliothek, 2024)]. A print was applied on the elevation to protect the book collections against excessive light penetration. The façade is composed of 600 panels of various forms with digital printing displaying stone textures. In order to achieve a realistic effect, 300 stone panels were used in the project. Photographs of the stone panels in the scale of 1:1, showing all the details, have been prepared with the help from Stefan Mueller (Folkwang Bibliothek, 2024). A realistic effect of a stone wall has been achieved (Figure 6A). The façade provides sunlight protection against the UV radiation. The impression of a natural stone cladding fits extremely well with the surrounding historical architecture of the University; it adds grandeur to the modern orthogonal body of the building. The modern architecture of the library is a feature that adds splendour not only to the university but indeed the entire town.

A B

Figure 6. The façade contains quotes from nature being a manifestation of the pro-ecological policy of the local authorities; A — Bibliothek — Folkwang Universität der Künste, Essen, Germany (Max Dudler Architekten, 2011), source: photo by author, B — Institute for Medical Systems Biology, der Humboldt-Universität, Berlin, Germany (Staab Architekten, 2018), source: Małgorzata Klimowicz

The building of the Institute for Medical Systems Biology, Humboldt-Universität [Staab Architekten; Completed: 2018; print (Berlin Institute b, 2024)] provides yet another example. The building is L-shaped, and is largely covered with a glass façade with organically shaped graphics printed over it (Figure 6B). Vertical organic strips protect the interior against excessive sunlight protection and against rooms overheating. The graphics are designed in such a way so as to make them the most transparent at the height of 1.6 m, where a typical adult would normally look. The arrangement of vertical strips is a reference to the building's purpose. It visually shortens the building, and the rhythm of the graphics adds grandeur to the building. It has become a prominent feature of the entire campus that spreads across the north-western part of town.

C. Plant motifs, references to nature

An example of a glass elevation covered with an organic print showing plant motifs is seen in the building of the Utrecht University Library in Utrecht, the Netherlands [Wiel Arets Architects studio; Completed: 2004; screen print using two colours: black and white (Utrecht University Library, 2024)]. Two separate areas can be pointed out in the library building's elevation: one made of black concrete panels and the other of glass covered with screen print

(Figure 7A). The link between the two materials is the papyrus motif referencing the building's purpose. It has been impressed in the concrete slabs as a relief (Pell, 2016), and placed on glass in the form of screen print. Linearly multiplied glass and concrete panels on the elevation make up horizontal rectangular geometric arrangements to add variety to the simple shape of the building. The geometric shape of the flat forms contrasts with the organic motif on the glazing. From afar, it is hard to recognise what the print on the glass shows, and it is seen as bright smudges. Only when one moves closer, can the plant motif in the image be identified. In parts of the elevation, glass panels have been placed inside vertically opened frames. Mobile components have been added to the static monumental body of the building in the form of large panels that can be opened. It is a vital feature, which adds variety to the elevation and improves the artistic expression of the building.

A B

Figure 7. The façade contains quotes from nature being a manifestation of the pro-ecological policy of the local authorities; A — Utrecht University Library, Utrecht, the Netherlands (Wiel Arets Architects, 2001), B — Institute for Hospital Pharmaceuticals, Basel, Switzerland (Herzog & de Meuron studio, 1998), source: photos by author.

Institute for Hospital Pharmaceuticals in Basel, Switzerland [Herzog & de Meuron studio; Completed: 1998; graphic area: 1545 m², screen print] is housed in a complex of buildings with an elaborate modern form, contrasting with the historical surroundings built in 17^{th} to late 20^{th} centuries. The building is shaped in a way that creates semi-closed yards, with an atrium in the centre of each. On the street side, a rectangular cuboid block has been put up that conceals the entire complex and matches the placement of other buildings. In most part, the façade has been covered with printed glass (Figure 7B). The printed glass on the elevation makes the building stand out among the historical buildings around it. The colour of the glazing is a reference to the building's purpose, it underlines its link with the plant world: herbal medicine. The green elevation matches the colour of ivy that grows on part of the elevation. A strong interaction occurs especially in contact with green colour.

Removing the glass surface from the face of the wall adds space to the building. Interference phenomena occurring between the two layers change as the observer moves, and the elevation looks animate, pulsating, which encourages passers-by to visually interact with the façade. The building is located along one of the main streets and has a prominent place in the town's scenery.

2.4. Historical references — emphasising the function

A. Figurative motifs

An important part of creating social identity is to highlight the sense of common history. The article references two buildings: the first one is linked to recent history, and the second one contains two contemporary elements as well as historical information.

The Jacques Herzog and Pierre de Meuron studio frequently utilises façade graphics, experimenting with the screen-printing technique and its applications in architecture. This can be seen as a continuation of architects' interest in photography — its nature and materiality (Ursprung, 2016). One of the experimental designs can be found in the Eberswalde Technical School Library [Herzog & de Meuron studio; Completed: 1999; graphic area: 509 m², screen print]. The building has been situated next to 19th century architecture, surrounded by an old park site. A rectangular cuboid building with a framed structure has been inserted into the historical fabric of the complex. A modern, three-storey block contrasts with the ancient surroundings. The designers' intention was to make a reference, with the exterior, to the style of storage containers (Figure 8A). To make the prints, photographs from the *Newspaper Photos* series were used, compiled in 1981–1991 (Newspaper Photos, 2024) by photographer Thomas Ruff. The photographs (Figure 8B) are taken from German newspapers and magazines. During the course of the project, 2500 photographs were collected, which the artist archived, dividing them according to the subject (Fenster und Tueren, 2024). Copies of 17 selected images were placed on the elevation. The prints were arranged in 17 rows and multiplied 66 times. The building is clearly visible in a small town that Eberswalde is, particularly against the backdrop of all the historic buildings.

A  B

Figure 8. The Eberswalde Technical School Library in Eberswalde, Germany (Herzog & de Meuron, 1999): A — view of the building body, B — close-up view, source: photos by author.

2.5. Highlighting the multicultural character of a building

The main function of façade graphics is information, linked to the building's purpose. Façade may display other content, challenging or inviting a certain social group. An example can be found in the façade of the Cottbus University Library [Herzog & de Meuron Architects; completed: 2004; graphic area: 5800 m², screen printing (Herzog & de Meuron 2005)]. The building is fully glazed. The elevation is made up of two layers (Edwards, 2011) of glass, placed at a distance from each other, on which lettering graphics have been placed (Figure 9A). The shape of the graphics comes from overlapping of letters from alphabets of different linguistic groups (Laube, Widrig, 2016). Put together, the letters create an abstract form made up of linearly arranged shapes. The graphics represent a contemporary interpretation of lettering graphics (Figure 9B). The form of the image is related to the building's shape. The image provides a distinctive graphical feature identifying the building. It is linked with the building's purpose, and the openness of the scientific community to international contacts. It shows the universal character of the book collection housed inside the library, and extends an invitation to the global community. This aspect highlighted in the façade elevates the town's status, and makes it a prominent spot in the region and the whole of Europe.

A  B

Figure 9. The Cottbus Technical University Library, Cottbus, Germany (Herzog & de Meuron, 2004), A — building view from a distance, B — close-up view, source: photos by author.

The next example combines an active louvre system with graphics on glass. It is the Ørestad College building in Copenhagen, Denmark [3XN Architects; Completed: 2007]. The louvre system is one of those that cooperate with other systems to ensure energy efficiency of the building. With the coloured louvres, the lighting can be freely set to any level using the electronic sensor system integrated with the heating. The system controls sunlight protection (Care et al., 2015). Glass panels dominate both outside and inside. They have a compositional role, drawing attention away from the vertical lines on the building (Figure 10A). The moving elements, with varying degrees of transparency, stress the rhythm and add colour to the elevation (Figure 10B) and the interior.

A B

Figure 10. Ørestad College, Copenhagen, Denmark (3XN Architects, 2007): A — View of the façade from the outside; B — Details of the glass coating, source: Maarten Helle.

Table 1.
Type of messaging / Features affecting how the message is formed; the building-image relationship.

Item	Object	Message				Façade graphics							
		Demonstration of innovative solutions	Demonstration of environmental policies	References to history and heritage	Highlighting the multicultural character	Form	Size	Compos.	Meaning	Colour	Building's form	Building's function	Graphical features — social awareness
1	Digital Innovation Centre, Würzburg, Germany	X				X	X	X	X		X	X	X
2	Sensor City building, Liverpool, UK	X				X	X	X	X	X	X	X	X
3	Toronto Metropolitan University, Toronto, Canada	X				X		X			X		
4	CityLabs 2.0, 2021, Manchester, UK	X				X		X					
5	The Royal College of Physicians, Liverpool		X			X	X	X	X			X	X
6	Inholland University, Rotterdam, the Netherlands		X			X		X		X			X
7	Bibliothek, Folkwang Universität der Künste, Essen, Germany		X			X	X	X	X	X			X
8	Institute for Medical Systems Biology, der Humboldt-Universität, Berlin, Germany		X				X	X					
9	University Library, Utrecht, the Netherlands		X			X	X	X	X	X		X	X
10	Institute for Hospital Pharmaceuticals, Basel, Switzerland		X						X	X		X	
11	Eberswalde Technical School Library, Germany			X		X	X	X	X			X	X
12	Cottbus Technical University Library, Germany			X	X	X	X	X	X		X	X	X
13	Ørestad College, Copenhagen, Denmark				X	X	X	X	X	X		X	

Source: own study.

3. Summary

The above research shows the significant role of art in the perception and identification of architecture. The analyses confirm the role of façade graphics in creating the message and identification of the place. This is particularly evident in higher education facilities. These facilities are implemented with the use of the latest technologies, including the use of façade graphics. The examples cited in the article confirm the significant impact of the image and the formation of characteristic objects associated with both the function of the object and its location. Thanks to properly selected means of expression and significant articulation, façade graphics can be used in branding, i.e. in creating a visual identification system of the brand, which expresses its identity by means of various features, such as name, logo, colours, characteristic features of services. Academic centers are often used as a showcase of the city and the region, connecting the city with the European academic community. Through long-term connection of students and graduates with the university and through international contacts, universities are an excellent channel for the promotion of the city and the region.

Each of the buildings has a slightly different way of delivering the message and interacting with the viewer. Academic buildings have a unique role in developing social integration.

The conducted analysis has shown the following features to be essential factors in creating the image: form, composition, and the way in which the imagery relates to the function (Table 1). In the majority of cases the building's form is very simple, orthogonal, and emphasises the minimalist approach of the authors. It seems to act as the background over which the graphics are displayed. The only exception is the Cottbus building, where the form and graphics are linked to shapes. Significant visual impact and direct contact that the viewer has with the graphics mean that the glass façade is a great medium to create messages and can be applied in both forming and strengthening social identity.

In some of the above examples, the message is built in a direct way, using the means used in the image (Table 1), such as: form, size, composition, meaning, colour. Examples have been observed in which the above measures have been fully used: examples 2, 7, 9, 13 (Table 1). Objects that use the direct message created in the façade have been distinguished. In these objects, colour is used to strengthen articulation, it does not take part in creating the message: examples 1, 5, 11, 12 (Table 1). In the research material, objects have been observed in which the message is created indirectly as a result of the interaction between form, function and image elements such as colour and texture: examples 3, 4, 6, 8,10 (Table 1).

In the research material referenced in the article, various strategies for using façade graphics in the creation of regional marketing were noted. It was observed that the façade may carry content which supports generating or enhancing social integration. The information contained in a façade, or a direct message created with the use of a metaphor is linked to the following aspects (Table 1):

- Demonstration of innovative solutions has a significant potential in terms of integration and marketing.
- Highlighting the green policies of the municipality or region in the façade is vital for marketing. It produces an image of a region, linked with the use of the latest trends of caring for the environment and being open to environmentally-friendly solutions and technologies.
- Historical references build and enhance social integration and raise social awareness; they may be used for creating a brand for the region.
- Highlighting the multicultural character of the building emphasises the location's and the region's openness to international contacts, and may encourage to develop new relations in various branches of economy.

The research corroborates the important role of façade graphics in creating the image for a region and conducting its marketing activities.

References

1. Berlin Institute for Medical Systems Biology. Retrieved from: https://www.baunetzwissen.de/treppen/objekte/kultur-bildung/berlin-institute-for-medical-systems-biology-7771283, 10.10.2024b.
2. Berlin Institute for Medical Systems Biology. Retrieved from: https://www.staab-architekten.com/de/projects/1328-berlin-institute-for-medical-systems-biology? 10.12.2024a.
3. Care, L., Evans, H., Holder, A., Kemp, C. (2015). *Building Schools: Key Issues for Contemporary Design.* Basel: Birkhauser, pp. 43.
4. CityLabs 2.0. *Manchester, with digitally printed glass façade*. Retrieved from: https://www.pressglass.com/citylabs20-manchester-with-digitally-printed-glass-facade/, 20.11.2022.
5. Edwards, B. (2011) *Sustainability as a Driving Force in Contemporary Library Design, Library Trends, Vol. 60, No. 1.* Baltimore, USA: The Johns Hopkins University Press, p. 169.
6. *Fenster und Tueren Fachhochschul Bibliothek Eberswalde*. Retrieved from: http://www.baunetzwissen.de/objektartikel/Fenster-und-Tueren_Fachhochschul-Bibliothek-Eberswalde_70698.html, 10.11.2024.
7. *Folkwang Bibliothek in Essen, Digital bedruckte Gläser mit Natursteinmotiven*. Retrieved from: https://www.baunetzwissen.de/glas/objekte/bildung/folkwang-bibliothek-in-essen-3150847, 10.10.2024.

8. Herzog & de Meuron (2005). *IKMZ BTU Cottbus*. Retrieved from: https://www.herzogdemeuron.com/index/projects/complete-works/151-175/166-cottbus-library.html, 25.11.2022.
9. https://www.herzogdemeuron.com/index/focus/263-FOCUS/VIDEO.html, 10.11.2024.
10. Kucharek, J.C. (2022). *AHR's extreme spec 'wellness' façade makes a Liverpool landmark*. Retrieved from: https://www.ribaj.com/products/extreme-spec-the-spine-liverpool-voronoi-facade-ahr, 20.10.2022.
11. Laube, A., Widrig, M. (2016). *Archigraphy: Lettering on Buildings*. Basel: Birkhäuser, p. 124.
12. Lipowicz-Budzyńska, A. (2019). Façade Art Glass in Three Contexts: Urban Landscape, Elevation of the Building and Its Interior. *IOP Conf. Ser.: Mater. Sci. Eng., 603*, doi:10.1088/1757-899X/603/4/042051
13. Lipowicz-Budzyńska, A. (2023a). Aspects of Coexistence between Art Glass and Architecture—Facade Graphics. *MDPI – Arts, 13, 110*, DOI: 10.3390/arts13030110
14. Lipowicz-Budzyńska, A. (2023b). Picture on glass - strategies of creating a metaphor in architecture. *Zeszyty naukowe Politechniki Poznańskiej*. Poznań. DOI: 10.21008/j.2658-2619.2023.12.10
15. *Newspaper Photos*. Retrieved from: https://www.medienkunstnetz.de/works/newspaper-photos, 10.11.2024.
16. Pell, B. (2016) *The Articulate Surface: Ornament and Technology in Contemporary Architecture.* Basel: Birkhäuser, p. 43.
17. *Sensor City Liverpool, UK*. Retrieved from: https://www.saflex.com/gallery/fields-gold-sensor-city, 4.07.2017.
18. *Sensor City Liverpool*. Retrieved from: https://burofour.com/projects/sensor-city-liverpool/, 25.11.2022.
19. Sheldon & Tracy Levy Student Learning Centre At Toronto Metropolitan University. Retrieved from: https://www.snohetta.com/projects/sheldon-tracy-levy-student-learning-centre-of-toronto-metropolitan-university, 20.11.2024.
20. TMU Student Learning Centre. Retrieved from: https://www.northernfacades.com/projects/tmu/, 17.10.2024.
21. Ursprung, P. (2016) Exposures Herzog & de Meuron and photography. In: S.K. Loschke (ed.), *Materiality and Architecture* (pp. 13-24). London/New York: Routledge.
22. Utrecht University Library. Retrieved from: http://www.wielaretsarchitects.com/en/projects/utrecht_university_library/, 10.11.2024.

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THE INFLUENCE OF ETHNIC DIVERSITY ON CRAFT: ASPECTS OF HERITAGE, INNOVATION AND UNTAPPED POTENTIAL

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Purpose: This study explores the multifaceted diversity of Polish crafts, analyzing how various factors—such as professional scope, market adaptation, and material use—shape the sector. It examines how diversity manifests within craftsmanship, focusing on the evolving definitions of a craftsman, the internal heterogeneity of the craft sector, and the extent to which ethnic diversity is acknowledged in the promotion of Polish crafts.
Design/methodology/approach: The research employs a qualitative approach, analyzing reports, book reviews, and online resources related to Polish craftsmanship. It examines different dimensions of diversity, including craft professions, business structures, skills, materials, and training opportunities, as well as the representation of ethnic and cultural diversity within institutional narratives.
Findings: The study reveals that diversity in Polish crafts is primarily discussed in terms of professional and creative variety, technological integration, and market-driven adaptations. However, ethnic diversity remains largely absent from the discourse, with only minimal references found in institutional materials. While the craft sector demonstrates strong internal differentiation, there is limited acknowledgment of intercultural influences, suggesting an opportunity for further integration of cultural diversity in craft promotion and policy.
Originality/value: This research provides new insights into the representation of diversity within Polish craftsmanship, highlighting the sector's broad scope while identifying gaps in the inclusion of ethnic and cultural dimensions. It underscores the need for a more comprehensive approach that integrates cultural diversity into the promotion and development of the craft sector.
Keywords: ethnic diversity, craftsmanship, heritage, innovation, cultural economy.
Category of the paper: Review.

1. Introduction

Craft traditions have long served as a reflection of cultural identity, storytelling, and heritage. Rooted in centuries-old techniques and passed down through generations, craftsmanship embodies the history and values of diverse communities. However, as societies become increasingly interconnected through migration, trade, and globalization, traditional craft practices are no longer confined to their places of origin. Ethnic diversity has emerged as a key factor in shaping contemporary craftsmanship, introducing new materials, techniques, and design aesthetics that enrich and redefine traditional art forms (Bhachu, 2021).

Scholars have examined the interconnected relationship between culture, creativity, and innovation across various contexts (Roy, Mohapatra, 2023), including cross-cultural management and the link between culture and innovation (Li et al., 2023; Santaro et al., 2020; Westwood, Low, 2003; Kwan et al., 2018). The cultural background of a group, nation, or subculture can shape creative processes, thereby influencing innovation (Yesuf et al., 2024; Shao et al., 2019; Nguyen et al., 2019; Morris, Leung, 2010; Glăveanu, 2010; Glăveanu, 2015; Glăveanu, 2019). Additionally, culture can play a direct or moderating role in determining a group's or community's capacity for innovation (Glăveanu et al., 2019; Nakano, Wechsler, 2018; Erez, Nouri, 2010; Zhou, Shalley, 2011).

Moreover, scholars have also examined the handicraft industry—closely linked to culture and creativity—through the lens of culture, creativity, and innovation (Corazza, Glăveanu, 2020). While significant research has addressed the challenges and obstacles within the handicraft sector (Bouzarjomehri, Eslamfard, 2017; Amiri et al., 2019), studies have often treated culture, creativity, and innovation as separate areas of inquiry. Researchers have investigated the role of innovation in handicrafts (Fransen, Helmsing, 2016; 2017; Fernández-Esquinas et al., 2017; Shafi, 2021; Shafi et al., 2019; Marques et al., 2019), the influence of culture on handicrafts (Shafi et al., 2021; Miralay, 2018), and the role of creativity in the sector. Additionally, the consumer perspective on craft consumption has been explored (Elliot, 2016). Birau (2025) underscores handicraft triggersa unique mental process enhancing a feeling of well-being. Li (2022) proposed a model of the influence of digital communication on handicraft intangible cultural heritage. However, within the triadic relationship of culture, creativity, and innovation, creativity has received comparatively less scholarly attention. Furthermore, there is a lack of studies that integrate the influence of culture on creativity in handicrafts and its subsequent impact on innovation in the industry.

The interaction between different cultural influences in craft has led to the development of hybrid styles, where artisans blend inherited skills with external inspirations. This fusion not only revitalizes traditional crafts but also ensures their survival in a rapidly changing world. As artisans from various ethnic backgrounds collaborate and innovate, craft practices evolve into unique cultural expressions that transcend geographical and historical boundaries (Bond, Worthing, 2016; Stabler, 2021).

Beyond artistic innovation, ethnic diversity in craft also has significant social and economic implications. It fosters cross-cultural appreciation, encourages knowledge exchange, and supports local economies by creating opportunities for skilled artisans in diverse communities. However, it also raises important questions about cultural appropriation, the commercialization of heritage, and the sustainability of traditional knowledge in an increasingly mechanized world (Moeran, 2021; Ferreira et al., 2019; Rodrigues et al., 2024; Dalal et al., 2024). Table 1 summarizes key insights into the intersection of ethnic diversity and craft traditions, highlighting areas of transformation, research gaps, and socio-economic implications.

Table 1.
Key findings on ethnic diversity and craft traditions

Main theme	Key findings	References
Cultural identity & craft	Craft traditions reflect cultural identity, storytelling, and heritage, shaped by centuries-old techniques.	Bhachu (2021)
Globalization & craft evolution	Migration, trade, and globalization have expanded the geographical reach and transformation of craft practices.	Bhachu (2021)
Culture, creativity & innovation	The triadic relationship between culture, creativity, and innovation influences craft development, but creativity has received less attention.	Roy, Mohapatra (2023), Glăveanu (2010, 2015, 2019), Zhou, Shalley (2011)
Handicrafts & innovation	Innovation in handicrafts has been studied separately from culture and creativity, highlighting gaps in research.	Fransen, Helmsing (2016, 2017), Shafi et al. (2019, 2021), Marques et al. (2019)
Cultural influence on handicrafts	Handicrafts are deeply influenced by cultural heritage, but digital communication is shaping their evolution.	Miralay (2018), Shafi et al. (2021), Li (2022)
Creativity in handicrafts	Creativity in handicrafts remains underexplored, despite its role in innovation and artisan well-being.	Corazza, Glăveanu (2020), Birau (2025)
Hybrid craft styles	Ethnic diversity leads to fusion styles, blending traditional craftsmanship with new influences.	Bond, Worthing (2016), Stabler (2021)
Social & economic impact	Ethnic diversity in craft promotes cross-cultural exchange, economic opportunities, and knowledge sharing.	Moeran (2021), Ferreira et al. (2019), Rodrigues et al. (2024)
Challenges in handicrafts	Issues such as cultural appropriation, commercialization, and sustainability remain concerns in the craft sector.	Dalal et al. (2024), Bouzarjomehri, Eslamfard (2017), Amiri et al. (2019)

Source: Own elaboration.

This study investigates the diverse dimensions of Polish craftsmanship, examining the key factors that influence the sector, including the range of professions, market dynamics, and the use of different materials. It aims to explore how diversity is reflected in craftsmanship, with particular attention to the changing perceptions of the craftsman's role, the internal complexity of the craft industry, and the degree to which ethnic diversity is recognized in the representation and promotion of Polish crafts.

The hypothesis is that while diversity is a defining feature of Polish craftsmanship, ethnic diversity is significantly underrepresented in institutional narratives. This lack of acknowledgment limits the potential for cultural exchange and innovation within the craft sector. Addressing this gap through research and policy initiatives can enhance the visibility and sustainability of cultural diversity, fostering a more inclusive and globally competitive craft industry.

This study presents a novel approach by moving beyond the traditional focus on either the economic or artistic dimensions of craftsmanship. Instead, it provides a comprehensive exploration of diversity within Polish crafts, integrating both professional and institutional perspectives. By examining factors such as market adaptation, material use, and evolving definitions of craftsmanship, this research offers a more holistic understanding of the craft sector. Additionally, it sheds light on the often-overlooked role of ethnic diversity in shaping contemporary craft narratives, emphasizing how cultural influences contribute to the sector's development and identity.

2. The specificity of craftsmanship

The characteristic features of the craft include its (Saxena, Pandey, 2024):

- personal, cultural, local, and emotional connections with human life,
- the embodiment of skills passed down from generation to generation and creativity related to knowledge,
- durability and quality of created products, but also their comparatively higher price,
- "self-insufficiency" - a craftsman is currently not only a creator, but also often an entrepreneur exploring modern business models,
- history related to the craftsman's passion,
- promotion of locality,
- relatively smaller impact on the natural environment,
- contribution to export,
- role in preserving cultural heritage, lifestyle, skills, and even national pride.

Crafts not only develop and evolve, but also influence the changing identity of those who practice them (Liu, 2023). Among the words used by craftsmen to define themselves, not only is *craftsman* mentioned, but also *designer, artist, technician, engineer, entrepreneur* or *studio owner*. Some craftsmen of the new trend do not want to submit to definitions and terminology related to a specific specialization. They prefer open concepts that allow for the development of creativity and creative work (Herman, 2019). For some, a craft is a "natural" choice (an example of craft family businesses), but it can also be a professional plan B, enabling survival or a starting point for, among others, artistic self-fulfillment (Policht, 2022).

Nowadays, craftsmanship is described as being reborn (Bravo, 2022; Nasri, Mansour, 2019), experiencing a renaissance (Luckman, 2015), with a "perceptible movement" associated with the emergence of new studios of young artists (Herman, 2020).

The diversity of crafts in international literature is presented in many dimensions, including through:

- The use of different business models by creative sector intermediaries working with artisans, and their role in enabling access to artisan careers that can overcome socio-economic, ethnic and geographical barriers (Comunian, England, 2022).
- Engaging in crafts and related activities to explore and appreciate multiculturalism and diversity (Buckley, Maqsoudi-Moreno, 2019).
- The fulfillment of various functions by crafts in everyday life, such as: ritual, means of expression, economic factor, educational means, means of social interaction, means of therapy, environmental protection, means of recreation, means of self-fulfillment, individual identity and symbol of cultural identity (Sudana, Mohamad, 2023),
- Diversity in crafts can be supported by developing skills in digital technologies (Patel, 2020).
- The potential for microaggressions that can make the craft industry unfriendly to people who are similar to certain members of a given culture, including being non-white and non-middle class (Patel, 2020).
- Managing diversity in the craft sector refers to the effective use of key resources in a given community or organisation resulting from the heterogeneity of people involved in craft activities. This includes diversity in terms of ethnicity, education, work experience, age, ability level and other factors that affect their competences and career prospects (CC, 2020).

3. Material and Methods

The conducted study focuses on finding an answer to the question of whether Polish crafts are currently described and promoted through the aspect of ethnic diversity. A literature review was undertaken within the scope of grey literature, i.e. materials that reach the average recipient of crafts, i.e. a reader not familiar with databases of scientific texts and interested only in open resources. The selection of texts was made using the Google search engine of Google LLC, which indexes over a billion websites. The study was conducted in February 2025. Using the terms "craft" AND "ethnic diversity", 105 materials meeting the search criteria were obtained from the search engine, 16 of which were related to the research topic (including those that concerned only Polish crafts, included texts that actually contained aspects of diversity, and were related to the contemporary crafts). In order to show the most relevant results, items identified by Google as very similar were omitted. Of the 16 texts obtained, 14 materials included texts posted on websites, and 2 materials were scientific articles available online.

Due to the relatively small number of texts obtained in this way, it was decided to proceed to research step 2 described below.

In the second stage of the research, materials published on the websites of Craft Chambers associated with the structure of the Polish Craft Association [in Polish: Związek Rzemiosła Polskiego], including 26 organizations shown in Table 2, were analyzed. The content of each of the available tabs on the guild websites was analyzed, and in the case of files posted on the websites, their content was also analyzed. The analysis of the obtained materials focused on content referring to cultural identity, the cultural background of the craftsmen, the specificity of local cultures, craft heritage, techniques passed down from generation to generation, cultural expression, local communities, local design, ethnic symbolism, etc.

The materials obtained in steps 1 and 2 were subjected to content analysis.

Table 2.
Craft chambers associated with the structure of the Polish Craft Association

No.	Name of the organization	Website
1	Chamber of Crafts and Entrepreneurship in Białystok [in Polish: Izba Rzemieślnicza i Przedsiębiorczości w Białymstoku]	http://www.rzemioslo.bialystok.pl/
2	Beskid Chamber of Crafts and Entrepreneurship in Bielsko-Biała [in Polish: Beskidzka Izba Rzemiosła i Przedsiębiorczości w Bielsku-Białej]	https://www.izbabielsko.pl/
3	Kuyavian-Pomeranian Chamber of Crafts and Entrepreneurship in Bydgoszcz [in Polish: Kujawsko-Pomorska Izba rzemiosła i Przedsiębiorczości w Bydgoszczy]	http://www.izbarzem.pl/
4	Częstochowa Chamber of Crafts and Entrepreneurship in Częstochowa [in Polish: Częstochowska Izba Rzemiosła i Przedsiębiorczości w Częstochowie]	https://cirzem.pl/
5	Pomeranian Chamber of Crafts, Small and Medium-sized Enterprises in Gdańsk [in Polish: Pomorska Izba Rzemieślnicza, Małych i Średnich przedsiębiorstw w Gdańsku]	www.pomorskaizba.com.pl/
6	Lubuska Chamber of Crafts in Gorzów Wielkopolski [in Polish: Lubuska Izba Rzemieślnicza w Gorzowie Wielkopolskim]	www.irgorzow.pl
7	Chamber of Crafts in Kalisz [in: Izba Rzemieślnicza w Kaliszu]	http://www.irip.kalisz.pl/
8	Chamber of Crafts and Small and Medium-Sized Enterprises in Katowice [in Polish: Izba Rzemieślnicza oraz Małej i Średniej Przedsiębiorczości w Katowicach]	http://www.ir.katowice.pl/
9	Chamber of Craftsmen and Entrepreneurs in Kielce [in Polish: Izba rzemieślników i Przedsiębiorców w Kielcach]	http://www.izbakielce.pl/
10	Małopolska Chamber of Crafts and Entrepreneurship in Krakow [in Polish: Małopolska Izba Rzemiosła i Przedsiębiorczości w Krakowie]	http://izba.krakow.pl/
11	Chamber of Crafts and Entrepreneurship in Lublin [in Polish: Izba Rzemiosła i Przedsiębiorczości w Lublinie]	www.izba.lublin.pl
12	Chamber of Crafts in Łódź [in Polish: Izba Rzemieślnicza w Łodzi]	http://www.izbarzem.eu/

Cont. table 2.

13	Chamber of Crafts and Entrepreneurship in Nowy Sącz [in Polish: Izba Rzemiosła i Przedsiębiorczości w Nowym Sączu]	http://www.izbarzem-ns.pl/
14	Warmia-Masuria Chamber of Crafts and Entrepreneurship in Olsztyn [in Polish: Warmińsko-Mazurska Izba Rzemiosła i Przedsiębiorczości w Olsztynie]	www.izbarzem.olsztyn.pl
15	Chamber of Crafts in Opole [in Polish: Izba Rzemieślnicza w Opolu]	http://www.izbarzem.opole.pl/
16	Chamber of Crafts in Rybnik [in Polish: Izba Rzemieślnicza w Rybniku]	https://izbarybnik.pl/
17	The Greater Poland Chamber of Crafts in Poznań [in Polish: Wielkopolska Izba Rzemieślnicza w Poznaniu]	www.irpoznan.com.pl/
18	Chamber of Crafts and Small Business in Radom [in Polish: Izba Rzemiosła i Małej Przedsiębiorczości w Radomiu]	http://www.izbarzemiosla.radom.pl/
19	Chamber of Crafts in Rzeszów [in Polish: Izba Rzemieślnicza w Rzeszowie]	http://www.izbarzemieslnicza.rzeszow.pl/
20	Chamber of Crafts and Entrepreneurship of Central Pomerania in Słupsk [in Polish: Izba Rzemiosła i Przedsiębiorczości Pomorza Środkowego w Słupsku]	http://www.rzemioslo.slupsk.pl/
21	Chamber of Crafts in Szczecin [in Polish: Izba Rzemieślnicza w Szczecinie]	https://irszczecin.pl/
22	Chamber of Crafts and Small and Medium-Sized Enterprises in Tarnów [in Polish: Izba Rzemieślnicza oraz Małej i Średniej Przedsiębiorczości w Tarnowie]	http://www.izbarzemieslnicza.tarnow.pl/
23	Masovian Chamber of Crafts and Entrepreneurship in Warsaw [in Polish: Mazowiecka Izba Rzemiosła i Przedsiębiorczości w Warszawie]	http://www.mirip.org.pl/
24	Chamber of Crafts of Mazovia, Kurpie and Podlasie in Warsaw [in Polish: Izba Rzemieślnicza Mazowsza, Kurpi i Podlasia w Warszawie]	http://www.izbarzem-mkp.com.pl/
25	Lower Silesian Chamber of Crafts in Wrocław [in Polish: Dolnośląska Izba Rzemieślnicza we Wrocławiu]	http://www.izba.wroc.pl/
26	National Chamber of Optical Crafts in Warsaw [in Polish: Krajowa Rzemieślnicza Izba Optyczna w Warszawie]	https://www.krio.org.pl/

Source: Based on the list of organizations associated in the structure of the Polish Craft Association (Związek Rzemiosła Polskiego; n.d.).

4. Results

4.1. Content analysis of non-scientific materials (journalists' texts, textbook, and studies)

Within the analyzed materials, the aspect of the diversity of Polish crafts is shown very generally, mainly through linking it to a very broadly understood diversity - terms such as wealth, variety, and heterogeneity. The above is associated with nine different aspects. The first aspect refers to both traditional professions, sole proprietorships, and very modern companies offering innovative solutions. Craftsmen, using the achievements of science and technology to improve their workshops and products, respond to the expectations of modern customers (Express Biznesu, 2021). The second aspect concerns the diversity of unique, hand-made products that are not available in traditional trade and are an expression of authenticity and a unique, artistic approach (One Bid, 2023). The third aspect emphasizes the diversity of professions performed (Stach, 2025). Another perspective connects crafts and diversity with the adaptation of craftsmen to the market - the emergence of new crafts previously not present in Poland, such as a maker of yerba mate vessels, and a creator of jewelry from recycled materials. The diversity of crafts is also presented from the perspective of various skills and interests of people engaged in crafts (Stach, 2025), as well as combining tradition with modernity, and centuries-old tradition, creating a brand of the region and competing on international markets (Kulka, 2025). Another aspect highlights the use of various materials (including textures, size, varieties, patterns and shapes) and tools (including their different sizes) by craftsmen (Herman, 2020; Górka, 2013). One of the obtained materials describes the diversity of craftsmanship in terms of craft activity and the declared aspirations and development potential of craftsmen/craft companies. This aspect appears in materials informing about the publication by the Polish Agency for Enterprise Development of the report "Tropami polskiego rzemiosła" presenting an analysis of the Polish craft sector (PARP, 2024). The last context is related to the complex diversity of the population inhabiting a given area (the example of the Carpathians), shaped not only by interactions between states, nations, religions, and cultures present in a given area but also by the influence of specific conditions of the natural environment. In this approach, craftsmanship is described as "not only the ability to use tools and knowledge of the materials used but also professional jargon, a rich world of beliefs, a certain specific view of the surrounding reality". In this case, the diversity approach refers more to the specificity of the region than to the craft profession (Stowarzyszenie Ekopsychologia, 2020). Only in the last source does the aspect of craft diversity refer to issues of ethnic diversity.

4.2. Content analysis of scientific materials (book review and research report)

Within the analyzed materials, the aspect of the diversity of Polish crafts is shown in the two-track way.

The first one concerns the diversity of definitions within the framework of public sociology issues - the use of the category of "craftsman" described in the book *Craftsmen and businesses. Owners of small and medium-sized private enterprises* [in Polish: *Rzemieślnicy i biznesmeni. Właściciele małych i średnich przedsiębiorstw prywatnych*] by J. Gardawski (Herman, 2013).

The second dimension is noticeable in the PARP report *Following the trail of Polish craftsmanship* [in Polish: *Tropami polskiego rzemiosła*], in which one can read that Polish craft is revealed significant internal heterogeneity of the sector, which results primarily from the wide scope of craft activities. The author of the report draws attention to two implications. Some categories of craft, despite certain similarities, are still characterized by significant internal diversity. The second aspect is related to the uneven representation within individual types of craft (niche, unique and artistic professions), which in the case of some professions, with a small number of their representatives in the sample, may make it difficult to precisely capture their specificity (Kowalewska, 2023). The craftsmen taking part in the research described in the report are also differentiated by (Kowalewska, 2023):

- using various forms of public aid (exemptions from ZUS contributions, tax reliefs and exemptions, non-refundable subsidies/grants, co-financing of a project implemented under EU programmes, development loans, co-financing of training and consulting services and sureties and/or guarantees),
- participation in various forms of improving qualifications (internal and external stationary and online courses/trainings, as well as self-education methods),
- specifying various short-term goals (financial, product, operational, image, investment, and those defined as conservative),
- representing different segments of craft companies due to their market condition and development potential (warriors, passive successors, conquerors, top students, cautious ones – briefly described in Table 3).

Table 3.
Polish craftsmen divided into segments by A. Kowalewska

Segment name	Financial condition	Key goals for the current year	Manifestations of development activity
Warriors	Not very advantageous	Maintaining a stable market position and ensuring financial liquidity.	Staff recruitment, investments in infrastructure and equipment, development strategy including product innovations and modernization of technical facilities
Passive Continuers	Not very advantageous	Rarely specified.	Low frequency of recruitment processes, limited investment activity, lack of a developed strategy and sporadic improvement of qualifications by the owner.
Conquerors	Good	Acquiring new customers and increasing sales results.	Recruitment of employees and planned further employment activities, investments in tools and machines, regularly updated strategy.
Primus	Very good	An extensive set of goals, including building the brand/company image.	Observed investment activity in various areas, with the intention of continuing it, developing competences and regularly updated strategy.
Cautious	Companies with different financial conditions	No specifics.	Investment activity in various areas, including process innovations, however with an expected tendency to limit, and relatively rare improvement of qualifications by the owner.

Source: own adaptation from Kowalewska (2023).

Also in this part of the study the diversity of crafts was not presented through the prism of ethnic diversity.

4.3. Content analysis of materials obtained from the websites of craft chambers

The analysis of the websites of the Chambers of Crafts indicates a lack of use of elements of ethnic diversity in the promotion of Polish crafts. On the examined websites, diversity appears only in the names of the chambers (guilds of various crafts) and refers primarily to the diversity of craft professions, as well as offers of conducting journeyman, master, and verification exams in various professions. Out of 26 analyzed websites, only one, run by the Greater Poland Chamber of Crafts in Poznań, contains one link to cultural diversity – the "International Master" [in Polish: „Międzynarodowy Mistrz"] training focusing on the subject of interculturalism in development cooperation. The training allowed for deepening knowledge of intercultural communication, stereotypes regarding different cultures and nationalities and their impact on communication processes, and culture shock, about the diverse cultures and socio-economic systems in the world (Wielkopolska Izba Rzemieślnicza w Poznaniu, n.d.).

5. Discussion

Ethnic diversity significantly influences the evolution of traditional crafts, both in terms of creativity and regional development. As different cultural influences intersect, artisans adopt new materials, techniques, and design aesthetics, leading to the creation of hybrid craft styles that enrich local traditions while ensuring their survival in a globalized world (Bhachu, 2021; Bond, Worthing, 2016). This fusion of cultural influences revitalizes traditional craftsmanship, helping it remain relevant amidst the changing demands of modern society (Stabler, 2021).

Culturally diverse crafts also have profound social and economic impacts. They encourage cross-cultural exchange and knowledge-sharing among artisans, while creating new opportunities for economic growth in local economies through tourism, markets, and digital engagement (Moeran, 2021; Rodrigues et al., 2024). The handicraft industry benefits from the global demand for unique, handmade products, contributing to the economic development of regions rich in cultural diversity (Ferreira et al., 2019).

Furthermore, the integration of ethnic diversity into craft practices helps shape regional identities and preserve intangible cultural heritage, ensuring that it is passed down through generations while adapting to modern influences (Morris, Leung, 2010; Glăveanu, 2019). However, challenges related to cultural appropriation, commercialization, and the mechanization of traditional crafts raise concerns about maintaining the integrity of craftsmanship (Dalal et al., 2024; Bouzarjomehri, Eslamfard, 2017). To address these issues, it is important to implement policies that protect artisans' rights and ensure fair trade practices.

However, the analysis of the reviewed materials reveals that the diversity of Polish crafts is presented in a broad and multi-faceted manner. It is primarily linked to a general understanding of diversity, encompassing various aspects such as the range of professions, the uniqueness of handmade products, the integration of tradition with modernity, and the adaptation of craftsmen to evolving market demands. The diversity of materials, tools, and skill sets, as well as the professional aspirations of craftsmen, further highlight the richness of the sector.

Additionally, scientific studies and reports illustrate this diversity through two key perspectives. The first pertains to the conceptualization of craftsmanship within public sociology, emphasizing the evolving definition of a craftsman. The second perspective, highlighted in the PARP report, showcases the internal heterogeneity of the craft sector, drawing attention to disparities in representation among craft professions and the varied access to resources, training, and market opportunities among craftsmen.

Despite this extensive exploration, the dimension of ethnic diversity remains largely absent from promotional and institutional narratives of Polish crafts. The only notable reference to cultural diversity is found in the training initiative of the Greater Poland Chamber of Crafts, which aims to enhance intercultural competence. This suggests that while Polish crafts are recognized for their professional and creative diversity, there remains an opportunity to further integrate and acknowledge the ethnic and cultural aspects of craftsmanship in Poland.

Additionally, institutions, craft organizations, and policymakers should consider implementing targeted actions to bridge the gap in ethnic diversity representation. For instance, organizing multicultural craft festivals or exhibitions could create platforms for craftsmen from diverse backgrounds to showcase their work, thus promoting cultural exchange and fostering inclusivity. Moreover, educational programs focused on cross-cultural collaboration, and initiatives that highlight the value of ethnic diversity in craftsmanship, could help raise awareness and inspire future generations of artisans to explore diverse influences in their work.

The Table 4 outlines concrete actions that institutions, craft organizations, and policymakers can take to enhance multicultural inclusion within the craft sector. These steps focus on creating diverse opportunities, supporting marginalized artisans, and fostering cross-cultural understanding through festivals, educational programs, and policy initiatives.

Table 4.
Recommendations for addressing the gap in multicultural representation in craft organizations, educational institutions, and policy development

Action	Recommendation	Steps for implementation
Organize multicultural craft festivals	Host annual multicultural craft festivals to showcase global and indigenous craft traditions.	- Partner with cultural organizations, museums, and embassies to invite artisans from various cultures. - Organize educational workshops on the history and techniques behind different crafts.
Diversify festival programming	Ensure festival programming represents diverse cultural backgrounds and underrepresented groups.	- Include artists from diverse backgrounds, especially those marginalized or overlooked. - Ensure fair compensation and exposure for all participants, including underrepresented groups.
Integrate multicultural craft education	Incorporate multicultural craft traditions into school curricula and educational programs.	- Collaborate with educators from different cultural backgrounds to design curriculum modules that include global crafts. - Offer specialized workshops on the techniques and cultural significance of various crafts.
Provide scholarships for artisans	Offer financial support for artisans from minority backgrounds to attend craft programs or residencies.	- Create funding opportunities for scholarships, fellowships, and artist residencies specifically for artisans from marginalized backgrounds. - Partner with craft institutions and universities to facilitate these opportunities.

Cont. table 4.

Offer grants to minority artisans	Establish grants and funding specifically for artisans from diverse and underrepresented backgrounds.	- Set up a grant program to support artisans from marginalized communities. - Offer training on how to apply for grants and manage financial resources effectively.
Create mentorship networks	Set up mentorship programs where experienced artisans from various cultures guide emerging talents.	- Facilitate cross-cultural mentorship opportunities, pairing seasoned artisans with new or younger artisans. - Promote exchanges between artisans from different regions and traditions.
Promote inclusive craft policies	Advocate for policy changes to promote multicultural inclusion within the craft sector.	- Review existing craft policies to ensure they incorporate multicultural perspectives. - Lobby for the inclusion of minority groups in leadership and decision-making bodies within the craft sector.
Implement accessibility for diverse communities	Ensure that craft events and programs are accessible to all cultural communities, including financial support.	- Offer financial assistance and discounted rates for multicultural communities to attend events. - Provide translation services and ensure venues are accessible to people with disabilities.
Promote multicultural crafts online	Use digital platforms to promote and sell multicultural crafts and artisans' works.	- Develop online marketplaces dedicated to multicultural crafts. - Use social media to highlight the stories and works of artisans from underrepresented communities.
Preserve cultural heritage through craft	Establish programs for the preservation and transmission of endangered craft traditions.	- Partner with local cultural groups, museums, and universities to protect and preserve endangered crafts. - Integrate cultural heritage preservation into craft education to ensure knowledge is passed down.

Source: Own elaboration.

Our study shows that the importance of ethnic diversity within crafts is emphasized mainly by the scientific community, and this topic is omitted in texts that could promote crafts through their content.

The limitation of the study is undoubtedly the focus on the analysis of only the websites of the Craft Chambers. In the future, it is worth continuing the research on the websites of craft guilds and craft cooperatives, as well as other institutions related to crafts and its promotion. It is also worth emphasizing that the craft professions listed on the websites of the Craft Chambers mostly refer to industry-oriented crafts. Therefore, the lack of analysis of units directly oriented to handicrafts of creators emphasizing the local character and regional heritage in their works can also be considered a limitation of the study.

To further enrich the analysis of ethnic diversity in Polish craftsmanship, future research could investigate the presence and impact of policies or government initiatives that support ethnically diverse craftsmen. Exploring programs such as national funding opportunities, cultural grants, and local government actions aimed at fostering diversity in crafts would provide a broader understanding of the practical support available to artisans from different ethnic backgrounds.

Table 5 outlines other potential future research directions to enhance the understanding of how ethnic diversity impacts the craft sector, with a focus on creativity, innovation, sustainability, and cultural preservation.

Table 5.
Direction of future research: key areas of focus

Research area	Description	Key references
Integration of culture, creativity, and innovation	Explore the interaction between culture, creativity, and innovation in the craft sector, focusing on how ethnic diversity influences these elements.	Roy, Mohapatra (2023), Glăveanu (2019)
Impact of digitalization on cultural heritage	Investigate how digital technologies affect the preservation of cultural heritage while fostering innovation in crafts.	Li (2022)
Cross-cultural collaboration and global networks	Examine how ethnic diversity facilitates global collaborations and creates new craft forms, impacting the global market.	Bond, Worthing (2016), Stabler (2021)
Economic sustainability and ethical practices	Focus on ensuring ethical practices, fair trade, and sustainable economic development in diverse craft industries.	Dalal et al. (2024), Bouzarjomehri, Eslamfard (2017)
Cultural appropriation and authenticity	Study the balance between cultural appreciation and cultural appropriation, ensuring the preservation of authenticity in global craft markets.	Moeran (2021), Ferreira et al. (2019)
Regional identity and craft practices	Investigate how crafts contribute to regional identity and community development, particularly in ethnically diverse regions.	Morris, Leung (2010)

Source: Own elaboration.

6. Conclusion

This study presents a novel approach by moving beyond the traditional focus on either the economic or artistic dimensions of craftsmanship. Instead, it provides a comprehensive exploration of diversity within Polish crafts, integrating both professional and institutional perspectives. By examining factors such as market adaptation, material use, and evolving definitions of craftsmanship, this research offers a more holistic understanding of the craft sector. Additionally, it sheds light on the often-overlooked role of ethnic diversity in shaping contemporary craft narratives, emphasizing how cultural influences contribute to the sector's development and identity.

Our research establishes new insights into the extent to which diversity is considered in the Polish craft sector, revealing that while professional and creative diversity are well recognized, ethnic diversity remains largely underrepresented in promotional and institutional discourses. Prior studies have extensively explored craftsmanship from economic and artistic perspectives, yet our study contributes a new dimension by integrating the sociological and cultural aspects of diversity in the craft sector.

A key finding of this study is that ethnic diversity plays a critical role in shaping global craft narratives, yet it remains a minor element in the promotion of Polish crafts. This contrasts with studies in other regions, where ethnic diversity is acknowledged as a driving force behind innovation and cultural sustainability in craftsmanship. By comparing these findings, we identify both similarities, such as the role of innovation in sustaining traditional crafts, and differences, particularly in the lack of institutional acknowledgment of cultural diversity in Poland.

From these findings, we can conclude that while the Polish craft sector is dynamic and evolving, there is a significant gap in how cultural diversity is integrated into its representation. Future research should focus on examining craft guilds and cooperatives, as well as how digital platforms and globalization influence ethnic diversity within Polish craftsmanship. This direction will help further explore the potential for incorporating cultural heritage into craft promotion and development strategies.

Our results confirm the hypothesis that while diversity is a key characteristic of Polish craftsmanship, ethnic diversity remains largely absent from institutional narratives. By addressing this gap, future research and policy initiatives can enhance the visibility and sustainability of cultural diversity in the craft sector, ensuring that traditional crafts continue to thrive in an increasingly interconnected world.

In conclusion, ethnic diversity serves as a powerful driver of creativity and regional development in the craft sector. By fostering inclusive environments that encourage cross-cultural collaboration and supporting sustainable craft industries, societies can effectively preserve their cultural heritage while promoting innovation and local economic growth (Li et al., 2023; Roy, Mohapatra, 2023).

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References

1. Amiri, S., Naderi, N. Mohammadi far, Y. (2019). Conceptualization of the Challenges in Home-based Busi-nesses in the Villages of Kermanshah Province (Persian). *Journal of Rural Research*, *10*(2), pp. 172-185.
2. Bhachu, P. (2021). *Movers and makers: Uncertainty, resilience and migrant creativity in worlds of flux*. Routledge.

3. Birau, M. M. (2025). Handmaking a better future: A scoping review on the role of handmade activities in advancing individual and societal well-being. *Psychology & Marketing*, *42*(1), pp. 44-63.
4. Bond, S., Worthing, D. (2016). *Managing built heritage: The role of cultural values and significance*. John Wiley & Sons.
5. Bouzarjomehri, K., Eslamfard, F. (2017). Reviewing the Barriers and Problems of Rural Indigenous Industries Development; the Study of Carpet and Gabbeh in Zarrin Dasht County. *Journal of Rural Research*, *8*(2), pp. 194-207.
6. Bravo, J.B. (2022). *From prototypes to monotypes. Neo-craftsmanship in architecture and design.* HERITAGE 2022 - International Conference on Vernacular Heritage: Culture, People and Sustainability, September 15th-17th, 2022 Valencia, Spain. doi: 10.4995/HERITAGE2022.2022.14287.
7. Buckley, K., Maqsoudi-Moreno, D. (2019). *Celebrating Diversity and Multiculturalism Through Crafts: Toolkit.* Retrieved online: https://infopeople.org/sites/default/files/civicrm/persist/contribute/files/webinar/2019/4_4_19/Handout_DiversityCrafts_2019.pdf, 27.02.2025.
8. CC (2020). *How can the craft world address its lack of diversity?* Crafts Council. Retrieved online: https://www.craftscouncil.org.uk/stories/how-can-craft-world-address-its-lack-diversity, 27.02.2025.
9. Comunian, R., England, L. (2022). Access and diversity in South African craft and design: The work of craft intermediaries in Cape Town. *European Journal of Cultural Studies, 25(6),* pp. 1597-1616. doi: 10.1177/13675494221136611.
10. Corazza, G.E., Glăveanu, V.P. (2020). Potential in creativity: Individual, social, material perspectives, and a dynamic integrative framework. In: *Creative learning in digital and virtual environments* (pp. 144-161). Routledge.
11. Dalal, A., Bhattacharya, S., Chattopadhyay, S. (2024). Hurdles to handicraft marketing for artisan entrepreneurs in an emerging economy. *Journal of Small Business and Enterprise Development*, *31*(1), pp. 74-94.
12. Elliot, E.A. (2016). Craft consumption and consumer transformation in a transmodern era. *Journal of Business Research*, *69*(1), pp. 18-24.
13. Erez, M., Nouri, R. (2010). Creativity: The influence of cultural, social, and work contexts. *Management and Organization Review*, *6*(3), 351-370.
14. Express Biznesu (23.12.2021). *Rzemiosło to ogromna różnorodność*. Retrieved online: https://expressbiznesu.pl/2021/12/23/rzemioslo-to-ogromna-roznorodnosc/, 28.01.2025.
15. Fernández-Esquinas, M., van Oostrom, M., Pinto, H. (2017). Key issues on innovation, culture and institutions: implications for SMEs and micro firms. *European Planning Studies*, *25*(11), pp. 1897-1907.

16. Ferreira, J., Sousa, B.M., Gonçalves, F. (2019). Encouraging the subsistence artisan entrepreneurship in handicraft and creative contexts. *Journal of Enterprising Communities: people and places in the global economy*, *13*(1/2), pp. 64-83.
17. Fransen, J., Helmsing, A.H.J. (2017). Absorptive capacity as a mediator: Innovation of handicraft exporters in Yogyakarta, Indonesia. *Tijdschrift voor economische en sociale geografie*, *108*(6), pp. 737-752.
18. Fransen, J., Helmsing, B. (2016). Breaching the barriers: The segmented business and innovation system of handicraft exports in Cape Town. *Development Southern Africa*, *33*(4), pp. 486-501.
19. Glăveanu, V.P. (2010). Paradigms in the study of creativity: Introducing the perspective of cultural psychology. *New ideas in psychology*, *28*(1), 79-93.
20. Glăveanu, V.P. (2015). Creativity as a sociocultural act. *The Journal of Creative Behavior*, *49*(3), pp. 165-180.
21. Glăveanu, V.P. (2019). Measuring creativity across cultures: Epistemological and methodological considerations. *Psychology of Aesthetics, Creativity, and the Arts*, *13*(2), 227.
22. Glăveanu, V.P., Ness, I.J., Wasson, B., Lubart, T. (2019). Sociocultural perspectives on creativity, learning, and technology. *Creativity under duress in education? Resistive theories, practices, and actions*, pp. 63-82.
23. Górka R. (2013). *Rękodzieło ludowe i rzemiosło artystyczne w aspekcie tradycji i możliwości rozwojowych w przyszłości,* Podgórzańskie Stowarzyszenie Rozwoju.
24. Herman, A. (2013). Praktyka i czas czynią Mistrza. In: J. Gardawski (Ed). *Rzemieślnicy i biznesmeni. Właściciele małych i średnich przedsiębiorstw prywatnych* (pp. 43-55). Warszawa: Scholar.
25. Herman, M. (01.10.2019). *Nowe rzemiosło.* Magazyn Miasta. http://magazynmiasta.pl/2019/10/01/nowe-rzemioslo/, 18.08.2024.
26. Herman, M. (17.04.2020). *Pierwotna radość twórcza – rzemiosło na własnych zasadach*. Retrieved online: https://www.projektpracownie.pl/pierwotna-radosc-tworcza-rzemioslo-na-wlasnych-zasadach/, 1.03.2025.
27. Kowalewska, A. (2023). *Tropami polskiego rzemiosła*. Raport z badań. Polska Agencja Rozwoju Przedsiębiorczości.
28. Kulka, D. (22.01.2025). *Rzemiosło to pasja, sztuki i tradycja. Inauguracja Roku Pomorskiego Rzemiosła*. Retrieved online: https://pomorskie.eu/rzemioslo-to-pasja-sztuki-i-tradycja-inauguracja-roku-pomorskiego-rzemiosla/, 1.03.2025.
29. Kwan, L.Y.Y., Leung, A.K.Y., Liou, S. (2018). Culture, creativity, and innovation. *Journal of Cross-Cultural Psychology*, *49*(2), pp. 165-170.
30. Li, J. (2022). Grounded theory-based model of the influence of digital communication on handicraft intangible cultural heritage. *Heritage Science*, *10*(1), 126.

31. Li, W., Yigitcanlar, T., Browne, W., Nili, A. (2023). The making of responsible innovation and technology: An overview and framework. *Smart Cities*, *6*(4), pp. 1996-2034.
32. Liu R.X. (2023). Identity Navigation and Self-Positioning in a Changing Craft World: Creativity and Cultures of Emerging Self-Employed Craft Workers in Jingdezhen. *The Journal of Modern Craft*. doi: 10.1080/17496772.2023.2269671.
33. Luckman, S. (2015). Introduction — Craft and the Contemporary Cultural Economy: The Renaissance of the Handmade. In: *Craft and the Creative Economy*. London: Palgrave Macmillan. doi: 10.1057/9781137399687_1.
34. Marques, C.S., Santos, G., Ratten, V., Barros, A.B. (2019). Innovation as a booster of rural artisan entrepreneurship: a case study of black pottery. *International Journal of Entrepreneurial Behavior & Research*, *25*(4), pp. 753-772.
35. Miralay, F. (2018). Türk Halk Kültüründe El Sanatlarının Önemi: Kıbrıs Örneği [The Importance of Handicrafts in Turkish Folk Culture: The Case of Cyprus]. *Journal of History Culture and Art Research*, *7*(5), pp. 495-509.
36. Moeran, B. (2021). *Creative and cultural industries in East Asia: An introduction*. Routledge.
37. Morris, M.W., Leung, K. (2010). Creativity east and west: Perspectives and parallels. *Management and Organization Review*, *6*(3), pp. 313-327.
38. Nakano, T.D.C., Wechsler, S.M. (2018). Creativity and innovation: Skills for the 21st Century. *Estudos de Psicologia (Campinas)*, *35*, pp. 237-246.
39. Nasri, M.H., Mansour, A.M. (2019) Reviving craftsmanship and crafts within the context of industrial architecture heritage, *Structural Studies, Repairs and Maintenance of Heritage Architecture, XVI*, pp. 443-454.
40. Nguyen, V.T., Siengthai, S., Swierczek, F., Bamel, U.K. (2019). The effects of organizational culture and commitment on employee innovation: evidence from Vietnam's IT industry. *Journal of Asia Business Studies*, *13*(4), pp. 719-742.
41. One Bid (28.11.2023). *Rzemiosło na Aukcjach: Unikalne Wyroby Rękodzielnicze na OneBid.pl*. Retrieved online: https://onebid.pl/pl/blog/408/rzemioslo-na-aukcjach-unikalne-wyroby-rekodzielnicze-na-onebid-pl, 28.02.2025.
42. PARP (7.02.2024). *Różne oblicza rzemiosła*. Polska Agencja Rozwoju Przedsiębiorczości. Retrieved online: https://media.ro.team/290068-rozne-oblicza-rzemiosla, 1.03.2025.
43. Patel, K. (2020). *Supporting Diversity and Expertise Development in the Contemporary Craft Economy*, Working paper 1. Birmingham City University, Craft Council, Arts & Humanities Research Council.
44. Policht, P. (18.08.2022). *Renesans rzemiosła*. Retrieved online: https://culture.pl/pl/artykul/renesans-rzemiosla, 20.08.2024.
45. Rodrigues, A.O.A., Marques, C.S., Ramadani, V. (2024). Artisan entrepreneurship, resilience and sustainable development: the quintuple helix innovation model in the low-

density and cross-border territories. *Journal of Enterprise Information Management*, *37*(5), pp. 1603-1626.

46. Roy, S., Mohapatra, S. (2023). Exploring the culture–creativity–innovation triad in the handicraft industry using an interpretive approach. *Journal of Business Research*, *156*, 113460.
47. Santoro, G., Bresciani, S., Papa, A. (2020). Collaborative modes with cultural and creative industries and innovation performance: the moderating role of heterogeneous sources of knowledge and absorptive capacity. *Technovation*, *92*, 102040.
48. Saxena A., Pandey S. (2024). Design for sustainability using a craft-based human-centric approach and consumer participation. *Shodh Kosh: Journal of Visual and Performing Arts, 5*(1), pp. 489-509. doi: 10.29121/shodhkosh.v5.i1.2024.774.
49. Shafi, M. (2021). Sustainable development of micro firms: examining the effects of cooperation on handicraft firm's performance through innovation capability. *International Journal of Emerging Markets*, *16*(8), pp. 1634-1653.
50. Shafi, M., Junrong, L., Yang, Y., Jian, D., Rahman, I.U., Moudi, M. (2021). Factors influencing the consumer acceptance of innovation in handicraft products. *Sage Open*, *11*(4), 21582440211061528.
51. Shafi, M., Sarker, M.N.I., Junrong, L. (2019). Social network of small creative firms and its effects on innovation in developing countries. *Sage Open*, *9*(4), 2158244019898248.
52. Shao, Y., Zhang, C., Zhou, J., Gu, T., Yuan, Y. (2019). How does culture shape creativity? A mini-review. *Frontiers in psychology*, *10*, 1219.
53. Stabler, A. (2021). A Sentimental Art Education. *Studies in Art Education*, *62*(1), pp. 63-81.
54. Stach J. (4.02.2025). *Czy warto zostać rzemieślnikiem?* Retrieved online: https://mapakarier.org/blog/138/czy-warto-zostac-rzemieslnikiem/, 28.02.2025.
55. Stowarzyszenie Ekopsychologia (2020). *Dziedzictwo historyczne i kulturowe*. Świat Karpat Podręcznik do edukacji ekologicznej. Zakliczyn. Retrieved online: https://swiatkarpat.pl/swiat-karpat/czlowiek-i-bioroznorodnosc-w-karpatach/dziedzictwo-historyczne-i-kulturowe/, 01.03.2025.
56. Sudana, I.W., Mohamad, I. (2023). Embracing the Diversity of Craft Functions in Daily Life. *International Journal of Literature and Arts, 11(4),* pp. 186-192. doi: 10.11648/j.ijla.20231104.14.
57. Westwood, R., Low, D.R. (2003). The multicultural muse: Culture, creativity and innovation. *International journal of cross cultural management*, *3*(2), pp. 235-259.
58. Wielkopolska Izba Rzemieślnicza w Poznaniu (n.d.). *Projekt - Rzemieślnicy bez granicy bez granic*. Retrieved online: https://www.irpoznan.com.pl/strona,projekt-rzemieslnicy-bez-granic.html, 1.03.2025.

59. Yesuf, Y.M., Getahun, D.A., Debas, A.T. (2024). Determinants of employees' creativity: modelling the mediating role of organizational motivation to innovate. *Journal of Innovation and Entrepreneurship*, *13*(1), 8.
60. Zhou, J., Shalley, C.E. (2011). *Deepening our understanding of creativity in the workplace: A review of different approaches to creativity research*.
61. Związek Rzemiosła Polskiego (n.d.). *Baza organizacji zrzeszonych w strukturze Związku Rzemiosła Polskiego*. Retrieved online: https://zrp.pl/baza-organizacji-i-firm-rzemieslniczych/, 28.02.2025.

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SHAPING THE NIGHT: POLICIES AND STRATEGIES GOVERNING THE NIGHTTIME ECONOMY

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Purpose: The nighttime economy (NTE) has become a defining feature of urban development, shaping city dynamics and governance worldwide. As cities transition into 24-hour hubs, balancing economic growth with residents well-being presents governance challenges. This study examines the policies and governance frameworks influencing the NTE, highlighting key strategies used by cities to foster vibrant, inclusive and sustainable nightlife.
Methodology: This research employs a document-based analysis of twelve policy documents from global cities. The study identifies trends, challenges, and governance strategies including night mayor initiatives, extended public transport services and collaborative safety measures by systematically reviewing policy objectives, implementation strategies and outcomes.
Findings: The findings reveal that while cities aim to align economic benefits with community well-being, tensions persist over noise management, inclusivity, public safety and limited diversity in nighttime offerings. Strategies such as night mayor appointments, regulatory reforms and extended transport services have contributed to improvements, yet governance challenges remain, particularly in ensuring long-term policy effectiveness and adaptability.
Limitations: The research is limited by its reliance on secondary sources, the absence of primary data affects the depth of insights. Future studies needing to address these gaps through firsthand data collection and stakeholder interviews.
Originality: This paper underscores the necessity of integrated, multi-stakeholder approaches to nighttime governance; by synthesizing international policy efforts, it provides insights into best practices and challenges in governing the NTE, offering recommendations for policymakers seeking to balance urban vibrancy with sustainability and social equity.
Keywords: Nighttime economy, Night Governance, Nighttime policy, Nighttime regulations, 24-hour cities.
Category of the paper: Research paper.

1. Introduction

Over the last decades, the nighttime economy (NTE) has showed its importance as a critical element of urban development, affecting policy decisions and reshaping cities dynamics around the world. The concept of the 24-hour city, which gained popularity in the late 20th century, emphasizing the growing necessity for urban centers to accommodate economic, cultural and social activities that go beyond traditional business hours (Roberts, Eldridge, 2009; Seijas, Gelders, 2021). Today, cities are adopting a more tailored nighttime urban policies to manage this shift, addressing several challenges including public safety, transportation, noise management and inclusivity while promoting economic growth.

This paper examines nighttime economy policies, frameworks, strategies and initiatives in major global cities in which patterns, challenges and recommendations in governing the NTE are identified through an in-depth analysis of secondary data. These policies aspire to boost the vibrancy and sustainability of urban nightlife but also to minimize negative externalities such as noise pollution, public nuisance, crime, alcohol-related violence and disruptions to residential areas (Góis, 2014; Nofre et al., 2018). The role of a specific nighttime governance structures such as night mayors and advisory boards, has further demonstrated the necessity of collaborative approaches to balance stakeholder interests (Seijas, Gelders, 2021).

The effectiveness of these policies is still up for debate, despite notable progress, in fact, research shows that there are ongoing difficulties in coordinating the objectives of economic development with the residents' needs, especially regarding safety, accessibility and inclusivity (Brands, Schwanen, 2014; Schwanen et al., 2012). Furthermore, the capacity to evaluate the long-term effects of these strategies on urban growth is constrained by the absence of standardized frameworks and assessment methods.

The objective of this paper is to analyze policies and frameworks related to the NTE across various global cities, specifically it aims to identify patterns, trends, challenges and recommendations within the analyzed documents.

2. Literature review

The development of comprehensive night governance literature has been constantly driven by the recognition that cities don't simply shut down after dark but instead they transit into a different mode of operation with unique challenges and opportunities (Lovatt, O'Connor, 1995). The growing interest in the 24-hour city concept led to an increasing number of research on the complex relation between urban planning, nightlife activities and resident wellbeing (Mahmoud, Zmyslony, 2024), reflecting the pivotal role it plays in shaping our modern cities.

The term NTE revolves around a spectrum of activities that happen after conventional working hours typically from 6 pm until early morning (Son et al., 2023, p. 1) and it includes leisure, hospitality, entertainment and cultural events (Aghasafari et al., 2021) but it also includes the various transportation services varying from public transit, rideshares and private taxis operating at night (Abraham et al., 2019).

Initially, the concept of a night economy first saw the light in the UK in the 1970's but become popular in the 1990's with the same definition mainly used today to describe the activity, that being; every activity and business associated with evening entertainment, socializing and leisure; for example the nightlife venues such as bars, restaurants, clubs and pubs are all part of the night industry but also theaters, cinemas, casinos, hotels and music venues. These activities not only contribute to economic growth but also enhance urban vibrancy and social cohesion (Chatterton, Hollands, 2003, p. 25). Both locals and tourists visits and use goods and services provided by the NTE (Bianchini, 1995; Field, 2008) however, in many cases, disputes between residents and NTE stakeholders (visitors, business owners) arise but also multiple other externalities exist and must be addressed such as crime, noise pollution, congestion, trash (Shaw, 2014) these issues are becoming big challenges to the NTE and to local and municipal authorities. Managing these externalities and unavoidable conflicts are a central challenge of the nighttime governance.

3. The Concept of Night Governance

The night governance is a distinct field of urban management in general and policy in particular that took its roots from the changing dynamics of urban life in the late 20th and early 21st centuries. As cities becomes more and more concerned with the concept of the 24-hour city, or even more specific the Nighttime economy, the need for specialized and tailored governance policies for nighttime hours has become apparent (Gwiazdzinski, 2018). The conventional day-time governance approach is not sufficiently effective in managing the complexity of the nighttime reflected in meditating conflicts and ensuring the safety of individuals while supporting the economic development of the city (Talbot, 2004; Shaw, 2014).

Hadfield (2015) outlines the development of night governance literature, pointing out that it began with the management of nighttime entertainment districts, the focus of night governance has then shifted to include a wider range of social, cultural, and economic factors. Originally, the literature concentrated on crime prevention and public order. This change reflects the increasing understanding that the night is not only a time for control and regulation, but also a time for cultural expression and economic opportunity.

The concept of the Nighttime economy has played an important role in shaping the night governance approaches and is still doing so nowadays, in fact Roberts & Eldridge in their seminal book Planning the Night-time City (2009) define the activity of the NTE as the range of economic activities that occur between 6 pm and 6 am, including hospitality, entertainment, and shift work, It is crucial for effective night governance to balance the economic benefits of a vibrant nighttime economy with the needs and rights of residents, particularly in terms of noise control and public safety.

As the phenomenon evolves, the topic gets more and more attention not only from decision-makers in big cities around the world but also from scholars who researched every details of the activity, for instance; Seijas and Gelders (2021) highlight the emergence of the "night mayor" role in cities worldwide as a key development in night governance, this position, first established in Amsterdam in 2012, serves as a mediator between various stakeholders in the nighttime city, including businesses, residents, and city officials, this relatively new form of night governance institutionalized as the night mayor represents recognizes the unique challenges and opportunities of nighttime urban management and debatably offers a more tailored response to the nighttime issues.

Night governance and the Nighttime Economy encompass far more than just entertainment and the overwhelming economic agenda, take, for instance, the work of Kyba et al. 2020: in which they argue that the night is steadily becoming its own interdisciplinary research independent from the urban studies.

The topic of addressing public safety and security concerns is essential for an effective nighttime urban governance, in reality; residents perceptions of safety and security in the urban environment play a decisive role in determining how livable and appealing a city is around the clock; a call for action has been initiated by the NTE advisor for the city of Dublin following the results of the survey “Your Dublin your voice” in which 50% of females and 40% of males reported not feeling safe at night (Night-time economy strategy, Dublin, 2021), which in consequences can limit the interaction with the Nighttime economy, in fact, techniques like more police presence and the installation of surveillance systems (CCTV) can improve people's feelings of safety and overall satisfaction with the nighttime environment in their city and thus their willingness to engage in the nighttime activity, which is consistent with the findings of Brands et al. (2015), in which it was concluded that the visible presence of police officers have strong effects on experienced safety and their presence enhance the safety perception more than the presence of CCTV as they are viewed as “a friend of everybody”.

In general, nighttime policies and regulations play a crucial role in managing the NTE by addressing the complex impacts on urban development and residents wellbeing, in fact effective policies ensure that the contribution of the NTE is positive to economic growth, vibrancy and labor market (employment opportunities), while mitigating the unavoidable externalities such as noise pollution, safety concerns and alcohol related issues. For instance, scholars have stressed the importance of integrating stakeholders perspective in the planning and management of the NTE to balance the interests of nightlife businesses, residents and local communities and governments to foster inclusivity and sustainability (Roberts, Eldridge, 2009). Furthermore, tailored laws, regulations and policies can potentially improve residents quality of life by improving safety, transportation options resulting in promoting a more harmonious coexistence between nocturnal and daytime urban activities (Shaw, 2010).

Thematic areas in the literature on nighttime economy policies reveal a spectrum of interlinked concerns that influence governing and managing the city after dark, central themes include economic impact, safety and security, noise and environmental complaints and lastly transportation and mobility. Roberts, Eldridge (2009) emphasized the economic contributions of nighttime activities from hospitality to entertainment while the study of Brands & Schwanen (2014) shows the safety concerns as a critical focus for urban governance. The study by Roberts & Gornostaeva (2007) showed the many concerns British towns and city center are facing at night, they note that noise pollution was a major complaint specifically in densely populated areas like inner London causing conflicts between residents and visitors.

Furthermore, safety and security are the main historical concerns in nighttime economy as they directly impact residents quality of life and the viability of nighttime economy which can potentially result in an economical loss over the longer period. Considering this, recent research has emphasized how difficult it can be to put in place efficient safety measures in urban night areas.

The biggest milestone in the nighttime safety is the improved street lighting, in fact it was one of the very first step towards a safe and engaging night, building on earlier work by Painter (1996), more recent studies have provided valuable insights into the relationship between lighting and perceived safety.

Improved governance tactics have developed to meet the difficulties of metropolitan environments at night, building on Hadfield et al (2009) examination of nighttime economy governance, several scholars have documented the evolution of urban night governance strategies, for instance, Seijas & Gelders (2021) traced the emergence of the night mayor position, documenting how Amsterdam’s appointment of their first night mayor in 2012 sparked a global movement with cities like London, Paris and New York following suit. The institutionalization of the night mayor position represented a shift toward more structured management of the NTE. Multiple studies argued that these roles have helped bridge the gap between municipal authorities and nightlife stakeholders and that night mayors could potentially be instrumental in mediating conflicts between residents, venue owners and local authorities.

The use of surveillance technologies in nighttime urban settings has grown increasingly sophisticated. While Welsh and Farrington (2009) highlighted the potential of CCTV in crime prevention, more recent work has explored the useful integration of smart technologies, for instance the work of Vogiatzaki et al. (2020) present a framework for integrating ICT-based systems such as LED lighting and Ai-enabled surveillance to enhance safety urban public spaces.

Addressing safety concerns in the nighttime economy inevitably extends to considerations of transportation and mobility, in fact efficient and safe nighttime transportation is essential for supporting nighttime economies and ensuring a smooth access to nightlife activities

The offering of 24-hour public transportation has expanded in many global cities, the offering is becoming more and more present in the cities with well-established NTE, multiple cities across the world have introduced or expanded late night transit services such as the London's Night Tube which has seen its inauguration in 2016. In many different urban areas, the service of extended and improved public transportation has been investigated, Gössling (2013) looked at Copenhagen's shift to become a bike-friendly city, taking into account nighttime mobility, while it doesn't specifically address public transportation that runs around the clock, this study shows how sustainable transport strategies such as public transportation and cycling infrastructure, can support and even benefit urban mobility at all hours such approaches not only facilitate nighttime economic activities but also have the potential to reduce carbon emissions by offering alternatives to private vehicle use. Gössling's research highlights the need of complete urban mobility efforts in enabling sustainable nighttime offering, even if additional research is needed to determine the precise effects of 24-hour public transportation.

A creative and innovative mobility solutions are seeing the light to address nighttime transportation challenges, recent research have explored the potential of what is known as micromobility services (e-scooters, bike-sharing) in supporting nighttime economies, their research suggests that these services can complement traditional public transport, particularly for short distance trips within nightlife districts, but require careful regulation to ensure safety and minimize conflicts with other road users, that said, the research by Plyushteva (2021) shows that much more efforts remain to be done by the urban authorities and transport planners in order to make nocturnal mobility inclusive in particular to shift and night workers.

While improving nighttime transit and mobility is necessary for a thriving NTE, these measures can introduce new challenges to policy makers, such a noise pollution. In some cases, unmanaged noise from transit hubs and cars can have an impact on residents quality of life, adding another dimension for nighttime governance to address.

Well in fact, the biggest challenge in urban night governance remains the need for balance between the vibrancy of the night and the residents wellbeing, the negative externalities observed like noise pollution, crime, congestion, trash, and conflicts between patrons and residents create social costs (Shaw, 2014; Chatterton, Hollands, 2002)

Ottoz et al. (2018) and recent studies researched noise control policies to explore more subtle approaches to urban noise management, for instance Asdrubali & Alessandro (2018) examines how smart cities address public issues such as noise pollution via ICT-based solutions.

New technologies are being used in noise control measures, for instance the paper by Bello et al. (2019) explored the use of sensor networks and machine learning algorithms for real time monitoring and forecasting of urban noise levels, their work highlights the important potential for scientific and data driven based approach to noise management that can inform more targeted and effective interventions which can potentially results in better management approaches.

4. Methodology

This study employs a document-based analysis to examine the policies, strategies and frameworks surrounding the nighttime economy (NTE) across major global cities. The goal is to identify common trends, challenges and contradictions in the governance of the NTE.

A total of twelve key policy documents were selected for analysis, representing diverse urban contexts across Europe, North America and Australia, these documents were obtained from official governments portals, municipal reports, academic publications and international organizations specializing in urban planning and nighttime economies. The inclusion criteria for document selection were:

1. Relevance to the NTE and its associated sector such as safety, transportation, urban planning and cultural development.
2. Accessibility.
3. Focus on urban nightlife policies.

A systematic review of each document was used to extract relevant data, the information was then categorized into five key dimensions to facilitate a structured comparison:

- Policy objective.
- Implementation strategies.
- Findings.
- Challenges.
- Recommendations.

5. Results

The results of this study are presented in Table 1. This document-based analysis of diverse reports on Nighttime Economy (NTE) policies, regulations and strategies across global cities reveals several common trends, patterns and observations. For instance, a consistent priority across cities is the desire to create vibrant, inclusive and sustainable nighttime economies, the reports from London, Sydney, New York and Ireland highlight the focus to balance cultural, social and economic needs while fostering community engagement. Likewise, enhancing safety and ensuring accessibility for diverse population are a common objectives in most analyzed policies and strategies.

Furthermore, several cities in order to achieve their NTE goals have adapted similar strategies such as the appointment of night mayors or equivalent role (Night Czar in London and Nightlife mayor in New York) which is a recurring governance strategy aimed at coordinating efforts and ensuring representation of nighttime interests in policymaking.

Another common approach found in the strategies used is expanding public transportation services to cover late night hours especially from midnight to 6am, few examples of how cities aim to support nighttime accessibility and safety is London's Night Tube, New York's extended transit hours and mobility improvements in Dublin.

Multiple documents recommended a public-private partnerships and collaborations with law enforcements, local councils and cultural institutions, these efforts are central to a successful NTE governance and are evident in the European Purple Flag Accreditation, London's strategy and New York's nightlife policies.

The main challenges facing nighttime economies center around three critical areas, first is noise management creating tension between venues and residents; second, public safety concerns particularly related to alcohol consumption and violence and third, economic and social inclusivity issues including high operational costs and limited diversity in activities. These challenges are consistently reported across different cities and require balanced as well as multi-stakeholder solutions.

Cities and businesses frequently encounter outdated or restrictive licensing systems, which is often criticized as a barrier to a dynamic NTE, as a result cities like London and Dublin work on modernizing their licensing frameworks to encourage more diverse and safe nighttime offerings. The need for flexible and adaptive regulatory approaches is highlighted in multiple reports, from New York's mediation efforts to the evolving guidelines in the European Purple Flag Accreditation. Additionally, there is a strong focus on integrating cultural activities into NTE strategies, encouraging non-alcohol based events and fostering a diverse range of cultural experiences is a shared goal in many cities such as Dublin and Montgomery County. Moreover, reports from Sydney and London stress the importance of protecting cultural assets and venues, emphasizing cultural diversity as a key element for successful nighttime economies. The World Economic Forum's report emphasize the significant revenue generated by nighttime activities, indicating that NTEs are big contributors to employment and is essential drivers of urban economies.

Lastly, a worth mentioning trend towards data-driven decision making in the NTE management, cities like London and regions with the Purple Flag Accreditation emphasize the use of assessments and monitoring to inform policy changes.

Table 1.
Results of the analysis of Nighttime Economy reports, policies and regulations

Document title	Key policy objective	Implementation strategies	Findings	Challenges	Recommendations
A report by the Night-time Economy taskforce of Ireland (Ireland 2021)	Develop a vibrant, inclusive and sustainable nighttime economy in Ireland particularly after the challenges of Covid-19.	Extend licensing hours, foster public-private collaboration, enhance public spaces and introduce pilot initiatives for new cultural and non-alcohol based nighttime activities.	The sector faces regulatory challenges, limited diversity in activities, public safety concerns and outdated infrastructure.	Noise management, achieving inclusivity, balancing residential and business interests and adapting to post Covid recovery needs.	Modernize regulations, improve public transport and safety, encourage cultural diversity and support nighttime advisors in local areas.
A vision for London as a 24-hour City (Policy vision 2017)	24-hours city with main objectives: Promote culture and leisure for all ages and interests Extend opening hours of and access to services Ensure safety, diversity, and inclusivity for residents, visitors, and nighttime workers Work closely with boroughs and police to create a balanced and sustainable evening and nighttime offer.	Appointment of Night Czar. Expanding nighttime transport: Night Tube (24-hour transport). Foster partnerships between stakeholders. Support diverse cultural activities. Introduce flexible licensing.	London's nighttime economy is vital but faces challenges like rising business costs, residential conflicts and limited inclusivity.	Ongoing challenges in managing noise and safety, addressing inequality, retaining cultural assets and adapting to changing demographics and technologies.	Create strategic policies, ensure inclusivity in planning, protect cultural venues, promote worker rights, enhance accessibility and sustainability in the nighttime economy.
New York City's Office of Nightlife	Support nightlife businesses, ensure inclusivity, and address noise and transport challenges.	Nightlife Advisory Board extended public transport hours, mediation for noise complaints. Appointment of a Nightlife mayor to support cultural institutions and safety.	Balancing residential and commercial interests, addressing safety and noise complaints.	Persistent noise complaints and accessibility disparities, preservation of cultural venues.	Introduce advanced noise control systems and collaborate with transport agencies for better service.

Cont. table 1.

Sydney's Lockout Laws (2014-2020)	Reduce alcohol-related violence through restricted late night trading hours to have significant impact on crime.	Lockout restrictions on entry and alcohol sales, reduced operating hours, enhanced police presence.	Initial reductions in violence but significant economic losses for nightlife businesses and a reduction in cultural vibrancy.	Economic downturn for nightlife venues; public backlash against restrictive measures. Long-term impact debated.	Develop balanced approaches combining harm reduction and business support mechanisms.
European Purple Flag Accreditation (established in 2006)	Establish standards for safety, diversity, and vibrancy in nightlife districts.	5 frameworks: Wellbeing, movement, appeal, place and policy envelope. Conduct assessments with local councils, businesses and law enforcement. Provide training and guidelines to achieve and maintain accreditation.	Cities with the purple flag accreditation have relatively enhanced safety, diverse nighttime economy, improved urban design and positive reputation.	Limited adoption of accreditation outside Europe. Limited budgets for cities to implement improvements required to achieve or maintain the accreditation. Difficulty in gathering reliable data to monitor the impact of the accreditation on safety, business growth and cultural diversity.	Expand Purple Flag standards internationally and develop partnerships for broader recognition. Use data driven approaches to address urban challenges Regularly review accreditation criteria to adapt to evolving urban needs Enhance public awareness and participation in urban safety and design initiatives.
World Economic Forum 2024: Rethinking 24-hour Cities: Night-Time Strategies to Address Urban Challenges	To develop and enhance 24-hour cities by effectively managing and growing NTE while ensuring safety, accessibility and economic benefits	Appointing Night Mayors or other consultative bodies Creating nighttime governance networks Establishing dedicated night work facilities Repurposing infrastructure for night use Adapting public spaces with lighting and extended hours	NTE generate significant revenue NTE support substantial employment One-third of London's workforce (1,6 million people) works evening or night shifts	Safety Limited mobility Digital commerce affecting traditional business areas Lack of reliable services during the night	Create more inclusive and safe public spaces Improve nighttime transportation options Design urban strategies specifically for NTE management Implement data-driven decision making for NTE development Establish dedicated facilities and services for nighttime workers

Cont. table 1.

Dublin's Nighttime economy strategy	3 Pillars of the Dublin's Nighttime Economy strategy: 1.Mobility and transport 2. Cultural activity 3. Safety.	Appointment of Dublin city's Nighttime Economy advisor to enhance and enrich the city's vibrant, diverse and inclusive communities.	Economic and cultural importance of Dublin's NTE (ranked 4th in summer nightlife spending in 2024) Safety concerns: perception of safety declined Barriers to nighttime activities: high costs and inadequate transport Transportation challenges: need improved public transit between midnight and 6am.	To establish a Pioneering Nighttime economy steering group, to oversee the cultural events coordination and lastly to propose innovative solutions.	36 recommendations on licensing, transport, safety enhancements, cultural initiatives, community engagement and sustainability.
Manifesto for Nighttime Economy (UK)	An inclusive thriving urban setting, that attracts every sector of the population, caters for every interest, attractive to all income groups, accessible at all hours and safe.	Appointing a Nighttime Economy minister. Creating a NTE strategy board (consultative body)	A great night economy is unlikely to happen and will never be sustained by accident, it must planned. A thriving NTE is a result of partnerships, investments and planning.	Binge drinking, crime, inadequate public transportation options. Licensing which in the NTE is reactive tool, while in the day economy is a planning tool.	Long list of recommendation including appointing a minister for the NTE and create a NTE strategy board, involving local authorities in strategic planning, placemaking (identifying late night zones), licensing process, best practices and reduced VAT rate.

Cont. table 1.

Policing the Nighttime Economy (UK)	Explore the relationship between NTE dynamics and law enforcement, it offers insights into strategies for managing violence, disorder and public safety effectively.	Public-private partnerships Crime mapping Self-regulation schemes Multi-agency approaches.	Violence and disorder are strongly linked to alcohol driven NTE. Clustering of licensed premises intensifies crime hotspots. Well managed venues and collaborative partnerships reduce disorder and improve safety.	Binge drinking culture Regulatory gaps Limited resources for proactive policing Balancing urban regeneration goals with community safety needs.	1. Partnerships: enhanced collaboration between police and stakeholders 2. Regulatory strategies: more solid licensing and monitoring. 3. Proactive policing 4. Cultural change: address binge drinking with education and harm reduction campaigns 5. Urban planning.
NSW 24-hour Economy Strategy	To Establish globally recognized 24-hour precincts that support thriving businesses, flourishing communities and engaging cultural experiences across New South Wales.	Five Pillars including regulatory frameworks, precinct development, worker support, safety, mobility access and inclusion and lastly authentic storytelling.	Expanding beyond leisure-based economy; addressing noise complaints and worker safety.	Growth in nighttime economy employment; promotion of vibrant, inclusive 24-hour precincts.	1.Regulatory Framework: simplify regulations. 2.Precint Development: create vibrant precincts 3.Work force collaboration: support nighttime workers through research and strategy 4. Safety and mobility: improve transportation and accessibility 5. Cultural promotion: to highlight local storytelling.
A review and strategy report for Braddon's night-time economy	Enhance harmony and vibrancy in Braddon's nighttime economy through planning and zoning reforms.	Introduce a Nighttime activity overlay (NTAO) with zoning adjustments and community engagement.	Mixed-use zoning causes noise, safety and participant conflicts. Nighttime activities lack diversity.	Noise conflicts, safety concerns, lack of activity diversity and integration of strategic and statutory planning.	Adapt NTAOs to guide zoning for activity clustering, regulate alcohol sales, improve safety and diversity nighttime offerings.

Cont. table 1.

Nighttime Economy Task Force Implementation Summary (Montgomery County)	Improve nightlife offerings in Montgomery county's urban centers to meet community needs.	Extend venues hours, revise zoning laws, enhance transportation and activate public spaces.	High noise levels, safety concerns within residents, limited public amenities and a lack of diversity in nighttime activities.	Safety Resistance to noise ordinance changes Balancing diverse stakeholder needs.	Introduction of urban noise areas, improve transportation, support small businesses and enhance pedestrian and bike access.

6. Limitation and further studies

This research is detailed in examining secondary sources, but it does have some limitations. Because the results are dependent particularly on the examined documents' quality, scope and focus, the evidence may not cover whole nights economy policies of changing urban contexts because the analysis is document heavy. The absence of primary data collection often limits the extent to which insights can be verified or contextualized by the firsthand accounts or perspectives of direct stakeholders. Variations in methodologies, reporting standards and regional priorities within the documents reviewed create challenges in synthesizing and comparing findings between case studies. Future studies must move into those areas, particularly research related to how nighttime economy policies are formulated and efficiently integrated into actual practice. This could be achieved through interviews with decision-making authorities such as night mayors, policymakers and other stakeholders to understand the implementation process and expected outcomes.

7. Summary

The evolution of nighttime governance reflects a shift from reactive control measures to proactive strategies that integrate cultural, economic and social objectives. Historically focused on managing crime and disorder, contemporary NTE policies now emphasize the economic and cultural potential of nightlife, recognizing its value in urban development. The Night Mayors position, as well as the European Purple Flag accreditation, symbolizes the growing tendency toward custom-tailored governance and standardized frameworks focused on inclusivity, safety and cultural diversity.

As advised earlier, future research should focus on developing standardized metrics to evaluate the long-term impacts of NTE policies with an emphasis on balancing economic growth with social wellbeing. Also, future studies should explore the role of emerging technologies in nighttime governance such as smart city solutions for safety and noise management and how they can be integrated with community-based approaches for more sustainable and inclusive urban nightscapes. Further research should also examine the use of social media and digital tools by the nighttime officials (night mayors and equivalent positions) to understand their role in real-time monitoring of urban nightlife. These efforts will contribute to a more vibrant, safe, sustainable and inclusive nighttime economies benefiting communities and cities worldwide.

References

1. Abraham, H., Scantlebury, D.M., Zubidat, A.E. (2019). The loss of ecosystem-services emerging from artificial light at night. *Chronobiology International, 36*, 296-298.
2. Aghasafari, H., Aminizadeh, M., Karbasi, A., Calisti, R. (2021). CO2 Emissions, Export and Foreign Direct Investment: Empirical Evidence from Middle East and North Africa Region. *The Journal of International Trade & Economic Development, 30(7),* 1054-1076. https://doi.org/10.1080/09638199.2021.1892866
3. Asdrubali, F., D'Alessandro, F. (2018). Innovative Approaches for Noise Management in Smart Cities: a Review. *Curr. Pollution Rep., 4,* 143-153. https://doi.org/10.1007/s40726-018-0090-z
4. Bello, J.P., Silva, C., Nov, O., Dubois, R.L., Arora, A., Salamon, J., Mydlarz, C. (2019). SONYC: A system for monitoring, analyzing, and mitigating urban noise pollution. *Communications of the ACM, 62(2),* 68-77.
5. Brands, J., Schwanen, T. (2014). Experiencing and governing safety in the night-time economy: Nurturing the state of being carefree. *Emotion, Space and Society, 11*, 67-78.
6. Chatterton, P., Hollands, R. (2002). Theorising urban playscapes: Producing, regulating and consuming youthful nightlife city spaces. *Urban Studies, 39(1),* 95-116. https://doi.org/10.1080/00420980220099096
7. Chatterton, P., Hollands, R. (2003). *Urban nightscapes: Youth cultures, pleasure spaces and corporate power.* Psychology Press. https://doi.org/10.4324/9780203402054
8. De Góis, M.P.F. (2014). A gestão da noite urbana carioca: entre discursos sobre ordem urbana e práticas socioeconômicas. *Sociedade & Natureza, 26(2),* 221-235. https://doi.org/10.1590/1982-451320140202
9. Dublin City. (2021). *Night-time Economy strategy*, https://www.dublincity.ie/sites/default/files/2024-10/nte-strategy-web.pdf
10. Friman, M., Gärling, T., Ettema, D. (2020). Improvement of public transport services for non-cycling travelers. *Travel Behaviour and Society, 19*, 103-109.

11. Gössling, S. (2013). Urban transport transitions: Copenhagen, City of Cyclists. *Journal of Transport Geography, 33,* 196-206.
12. Gwiazdzinski, L. (2018). The many facets of the urban night time. *Cities and Lighting, 7.* https://www.luciassociation.org/magazine/Cities-Lighting-007/
13. H.Mahmoud, M., Zmyślony, P. (2024). Evaluating Nighttime Governance Structures: Implications for Urban Policy in Night Mayor and Consultative Body Models. *Studia Periegetica, 45(1),* 71-89. https://doi.org/10.58683/sp.1986
14. Hadfield, P. (2015). The night-time city. Four modes of exclusion: Reflections on the Urban Studies special collection. *Urban Studies, 52(3),* 606-616. https://doi.org/10.1177/0042098014552934
15. Hadfield, P., Lister, S., Traynor, P. (2009). 'This town's a different town today': Policing and regulating the night-time economy. *Criminology & Criminal Justice, 9(4),* 465-485. https://doi.org/10.1177/1748895809343409
16. Kyba, C.C., Pritchard, S.B., Ekirch, A.R., Eldridge, A., Jechow, A., Preiser, C., Straw, W. (2020). Night matters—why the interdisciplinary field of "night studies" is needed. *Multidisciplinary Scientific Journal, 3(1),* 1-6.
17. Lovatt, A., O'Connor, J. (1995). Cities and the night-time economy. *Planning Practice & Research, 10(2),* 127-134.
18. Nofre, J., Giordano, E., Eldridge, A., Martins, J.C., Sequera, J. (2018). Tourism, nightlife and planning: challenges and opportunities for community liveability in La Barceloneta. *Tourism Geographies, 20(3),* 377-396.
19. Ottoz, E., Rizzi, L., Nastasi, F. (2018). Recreational noise: Impact and costs for annoyed residents in Milan and Turin. *Applied Acoustics, 133,* 173-181.
20. Painter, K. (1996). The influence of street lighting improvements on crime, fear and pedestrian street use, after dark. *Landscape and Urban Planning, 35(2-3),* 193-201.
21. Plyushteva, A. (2018). Commuting and the urban night: nocturnal mobilities in tourism and hospitality work. *Journal of Policy Research in Tourism, Leisure and Events, 11(3),* 407-421. https://doi.org/10.1080/19407963.2018.1556673
22. Roberts, M., Eldridge, A. (2009). *Planning the night-time city*. Routledge.
23. Roberts, M., Gornostaeva, G. (2007). The night-time economy and sustainable town centres: Dilemmas for local government. *International Journal of Sustainable Development and Planning, 2(2),* 134-152. https://doi.org/10.2495/SDP-V2-N2-134-152
24. Schwanen, T., Van Aalst, I., Brands, J., Timan, T. (2012). Rhythms of the night: Spatiotemporal inequalities in the nighttime economy. *Environment and Planning a Economy and Space, 44(9)*, 2064-2085. https://doi.org/10.1068/a44494
25. Seijas, A., Gelders, M.M. (2021). Governing the night-time city: The rise of night mayors as a new form of urban governance after dark. *Urban Studies, 58(2),* 316-334.
26. Shaw, R. (2010). Neoliberal Subjectivities and the Development of the Night-Time Economy in British Cities. *Geography Compass, 4(7),* 893-903.

27. Shaw, R. (2014). Alive after five: Constructing the neoliberal night in Newcastle upon Tyne. *Urban Studies, 51(4),* 775-792. https://doi.org/10.1177/0042098013499537
28. Talbot, D. (2004). Regulation and racial differentiation in the construction of night-time economies: A London case study. *Urban Studies, 41(4),* 887-901. https://doi.org/10.1080/0042098042000194160
29. Vogiatzaki, M., Zerefos, S., Hoque Tania, M. (2020). Enhancing City Sustainability through Smart Technologies: A Framework for Automatic Pre-Emptive Action to Promote Safety and Security Using Lighting and ICT-Based Surveillance. *Sustainability, 12(15),* 6142. https://doi.org/10.3390/su12156142
30. Welsh, B.C., Farrington, D.P. (2009). Public area CCTV and crime prevention: An updated systematic review and meta-analysis. *Justice Quarterly, 26(4),* 716-745.

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SUSTAINABILITY REPORTING AND THE EDUCATION OF ACCOUNTING PROFESSIONALS USING EXAMPLES FROM SELECTED UNIVERSITIES

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Purpose: The aim of the paper is to evaluate the curricula of selected universities educating accounting professionals in terms of preparing graduates for sustainability reporting.
Design/methodology/approach: The paper analyses literature sources on the essence of sustainability and its reporting. The content of accounting courses and their corresponding learning outcomes were analysed to determine the scope of student education for sustainability reporting. The study covered three selected universities educating future accounting professionals. For the empirical research, the method of analysing the curriculum content of the surveyed units and comparative analysis was used.
Findings: An evaluation of the curricula of the selected universities showed that they include learning outcomes and content on sustainability reporting. However, the range of skills related to this courses matter is typically limited. This fact raises the need to expand the course content to include issues related to increasing reporting requirements.
Research limitations/implications: The study is only exploratory and aims to determine the degree to which future accounting professionals are prepared for sustainability reporting. Since only to the fact that only three universities were analysed, it is difficult to generalise the results obtained; nevertheless, the findings highlight the need to review and possibly adapt the curricula at all universities educating future accountants to the changing requirements of the reporting obligations of business entities.
Originality/value: The research conducted is novel in that, in practice, no review of university curricula for their compliance with sustainability reporting needs has been performed to date. The article can serve as a basis for efforts to modify curricula in line with the needs of business practice.
Keywords: sustainability, non-financial reporting, study programmes, accountant competencies.
Category of the paper: Research paper, case study.

1. Introduction

Increasing public awareness of the impact of business on the environment and the unethical actions taken by business entities while violating human rights and creating disparities between different social groups has necessitated a change in the approach to management. Nowadays, enterprises must take into account not only economic, but also ecological and social objectives in their management decisions, i.e. conduct business in accordance with the concept of sustainable development (Szadziewska, Majchrzak, Remlein, Szychta, 2021). The issue of sustainable business development has been addressed since the end of the 20th century. Discussions in this area are considered both in academia and among practitioners. They concern both the definition of the concept of sustainability (Berger, Gordon, Bahr, 1978; Bebbington, Gray, 2002; Poskrobko, 2011; Szadziewska, 2013; Sneirson, 2014; Bergman et al., 2017), directions and modes of action for companies to efficiently produce socially desirable products while reducing the consumption of natural resources and taking care to meet the expectations of different stakeholder groups, and solutions to disclose the activities carried out by companies in this regard (Frog-Nieroda, 2023; Diaz-Sarachaga, 2021; García-Meca, Martínez-Ferrero, 2021; Santos, Silva Bastos, 2020; Heras-Saizarbitoria, Urbieta, Boiral, 2022; Martínez-Ferrero, Guidi, García-Meca, 2022). The literature emphasises that the results of companies' socially responsible activities should be reflected in properly prepared and published reports (Wallage, 2000; Bebbington, Higgins, Frame, 2009; Hahn, Kühnen, 2013; Kamieniecka, Nóżka, 2016; Wójcik-Jurkiewicz, 2020). This is due, inter alia, to an increase in the demand for reliable information of a non-financial nature, i.e. information presenting the current and future economic, social and environmental potential of an economic unit (Krasodomska, 2014; Dziawgo, 2016; Fijałkowska, Krasodomska, Macuda, Mućko, 2019; Krasodomska, Zarzycka, Dobija, 2022). In doing so, attention is drawn to the fact that the disclosure of environmental information is facilitated by regulatory compulsion.

The concept of non-financial information, its scope and the way it is presented have evolved over successive periods (Krasodomska, 2014; Standard for Non-Financial Information (SIN), 2017; Bek-Gaik, Krasodomska, 2018, Directive 2014/95/EU). At the same time, there is an ongoing discussion, both in Poland and globally, on the construction of an information system through which information on environmental, economic and social aspects of companies' activities should be measured and presented, the standard of sustainability reporting and the role of accounting and accountants in the implementation of the concept of sustainability (IFAC, 2021; Carnegie, 2023). In Poland and the European Union, these discussions are aimed at unifying both the information and the form of its presentation (Directive 2022/2464/EU, draft law amending the Accounting Act, the Act on Statutory

Auditors, Audit Firms and Public Supervision and some other laws (UC14), Baran, 2022; Szadziewska, Szychta, Waniak-Michalak, 2023).

Irrespective of the manner in which non-financial information is presented and its material scope, the obligation for business entities to disclose non-financial information makes it necessary to adequately prepare staff for the collection, proper processing of non-financial data into information and their subsequent compilation in reports. Much of the work in this area is carried out by employees in the finance and accounting departments. It is therefore imperative that they are competent enough to produce reports in accordance with applicable standards and regulations, as well as appropriately to the needs of stakeholders (Nadolna, 2019; ACCA, 2021; Carnegie, Parker, Tsahuridu, 2022; IAFC, 2024). It is therefore reasonable to adapt the curricula of universities training future accountants to the needs of non-financial reporting.

The aim of this article is to evaluate the educational programmes of selected universities training accounting professionals in terms of preparing graduates for sustainability reporting. The presented objective was the starting point for the formulation of the following research hypotheses:

Hypothesis 1: Universities training accounting specialists include learning outcomes and content on sustainability reporting in their curricula.

Hypothesis 2: Sustainability reporting issues constitute course content included in the subject groups of reporting, costing and management accounting.

Hypothesis 3: The specific nature of the university influences the inclusion of sustainability reporting issues in the curricula.

The formulation of the aim of the study and the setting of the research hypotheses were preceded by a literature study on the essence of sustainable development and the reporting of information on the environmental and social impact of economic agents. In conducting the literature review, the methods of comparative analysis and analysis and criticism were used. The subject of the empirical research is the content contained in the syllabuses of accounting subjects and the corresponding educational results at purposefully selected universities educating students of economic faculties with specialisations related to accounting. An analysis of the syllabus content of the surveyed units and a comparative analysis were used for the study.

2. Research methodology

The basis of the empirical study was an analysis of the content of the courses in the area of accounting and the corresponding learning outcomes in order to determine the degree and extent to which economics students are prepared to prepare sustainability reports.

The first stage of the research procedure was to select universities educating students in economics whose curricula would be assessed. For this purpose, a report prepared by the educational monthly magazine 'Perspektywy', which for several years has been publishing reports and rankings of higher education institutions, including economic universities, was used.

On the basis of the information contained in the 'Ranking Szkół Wyższych Perspektywy' for the years 2019-2023, a purposive selection of the research sample was made. Due to the pilot nature of the research, three universities occupying significant positions in the ranking in question (www.ranking.perspektywy.pl) and at the same time the best places in their provinces in education in the discipline of 'economics and finance' were included. These were: Poznań University of Economics (PUE), Wroclaw University of Economics and Business (WUEB) and the West Pomeranian University of Technology in Szczecin (WPUT). PUE topped the ranking of economics universities in 2019, and was on the last step of the podium in subsequent years. WUEB, on the other hand, ranked just outside the top three in 2019-2022, and came fifth in 2023. In the period under review, more distant positions in the 'Perspektywy ranking' in relation to the universities of Poznań and Wrocław were occupied by WPUT, but this entity took first place in its region in the group of universities teaching economics, and moreover the inclusion of this university in the research group is justified by the specifics of the entity under review. The Faculty of Economics WPUT, where accounting specialists are educated, originates from the structures of the university of agriculture and agricultural economics education, which indicates that it has a long tradition of education oriented towards social responsibility for the environment.

In the next stage of the research procedure, research material was collected. The choice of sources was determined by the stated objective, so for each of the studied universities, the curriculum content included in the curricula of first- and second-degree studies at faculties educating future accounting specialists was analysed. The study covered curricula for the educational cycle starting in the academic year 2023/2024, i.e. educational programmes:

1. PUE for the faculty of 'Accounting and business finance' first- and second-degree studies with specialization in 'Finance and accounting of enterprises'.
2. WUEB for the direction 'Finance and Accounting' first degree studies with specialization:
    - 'Accounting',
    - 'Company finance and accounting'.
3. WPUT – curricula for the faculty of 'Economics' first- and second-degree studies with specialisation 'Accounting and finance in economic units'.

On this basis, courses that were directly related to sustainable reporting or within which content related to this issue could be covered were identified.

The final stage of the research procedure involved an analysis of the collected material, i.e. the content contained in the syllabuses of the selected subjects and the corresponding learning outcomes. The aim of this analysis was to obtain answers to the research questions posed and to realise the stated aim of the study. At this stage, methods of content analysis of data sources and comparative analysis were applied.

3. Analysis of curriculum content and learning outcomes for accounting courses at the universities surveyed

The starting point for assessing the extent to which graduates of the universities under study are prepared for non-financial sustainability reporting was an analysis of the educational programmes of these universities. The authors' familiarity with the essence of sustainable development and non-financial reporting, as well as their direct involvement in teaching at accounting-related faculties, made it possible to select the areas within which sustainability reporting issues could be addressed. These were assumed to be blocks related to reporting, standards for their preparation and cost and management accounting.

Based on the analysis of the list of courses, it was found that at each of the surveyed universities, within the framework of the analysed majors and specialisations, both at first- and second-degree studies, classes with similar names are taught within the selected areas (Table 1).

Table 1.
List of areas and subjects within which sustainability reporting content can be implemented

Block	Course	Characteristics	PUE	WUEB	WPUT
Reporting	Financial reporting	degree/semester of study	I/4	I/5	
		number of hours/class form*	15L/30E	15L/15E	
		course type**	SS	SM	
	Financial reporting and accounting organisation	degree/semester of study			I/4
		number of hours/class form			15L/50E
		course type			SS
	Financial reporting and auditing	degree/semester of study			II/4
		number of hours/class form			30L/30E
		course type			SS
	Sustainability reporting and its attestation	degree/semester of study	II/3		
		number of hours/class form	30L		
		course type	GS		
Reporting standards	Standards (Polish and international) of accounting and auditing	degree/semester of study	I/5		
		number of hours/class form	30L		
		course type	SS		
	Financial reporting standards	degree/semester of study		II/1	
		number of hours/class form		15L/15E	
		course type		SM	
	International and national accounting regulations	degree/semester of study			II/3
		number of hours/class form			25L/45E
		course type			SS

Cont. table 1.

Cost accounting and management accountinga	Cost accounting	degree/semester of study	II/3		
		number of hours/class form	30L		
		course type	SS		
	Cost and performance accounting	degree/semester of study			I/5
		number of hours/class form			15L/35E
		course type			SS
	Fundamentals of cost accounting and management accounting	degree/semester of study	I/6		
		number of hours/class form	30L		
		course type	ES		
	Management accounting and cost accounting	degree/semester of study		I/4	
		number of hours/class form		30L/30E	
		course type		SM	
	Management accounting	degree/semester of study	II/1		II/2
		number of hours/class form	30L/30E		30E
		course type	GS		ES
	Elements of management accounting	degree/semester of study			I/5
		number of hours/class form			25E
		course type			ES
	Advanced management accounting and cost accounting	degree/semester of study		II/3	
		number of hours/class form		15L/15E	
		course type		SM	

* class form: L – lecture, E – exercises, including audit, laboratory and other exercises; ** course type: SS –specialised subject, GS – general subject, ES – elective subject, SM - subject matter.

Source: own study based on curricula of the surveyed universities. Retrieved from: https://usosweb.ue.poznan.pl/kontroler.php?_action=katalog2/programy/szukajProgramu&method=by_faculty&jed_org_kod=PUE; https://ue.e-sylabus.pl/SL/Reportsforms/default.aspx?options=cHJA1geRKSv3t7ny9bSQ0Q; https://prk.WPUT.edu.pl/pl/2023-2024, 20.02.2024.

Within the first of the subject blocks analysed, i.e. reporting, only one of the universities surveyed has a subject directly dedicated to sustainability reporting. These are classes called ‘Sustainability reporting and its attestation’. This subject is taught at PUE in the second-degree studies, majoring in ‘Accounting and Business Finance’, with 30 hours of lectures. It is an obligatory subject for students of the specialisation ‘Business Finance and Accounting’, so it should be assumed that all graduates of this specialisation will have adequate knowledge in the subject. In particular, they will acquire knowledge in the preparation of sustainability reports and their attestation taking into account legal regulations and applicable standards. In addition, graduates of the studied specialisation will be prepared to analyse the information contained in such reports. Detailed characteristics of the course content and learning outcomes in terms of knowledge and skills are presented in Table 2.

Table 2.
Characteristics of the curricular content of the course 'Sustainability Report and its Attestation' and the intended learning outcomes in terms of knowledge and skills

General characteristics of the activities	Learning outcomes	
	Knowledge	Skills
1. Introduction to sustainability reporting. 2. Sustainability reporting regulations and standards. 3. Principles of sustainability reporting. 4. Organisation of the reporting process - reporting team and communication. 5. Stakeholder dialogue - exploring the materiality of ESG areas. 6. Defining report content - ESG indicators. 7. Collecting ESG data - IT tools. 8. Sustainability report analysis - case study. 9. Introduction to sustainability report attestation. 10. Acceptance and follow-up with the client - ethical issues. 11. Planning and execution of the attestation assignment. 12. Application and preparation of the attestation report.	1. The student knows the regulations, standards and principles for the preparation of the sustainability report and its attestation. 2. The student knows the stages of the process of preparing and analysing the sustainability report. 3. The student knows the attestation process of the sustainability report.	1. The student is able to apply the relevant regulatory requirements and standards when preparing a sustainability report. 2. The student is able to prepare a sustainability report. 3. The student is able to analyse ESG indicators in a sustainability report. 4. The student is able to formulate a conclusion and prepare an assurance report.

Source: own study based on the educational programme of the PUE second-degree studies. Retrieved from: https://usosweb.ue.poznan.pl/kontroler.php?_action=katalog2/programy/szukajProgramu&method=by_faculty&jed_org_kod=PUE, 20.02.2024.

In the case of the other universities, financial reporting, possibly combined with auditing of financial statements or accounting organisation, is taught at all analysed faculties. A detailed analysis of the programmes and learning outcomes indicates that graduates of these faculties can acquire selective knowledge and skills in balanced reporting within the content on the preparation of financial statements (Table 3), including in particular the notes and the management report. This approach is due to the fact that in business practice, this type of information is disclosed, among other things, in such reports.

Table 3.
Sustainability content implemented in reporting subjects

University	Course	General characteristics of the activities
PUE	Financial reporting	Other elements of the financial statements, including additional information and explanations
WUEB	Financial reporting	-
WPUT	Financial reporting and accounting organisation	1. Notes to the financial statements 2. Management report on operations
	Financial reporting and auditing	Non-financial reporting

Source: own study based on the educational programmes of the surveyed universities. Retrieved from: https://usosweb.ue.poznan.pl/kontroler.php?_action=katalog2/programy/szukajProgramu&method=by_faculty&jed_org_kod=PUE; https://ue.e-sylabus.pl/SL/Reportsforms/default.aspx?options=cHJA1geRKSv3t7ny9bSQ0Q; https://prk.WPUT.edu.pl/pl/2023-2024/, 20.02.2024.

As can be seen from Table 3, the subject content of financial reporting classes at each of the analysed universities, with the exception of WUEB, may include sustainability reporting issues. For example, at WPUT, issues of non-financial reporting are realised as part of the subject

‘Financial Reporting and Auditing’ in second-degree studies. The course syllabus provides for approx. 10 hours of classes, including six hours of lecture and approximately four hours of audit exercises. However, no direct reference to knowledge and skills in the subject area can be found in the learning outcomes for the subject. It is only specified that the student:

1) knows and understands issues related to the preparation and audit of financial statements in accordance with accepted standards and
2) is able to apply knowledge of accounting to describe, analyse and formulate audit opinions and reports and to select data and methods for their analysis.

Another of the blocks of classes selected for study in which there is an opportunity for teaching content on equivalent reporting is reporting standards. This is a thematic block that complements the block of classes on reporting, as the correct preparation of financial statements requires knowledge of the standards for their preparation.

As the conducted analysis of the curricular content realised within the subjects related to reporting standards has shown, the possibility of including sustainability information in financial reporting, i.e. notes and the management report and other business reports, can be learnt by graduates of WUEB's second degree programme within the directional subject ‘Financial reporting standards’. It should be emphasised that content of this kind was not included in the course ‘Financial Reporting’ taught in the first degree programme.

In the case of the other universities surveyed, content on sustainability reporting could be covered within the topics on accounting standardisation and harmonisation, the role of EU directives on accounting and accounting developments.

Another block of courses in which students could acquire skills in collecting and processing data for non-financial reporting is ‘Cost accounting and management accounting’.

However, an analysis of the subject content of costing and management accounting included in the curricula of the surveyed universities revealed that there is no place within the courses taught for the transfer of knowledge and the formation of students' skills in the collection and processing of cost and performance data and their use for sustainable reporting. Students at all surveyed universities acquire basic knowledge of the scope and essence of cost accounting and management accounting as part of their coursework. In particular, they learn about:

- the essence and criteria of cost classification and the principles of their measurement,
- principles of recording and settling costs within the framework of traditional cost accounting,
- the essence of calculation and its methods,
- different varieties of cost accounting,
- use of management accounting tools for decision making,
- short-term decision-making accounts,
- principles and methods of long-term decision-making taking into account risk and uncertainty.

Knowledge of the nature and scope of cost accounting and management accounting allowed the authors of this study to seek space for the collection of ex ante and ex post data on social responsibility not only of a value nature, but also of a quantitative and qualitative nature (Bennett, James 1998) within the management accounting system and management varieties of cost accounting. For example, information on the environmental aspect of sustainability collected within a management accounting system may relate to (Szadziewska, 2013):

- compliance with applicable legislation and the environmental policy adopted for implementation,
- eco-efficiency, which implies the simultaneous reduction of costs and negative environmental impacts by increasing the efficiency of energy, water and material use in internal operations and final products,
- strategic positioning of the company, which depends on the implementation of effective and environmentally friendly programmes to ensure the organisation's long-term competitiveness.

The social, including employee aspects generated by management accounting can refer to information related to (Nita 2014):

- human resources policies,
- remuneration systems adopted in the business unit,
- assessment of employee motivation and satisfaction,
- assessment of human resources effectiveness.

The detailed analysis of the content of the studied faculties at individual universities indicates that at some of the studied universities, i.e. PUE and WUEB, in the subject content of other subjects than those shown in the discussed blocks, issues related to sustainability reporting are noted. At PUE, students additionally have the opportunity to acquire knowledge and skills on sustainability reporting as part of the elective course ‘Accounting in sustainable development’ taught at first degree and the specialisation course for second degree students ‘Advanced financial accounting’.

In the case of first-degree students, it is up to the students to decide whether they want to acquire specific competences in sustainability reporting. However, in view of the fact that the subject is taught in the sixth semester, students are well aware of the need for knowledge in this area and choose this subject. Within the framework of this subject, students have the opportunity to become comprehensively acquainted with the idea of sustainable accounting and its importance in business management. The detailed characteristics of the course content and the learning outcomes in terms of knowledge and skills are presented in Table 4.

Table 4.
Characteristics of the curricular content of the subject 'Accounting in sustainable development' and the intended learning outcomes in terms of knowledge and skills

General characteristics of the activities	Learning outcomes	
	Knowledge	Skills
1. The assumptions of the concept of accountability and the role of accounting in achieving corporate sustainability objectives. 2. Accounting as an information system on financial and non-financial ESG performance. 3. Functions of financial and management accounting to support efforts to achieve sustainability goals. 4. Accounting tools to support the achievement of sustainable development goals. 5. Assumptions of sustainability performance reporting.Wpływ regulacji prawnych i wytycznych na rozwój sprawozdawczości z dokonań na rzecz rozwoju zrównoważonego. 6. Development of sustainability performance reporting globally and in Poland. 7. Attestation of sustainability performance reporting. 8. The essence and functions of cost accounting in achieving sustainable development goals. 9. Systematic costing in environmental protection and social cost accounting. 10. Activity-based costing in environmental protection as a process tool for managing sustainable development outcomes. 11. Other models of cost accounting in the implementation of sustainable development strategies (product life cycle costing, target costing, quality costing).	1. The student knows the place and importance of accounting in an enterprise implementing sustainable development strategy. 2. The student knows the practical and theoretical principles of sustainability performance reporting and its attestation, as well as the possibilities of using the accounting system in this respect. 3. The student knows and understands the structure of cost accounts supporting the implementation of the sustainable development strategy.	1. The student is able to use basic accounting tools supporting the implementation of sustainable development goals, including selecting and applying cost accounting adequate to the possibilities of implementing the enterprise's sustainable development strategy. 2. The student is able to prepare a sustainability performance report according to selected standards; 3. The student is able to interpret the information disclosed in the sustainability performance report and the attestation report of such a report.

Source: own study based on the educational programme of the PUE second-degree studies. Retrieved from: https://usosweb.ue.poznan.pl/kontroler.php?_action=katalog2/programy/szukajProgramu&method=by_faculty&jed_org_kod=PUE, 20.02.2024.

In the second subject analysed, i.e. 'Advanced Financial Accounting' conducted as part of the second degree programme, students have the opportunity to learn about the nature and scope of social accounting and environmental accounting as a challenge of the 21st century.

At WUEB, the course 'Performance Management' is part of the specialisation subjects. An analysis of the topics covered in this subject indicates that the group of topics on specialised management accounting systems and cost accounting includes a topic on environmental accounting. Furthermore, in the field of performance measurement and control, students can develop knowledge and skills in management reporting, which includes environmental reporting.

4. Final conclusions

The research carried out, the results of which are presented in the article, confirms hypothesis 1, according to which universities training accounting specialists include learning outcomes and content on sustainability reporting in their curricula. For the most part, these relate to sustainability reporting and are reflected within the courses in the area of reporting and the standards for their preparation. However, there is relatively little information on non-financial reporting, which contributes to the fact that graduates of the universities surveyed are not sufficiently well prepared to perform the activities related to the preparation of reports on the company's impacts on the environment. An exception in the surveyed group of universities is the Poznań University of Economics, which has as many as two courses in its curriculum fully devoted to sustainability reporting and accounting in sustainable development. In the curricula of the other universities, there are only single courses implemented in various classes. The research carried out did not reveal the inclusion of sustainability content in cost accounting and management accounting classes. Therefore, hypothesis 2 was only partially confirmed.

In the assumptions for the research, the authors assumed that the traditions of a university originating in agricultural economics exert an influence on the approach to shaping the attitudes of its graduates towards sustainability. However, the research carried out did not confirm hypothesis 3. In the curriculum of the training of accounting specialists at the WPUT in Szczecin, there are references to these issues, but they are relatively few in comparison to the curriculum of the Poznań University of Economics.

It is difficult to generalise the obtained results to all universities due to the small research sample, nevertheless, the results of the research draw attention to the need for ongoing updating of educational programmes and their adaptation to the changing requirements of new reporting obligations and the needs and expectations of external stakeholders.

References

1. ACCA (2021). *Professional accountants at the heart of sustainable organisations*. Retrieved from: https://www.accaglobal.com/content/dam/ACCA_Global/professional-insights/pahso/PI-PATF-SUSTAINABLE-ORGANISATIONS-SUMMARY.pdf, 10.06.2024.
2. Baran, W. (2022). Rachunkowość w realizacji potrzeb informacyjnych i edukacyjnych w aspekcie zrównoważonego rozwoju. *Kwartalnik Nauk O Przedsiębiorstwie*, *No. 64(2)*, pp. 59-71.

3. Bebbington J., Higgins, C., Frame, B. (2009). Initiating sustainable development reporting: evidence from New Zealand, *Accounting, Auditing & Accountability Journal*, *Vol. 22, no. 4*, pp. 588-625.
4. Bebbington, J., Gray, R. (2002). *Accounting for the Environment.* London: SAGE Publications.
5. Bek-Gaik, B., Krasodomska, J. (2018). Informacje niefinansowe jako obszar współczesnej sprawozdawczości przedsiębiorstw – definicje, źródła i proponowane kierunki badań. *Zeszyty Naukowe Uniwersytetu Ekonomicznego w Krakowie*, *No. 2(974),* pp. 25-40.
6. Bennett, M., James, P. (1998). The Green Bottom Line. In: M. Bennett, P. James (Eds.), *The Green Bottom Line. Environmental Accouning for Management. Current Practice and Future Trends*. Sheffield: Greenleaf Publishing.
7. Berger, Ch.J., Gordon, L.A., Bahr, M.S. (1978). Toward a Behavioural Understanding of Corporate Social Responsibility: Implications for the Design of Managerial Accounting Systems. In: L.A. Gordon (Ed.), *Accounting and Corporate Social Responsibility.* The University of Kansas.
8. Bergman, M.M., Bergman, Z., Berger, L. (2017). An Empirical Exploration. *Typology, and Definition of Corporate Sustainability, Sustainability, Vol. 9(5),* Retrieved from: https://www.mdpi.co,/2071-1050/9/5/753, 21.03.2024.
9. Carnegie, G., Parker, L., Tsahuridu, E. (2022). *SOS accounting educators: developing accounting and accountants for a better world.* Knowledge Gateway, IFAC, 19 April. Retrieved from: https://www.ifac.org/knowledge-gateway/preparing-future-ready professionals/discussion/sos-accounting-educators-developing-accounting-and-accountantsbetter-world, 10.06.2024.
10. Diaz-Sarachaga, J.M. (2021). Shortcomings in reporting contributions towards the sustainable development goals. *Corporate Social Responsibility and Environmental Management*, *Vol. 28, Iss. 4*, pp. 1299-1312.
11. Dyrektywa Parlamentu Europejskiego i Rady (UE) 2014/95/UE z dnia 22 października 2014 r. zmieniająca dyrektywę 2013/34/UE w odniesieniu do ujawniania informacji niefinansowych i informacji dotyczących różnorodności przez niektóre duże jednostki oraz grupy, Dz. Urz. UE L 330/1 (2014).
12. Dyrektywa Parlamentu Europejskiego i Rady (UE) 2022/2464 z dnia 14 grudnia 2022 r. w sprawie zmiany rozporządzenia (UE) nr 537/2014, dyrektywy 2004/109/WE, dyrektywy 2006/43/WE oraz dyrektywy 2013/34/WE w odniesieniu do sprawozdawczości przedsiębiorstw w zakresie zrównoważonego rozwoju, Dz. Urz. UE L 322/15 (2022).
13. Dziawgo, D. (2016). Znaczenie raportowania pozafinansowego w opinii inwestorów indywidualnych. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, No. 436*, pp. 105-114.

14. Fijałkowska, J., Krasodomska, J., Macuda, M., Mućko, P. (2019). *Sprawozdawczość niefinansowa. Regulacja i standaryzacja raportowania niefinansowego przedsiębiorstw*. Szczecin: Wydawnictwo Naukowe Uniwersytetu Szczecińskiego.
15. García-Meca, E., Martínez-Ferrero, J. (2021). Is SDG reporting substantial or symbolic? An examination of controversial and environmentally sensitive industries. *Journal of Cleaner Production, Vol. 298(8),* pp. 126781-126781.
16. Hahn, R., Kühnen, M. (2013). Determinants of sustainability reporting: a review of results, trends, theory, and opportunities in an expanding field of research. *Journal of Cleaner Production*, *Vol. 59*, pp. 5-21.
17. Heras-Saizarbitoria, I., Urbieta, L., Boiral, O. (2022). Organizations' engagement with sustainable development goals: From cherry-picking to SDG-washing? *Corporate Social Responsibility and Environmental Management*, *Vol. 29*, pp. 316-328.
18. https://prk.WPUT.edu.pl/pl/2023-2024/, 20.02.2024.
19. https://ue.e-sylabus.pl/SL/Reportsforms/default.aspx?options=cHJA1geRKSv3t7ny 9bSQ0Q, 20.02.2024.
20. https://usosweb.ue.poznan.pl/kontroler.php?_action=katalog2/programy/szukajProgramu &method=by_faculty&jed_org_kod=PUE, 20.02.2024.
21. IAFC (2024). *Educating accountants for a sustainable future educating accountants for a sustainable future. A Literature Review of Competencies, Educational Strategies, and Challenges for Sustainability Reporting and Assurance*. Retrieved from: https://www.ifac.org/knowledge-gateway/education/publications/educating-accountants-sustainable-future, 10.06.2024.
22. IFAC (2021). *The Role of Accountants in Mainstreaming Sustainability in Business, Insights from IFAC's professional accountants in business advisory group*. Retrieved from: https://www.ifac.org/knowledge-gateway/discussion/role-accountants-mainstreaming-sustainability-business. 10.06.2024.
23. Kamieniecka, M., Nóżka, A. (2016). Źródła i zakres raportów środowiskowych oraz ocena możliwości ich integracji ze sprawozdaniem finansowym. *Studia Ekonomiczne. Zeszyty Naukowe Uniwersytetu Ekonomicznego w Katowicach*, *No. 284*, pp. 53-65.
24. Krasodomska, J. (2014). *Informacje niefinansowe w sprawozdawczości spółek.* Kraków: Uniwersytet Ekonomiczny w Krakowie.
25. Krasodomska, J., Zarzycka, E., Dobija, D. (2022). Czynniki determinujące raportowanie przez przedsiębiorstwa informacji o działaniach na rzecz realizacji Celów Zrównoważonego Rozwoju. *Zeszyty Teoretyczne Rachunkowości*, *No. 46(3),* pp. 99-118.
26. Martínez-Ferrero, J., Guidi, M., García-Meca, E. (2022). Sustainability restatements, firm risk and controversial industries: Analysing the signals based on revision type. *Corporate Social Responsibility and Environmental Management, Vol. 30*, pp. 473-485.
27. Nadolna, B. (2019). Finansowa i niefinansowa sprawozdawczość przedsiębiorstwa a program studiów z perspektywy nauczyciela akademickiego i studenta. In: Z. Głodek,

M. Trocka (Eds.), *Kierunki rozwoju współczesnej sprawozdawczości finansowej* (pp. 149-165). Gorzów Wielkopolski: Akademia im. Jakuba z Paradyża w Gorzowie Wielkopolskim.
28. Nita, B. (2014). *Sprawozdawczość zarządcza.* Warszawa: PWN.
29. Poskrobko, B. (2011). Kanony ekonomii zrównoważonego rozwoju. In: B. Poskrobko (Ed.), *Ekonomia zrównoważonego rozwoju w świetle kanonów nauki*. Białystok: Wyższa Szkoła Ekonomiczna w Białymstoku.
30. Santos, M.J., Silva Bastos, C. (2020). The adoption of sustainable development goals by large Portuguese companies, *Social Resposibility Journal*, *Vol. 17(8),* pp. 1079-1099.
31. Sneirson, J.F. (2014). *The Sustainable Corporation and Shareholder Profits*. Retrieved from: https://www.wakeforestlawreview.com/wp-content/uploads/2014/10/Sneirson_LawReview_October2011.pdf, 21.03.2024.
32. *Standard Informacji Niefinansowych (SIN)* (2017). FSR. Retrieved from: https://mf-arch2.mf.gov.pl/c/document_library/get_file?uuid=112be273-9ca8-427d-af14-48bbd64c3166&groupId= 764034, 10.06.2024.
33. Szadziewska, A. (2013). *Sprawozdawcze i zarządcze aspekty rachunkowości środowiskowej*. Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
34. Szadziewska, A., Majchrzak, I., Remlein, M., Szychta, A. (2021). *Rachunkowość zarządcza a zrównoważony rozwój przedsiębiorstwa*. Katowice: IUS Publicum.
35. Szadziewska, A., Szychta, A., Waniak-Michalak, H. (2023). Pomiar realizacji Celów Zrównoważonego Rozwoju przez spółki notowane na Giełdzie Papierów Wartościowych w Warszawie w świetle wytycznych UNCTAD−ISAR. *Zeszyty Teoretyczne Rachunkowości*, *No. 47(3),* pp. 157-185.
36. Wójcik-Jurkiewicz, M. (2020). Raportowanie niefinansowe banków z perspektywy społecznie odpowiedzialnej – przykłady z WIG-ESG. *Zeszyty Teoretyczne Rachunkowości, No. 108(164)*, pp. 207-228.
37. www.ranking.perspektywy.pl, 20.02.2024.
38. Żaba-Nieroda, R. (2023). Odpowiedzialne inwestowanie i zrównoważony rozwój w przedsiębiorstwach sektora energii. In. M. Proniewski, D. Kiełczewski (Eds.), *Mechanizmy zrównoważonego rozwoju* (pp. 67-86). Białystok: Wydawnictwo Uniwersytetu w Białymstoku.

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IMMERSIVE REALITIES IN SUPPLY CHAIN MANAGEMENT: A TECHNOLOGICAL PERSPECTIVE

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Purpose: The research aims to explore the integration of immersive reality technologies into supply chain management. The study focuses on how these technologies can revolutionize decision-making processes and enhance resource optimization, leading to a more sustainable and efficient operational framework.

Design/methodology/approach: The objectives of the research are achieved through a systematic literature mapping methodology. This method involves conducting a comprehensive review of existing resources in the field of immersive realities in supply chain management.

Findings: The analysis of patent applications revealed thematic groups within the patent content and highlighted changes in the number of patents filed and granted over time. This analysis suggested that technologies implementing immersive reality are at a mature stage of the innovation process, indicating a potential intensification of activities related to the diffusion of these solutions in practice.

Research limitations/implications: The paper highlights the need for research into the long-term health effects of these technologies to ensure user safety and comfort, improve accessibility for people with disabilities, and support inclusivity. The paper also identifies limitations in the current research process, such as the lack of coordination in research efforts and technical knowledge gaps, which pose significant barriers to the successful implementation of these technologies.

Practical implications: The integration of these technologies with artificial intelligence (AI) and other advanced technologies can further enhance operational management and training, focusing on areas such as product design, quality control, and remote collaboration.

Social implications: These technologies can enhance the efficiency of supply chains, leading to reduced resource consumption and waste, which aligns with broader societal goals of sustainability and environmental conservation.

Originality/value: The paper provides a comprehensive analysis of patent applications to understand the development and application of these technologies in the field. This approach offers new insights into the thematic groups of patent content and tracks changes in the number of patents filed and granted over time, highlighting trends and the maturity of these technologies in the innovation process. The paper is primarily addressed to researchers and practitioners in the fields of supply chain management and immersive technologies. It is also valuable for policymakers and industry leaders interested in the adoption of innovative technologies to enhance sustainability and efficiency in supply chains.

Keywords: immersive realities, virtual reality (VR), augmented reality (AR), mixed reality (MR), supply chain management.
Category of the paper: Research paper, Literature review.

1. Introduction

The integration of virtual, mixed and augmented reality technologies into supply chain management has the potential to transform operational practices within organisations. By leveraging these technologies, organisations can achieve greater visibility, improved operational efficiency and enhanced decision-making capabilities.

Immersive realities, including technologies such as virtual reality (VR), augmented reality (AR) and mixed reality (MR), are relevant to supply chain management because of their potential benefits in various aspects of the supply chain process (Wenzel et al., 2003). For example, these technologies can be used in the quality control phase of products to detect defects and improve the accuracy of inspections; in training and coaching operators to improve their skills in repairing or assembling components; they can facilitate remote collaboration, image and video sharing, enabling effective communication and decision-making among supply chain stakeholders; have the potential to improve product quality, operational efficiency, collaboration and decision-making in supply chain management (Chu, Pan, 2023).

Technologies that introduce immersive realities include the use of head-mounted displays and various other devices designed to provide users with deeply interactive and immersive encounter (Somrak, Guna, 2018; Tubis, Rohman, 2023). Immersive realities allow users to perceive and engage with digital content in a way that simulates integration with their physical surroundings, blurring the distinction between the tangible world and the digitally produced realm. These technologies are used in a variety of areas, including training, simulation, visualisation, collaboration and data analysis.

The term "immersive" is commonly used in many disciplines such as education, entertainment, healthcare, and marketing. Depending on the intention, it can be understood as "surrounding" or "engaging". The concept of immersion can be understood in both technological and psychological terms. Technologically, immersion is impacted by variables such as display resolution and frame rate that relate to the user's level of immersion. Psychologically, immersion represents a subjective state in which users experience a sense of detachment from the physical, real world (Wong, Lee, 2024).

Immersive realities are mainly associated with virtual reality (VR), a fully computer-generated reality that is not entirely non-physical, although sometimes inappropriately. Access to it involves interaction through sensory stimuli such as visual and sound elements (Liberatore, Wagner, 2021). It aims to create a sense of presence and immersion by simulating a realistic and interactive environment, but still requires physical devices such as headsets, visualisation devices and controllers. While the environment is computer-generated, the user's physical presence and interaction within it is real (Bal et al., 2023).

Immersive reality is particularly relevant today as technological advances have made it more accessible and affordable to a wider range of industries and applications. The COVID-19 pandemic has also accelerated the adoption of these technologies, providing tools for remote collaboration and training. Its importance lies in its ability to transform industries and provide innovative solutions to cross-industry challenges (Tiwari et al., 2023; Yadav et al., 2023).

The literature mapping methodology used in this paper involves conducting a systematic review of existing resources in a particular research area in order to gain a comprehensive insight into the structure of the field, relevant topics and research trends. It is a specific form of a systematic review of sources that examines the broader topic and classifies the basic research outputs in the field under study (Chen, 2017; Waltman et al., 2010). Mapping helps researchers understand the development of a field, identify research areas, reveal the evolution of research directions, and map changing paradigms. In this paper, the development of the direction of immersive reality used in supply chain management was studied by examining active patent applications (Donthu et al., 2021). Methods and tools typically used for the analysis of bibliographic sources can be applied to the analysis of patent applications, thanks to which new insights will be developed on subject groups of the patent application content and changes in the number of patents filed and granted.

The research results may be of interest to decision makers in companies and organisations involved in supply chain operations, logistics and inventory management. The results may provide insight into how immersive reality technologies, such as virtual reality, augmented reality and mixed reality, can be used to improve efficiency, accuracy and decision-making in supply chain processes. In addition, the results may be of value to researchers investigating innovative technological solutions applied to supply chain management. The results will facilitate an understanding of how immersive realities can be used to improve supply chain management processes from a technological perspective.

This study aims to reinterpret the existing research findings on the introduction and impact of technologies using virtual, mixed or augmented reality in supply chain management, identify knowledge gaps, determine limitations and propose potential directions for future research.

2. Research background

In spaces where reality and virtuality intersect, VR refers to activities that use visual and immersive tools to create a virtual environment, so that users can experience stimuli that are as real as possible (Milgram, Colquhoun, 1999). However, its ability to provide adequate realism is limited by hardware constraints. On the other hand, AR integrates virtual images with images from the real world. The placement of virtually generated models in the real world space can enrich the final effect and thus meet the user's perceptual expectations. The division between VR and AR is based on whether visual impressions from the real world are used, regardless of the establishment of immersion or display mechanisms. When a mix of reality and virtuality is used, such technology can always be referred to collectively as the Mixed Reality (MR). However, MR more often refers to a reality that not only mixes the sensation of real and virtual reality, but also provides opportunities to interact with and access information about elements of the perceived reality (Li et al., 2018).

Virtual reality (VR) can be perceived as a gateway to a computerised world that is different from the real world (Radhika et al., 2023). Devices (headsets, goggles or rooms with screens) are used to make it feel like a different place, allowing you to move around and interact with the generated world. Augmented reality (AR) is a technology that adds digital images or information to the world around us. Mixed reality (MR) resembles a blend of the real world and the digital world, where you can see and interact with both at the same time, as opposed to AR, which superimposes digital information on the real world, but without the ability to interact between the two. MR combines elements of Augmented Reality (AR) and Virtual Reality (VR) to create a new kind of environment where real and computer-generated objects can coexist. MR is a unique way to explore and understand how real and virtual things can work together (Radhika et al., 2023).

A broader view of immersive realities has been proposed by Schnabel et al. (2007), who, in addition to VR, AR and MR, have also proposed augmented reality, mediated reality, augmented virtuality and virtualised reality (Figure 1). Amplified reality is the enhancement of the perceived properties of a physical object through the use of embedded computing resources. Amplified Reality was originally introduced as a complementary concept to AR, where AR refers to how the user perceives reality, while Amplified Reality is based on how the perceiver can control the way in which information is made available. Mediated Reality refers to a more general framework for artificially modifying human perception through devices. Mediated Reality has proven useful in deliberately reducing the perception of reality, leading to a different concept of 'reality'. It creates special effects to help urban planners visualise the resulting landscape where a building is proposed, removed or replaced from the original landscape. In the person-to-person interaction, Augmented Virtuality (AV), or the augmentation of a virtual environment with real objects, enables a multi-layered, three-dimensional virtual environment to be combined with a real-world experience. Virtualised Reality virtualises scenes from the real world and then processes them from any point of view. To generate data for such a medium, the scene must be captured by multiple cameras positioned to cover the scene from all sides.

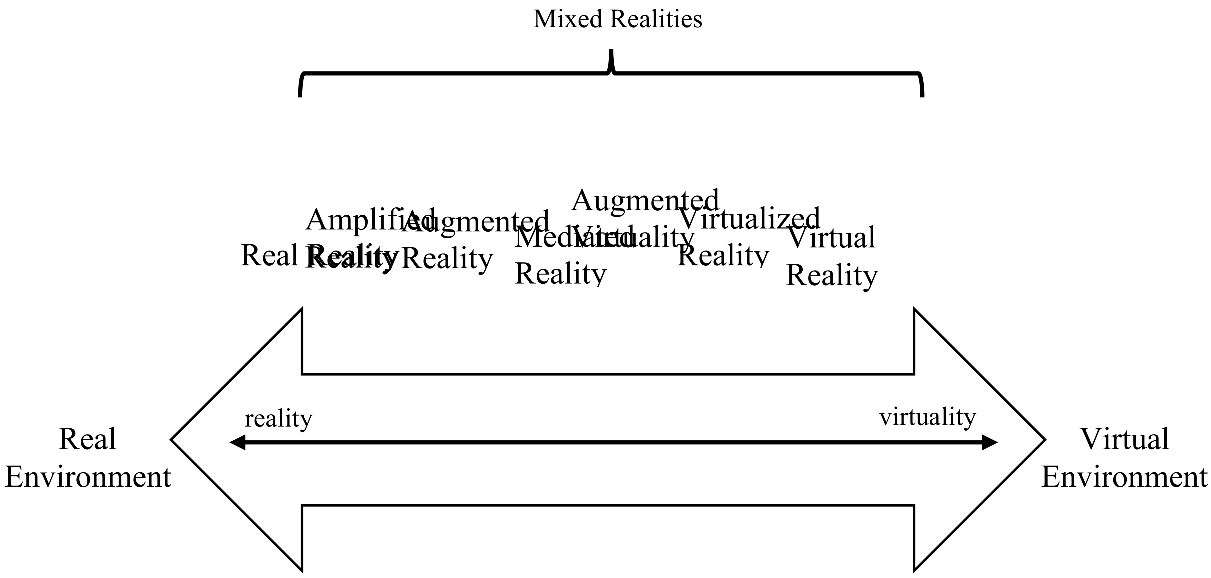

Figure 1. Order of reality concepts in the reality-virtuality continuum.

Source: modified from Milgram, Colquhoun, 1999; Schnabel et al., 2007.

A fuller understanding of concepts related to the interpenetration of reality and virtuality is aided by the analysis along two dimensions: action and perception, and the degree of interaction with real objects (Figure 2). Improving the performance of tasks performed with immersive realities requires physical interaction and feedback, which should take place in the same space. On the other hand, the development of thought and cognitive activity requires social interaction and exchange with the physical environment. The physical environment remains important because it is used to externalise thoughts and as an external memory. In this context, the degree of interaction with real artefacts refers to the extent to which users can make changes to real artefacts.

The degree of immersion is a matter of convention to some extent – whether the reality is augmented (AR) or virtual (VR) may depend on the intent and purpose of a particular application. As Sarkar et al. (2023) point out, VR can be semi-immersive, meaning that it combines elements of the real and digital worlds, allowing users to interact with the virtual environment while remaining aware of their real surroundings. This type of VR is less complex than full immersion systems and is often used for purposes such as pilot training using simulators. Users experience a virtual world through large screens or projection systems that display a simulated environment, and can interact using controls or motion platforms.

Another concept of taxonomies relating to reality spaces without reference to immersion-related “surrounding” or “engaging” is proposed by the concept of cross-realities, linking sensor networks and virtual worlds so as to enhance human interaction and perception beyond traditional boundaries (Paradiso, Landay, 2009; Yadav et al., 2023). Regardless of the accepted way of classifying the realities that make up the perceived spaces, it is suggested that as technology becomes more efficient and cheaper, we may soon see a world in which virtual and ‘real’ experiences are seamlessly connected and intermingle without a clear boundary.

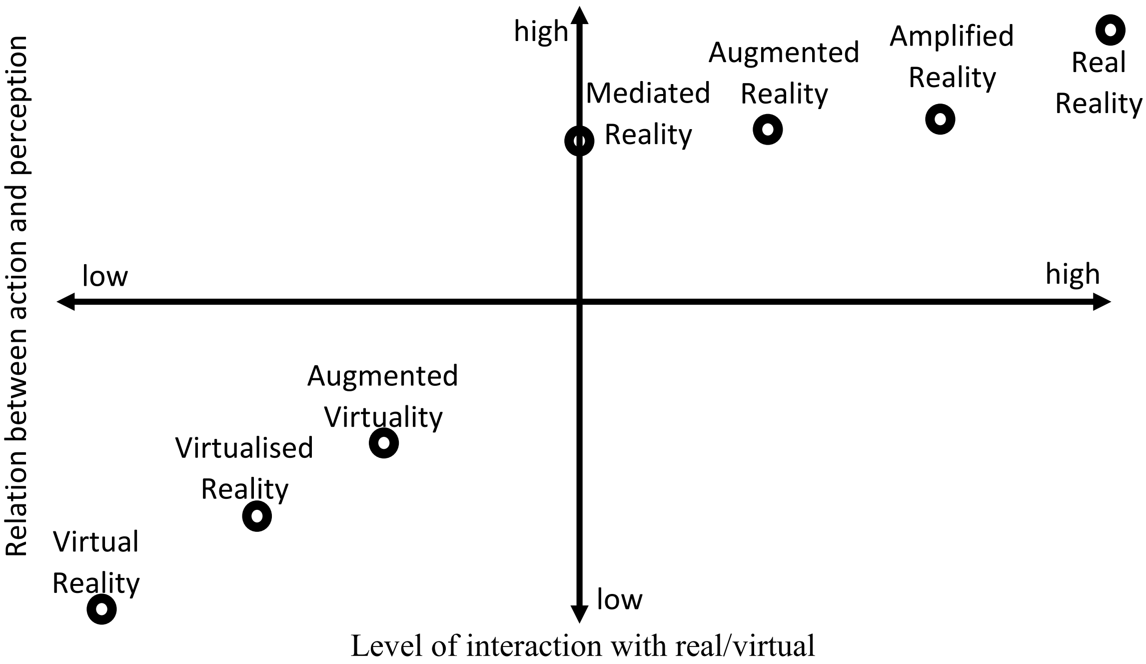

Figure 2. Immersive reality perception and influence.

Source: modified from Schnabel et al., 2007.

Virtual reality research began in the 1960s, and the results were first used commercially in the late 1980s (Cipresso et al., 2018). Augmented reality technologies are newer than VR, with the use of AR beginning in the early 1990s. Both VR and AR have developed into many applications, such as video games and learning. Four phases of VR research can be identified:

- **Pioneering** – began with the conceptualisation of VR in the 1960s and included the development of interfaces for various applications,
- **Technological development** – supported by technological advances coinciding with the "dot-com bubble" of the late 1990s, with significant investment in information technology.
- **Clinical** – began with the new millennium, focusing on applications in rehabilitation and neurosurgery, as well as improving therapeutic and laparoscopic skills,
- **Current** – growth in hardware innovation and software advances driven by independent developers and communities.

At present, VR and AR are not just about viewing realistic images, but also about interacting with the virtual world. Key application areas for VR include gaming, education and medical applications – rehabilitation and neurology. The leading countries in the field of VR research are: the United States, China, the United Kingdom and Germany (Cipresso et al., 2018). Liberatore & Wagner (2021) conducted a detailed analysis of healthcare, business and marketing research to show how immersive technologies are impacting areas such as cognitive therapy, addiction treatment and brand awareness. They showed that some technologies may be more appropriate for certain types of problems, suggesting the need for further research to match technologies to the expected outcomes.

Education is one of the obvious applications of immersive reality. VR has the potential to increase the effectiveness of higher education in areas such as (Radianti et al., 2020): engineering, computer science, architecture, surgery, nursing, learning of specific subjects – astronomy, geography, physics, security, and foreign languages. The use of learning theory is often overlooked in the development of VR applications for education, which is the key to guiding the development of tools with the realisation of learning outcomes in mind. This means that while apps may be engaging or look good, they may not be as helpful to learning as they could be if they were designed with educational principles in mind. In most cases, VR apps are evaluated based on their ease of use, rather than an actual and real assessment of their impact on improving learning outcomes. VR can make learning fun by turning lessons into games where students can earn points and badges, making them want to learn more. Tang et al. (2020) conducted research on the effectiveness of MR technology in the teaching of design-related subjects. They pointed to improved creativity and systematicity in design – MR led to better performance in the geometric analysis and model visualisation. MR allows students to interact with 3D models in real time, providing a more engaging and immersive learning experience that can stimulate creative thinking. Students who used MR technology showed significant improvements in their ability to analyse geometric shapes and creativity compared to those who had access to traditional teaching materials.

Immersive realities are also being used in very specialised areas of education. Hořejší (2015) explored the use of AR in teaching assembly tasks to workers, using a webcam and appropriate monitor configuration to overlay 3D model instructions on a real work area. Such a system can significantly reduce the time needed to learn assembly tasks. Satisfactory results for new workers have been observed after only 10 trials. The system uses simple equipment such as a webcam and monitor, making it a cost-effective solution for virtual training in assembly tasks. VR is also being used in military training (Liaropoulos, 2023). It is used to create realistic training situations in which soldiers can practice without real danger, helping them prepare for real combat situations. It allows soldiers to train in a variety of environments and scenarios to improve their skills and prepare for the different challenges they may face. VR training includes learning how to safely operate complex machinery or equipment before using it in real missions, reducing the risk of very costly mistakes during real operations.

Bhavadharini et al. (2023) explored virtual reality, augmented reality and mixed reality technologies used to understand consumer behaviour when choosing food products. They used these technologies to investigate the influence of the environment on beverage choice, demonstrating that context can influence consumer preferences. Understanding consumer behaviour is particularly important when developing new products – it helps to understand the emotions involved in the product choice. They found that immersive realities can effectively analyse consumer behaviour in food choice, which is crucial for product development and market success. Immersive technologies can provide realistic experiences, leading to more reliable data on consumer behaviour compared to traditional methods. The potential of immersive reality, particularly AR, in its ability to understand consumer behaviour, has contributed to the development of the 4C model (Rauschnabel et al., 2024). The 4C framework model includes: consumer, content, context and computing device. An effective analysis of AR usage should be based on analysing the relationship between these four elements.

Technologies such as mixed reality can improve public participation in urban land use planning by helping residents visualise plans more accurately (Büscher, Lorenz, 2023). They can make it easier for residents to understand urban planning by allowing them to view 3D models of planning spaces using mixed reality implementation devices. The limitations of this technology – its cost and limitations in the level of detail of the models obtained – have also been highlighted.

Fross et al. (2022) presented research on the use of Mixed Reality (MR) technology in research, education and architectural and building design, focusing on the presentation of BIM models and building inspections. MR can help clients and future users better understand and interact with projects, potentially reducing errors. This gives the technology the potential to replace traditional construction tools with digital, electronic and laser devices. They also showed that MR has not been widely used yet, mainly due to high costs and technological barriers. The use of VR technology can increase safety on construction sites by helping workers see and understand hazards before they occur (Li et al., 2018). Immersive realities can be used to improve safety in three areas: 1) improving safety design, 2) studying human behaviour after a disaster, and 3) emergency response training (Radhika et al., 2023). AR and VR technologies were shown as being promising for disaster management. It was suggested that future research should focus on comparing different AR and VR hardware configurations to determine their effectiveness in disaster management.

MR technology is being increasingly used in the medical field, particularly for the visualisation of 3D medical images to aid in surgical planning, diagnosis and medical training (Skalski et al., 2020). The technology allows for a more intuitive understanding of complex medical data, potentially leading to faster and more effective diagnoses. MR has been shown to improve the planning and execution of medical procedures, particularly in the minimally invasive surgery.

Interesting results have been obtained by combining technologies such as artificial intelligence (AI), artificial life (AL) and virtual reality (VR) (Chadha et al., 2023). Such a combination could create new ways of perceiving and performing tasks that could change many components of life, such as the way we travel, educate or receive healthcare. The integration of AI and VR has shown promise in improving healthcare, particularly for chronic diseases such as cancer and cardiovascular disease, allowing for more personalised treatment plans (Yadav et al., 2023). It is possible to personalise the treatment of chronic diseases and help during health crises such as the COVID-19 pandemic. However, the concerns of healthcare professionals and patients about artificial intelligence need to be addressed. Sharma & Chamoli (2023) explored solutions using VR and deep learning (DL) models in diagnosis and decision making, particularly in the context of brain tumour classification. They found that the integration of artificial intelligence with VR will increase, enabling immersive and interactive solutions for medical training and patient care. The enhanced 5G technology will improve the performance of AI and VR applications, enabling faster data transmission and reliable connectivity. The development of DL models (e.g. convolutional neural networks) will enable more accurate and efficient disease diagnosis, such as identifying brain tumours from CT images. The integration of immersive realities with other technological solutions can provide potential savings by increasing the level of healthcare services.

3. Methods and material

Literature mapping belongs to a group of methods known as systematic literature reviews (Cai, Lo, 2020). It is a specific form of systematic literature review that aims to review a broader topic, classify primary research in a particular area and identify subtopics, empirical methods used and areas of relevant empirical studies for more detailed systematic reviews.

Alternative methods to literature mapping include scoping reviews, rapid reviews and umbrella reviews. Scoping reviews provide a broad overview of a research topic, identifying key concepts, sources and gaps in the literature. Rapid reviews are designed to speed up the review process with streamlined methods, such as limiting the scope of the search or excluding certain research designs. Umbrella reviews synthesise the results of multiple systematic reviews to provide a comprehensive summary of the evidence on a particular topic (Cai, Lo, 2020). In addition to a classic literature review, extended bibliometric analysis methods are used, such as a unified science mapping approach that includes clustering and visualisation of source documents (Donthu et al., 2021).

The bibliometric analysis is a rigorous method for examining and analysing large amounts of scientific data (Donthu et al., 2021). It can be used to unravel and map complex, cumulative scientific knowledge, identify knowledge gaps, or generate new research ideas. The bibliometric analysis uses both objective (e.g., performance analysis) and subjective (e.g., thematic analysis) assessments and can be used to provide an overview of the field, identify trends, and examine patterns of collaboration. The main methods of the bibliometric analysis are performance analysis and science mapping (Figure 3).

Science mapping includes techniques such as the citation analysis, co-citation analysis, co-citation network analysis, co-occurring word analysis and co-authorship analysis. These techniques, combined with the network analysis, help show the bibliometric and intellectual structure of the research field. The performance analysis consists of analysing measures such as the number of publications, annual number of citations, citations per publication and h-index. These measures provide tools for analysing productivity and the impact of the dataset studied on the development of a specific scientific field.

The performance analysis is another category of the bibliometric analysis that focuses on examining the contribution of research components to a field. It includes the analysis of performance at different levels of the production of scientific output, such as authors, institutions, countries and journals. The performance analysis is descriptive in nature and is used to provide a background or profile of actors. It helps understand the impact of individual research actors, identify potential collaborators and assess their productivity and the quality of their outputs. The performance analysis provides a valuable insight into the current state of the research field, highlighting key players and their contributions. It can be used to identify emerging trends and knowledge gaps (Donthu et al., 2021). The above techniques, combined with the social network analysis, provide access to the intellectual structure, knowledge flows and subject cluster analysis capabilities. They help identify influential publications, key research areas, emerging trends and patterns of collaboration. Research mapping techniques are valuable for understanding the research landscape, informing strategic decisions and identifying research gaps and opportunities.

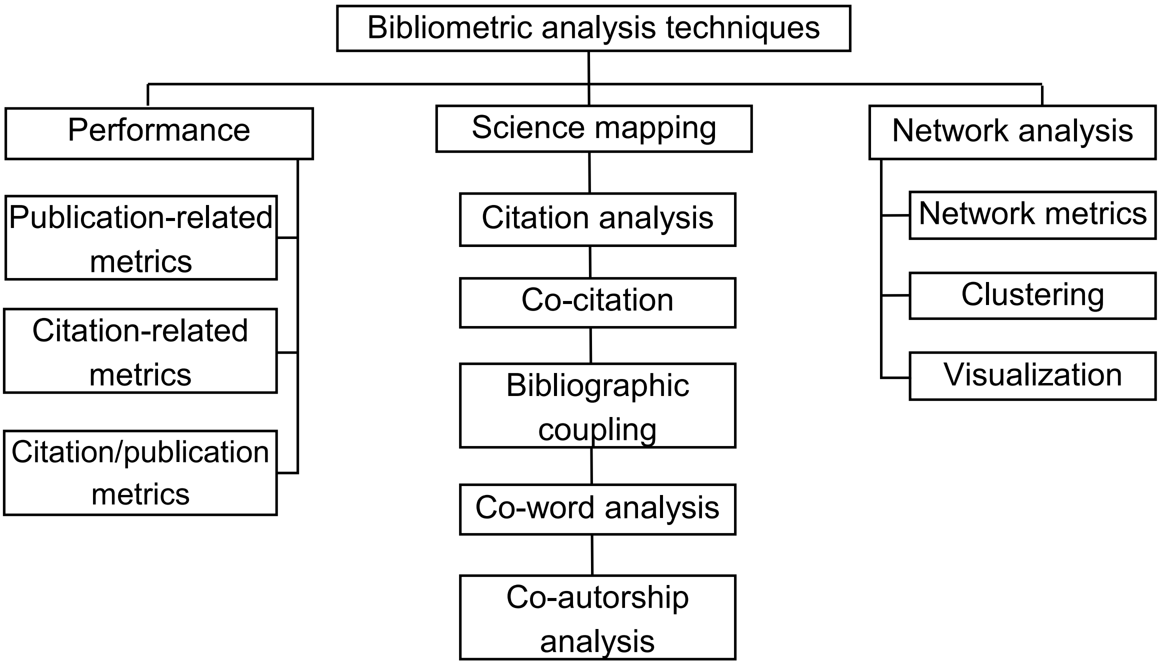

Figure 3. Basic techniques for bibliometric analysis.

Source: modified from Donthu et al., 2021.

The social network analysis is a category of the bibliometric analysis that focuses on the study of relationships and interactions between research entities such as authors, publications or keywords. It involves the analysis of a network structure and properties to gain insights into knowledge flows, collaboration patterns and topic clusters. It enables the mapping of collaborations over time, providing potential researchers with valuable information on how to approach and collaborate with established researchers. It can shed light on specific regions, encouraging collaboration and research development in underrepresented areas. The social network analysis provides a comprehensive picture of social interactions and relationships among researchers, contributing to a deeper understanding of the dynamics of the research field and facilitating strategic decision-making in research planning and resource allocation (Donthu et al., 2021).

The social network analysis as a tool for the bibliometric analysis includes tools and techniques such as network measures, group analysis and visualisation. The basic network measures used in the bibliometric analysis are: Degree of centrality – the number of connections of a research component, indicating its importance and influence in the network; Centrality – measures the ability of a node to connect to other groups of nodes, indicating its role in information flow and knowledge diffusion; Eigenvector centrality – determines the importance of a node based on its connections to other highly connected nodes, highlighting important objects in the network; Clustering coefficient – measures the degree to which nodes in the network tend to cluster together, indicating the presence of research communities or thematic clusters. Visualisation techniques such as network maps and graphs help identify influential researchers, research communities and emerging trends, enabling researchers to make decisions and identify potential researchers or research groups to collaborate with.

One approach to literature mapping is based on the creation of bibliometric networks. Bibliometric networks are networks consisting of nodes and links that represent relationships between different bibliometric entities (van Eck, Waltman, 2014). Nodes in bibliometric networks can represent entities such as publications, journals, researchers or keywords. Links in bibliometric networks indicate relationships between pairs of nodes. The most commonly studied types of relationships in bibliometric networks include citation networks, keyword co-occurrence networks and co-authorship networks. Citation networks refer to links between publications based on their citation patterns. Co-citation networks occur when two publications are cited in a third publication, indicating a relationship between them. Keyword co-occurrence networks represent the occurrence of two keywords in a document's title, abstract or keyword list. Co-authorship networks indicate links between the authors of a document: researchers, research institutions or countries of origin of the authors.

Citation networks are based on direct citations, co-citations and bibliographic links. Citation networks represent links between publications based on citations from other publications. Direct citation networks focus on direct citations between individual publications. On the other hand, co-citation networks analyse the co-citation patterns of publications, where two publications are considered to be co-cited if both are cited by a third publication (van Eck, Waltman, 2014).

Waltman et al. (2010) have proposed a unified approach to bibliometric network mapping and clustering that can be used in the bibliometric network analysis. This approach can be particularly useful when an analysis of a particular research area is required at different levels of detail. It provides a coherent and integrated framework for the bibliometric network analysis, leading to more comprehensive and accurate insights into the structure and dynamics of research networks. This approach can be used to analyse links, shared citations or bibliographic connections between nodes, allowing the identification of relationships and patterns in research networks. Such an approach can be particularly valuable in specific policy contexts, such as policies to support research and technological development.

The visualisation of bibliometric networks using software tools can provide insights into the relationships and forces of influence between publications, researchers and other actors in the field. Van Eck and Waltman (2010) analysed the functionalities of software tools, such as:

- **VOSViewer**: can be used to construct, analyse and visualise bibliometric networks, providing a distance-based and timeline-based visualisation tool.
- **CitnetExplorer**: provides functionality for viewing publication citation networks and offers timeline-based visualisations.
- **HistCite**: focuses on the analysis and visualisation of networks of direct citation relationships between publications – provides timeline-based visualisations of citation networks.

Commonly used sources of scientific literature are indexing platforms, such as Web of Science (WoS), Scopus, Google Scholar and PubMed (Chen, 2017). An analysis by Martín-Martín et al. (2021) showed that Google Scholar found 88% of citations, many of which were not found using other platforms. The second highest performing platform was Microsoft Academic. In most categories, Microsoft Academic found more citations than Scopus and WoS, but had coverage gaps in some areas, such as physics and some humanities categories. Researchers and users of bibliographic databases can make more informed decisions when selecting data sources for their specific information needs. Researchers should consider using multiple data sources to ensure a comprehensive coverage of citations in their field of research. Sources other than the bibliographic ones should also be considered.

Platforms that collect information on patent applications are an important source of knowledge about current directions and trends in research and development. There are several well-known databases and platforms that provide access to patent information: the United States Patent and Trademark Office (USPTO), providing access to a collection of patents and patent applications filed in the United States; the European Patent Office (EPO), providing a comprehensive database of European patents and patent applications; the World Intellectual Property Organisation (WIPO) Patentscope database – providing access to international patent applications filed under the Patent Cooperation Treaty (PCT); Google Patents – a free search engine that allows users to search and discover a wide range of patents from different countries; Espacenet – provided by the European Patent Office, offering a global patent database with millions of patent documents from around the world; Lens.com – indexes scientific articles and patent applications from around the world.

4. Immersive realities: mapping patent applications and discussion

4.1. Patent application profiles

The aim of the systematic review of patent applications was to understand the direction and dynamics of technological solutions for immersive realities. Active patent applications in the lens.com database were searched using a keyword query: (logistics OR (supply AND chain)) AND (reality AND (virtual OR (mixed OR augmented))). This resulted in 16,542 documents from 2004 to 2021, which were further analysed. The content of the collected documents was graphically visualised using the VOSviewer software. The co-occurrence network was structured and visualised on the basis of terms extracted from the metadata.

In the analysis, the threshold for the minimum number of keyword occurrences was set at 170. This allowed 85 keywords that met this threshold to be extracted from a total of 57,875 terms. The total strength of co-occurrence links with other keywords was then calculated. The keywords with the highest total link strength were selected. A two-dimensional map was created using the VOSviewer software (Figure 4).

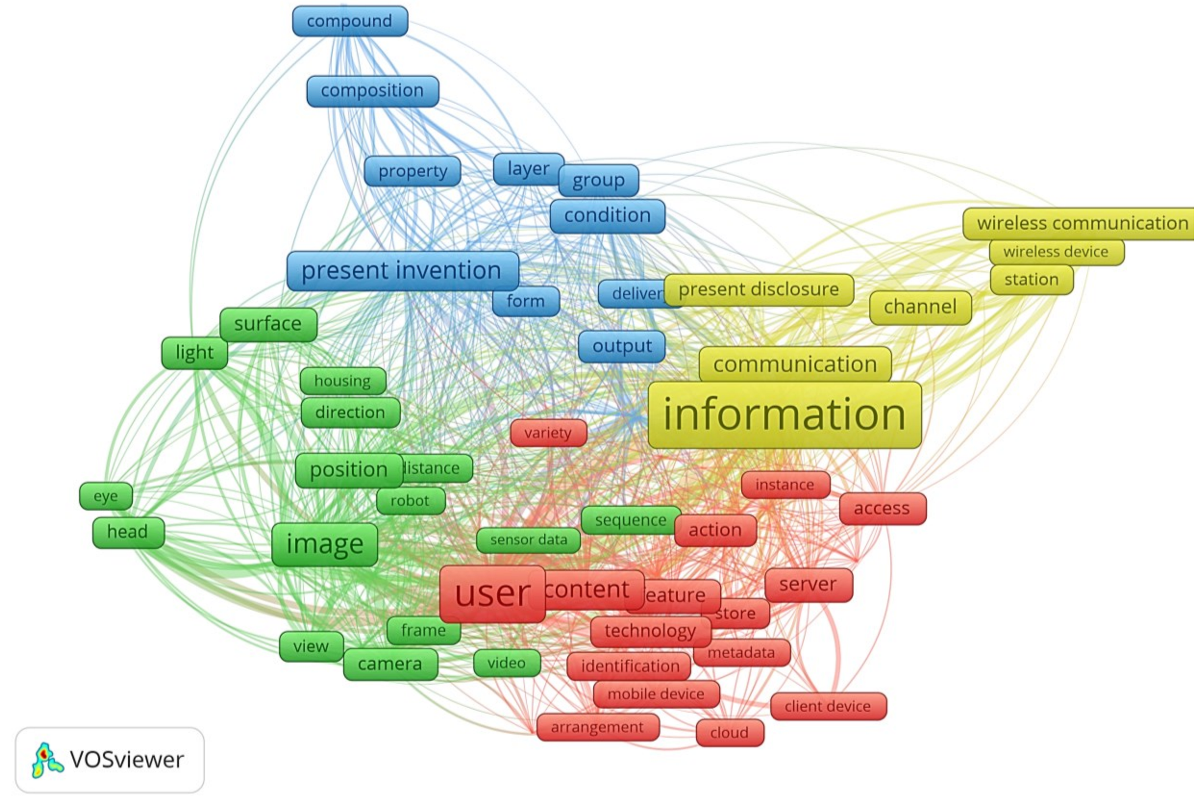

Figure 4. The network of relationships and word groups occurring in abstracts of immersive reality patent applications.

Data Source: metadata from lens.com

Terms with high relevance are grouped into clusters with nodes of different colours and sizes. The relationships between each node are shown as curved lines. The analysis of the terms in each of the four clusters obtained allowed the identification of thematic areas (Table 1). In some clusters, more than one thematic area was mentioned. Central words such as ‘information’, ‘communication’ and ‘image' are clearly visible, indicating that they are key concepts in the context of abstracts of the patent applications examined. Different thematic groups are indicated by four colours: the green group contains words suggesting a link to visual aspects; the red group contains concepts related to user interaction – access and storage of data; the blue group indicates a link to the innovation process; the yellow group relates to communication methods.

Table 1.
Groups of words based on the analysis of words appearing in abstracts of immersive reality patent applications

Group number	Colour	Number of words	Range of subjects
1	red	28	Access and storage
2	green	23	Visualisation
3	blue	19	Innovation process
4	yellow	15	Communication

Data source: metadata from lens.com

The highest number of patent applications during the period was achieved in 2020 (Figure 5a) and this was also the year in which the most patents were granted (1010). The decreasing dynamics of patent applications and granted patents (Figure 5b) may indicate that technologies implementing immersive reality are at a mature stage of the innovation process, so that an intensification of activities related to the diffusion of these solutions in practice can be expected.

The most cited patent (2393 citations) was the patent (Bradski et al., 2016) relating to configurations for presenting virtual and augmented reality experiences to users using image capture devices. The patent was filed in 2015 and allowed in 2019. The patent belongs to the company that filed it – Magic Leap. The analysis of the number of patents applied for and held (Figure 6) shows that LG Electronics (657 applications and 593 patents held) and Qualcomm (539 and 540, respectively) hold the most patents in the studied area. The issue of patent ownership and continued use of patents is related to the possible problems of taking over patents mainly to profit from legal claims rather than using them in business (patent trolling) (Marjak, 2016).

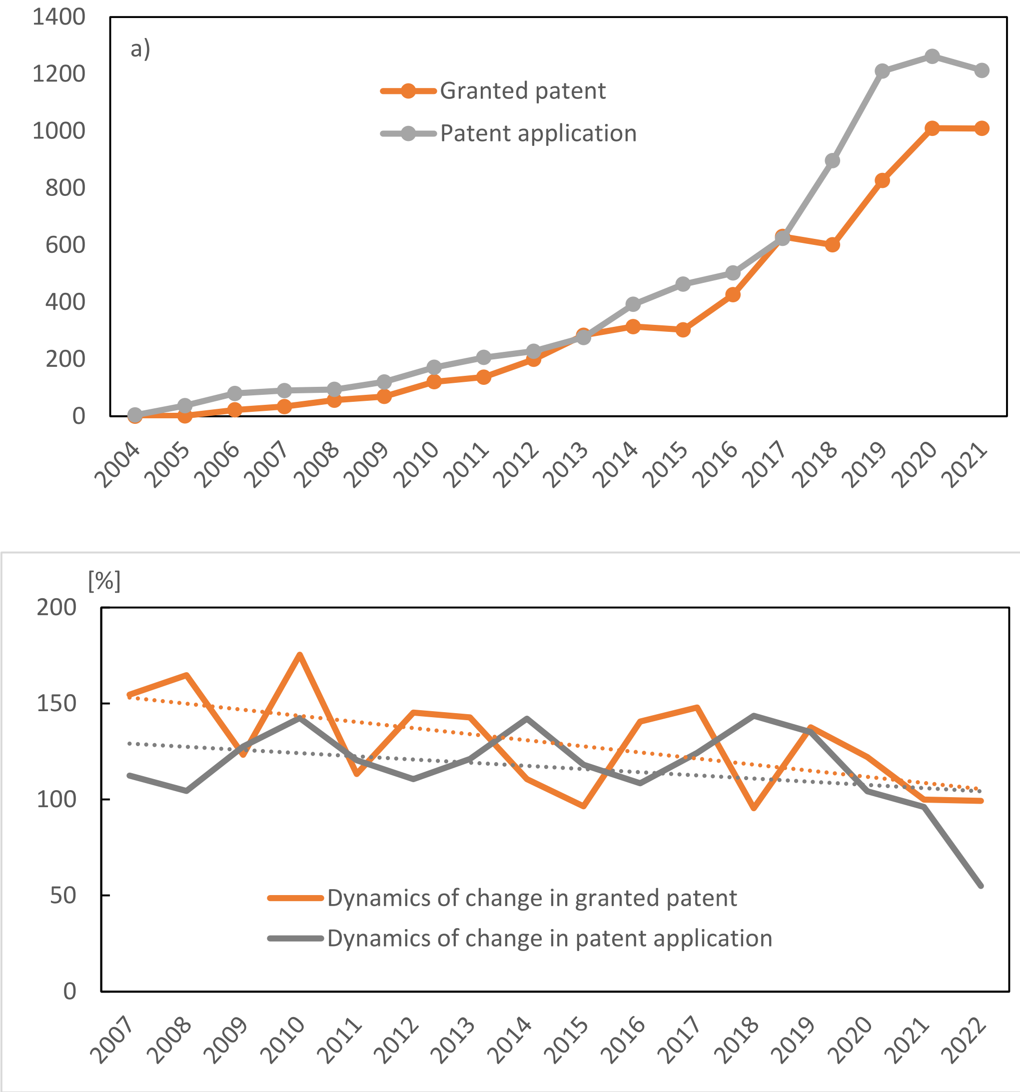

Figure 5. Patent applications and patents granted: a) number (2004-2021) b) dynamics (2007-2021).
Data Source: metadata from lens.com

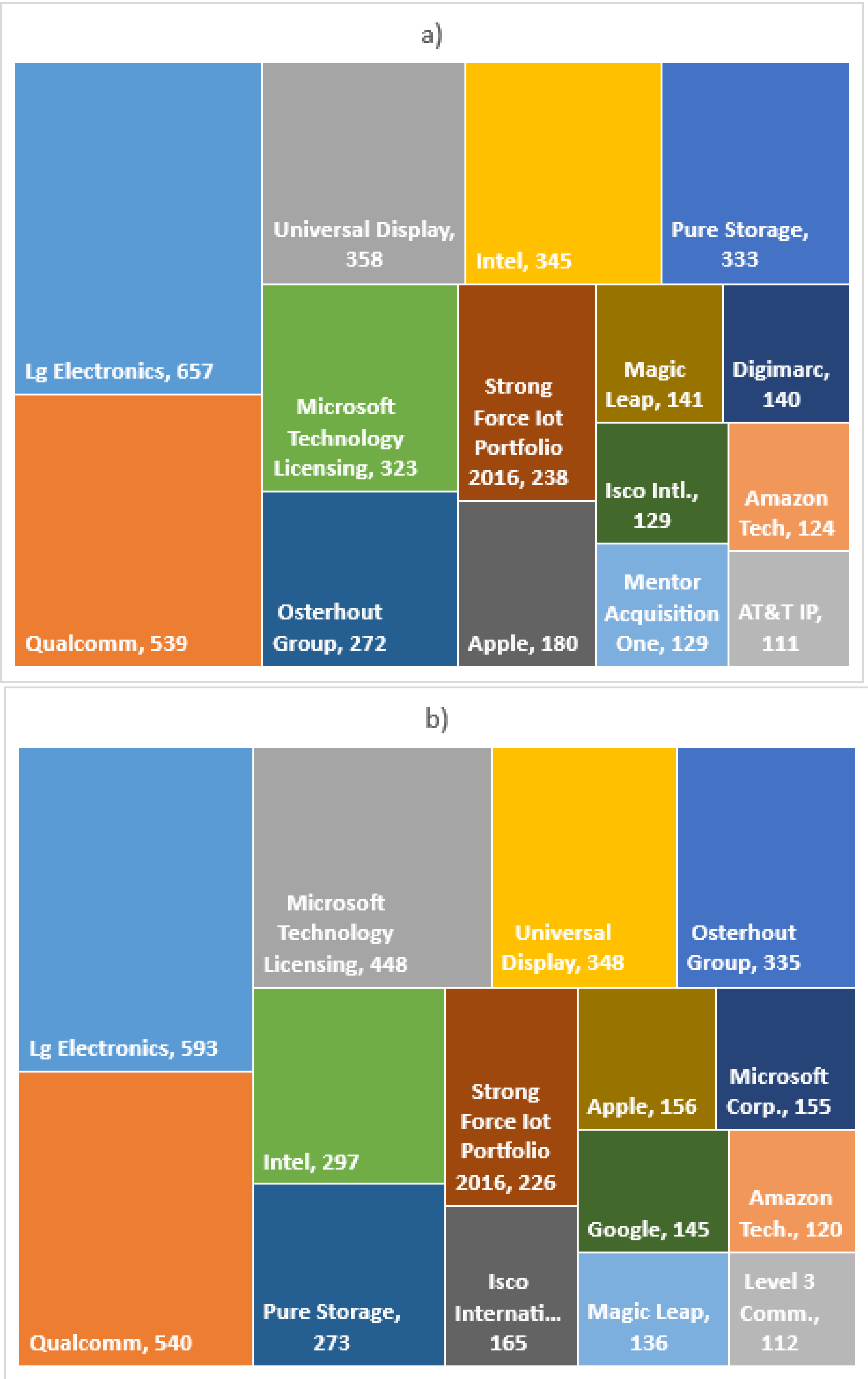

Figure 6. Companies a) the most patent applications; b) owners of the highest number of active patents. Data Source: metadata from lens.com.

4.2. Technological implementation

The use of immersive realities is made possible by appropriate technological solutions. For the most part, immersion into another reality takes place mainly in the realm of visuals – through appropriate head-worn displays (HWDs) and sound through appropriate quality headphones. However, when considering immersive realities, other senses, such as touch for shape recognition cannot be ignored.

Pełka et al. (2019) compared the implementation of VR goggles from different manufacturers. In the comparative analysis, they took into account features such as the weight of the device, the comfort of attaching it to the head, mobility, the overall quality of the displayed image, the sharpness of the edges of the displayed image, the smoothness of the image, the range of accurate vision of the virtual world, the level of eye fatigue, and the overall feeling of use. Based on the tests, users gave an overall rating for the device. The devices tested were at very different levels of technology: Oculus Rift DK2, Vrizzmo, Hykker VR Glasses 3D, Google Cardboard. The Oculus Rift DK2 scored the highest in most categories, but its advantage over the Hykker VR Glasses 3D was not significant. Hykker VR Glasses 3D scored better than Oculus Rift in terms of mobility, edge sharpness, field of view and device weight. Google Cardboard is the simplest and cheapest option, showing that access to virtual reality does not require expensive hardware, such as Oculus Rift (Pełka et al., 2019).

Tests on a larger set of devices were carried out in 2021 (Majdanik et al., 2021). The technical parameters of the devices were tested separately, as well as their operation as Natural User Interfaces (NUI), i.e. those that allow the user to communicate using natural commands such as hand, head or body movements, i.e. implementing technology. The devices tested included: HTC Vive, HTC Vive Cosmos, HTC Vive Pro, Oculus Go, Oculus Quest, Oculus Rift, Oculus Rift S, PlayStation VR, and Samsung Gear VR. The analysis of the technical parameters covered: the weight of the glasses, price on the day of release, and graphics. The natural interface analysis included the following categories: main menu, additional peripherals – gloves, standard peripherals – controllers, and natural motion detection. The best scores in the technical analysis were given to the Oculus devices (most 14 points – Oculus Rift S), while the worst score was given to the HTC Vive Pro with only 7 points. In the natural interface analysis, the HTC Vive device scored the highest with 5 points, but the Oculus Rift goggles came in second with 4 points, so the authors considered the Oculus devices to be the most optimal in terms of technical parameters and implemented NUI.

Research carried out with the VUZIX-M100 device, manufactured by the Vuzix Corporation, a company known for developing visual technology and smart glasses products, has highlighted some problems associated with its implementation, in addition to its benefits (Bal et al., 2023). Data was collected from users through interviews and documents, with durations ranging from 2 to 82 minutes. The non-invasive size and adjustable optics were cited as advantages, while problems with heating and battery life were cited as disadvantages.

Software developers and suppliers worked together to extend the battery life with an external battery, despite the inconvenience of cables.

Research using smart glasses (Microsoft HoloLens) has shown that they work well when humans and robots work together (Kirks et al., 2019). HoloLens is a type of computer that can be worn like a pair of glasses. It helps determine the position and movement of the person wearing it. It looks at how the person is moving and monitors that movement. Tests have been conducted to see how HoloLens can help people and robots share what they see and understand each other’s movements. HoloLens can relay information about a person’s position to other devices or systems, especially if the person is unable to do so independently.

In the case of immersive devices other than vision ones, interesting research has been carried out with special gloves that allow communication without sound – using hand gestures (Achenbach et al., 2023). The Manus Prime X Haptic gloves being tested are designed for use in virtual reality, enabling natural interactions and a sense of immersion. They are equipped with sensors that can accurately capture hand shapes, which is important for non-verbal communication. They can be calibrated for different hand sizes to ensure accurate data collection. Research has shown that using this type of glove has the potential to detect hand gestures with a high degree of accuracy, which is useful for silent or non-verbal communication in virtual reality. The detailed analysis of gesture recognition led to the conclusion that logistic regression with outlier detection is recommended when a balance between speed and accuracy is required. Accuracy was also affected by hardware limitations, where the use of more accurate gloves could improve results (Achenbach et al., 2023). The smart glove market is volatile, with new companies constantly emerging (Manus VR, SenseGlove, Neurodigital and Sensoryx) and others ceasing their production (Plexus, Teslasuit and VRGluv). The technology is not mature enough yet to deliver satisfactory results across the board (Caeiro Rodriguez et al., 2021).

4.3. Applications in the supply chain

Initially, visualisation techniques in supply chain management were mainly used in manufacturing and logistics simulations (Wenzel et al., 2003). Visualisation techniques can include static methods, such as diagrams, as well as dynamic methods, such as 3D animation and virtual reality. Each of these methods serves different purposes and audiences. Effective visualisation is critical to understanding the simulation results, which can be hindered by inexpressive and ineffective visualisations. A taxonomy of visualisation methods can serve as a decision support tool, guiding users to select the appropriate visualisation technique for specific needs.

Virtual reality (VR) is becoming a useful tool for designing places where products are manufactured or stored (Reif, Walch, 2008). Users can use the software to design products and storage areas, creating 3D spaces. This allows designers to see their designs in 3D as if they were real, helping them understand and plan them more effectively. When testing solutions using AR, it was found that staff using AR took longer to pick orders than when using a paper list. However, AR helped them make fewer mistakes when selecting items. Reasons for the longer turnaround time include the limitations of the technology and the longer time it takes to communicate with the system, as well as the size of the experimental warehouse, which was too small to demonstrate the benefits of AR, which could help find items faster in a larger space.

Virtual reality (VR) is mainly used to train employees in logistics, allowing them to gain experience and learn how to navigate a virtual warehouse, helping them understand the processes, operations and layout of the warehouse without being physically present (Somrak, Guna, 2018). It is also being used to simulate scenes in logistics centres for security training, allowing operational staff to participate in training without regional restrictions, thereby improving training efficiency (Mantovani et al., 2023; Tubis, Rohman, 2023; Ulmeanu et al., 2023). VR is being used to study pedestrian behaviour when interacting with automated vehicles, helping understand how people may react to new technologies on the road (Nuñez Velasco et al., 2019). It allows researchers to create realistic experimental scenarios without the costs and limitations of real-world testing, such as weather and road conditions. It provides the ability to simulate port operations, allowing users to practice tasks, such as crane handling and cargo management in a virtual environment (Jasso et al., 2023; Varriale et al., 2023), as well as freight operations and visualisation of the delivery process, which is particularly useful for last-mile delivery management (Tiwari et al., 2023). VR also supports communication between remote locations, reducing travel and CO2 emissions (Chu, Pan, 2023).

Augmented reality (AR) helps select specific activities by overlaying digital information on the real-world view, showing employees the most efficient routes and item locations (Jasso et al., 2023; Somrak, Guna, 2018; Tubis, Rohman, 2023). AR streamlines item delivery processes, replacing manual tasks, such as reading barcodes, identifying and updating inventory data (Bale et al., 2023). It assists with service advice, allowing information to be annotated and updated without the need for technical manuals or forms (Varriale et al., 2023). It is used to visualise data during machining processes, which can improve interaction in production processes and provide real-time updates (Chu, Pan, 2023; Ulmeanu et al., 2023). AR helps with plant layout planning by visualising machine layout and production line configurations (Tiwari et al., 2023), managing transportation and improving maintenance activities. AR technologies enable real-time monitoring and visualisation of cargo movement, streamlining logistics operations and providing a comprehensive understanding of cargo movement (Mantovani et al., 2023).

Mixed reality (MR), on the other hand, can facilitate remote assistance and collaboration in situations where experts can guide less experienced employees off-site (field service) to solve complex tasks or perform maintenance on refined equipment (Tang et al., 2023). Other applications of MR implemented with Microsoft HoloLens are highlighted in a study conducted by Lang et al. (2019). MR helps guide workers through the component picking process by showing a virtual path and number of components to select, improving efficiency and reducing errors. The technology streamlines the process of preparing component kits for assembly lines by highlighting the correct components and the container for the selected components. It improves decision-making by presenting complex data in a more interactive and understandable way (Wong, Lee, 2024).

4.4. Limitations associated with the use of immersion technologies

The use of immersive reality technology may have limitations in accurately simulating physical sensations, such as weight and texture. The generated reality may not fully capture the complexity of real-world scenarios, which can lead to a gap between virtual practice and real-world performance. These technologies require reliable and fast data connections to work effectively, which can be a challenge in some working environments. The cost of these technologies, including hardware, software and integration with the existing systems, can also be high, which may limit their widespread adoption in smaller organisations (Mantovani et al., 2023; Tiwari et al., 2023). Resistance to change from employees accustomed to traditional methods and a steep learning curve for these solutions can also be an issue (Mantovani et al., 2023; Varriale et al., 2023; Wong, Lee, 2024).

Some AR solutions have failed in the market because they overlay content without building experience, failing to exploit an important feature of this technology – contextual relevance (Rauschnabel et al., 2024). Compatibility issues between the AR software and hardware need to be addressed to ensure the self-sustainability of AR solutions (Chu, Pan, 2023). The effectiveness of AR systems is reduced in smaller spaces, as their potential for wayfinding and reduced search times is better exploited in larger warehouses (Reif, Walch, 2008).

VR can lead to excessive isolation as it immerses users in a completely virtual environment, which can limit collaboration with the real world and other team members (Ulmeanu et al., 2023; Varriale et al., 2023). The use of immersive technology can cause discomfort, eye fatigue, motion sickness and distraction in some users, which may limit its use for longer training sessions and potentially lead to accidents (Jasso et al., 2023; Somrak, Guna, 2018; Tubis, Rohman, 2023).

4.5. Challenges and directions for future work

Future research should focus on developing more industrial immersive reality applications that take full advantage of the unique feature of interacting with virtual objects (Lang et al., 2019). The exploitation of the immersive reality technology potential in industrial applications may be limited due to the lack of coordination of research on this topic (Tang et al., 2023). There is a need for a standardised, modular and open design framework to facilitate the use of AR in supply chain management (Chu, Pan, 2023).

Research into long-term health effects of the use of these technologies is needed to ensure user safety and comfort, improve accessibility for people with disabilities, and support inclusivity (Somrak, Guna, 2018). The economic benefits and potential savings could be highlighted by comparative studies evaluating the cost-effectiveness of virtual reality training compared to traditional methods in logistics and supply chain management (Jasso et al., 2023; Wong, Lee, 2024).

The research should be used to develop tools to assess how the implementation of these technologies would align with the organisation's vision and impact the supply chain coordination and the promotion of sustainable supply chain practices, to identify related barriers and to define the required competencies (Tiwari et al., 2023). They should also include an examination of technical knowledge gaps and skill shortages, which are significant barriers to the successful implementation of these technologies (Tubis, Rohman, 2023).

Future research should also assess how virtual reality (VR), augmented reality (AR) and mixed reality (MR) can be combined with artificial intelligence (AI) to create immersive environments that enhance operational management and training, focusing on areas such as product design, quality control and remote collaboration to reduce working time and improve overall business performance (Varriale et al., 2023). They should also address integration with other advanced technologies, such as machine learning, sensor technologies, the Internet of Things, and blockchain (Wong, Lee, 2024).

5. Conclusions

The integration of virtual realities, such as Virtual Reality (VR), Augmented Reality (AR) and Mixed Reality (MR) into supply chain management has transformative potential for operational practices, improving operational efficiency and decision-making capabilities. The research highlights the multifaceted impact of immersive realities on sustainability, from improving supply chain management and consumer product interaction to contributing to more sustainable urban planning and healthcare practices. These technologies facilitate quality control processes, enable effective training and skill development for operators, and support remote collaboration and decision-making among supply chain stakeholders.

The systematic review of patent applications is aimed at understanding trends and dynamics in immersive reality technologies. The analysis was conducted using 16,542 documents from 2004-2021 and the VOSviewer software to visualise and structure the network based on terms derived from metadata. A two-dimensional map was generated, highlighting four thematic clusters, identifying key terms such as 'information', 'communication' and 'image' as key in the context of immersive reality patents. These clusters represent visual aspects, user interaction, innovation processes and communication methods, indicating the multidisciplinary nature of immersive reality technologies. The most cited patent relates to virtual and augmented reality experiences using image capture devices.

Immersive reality technologies facilitate user engagement through visual and audio devices, especially wearable displays and high quality headphones, but the integration of other senses, such as touch for shape recognition, remains crucial. Initially, visualisation techniques in supply chain management were mainly used in production and logistics simulations, incorporating both static methods, such as charts and dynamic methods, such as 3D animation and virtual reality (VR), each serving different purposes and audiences. Effective visualisation is crucial to understanding simulation results, and a taxonomy of visualisation methods helps select appropriate techniques for specific needs. VR has proven to be a valuable tool in the design of manufacturing and warehousing spaces, improving planning through realistic 3D visualisations, and has been essential in the training of logistics personnel by simulating warehouse operations and safety training scenarios without geographical constraints. Augmented reality (AR) improves the efficiency of item selection by overlaying digital information on the real view, optimising delivery processes and maintenance operations. Mixed reality (MR) facilitates remote assistance and collaboration, guiding less experienced workers through complex tasks using devices such as Microsoft HoloLens, improving efficiency and reducing errors in component assembly and maintenance tasks.

The technologies studied face challenges related to the accuracy of simulating physical impressions and the complexity of real-world scenarios, potentially leading to a performance gap between virtual practice and real-world performance. High costs, resistance to change and steep learning curves may limit widespread adoption, particularly in smaller organisations. In addition, issues such as AR compatibility, VR-induced isolation and user discomfort may further limit the effective use of these technologies in different environments.

Future research should focus on developing industrial applications of immersive reality to exploit the unique feature of interacting with virtual objects, addressing the lack of coordinated research and the need for a standardised, modular and open design framework to facilitate the application of AR in supply chain management. The long-term health effects of these technologies, their economic benefits and their feasibility compared to traditional logistics and supply chain management training methods should also be investigated. In addition, research should aim to integrate VR, AR and MR with artificial intelligence and other advanced technologies, such as machine learning, sensor technologies, IoT and blockchain to improve operations management, with a focus on product design, quality control and remote collaboration to enhance business efficiency.

References

1. Achenbach, P., Laux, S., Purdack, D., Müller, P.N., Göbel, S. (2023). Give Me a Sign: Using Data Gloves for Static Hand-Shape Recognition. *Sensors, 23(24),* 9847. https://doi.org/10.3390/s23249847.
2. Alberto Martín-Martín, Thelwall, M., Orduna-Malea, E., Delgado López-Cózar, E. (2021). Google Scholar, Microsoft Academic, Scopus, Dimensions, Web of Science, and OpenCitations' COCI: A multidisciplinary comparison of coverage via citations. *Scientometrics, 126(1)*, pp. 871-906. https://doi.org/10.1007/s11192-020-03690-4.
3. Bal, M., Vermeerbergen, L., Benders, J. (2023). Putting head-worn displays to use for order picking: A most-similar comparative case study. *International Journal of Logistics Management, 34(5)*, pp. 1475-1499. Scopus. https://doi.org/10.1108/IJLM-12-2021-0570.
4. Bale, A.S., Joy, S., Baby Chithra, R., Rithish Revan, S., Vinay, N. (2023). 4 Augmented reality in cross-domain applications. *Augmented and Virtual Reality in Social Learning: Technological Impacts and Challenges, Vol. 3.* De Gruyter, pp. 43-62. https://doi.org/10.1515/9783110981445-004.
5. Bhavadharini, B., Monica, V., Anbarasan, R., Mahendran, R. (2023). Virtual, augmented, and mixed reality as a versatile tool in food consumer behavior evaluation: Recent advances in aroma, taste, and texture incorporation. *Comprehensive Reviews in Food Science and Food Safety, 22(6),* pp. 4925-4956. https://doi.org/10.1111/1541-4337.13248.
6. Bradski, G.R., Miller, S.A., Abovitz, A. (2015). *Methods And Systems For Creating Virtual And Augmented Reality* (Patent No. US 2016/0026253 A1). https://lens.org/131-928-864-170-858.
7. Büscher, S., Lorenz, S. (2023). 7 Mixed Reality Systems in the Participation in Urban Land Use Planning. In: *Innovations and Challenges of the Energy Transition in Smart City Districts* (pp. 109-118). De Gruyter.
8. Caeiro-Rodriguez, M., González, I., Mikic-Fonte, F., Llamas-Nistal, M. (2021). A Systematic Review of Commercial Smart Gloves: Current Status and Applications. *Sensors, 21*, p. 2667. https://doi.org/10.3390/s21082667.
9. Cai, Y.-J., Lo, C.K.Y. (2020). Omni-channel management in the new retailing era: A systematic review and future research agenda. *International Journal Of Production Economics, 229*, p. 107729. https://doi.org/10.1016/j.ijpe.2020.107729
10. Chadha, G.K., Punhani, R., Saini, S. (2023). 3 Merging of artificial intelligence (AI), artificial life (AL) and virtual reality (VR). *Artificial Intelligence for Virtual Reality, Vol. 14.* De Gruyter, pp. 27-44. https://doi.org/10.1515/9783110713817-003.
11. Chen, C. (2017). Science Mapping: A Systematic Review of the Literature. *Journal of Data and Information Science, 2(2)*, pp. 1-40.

12. Chu, C.-H., Pan, J.-K. (2023). A Systematic Review on Extended Reality Applications for Sustainable Manufacturing Across the Product Lifecycle. *International Journal of Precision Engineering and Manufacturing-Green Technology, 11,* pp. 1017-1028. https://doi.org/10.1007/s40684-023-00567-8.
13. Cipresso, P., Giglioli, I.A.C., Raya, M.A., Riva, G. (2018). The Past, Present, and Future of Virtual and Augmented Reality Research: A Network and Cluster Analysis of the Literature. *Frontiers in Psychology, 9*, 309500.
14. Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., Lim, W.M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research, 133*, pp. 285-296. Scopus. https://doi.org/10.1016/j.jbusres.2021.04.070.
15. Fross, K., Szuliński, T., Fross, R. (2022). Mieszana rzeczywistość w projektowaniu BIM i inspekcjach budowli. *Builder, 26(12)*, 8-11. https://doi.org/10.5604/01.3001.0016.0920.
16. Hořejší, P. (2015). Augmented Reality System for Virtual Training of Parts Assembly. *Procedia Engineering, 100*, pp. 699-706. https://doi.org/10.1016/j.proeng.2015.01.422.
17. Jasso, J., Cruz, Z., Álvarez, J. (2023). Applying Virtual Reality for Port Logistics Learning. *2023 IEEE International Conference on Engineering Veracruz (ICEV)*, pp. 1-5. https://doi.org/10.1109/ICEV59168.2023.10329707.
18. Kirks, T., Jost, J., Uhlott, T., Pueth, J., Jakobs, M. (2019). Evaluation of the Application of Smart Glasses for Decentralized Control Systems in Logistics. *2019 IEEE Intelligent Transportation Systems Conference (ITSC)*, pp. 4470-4476.
19. Lang, S., Kota, M.S.S.D., Weigert, D., Behrendt, F. (2019). Mixed reality in production and logistics: Discussing the application potentials of Microsoft HoloLensTM. *Procedia Computer Science, 149*, pp. 118-129. https://doi.org/10.1016/j.procs.2019.01.115.
20. Li, X., Yi, W., Chi, H.-L., Wang, X., Chan, A.P.C. (2018). A critical review of virtual and augmented reality (VR/AR) applications in construction safety. *Automation in Construction, 86,* pp. 150-162. https://doi.org/10.1016/j.autcon.2017.11.003.
21. Liaropoulos, A.N. (2023). Digitizing the battlefield: Augmented and virtual reality applications in warfare. In: *Routledge Handbook of the Future of Warfare* (pp. 308-318). Routledge; Scopus. https://doi.org/10.4324/9781003299011-33.
22. Liberatore, M.J., Wagner, W.P. (2021). Virtual, mixed, and augmented reality: A systematic review for immersive systems research. *Virtual Reality, 25(3)*, pp. 773-799. https://doi.org/10.1007/s10055-020-00492-0.
23. Majdanik, D., Madoń, A., Szymczyk, T. (2021). Natural interfaces in VR - comparative analysis. *Journal of Computer Sciences Institute, Vo1. 8,* pp. 1-6. https://doi.org/10.35784/jcsi.2385.
24. Mantovani, C., Pavanatto, L., Pinho, M.S. (2023). A Framework for Monitoring Cargo Movement using Virtual Reality. *Proceedings of the 25th Symposium on Virtual and Augmented Reality*, pp. 259-263. Scopus. https://doi.org/10.1145/3625008.3625040.

25. Marjak, H. (2016). Negatywne zjawiska związane z rozwojem innowacyjności: Patent trolling. In: *Działalność innowacyjna przedsiębiorstw w Polsce—Dylematy i sposoby wspierania środkami Unii Europejskiej* (pp. 199-213). CeDeWu.
26. Milgram, P., Colquhoun, H.W. (1999). Chapter 1a Taxonomy of Real and Virtual World Display Integration. In: *Augmented Reality*.
27. Paradiso, J.A., Landay, J.A. (2009). Guest Editors' Introduction: Cross-Reality Environments. *IEEE Pervasive Computing*, *8(3),* pp. 14-15. https://doi.org/10.1109/MPRV.2009.47.
28. Pełka, Ł., Podstawka, Ł., Szymczyk, T. (2019). Analiza porównawcza gogli do VR. *Journal of Computer Sciences Institute, 10*, pp. 36-43.
29. Radhika, K.B.K., Bharany, S. (2023). 10 Augmented Reality and Virtual Reality in disaster management systems: A review. *Handbook of Augmented and Virtual Reality, Vol. 1.* De Gruyter, pp. 155-174. https://doi.org/10.1515/9783110785234-010.
30. Radianti, J., Majchrzak, T.A., Fromm, J., Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education, 147,* p. 103778. https://doi.org/10.1016/j.compedu.2019.103778.
31. Rauschnabel, P.A., Felix, R., Heller, J., Hinsch, C. (2024). The 4C framework: Towards a holistic understanding of consumer engagement with augmented reality. *Computers in Human Behavior, 154*, p. 108105. https://doi.org/10.1016/j.chb.2023.108105.
32. Reif, R., Walch, D. (2008). Augmented & Virtual Reality applications in the field of logistics. *The Visual Computer, 24(11),* pp. 987-994. https://doi.org/10.1007/s00371-008-0271-7.
33. Sarkar, A., Bansal, M., Lea, D., Bura, D. (2023). 1 Virtual reality: A simulated experience: a comprehensive view. In: J. Hemanth, M. Bhatia, I. De La Torre Diez (Ed.), *Artificial Intelligence for Virtual Reality* (pp. 1-14). De Gruyter. https://doi.org/10.1515/9783110713817-001.
34. Schnabel, M.A., Wang, X., Seichter, H., Kvan, T. (2007). From Virtuality to Reality and Back. *Proceedings of the International Association of Societies of Design Research, 1*, *1,* pp. 15-129.
35. Sharma, S., Chamoli, N. (2023). 8 Merging of artificial intelligence (AI) with virtual reality (VR) in healthcare. In: In J. Hemanth, M. Bhatia, I. De La Torre Diez (Ed.), *Artificial Intelligence for Virtual Reality* (pp. 103-128). De Gruyter. https://doi.org/10.1515/9783110713817-008.
36. Skalski, A., Stanuch, M., Złahoda-Huzior, A., Kuszewski, T. (2020). Wykorzystanie mieszanej rzeczywistości w zakresie wizualizacji obrazowych danych trójwymiarowych. *Inżynier i Fizyk Medyczny, 9(3)*, pp. 193-198.

37. Somrak, A., Guna, J. (2018). Overview of devices and technologies in the area of virtual- ,augmented-, and mixed-reality applications. *Elektrotehniski Vestnik [Electrochemical Review], 85(1-2)*, pp. 54-61.
38. Tang, Y.M., Au, K.M., Lau, H.C. W., Ho, G.T.S., Wu, C.H. (2020). Evaluating the effectiveness of learning design with mixed reality (MR) in higher education. *Virtual Reality, 24(4)*, pp. 797-807. https://doi.org/10.1007/s10055-020-00427-9.
39. Tang, Y.M., Kuo, W.T., Lee, C.K. (2023). Real-time Mixed Reality (MR) and Artificial Intelligence (AI) object recognition integration for digital twin in Industry 4.0. *Internet of Things, 23*, p. 100753. Scopus. https://doi.org/10.1016/j.iot.2023.100753.
40. Tiwari, S., Baral, S.K., Goel, R. (2023). Application of AR and VR for supply chain: A macro perspective approach. In: *Augmented and Virtual Reality in Industry 5.0* (pp. 1-18). Scopus. https://doi.org/10.1515/9783110790146-001.
41. Tubis, A.A., Rohman, J. (2023). Intelligent Warehouse in Industry 4.0—Systematic Literature Review. *Sensors, 23(8),* p. 4105. https://doi.org/10.3390/s23084105.
42. Ulmeanu, M.-E., Dijmărescu, M.-R., Abaza, B.-F., Szuder, A., Doicin, C.-V. (2023). Digital Manufacturing Pilot Study for Stepping Towards Mixed Reality Applications in Tertiary Education. *Leveraging Transdisciplinary Engineering in a Changing and Connected World, Vol. 41*. IOS Press; Scopus, pp. 643-652.
43. Van Eck, N.J., Waltman, L. (2014). Visualizing Bibliometric Networks. In: Y. Ding, R. Rousseau, D. Wolfram (Eds.), *Measuring Scholarly Impact: Methods and Practice* (pp. 285-320). Springer International Publishing. https://doi.org/10.1007/978-3-319-10377-8_13.
44. Varriale, V., Cammarano, A., Michelino, F., Caputo, M. (2023). Critical analysis of the impact of artificial intelligence integration with cutting-edge technologies for production systems. *Journal of Intelligent Manufacturing*, pp. 1-33. https://doi.org/10.1007/s10845-023-02244-8.
45. Velasco, J.P.N., Farah, H., Van Arem, B., Hagenzieker, M.P. (2019). Studying pedestrians' crossing behavior when interacting with automated vehicles using virtual reality. *Transportation Research Part F: Traffic Psychology and Behaviour, 66*, pp. 1-14. https://doi.org/10.1016/j.trf.2019.08.015.
46. Waltman, L., Van Eck, N.J., Noyons, E.C.M. (2010). A unified approach to mapping and clustering of bibliometric networks. *Journal of Informetrics, 4(4)*, pp. 629-635. https://doi.org/10.1016/j.joi.2010.07.002.
47. Wenzel, S., Bernhard, J., Jessen, U. (2003). A taxonomy of visualization techniques for simulation in production and logistics. *Proceedings of the 2003 Winter Simulation Conference*, *1*, pp. 729-736. https://doi.org/10.1109/WSC.2003.1261489.

48. Wong, E.Y.C., Lee, P.T.Y. (2024). Virtual reality in transportation and logistics: A clustering analysis of studies from 2010 to 2023 and future directions. *Computers in Human Behavior*, *153*, p. 108082. https://doi.org/10.1016/j.chb.2023.108082.
49. Yadav, S.S., Chauhan, V., Arora, N., Singh, V., Verma, J. (2023). 6 Challenges and the future of artificial intelligence in virtual reality in healthcare. *Artificial Intelligence for Virtual Reality, Vol. 14.* De Gruyter, pp. 71-86. https://doi.org/10.1515/9783110713817-006.

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URBAN SPACE AS A HUB OF ACTIVE LEARNING AND THE PROMOTING OF CRAFT

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Purpose: The article presents the currently used forms of promoting urban crafts, emphasizing their importance and role in shaping the character and cultural landscape of the cities in the Greater Poland region (Poland). Examples of innovative revitalization and promotion projects create new ways to attract attention and interest in crafts in the urban context and contribute to the development of crafts, and the region.
Design/methodology/approach: The article presents the context of the issues studied, explaining in detail the motives for undertaking the subject and the reasons for concentrating the analyses on one region of Poland. The structure of the study covers the following areas: the development of contemporary crafts, their functioning in the urban space, and the importance of Greater Poland as a key center of crafts in Poland. To analyze contemporary methods of craft promotion in the Greater Poland region, a bibliographic study was conducted using the Web of Science and Scopus databases. Then, all available materials related to the topic, identified using the Google search engine, were reviewed. As a result, 148 of the most relevant results were obtained. This article aims to show the role of crafts in the urban space of this region and to present contemporary strategies for its promotion, which include elements that increase the involvement and interaction of the craft community with the environment.
Findings: The study highlights that contemporary crafts in this region are promoted primarily through a combination of city events with elements of education and games, which allows for greater community involvement and the popularization of craft articles and services not only among its recipients - consumers, but also the young generation deciding to educate themselves in crafts.
Originality/value: The article discusses five competitions organized in Greater Poland, of which LET'S PLAY CRAFT stands out with the largest number of references in the online space. Additionally, events, such as fairs and festivals, where craft was a central theme, were presented. The visibility of Greater Poland craft is strengthened not only by its presence on the Internet but also by investments in the urban space, especially in the context of material and social revitalization. In addition, the growing interest in craft is supported by film productions showing craftsmen shaping the cultural landscape of the region and various informational and educational campaigns.
Keywords: craft promotion, active learning, city events, craft culture, cultural economy.
Category of the paper: Literature review.

1. Introduction

Nowadays, crafts are seen as a passionate business with historical significance, playing a significant role in the urban space, while confronting market challenges. Crafts are associated with regional heritage, artistic and industry-oriented activities, and sentimental tourism, as well as being a significant element contributing to regional development - producing economic benefits and supporting cultural heritage. Crafts, like other types of production activities that generate income, create jobs, influence local and regional markets and support their development – all of which require applied promotion. It contributes to its visibility and recognition, stimulates demand for craft products and services, encourages education in craft professions and the cultivation of values related to regional tradition. The influence of crafts on the perception of the attractiveness of the region, and thus its role in regional development, has been emphasized in the results of research conducted, among others, in various Polish regions - Highlands/Podhale (Pakuła, 1994), Subcarpathia/Podkarpacie (Kosmac, 2011) and Opole Silesia/Opolszczyzna (Mazur-Włodarczyk, 2024).

Research conducted by R. Lissowska and D. Postaremczak (2011) indicates that a little over a decade ago, the craft environment and vocational education in Greater Poland/ Wielkopolska region required urgent promotion. Crafts were not promoted sufficiently in the media, and there was little information about students of vocational schools compared to students of general secondary schools and graduates of universities. The promotion of vocational education and craftsmen's work escaped the attention of the media and was limited to internal activities in the craft environment. Festivals and fairs devoted to craft were organized, but information about them did not appear in the media. On the other hand, information about craft educational paths was associated with places of education for students with lower academic results. These researchers also indicated the following elements that had a positive impact on improving the image of students of vocational schools and the craft environment (Lissowska, Postaremczak, 2011):

- promoting craftsmen running production or service establishments who have achieved significant economic success,
- rewarding the most talented students of vocational schools,
- indicating high-quality establishments where internships are worth taking up,
- organizing competitions within various crafts.

Nowadays, headlines of articles such as “City game, workshops, tastings – this is what the promotion of crafts looks like today” (TVP3 Poznań, 2023), “A great event promoting crafts is behind us” (Wielkopolska Izba Rzemieślnicza w Poznaniu, 2024), or "The promotion of tradition and creativity, or the 1st Craft Festival" (Wirtualna, 2024) may indicate that there have been major changes in the methods of promoting crafts in the Greater Poland. The above inspired a search for an answer to the question of how crafts in the province of Greater Poland are promoted today.

Contemporary research on the promotion of crafts primarily focuses on the following areas: strategies for differentiating niche craft products, which are related to the promotion of export competitiveness (Traiyarach, Banjongprasert, 2022a, 2022b); crafts as a factor influencing tourism promotion (Nzei, 2024); destination marketing through crafts (Srivastav, 2017); as well as the promotion of crafts through national education policy (Kumar, Rohit, 2023). The conducted research focuses on the analysis of the relevant literature, both those indexed in scientific text databases – Web of Science and Scopus – as well as in a more "grey" but also more accessible for potential craft audiences, including all available materials related to the subject, identified using the Google search engine. Two research hypotheses were defined:

H1: Integration of city events with educational and entertainment elements in Greater Poland contribute to the involvement of the local community and interest in crafts among consumers and young people choosing an educational path in this area.

H2: Innovative promotion projects, including city games, contribute to greater visibility and development of the craft sector in Greater Poland.

The article aims to demonstrate the presence of crafts in the urban space of this region and to present its contemporary promotion, including elements that engage and increase the interaction of the craft community with its surroundings. The above provides valuable insights and also presents an original approach to examining the promotion of crafts not through traditional marketing tools but through an element from the field of education, which can also contribute to increasing recognition, attracting customers (both those interested in craft products/services and craft professions), and building engagement.

The article first presents the background of the issues chosen for the study, explaining the aspects of interest in the chosen topic and the reasons for focusing on this region of Poland. It includes the following arrangement: the flourishing of contemporary crafts → crafts in the framework of urban life → Greater Poland as a key region for Polish crafts. After presenting the research methodology, examples of activities promoting crafts in the cities of this region were presented.

2. Pragmatic Background

2.1. The ubiquitous presence of the contemporary crafts

Craftsmanship is described as "omnipresent" and as acting as a link between various fields (Groth et al., 2022). It is also a tool used to shape the cultural image and create a national cultural symbol (Hu, Abindinhazir, 2024). Research on crafts is conducted by representatives of various scientific disciplines. The issue of crafts is primarily in the area of interest of cultural anthropology, ethnology and ethnography, design, as well as the technical sciences. However, interest in issues related to the formation and perception of crafts is slowly growing among representatives of the economic sciences.

Craftsmanship is currently experiencing a renaissance - it is fashionable, and visible within:

- tradition and innovation - restoring historical production methods (Sheppy, 2023) and combining new solutions with the experience of past generations (Ladekarl et al., 2023),
- the world of science (craft science) - in various areas of craft activity and various academic contexts (Almevik et al., 2022; Kokko, 2021, 2022),
- new technology environments (Benford et al., 2017; Wu et al., 2021; Li, Liu, 2022),
- urban space, including through the opening and renovation of studios (abandoned or destroyed craft premises are no longer perceived as outdated and re-appear in the urban landscape), and the presence of craftsmen and their products at fairs and festivals.

As regards the last aspect, research attention in the literature on the subject is mainly focused on the topic of craft breweries and adaptations of buildings that previously performed other roles, thus contributing to the revitalization of urban districts. By transforming abandoned buildings and deteriorating environments (where social problems, including poor economic condition and crime, are visible) into destinations for residents and tourists. However, this affects rising rents and moving in search of cheaper accommodation (Reid, 2018). Revitalized buildings include warehouses and industrial buildings, including those of great historical value while maintaining individual, local features supporting sustainable development (Feeney, 2017). These breweries are mainly located in cities, and their activities also affect other aspects of the lives of city residents. For example, based on the results of research by V. Mathews (2023), breweries located in close proximity to residential areas, where the main goal is consumption, cause or extend the phenomenon of gentrification - through modernization and reinvestment, causing displacement/rotation of people from more affluent social groups (i.e. middle and upper class). Mathews & Picton (2014) note that craft beers can be treated as tools in creating new spaces of cultural consumption – by building interest, they aestheticize the industrial past, soften resistance to the gentrification of city centers, make the location more attractive and alleviate concerns about the affordability of housing. This topic is also addressed by the research of the Nilsson & Reid (2019), who indicated the impact of craft breweries on the revitalization of economically affected urban districts, and consequently on increasing the value of real estate in this area. Places closely associated with craft production can therefore have an impact on the broader processes of transformation of urban spaces also in rural areas, in towns and small cities (Mathews, Picton, 2023).

Crafts, as one of the elements of the cultural sector, can be treated as a growing pool of jobs and a stimulator of the development of human-, social- and cultural capital. In the literature on the subject, crafts in this approach are not currently given much attention, however it can play a key role in developing ties with the local community, strengthening the sense of belonging and promoting social interactions. Activities related to crafts also support communities in discovering and appreciating their own cultural heritage. Joint participation in events or involvement in their organization contributes to deepening interpersonal relationships, which leads to an increase in social capital. In addition, crafts play an important role in promoting the idea of lifelong learning and acquiring knowledge through experience (Sanetra-Szeliga, 2018). Cultural events and the public space they are associated with facilitate meetings of local communities and the development of bridging social capital, providing an opportunity for interaction between the local community, which is diverse in terms of demographic, ethnic and religious characteristics (Murzyn-Kupisz, Działek, 2013).

As Łukaniszyn-Domaszewska et al. (2024) note, despite the recognition of heritage as important by experts, the younger generation does not show the same interest in it, which may lead to the loss of traditional values. Beneficial links have also been observed between the development of a heritage-based economy and the achievement of social effects in a given area, such as an increase in the quality of life, the development of residents' social competences and local identity, and an increase in cultural awareness in connection with the implementation of educational activities. Soft factors related to culture, increasing the attractiveness and climate of a given place, also have an impact on attracting investors and new residents (Murzyn-Kupisz et al., 2022). Cultural events also contribute to the regeneration of urban areas and the formation of urban belonging (De Jong, Steadman, 2021). By enabling the learning and experiencing of crafts and the city in which they occur, it can attract residents of the region and tourists, leading to the fulfillment of social functions similar to tourism. Biegańska et al. (2014) lists among these functions building awareness of local and regional communities, strengthening social capital, activating local communities, creating care for spatial order and building intergenerational bonds. Crafts, similarly to tourism, create opportunities for meetings, entering into relationships, making spending free time more attractive, connecting in the framework of finding common interests and passions, providing experiences and emotions (Bieganska et al., 2014).

It is also worth mentioning that craftsmanship, despite the currently growing interest in it, also encounters challenges shown in Table 1.

Table 1.
The selected challenges of contemporary craftsmanship

Type of challenge	Context
Mass production	Competition in the form of products that are made faster, more standardized and involve less human work
Consumerist lifestyle	Consumer interest is focused on buying newer and newer products, without taking into account the possibility of repairing old ones
Traditional limitation of the craft industry	Relatively closed and conservative inheritance system
Replacement of generations	Lack of practitioners and successors of the master craftsmen - staff shortages and problems with knowledge transfer
Fully based on unchanging tradition	Most traditional handicrafts are based on old themes, techniques and aesthetic customs

Cont. table 1.

Fast consumption	Scarcity of resources and degradation of the intrinsic values of crafts
Rare occurrence of crafts within academic fields	Crafts dominate education at secondary and/or vocational level
The lack of perception of the craftsman as an entrepreneur and not just a creator	Lack of marketing and e-commerce skills
Market challenges	High costs of doing business, difficulties in acquiring customers, meeting local, national and/or international competition

Source: own elaboration based on Mazur-Włodarczyk, Drosik (2022).

2.2. Crafts as an element of urban life

The craft discussed in the article is performed in the urban space, i.e. within a settlement unit characterized as, among others: a) isolated from the surroundings, b) with a predominance of compact development and a formed center, c) performing non-agricultural functions, d) having city rights or the status of a city, e) with defined administrative features, f) individualized, g) with a concentration of economic entities, h) in which the process of changes in land use is discontinuous in time and space, i) encompassing a population center with diversified characteristics, within which secondary groups predominate over primary ones, and material contacts over personal ones (Sanetra-Szeliga, 2013). The urban environment provides people residing in it with various layers of information influencing aesthetic and semantic values (Kulczyńska, Matykowski, 2011).

Culture plays a key role in shaping creative capital, i.e. a pool of qualified employees characterized by a high level of creativity. These people prefer to settle in places that are conducive to innovation, diversity and openness. Therefore, long-term development of cities requires creating conditions that are conducive to attracting and retaining the creative class (Florida, 2010). Cultural activity plays an important role in the development of the city, influencing social involvement, a sense of pride and identity of residents and their bond with the place of residence. It also contributes to shaping an attractive living environment, increases the potential of the city as a tourist destination and investment location, supports the implementation of cultural projects and strengthens its image and promotion. The above influences the observation that aspects of culture have a significant impact on the urban model of sustainable development (Sanetra-Szeliga, 2013). L. Gullì and M. Zazzi (2011) note that the craft districts of Italian cities have changed their role, they are no longer located far from the historic city centers, but are closely linked to contemporary urban development zones, constituting their strategic orientation point. This is related to the emergence of conflicts between the interests of landowners and the protection of low-value production activities. The results of research conducted by K. Meyer (2023) among German craftsmen of the Ruhr area indicate, among other things, that shop crafts are oriented towards location in inexpensive and well-connected locations on the ground floor. Construction crafts in particular require location in facilities that allow for the easy loading/unloading of trucks, which is different from other craft groups. Regardless of the type of craft, craft groups are open to locating their businesses in mixed-use buildings, i.e. including both office and workshop spaces as well as common spaces (garages, canteens, showrooms) (Meyer, 2023).

M. Zabłocka (2019, p. 6) notes that the city is synonymous with people whose crafts were and are its "backbone", while reflection on the city takes place on the physical plane (urban and architectural space) and the cultural and social plane (economics, law, religion, art). M. Herman (2019) indicates, however, that the presence of crafts in the urban space is necessary to maintain a balance between the human and technological aspects. Among the benefits of urban crafts, she lists the involvement of its residents (who have no previous experience, e.g. in design), the development of their creativity and manual skills, the activation of the community and the possibility of urban population learning under the supervision of specialists (Herman, 2019).

Engagement in craft activities and participation in events related to them, which are an integral part of the cultural sector, can significantly improve the quality of life in urban spaces. Of particular importance are the opportunities and potential offered by a given city, which can contribute to improving the subjective sense of well-being of residents (Sanetra-Szeliga, 2017).

The relationship between craftsmen and cities is described several ways in the literature, also including:

- Places that "attract" the rural population (including those involved in crafts), the development of cities resulting from the separation of crafts from agriculture, technical inventions introduced by craftsmen and influencing the connection of cities with the synonym of modernity, the settlement of craftsmen of other nationalities, the formation of craft guilds, associations, craft unions, and factories, and the development of regulations related to the requirements of education in a craft profession (Zabłocka, 2019),
- In the past, craftsmen gained political and economic privileges related to the exclusive right to produce a specific range of products within the city limits (De Munck, 2019),
- Creating a health and safety system for crafts (Musialik, 2019),
- Conditions of demand for crafts (Mazur-Włodarczyk, Drosik, 2020),
- Symbols of craft and professional activity (Starczewska-Wojnar, 2021),
- The UNESCO Creative Cities Initiative, established in 2024 (UNESCO, 2023),
- Adapting buildings, materials and products in the urban environment to new, originally unplanned uses. This involves, among other things, transforming entire urban zones (e.g. ports, industrial zones, districts), architectural objects (industrial objects - e.g. cranes, tracks) and products (e.g. tanks) into parks, housing complexes, external and internal equipment of public spaces (Montana-Hoyos, Scharoun, 2014),
- Clustering phenomena related to the settlement of craft groups in the city close to each other, e.g. in the form of markets, bazaars or craft districts including studios and craft inns. These groups prefer a location in the city center, and this is conditioned by easier

access to various sectors, a diversified workforce, infrastructural advantages and easy access to craft recipients. On the other hand, the outflow of craftsmen from these locations is associated with the implementation of neoliberal urban policy (Desticioğlu, Gökmen, 2023).

2.3. Crafts of Greater Poland

Greater Poland is an interesting case for analysis as a region that is compared to the "mainstay" of Polish crafts (Jagodziński, 2011), and the crafts of Greater Poland is described as a "real power" (Radio Poznań, 2017). According to K. Bondyra (2010), craftsmanship is a key element of the identity of this region. Greater Poland is characterized by the highest density of craft studios in the country, and the ethos of this region has historically been shaped by values related to craftsmanship, such as the cult of "good work", frugality and the pursuit of acquiring "a craft in hand" (Bondyra, 2010).

The crafts of past generations are presented, among others, in the Greater Poland Ethnographic Park, showing the fulfillment of household needs, changing human needs and specializations resulting from the cultural and economic specificity of the region by means of: movable inventory, studios and craft workshops (Fryza, 1991). The District Museum in Konin presents a collection of objects related to crafts, which has been recognized as one of the most important and valuable in these collections. It contains seal dies, documents, guild accessories and craft souvenirs (Cech Rzemiosł Różnych w Koninie, n.d.). The popularity of crafts in this region is also evidenced by the opening of private museums. Examples of which are the Museum of Craft Tradition and the Greater Poland Private Museum of Bakery in Pleszew (RC, 2017). The album by B. and Z. Dolczewski (2011) is devoted to the subject of the artistic crafts of Greater Poland of past generations (from the 10th to the 20th century) kept not only in museums but also in churches in Greater Poland. From a historical perspective, the crafts of Greater Poland are also devoted to works focusing on: the southern part of the region (Moczyński, 2003), during the partition period 1793-1918 (Łuczak, 1962), the structure of crafts and urban industry in the second half of the 18th century (Szymański, 2015) and craft organizational activity in the years 1919-1968 (Barański, 1969). Important events in the history of crafts in Greater Poland include its relationship with the developing medieval towns (starting from the 13th century), the emergence of manufactories, the formation of economic self-government organizations associating craftsmen and its coexistence with industry (see: Table 2).

Table 2.
Important events in the history of crafts in Greater Poland

Period	Characteristic
13th century	- Development of medieval cities - Separation of craft production - Establishment of municipal governments supervising craft guilds
15th century	- Intensive development of professional brotherhoods
18th century	- The emergence of cloth factories - Increased iron production - The development of industry pushing crafts out of the market
19th century	- Separation of crafts from industry - Integration of regional values, the positivist idea of organic work and traditional craft values (including diligence, reliability, honesty, entrepreneurship and respect for work) - Establishment of craft chambers - Privilege of German crafts and discrimination against Polish crafts - Organisation of lectures, courses, schools, exhibitions, conventions, professional magazines and brochures by Polish companies - Crafts constitute the main branch of the economy
20th century	- Regulation on social insurance for craftsmen - Establishment of the Central Craft Association (currently the Polish Craft Association) - Possibility of belonging to craft cooperatives - Exclusion from the scope of craft: commercial, catering, transport, hotel and medical services, activities of visual artists and photographers - Craft is an activity that partially supplements the shortages of large-scale industrial products and meets local demand for basic food goods
21st century	- Renaissance of crafts and vocational education

Source: own study based on: Jagodziński (2011); Górka (2013); Instytut Analizy Rynku Pracy (2020).

According to information published by the Guild of Various Crafts in Piła, in the years 1984-2020, outstanding craftsmen from greater Poland received three types of distinctions – badges: silver, gold, and honorary, awarded to them for their services in the development of Greater Poland crafts. Most of them were awarded in 2007 (27 badges), 2014 (29 badges), and 2018 (23 badges) (Cech Rzemiosł Różnych w Pile, n.d. a, b, c) – see Figure 1.

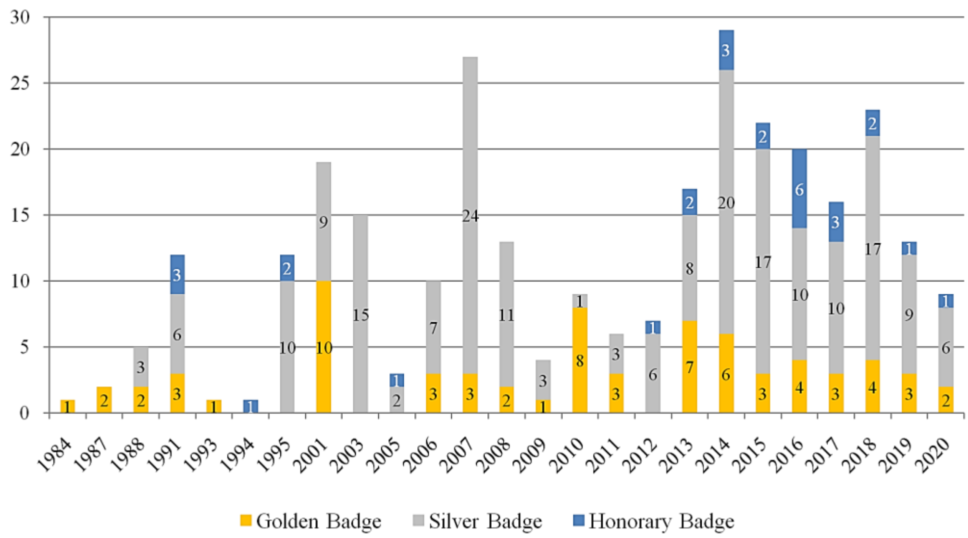

Figure 1. The number of craftsmen's distinctions in the form of: the Golden Badge for Merit in the Development of Greater Poland Crafts, the Silver Badge for Merit in the Development of Greater Poland Crafts and the Honorary Badge of Crafts.

Source: Cech Rzemiosł Różnych w Pile (n.d.; a; b; c).

Publications relating to the more contemporary crafts of the studied area emphasize, among others, aspects linking vocational education with the labor market (Bondyra, Sikora, 2008), including the importance of dual education in Greater Poland, which opens the way to stable employment (Bondyra et al., 2016).

3. Materials and methods

As part of the analysis of active methods for promoting craftsmanship in the Greater Poland region, a bibliographic study was designed utilizing the Web of Science (WoS) and Scopus databases. The search employed key terms and their synonyms, combined with AND/OR operators, as outlined in Table 3.

Table 3.
Guidelines for keywords, operators and actions

AND →	AND →	
OR ↓	OR ↓	OR ↓
craft	*promotion*	*"Greater Poland region"*
artisanry	*advertising*	*"Greater Poland province"*
	marketing	*„Greater Poland Voivodeship"*
	campaign	*"Wielkopolska region"*
		"Wielkopolska province"
		"Wielkopolska Voivodeship"

Source: own elaboration.

In the WoS, the search was conducted across the 'All Fields' category, whereas in the Scopus database, the focus was placed on 'Article Title, Abstract, and Keywords.' Despite these efforts, no materials meeting the specified criteria were identified in either database. This outcome highlights a significant research gap concerning the promotion of craftsmanship in the Greater Poland. Given the absence of published studies on the selected topics in scientific text databases and industry reports, the decision was made to proceed with research employing the desk research method. This method is nonreactive, encompassing the analysis of every type of available data. It is compared to the 'essence' of content analysis, analysis of existing statistical data, and historical-comparative analysis (Bednarowska, 2015). This approach involved analyzing all available materials related to the subject, identified using the Google search engine. In this way, 148 of the most relevant results were obtained, i.e. not including results defined by Google as very similar. During the analysis, the content of all websites was reviewed. However, the analysis did not include advertisements for handicrafts and accessories, as well as photo reports.

Another reason for undertaking the analysis of texts published on the Internet was to focus on the currently most popular mass medium informing consumers about available offers within a given administrative unit. For example, Dudek-Mańkowska (2011) draws attention to the fact that the intangible resources that may constitute a competitive advantage of a city include the subjective feelings and opinions of individuals residing in it and using city offers, information about which often comes from the mass media.

In the context of active learning methods, selected research results were published in a post-conference monograph (see: Mazur-Włodarczyk, 2024a), which formed the basis for further analyses presented below.

4. Results and Discussion

4.1. Promoting crafts through activities in the cities of Greater Poland

As noted by B. Namyślak (2015), it is extremely important within the strategic activities of the city to highlight specific cultural values, including the achievements of the local culture, influencing its development and increasing competitiveness. On the other hand, the power of attraction is the greatest within the activities of an entertainment nature. Among the activities promoting the crafts of Greater Poland, one should mention the Revitalization of Garbary in Poznań, encompassing the "revival" of this part of the city in the material dimension (including narrowing the traffic, creating a bus lane, planting and introducing elements of small architecture) and in the social dimension, which is expressed by the program of promotion and support of crafts *Craftsmanship Alley* [in Polish: *Zaułek Rzemiosła*], launched in 2017. Its aim was the economic, social and the cultural revitalization of Poznań, with the promotion and professional activation of unemployed people related to craft professions. (Poznań, 2022a). The programme participants – craft enterprises – are listed with brief characteristics in Table 4.

Table 4.
Craftsmen involved in the program Zaułek Rzemiosła

Participant	Description
Studio Artystyczne Małachowscy	Dealing with artistic bookbinding, renovation and repairing of old prints,
Pracowania Fotograficzna Dark, Szymidło	A studio and shop offering styling made of linen, jewellery, natural leather handbags and tapestry
Pracownia OYCA form artystycznych	Jewellery, small sculptures, statuettes and personalised works
Ceramika Kopiczko	Produces vessels turned on a potter's wheel and fired
Klinika Starych Zegarów	Specializing in the reconstruction, renovation, maintenance, repair and sale of antique clocks and wristwatches
Greenowacja	In which green paintings and decorations with reindeer moss are created,
Wytwórca Bakcyl	Ceramic studio
Krawiectwo Miarowe Krupa i Rzeszutko	Suits and other tailor-made clothing
Reklama NEONY Piotr Heinze	Produces the most recognizable neon signs in Poland
Pracownia lutnicza Niewczyk & Synowie	The oldest violin making studio in Poland dealing with the construction, repair and maintenance of violin-making instruments
HELLO Calligraphy	Calligraphy studio

Cont. table 4.

Introligatornia Lewandowscy	A studio where old books are repaired and preserved, and modern bindings are made
Sir. B Fancy Buttons	Specializing in the design and hand-making of buttons
Cukiernia Weber	Which produces baked goods with tradition
Pracownia szycia kołder i czyszczenia pierza	Processing of fabric into quilts, feather cleaning, sewing of quilts to order and sale of finished products
Pracownia szewska Bernarda Jakubowskiego	Shoemaker's workshop
ARTISAN	Watchmaker's studio
Piórko	Czyszczenie pierza, specializing in the production and sale of pillows, cushions and duvets
Pracownia Retro & Folk	Dealing with applied arts
Dr Shoes	A service company operating in the footwear industry, specializing in shoe customization
Etażerka	A furniture and wooden products renovation studio
Pracownia kaletnicza Geccobag	Which produces bags, backpacks, covers, and in the spirit of slow fashion
Pracownia PGiP	Graphic and spatialdesign studio

Source: own elaboration based on: Poznań (2022b-d; 2023a-d; 2024a-h; n.d. a-k).

The specific objectives of the programme include locating groups of craft studios representing rare specialties in the city, supporting forms of cooperation between craftsmen (including in the form of mini-clusters), increasing the attractiveness of the district areas and attracting customers from other districts, as well as developing municipal commercial premises, conducting educational campaigns and cooperation with vocational and technical schools in order to promote craft professions (Wojewódzki Urząd Pracy w Poznaniu, n.d.)

Another important initiative popularizing crafts is the Poznań Craftsmen program, which involved creating films about Poznań craft studios. The program was initiated in 2021 by the Made in Art Foundation. Its goal was to promote crafts as one of the unique elements shaping the cultural landscape of Poznań and urban identity, as well as to build a narrative about the city. The series of the films presents, among other things, craft studios, the realities of work, the tools and techniques used, as well as the course of the creative process (Poznań, 2023e).

As part of the activities combining the promotion of crafts with elements of active learning, it is also worth mentioning the city game *LET'S PLAY CRAFT* [in Polish: *ZaGRAjMY w RZEMIOSŁO*] taking place as part of the Craft Festival. The first edition took place in April 2023, and the second edition took place in April 2024 in the cities of Poznań, Leszno, Wągrowiec and Konin. The event was organized by the Greater Poland Chamber of Crafts in Poznań, and the event partners were: the Guild of Various Crafts in Wągrowiec, the First Degree Trade School in Wągrowiec, the Guild of Various Crafts in Konin, the Craft Vocational School of the Guild of Various Crafts in Konin and the Guild of Various Crafts in Leszno. In addition to demonstrations of craft professions (presentations of industries and services), meetings with craftsmen, tastings of local products, the program also included a city game aimed at students of grades 7 and 8 of primary schools. The teams participating in the game consisted of four students and their guardian. The games consisted of walking around the city according to a map of designated stations (and tasks to be performed within them) and a game card, based on which participants became acquainted with craft professions, visited craft companies and competed for points and time with other groups (Wielkopolska Izba Rzemieślnicza w Poznaniu, 2024).

As part of the promotion of Greater Poland crafts, 5 competitions are organized, addressed to three target groups: primary school students (2 competitions), vocational school students (2 competitions) and young craft workers who are pursuing education in craft professions (1 competition) - Table 5. Consumption of crafts during craft festivals can also, using an analogy to film festivals studied by W. Cudny and P. Ogórek (2014), play the role of developing social capital. They integrate people during shows, informal meetings and discussions. They provide an opportunity to establish new professional and social contacts and develop craft knowledge and skills.

Table 5.
Craft-themed competitions divided into groups to which they are addressed

Competitions for primary school students	Competitions for students of vocational schools	Competitions for young workers pursuing craft training
Professional festival game [in Polish: Zawodowa gra festiwalowa]. Organizer: Center for Support of Crafts, Dual and Vocational Education in Kalisz for students of grades 6-8 of primary schools.	Inter-school Mathematical Competition Specialist [in Polish: Międzyszkolny Konkurs Matematyczny Fachowiec]. One of the patrons was the Greater Poland Chamber of Crafts in Poznań The competition is intended for students of basic vocational schools.	Your profession [in Polish: Twój zawód]. Organizer: Greater Poland Chamber of Crafts in Poznań. It is addressed to young workers pursuing education in craft professions in first-degree vocational schools or in the extracurricular system.
LET'S PLAY CRAFT [in Polish: ZaGRAjMY w RZEMIOSŁO]. Organizer: Greater Poland Chamber of Crafts in Poznań. It is intended for students in grades 7 and 8 of primary schools.	Greater Poland Competition for Students of Hairdressing Craft [in Polish: Wielkopolski Konkurs Uczniów Rzemiosła Fryzjerskiego]. It is addressed to students of the third grade of the First Degree Vocational School, people with the title of journeyman, students of the 4th year of full-time technical school, students of part-time technical school, people who have previously participated in similar competitions.	

*The table is based on information available on the Internet, informing and advertising a given competition.

Source: own study.

In Greater Poland, fairs and events promoting crafts and, for the most part, the cultural urban landscape are also organised. Examples are organized at different times of the year: Targi Produktów Świątecznych i Okazjonalnych Special Days (February), Sakralia Fair (spring), Greater Poland Craft Festival (spring), Festival of Crafts in Poznań (spring), St. Bernard's Festival (Mai), St. John's Fair (June), "Magdalena's Braid" Festival (July), Windmill Days (summer/ autumn), Międzychód Craft Days (autumn), Rawicz Historical Fair (September), Christmas Fair "Bethlehem Poznańskie" (November-January), Festival of Art and Artistic Objects (December), and Christmas Fair in Oborniki (December). Table 6 lists 13 events divided into the seasons in which they are organised.

Table 6.
Craft-themed events divided into seasons

<table>
<tr><th>Spring</th><th>Summer</th><th>Autumn</th><th>Winter</th></tr>
<tr><td>Sakralia Fair
[in Polish: Targi Sakralia] - vestments, liturgical clothing and objects, church equipment, bells, chimes, sacred art (icons, sculpture, stained glass), candles, incense</td><td>St. John's Fair
[in Polish: Jarmark Świętojański] - handicrafts.</td><td>Międzychód Craft Days
[in Polish: Międzychodzkie Dni Rzemiosła] - Traditional Craft Festival</td><td>Targi Produktów Świątecznych i Okazjonalnych SPECIAL DAYS [in Polish: Targi Produktów Świątecznych i Okazjonalnych SPECIAL DAYS] - Christmas items, seasonal decorations, candles and scented products
Florist and decorative industry</td></tr>
<tr><td>Greater Poland Craft Festival
[in Polish: Wielkopolski Festiwal Rzemiosła] - painting a wall yourself, hammering nails, making clay pots and paper decorations</td><td>"Magdalena's Braid" Festival
[in Polish: Festyn „Warkocz Magdaleny”] - products from the Artistic Embroidery Workshop in Poznań</td><td>Rawicz Historical Fair
[in Polish: Rawicki Jarmark Historyczny] - cultural heritage of Greater Poland</td><td>Christmas Fair "Bethlehem Poznańskie"
[in Polish: Bożonarodzeniowy kiermasz „Betlejem Poznańskie”] - handicrafts</td></tr>
<tr><td>Festival of Crafts in Poznań
[in Polish: Festiwal Rzemiosła w Poznaniu] - presentation of the potential and educational offer of crafts and promotion of vocational training</td><td colspan="2">Windmill Days [in Polish: Dni wiatraka] - blacksmithing and pottery demonstrations and workshops for young people.</td><td>Festival of Art and Artistic Objects [in Polish: Festiwal Sztuki i Przedmiotów Artystycznych] - jewelry, Christmas decorations and beeswax products.</td></tr>
<tr><td>St. Bernard's Festival
[in Polish: Festyn Św. Bernardyna] - w silverware, hand-painted pictures, crochet products, tatting, ecological toys, beekeeping products and upholstered furniture</td><td></td><td></td><td>Christmas Fair in Oborniki
[in Polish: Jarmark Świąteczny w Obornikach] - hand-made, including by local craft companies</td></tr>
</table>

*The table is based on information available on the Internet, informing and advertising a given competition.

Source: own study.

Craft-oriented competitions are not only held during them. A list of craft-related competitions held in Greater Poland include: Your profession, Professional festival game, Inter-school Mathematical Competition Specialist, Greater Poland Competition for Students of Hairdressing Craft, and LET'S PLAY CRAFT. The first one concerns an initiative aimed at young workers learning crafts in vocational schools of the first degree or outside the school system. Its aim is to promote crafts and develop artistic interests of participants. The task of participants is to create a digital film presenting the craft they practice. The second competition is aimed at students of grades 6-8 of primary schools and aims to popularize dual and vocational education and to introduce the specificity of various professions. Participants are to visit 10 craft stands, solve thematic tasks competing against the clock. The mathematics competition aims to promote the skills of students of Basic Vocational Schools related to the "queen of sciences" and its practical applications. The fourth competition is aimed at students of grades III of the Vocational School of the first degree, journeymen, students of the 4th year of full-time and part-time technical school and people who have previously participated in similar competitions. Participants are to make creative hairstyles within the designated competitions in the women's and men's departments. The last of the mentioned competitions is dedicated to students of grades 7 and 8 of primary schools. Its main task is to popularize vocational education in crafts and vocational training based on an employment contract. As part of the competition, four-person teams with guardians visit craft companies, where they carry out assigned tasks according to the instructions included in the map.

4.2. The linking of teaching and gaming with craft promotion

Education and training in crafts are crucial for improving craft skills and preserving cultural heritage. Furthermore, as O.G. Berta notes, the development of crafts is possible through the existence of a market for this craft (Berta, 2023). Craft education affects the labor market and the economy, which in turn influences the introduction of changes to teaching programs and their adaptation to emerging needs, including creating interest in craft among its recipients – consumers and people starting their education – potential craftsmen.

Crafts are promoted in many ways, and the form of promotion depends on, among other things, the type of craft, which are the topics of research in the international scientific community (Borrus, 1988; Zbuchea, 2014; Makhitha, 2016; Machowska, 2016, Czerska, Michalczyk, 2017; Pech, Kopova, 2022; Komen, Mijatović, 2024; The Greater Poland Chamber of Crafts in Poznań, n.d. b).

As noted by M. Czajkowski (2011), the perception of crafts by society is influenced by building its image, among other things, by taking initiatives - organizations representing crafts and promoting their presence on the web, thus fulfilling a marketing role. In Poland, Łódź is an example of a city that is a production centre and has chosen a development direction focused on promotion through cultural activities. It organizes film festivals based on the specific heritage of this city, which is currently a tourist asset and a cultural product at the same time (Cudny, 2011). Particularly noteworthy are events visible in the urban space, such as fairs, festivals and accompanying competitions aimed at various craft groups. In Poland, there are 13 nationwide competitions dedicated to crafts and promoted on the Internet: Socially responsible craftsman, Construction Tournament "Golden Trowel", National Confectionery Tournament named after W. Kandulski, Anna Butka National Baking Tournament, National

Cooking Tournament, National Tournament for the Best Confectioner Student, National Tournament for the Best Student in the Baker's Profession, Skills Poland, National Occupational Health and Safety Knowledge Competition "Safely from the Start", National Goldsmiths' Competition - Gold and Silver in Crafts, “MAN-JEWELRY-WORLD” Photo Contest, and Master of Beauty – Polish Open Hairdressing Championships (Table 7). These competitions are mainly aimed at students of crafts (10 competitions). A few of them are addressed to young employees (3 competitions) and entrepreneurs (1 competition). Their goals include, among others, distinguishing young apprentices of crafts/craftsmen, promoting talents, raising the profile and quality of vocational education, promoting vocational education, popularizing knowledge about crafts and showing craft skills. The most common organizers include craft chambers, craft guilds, vocational school, the Polish Craft Association and the National Labor Inspectorate.

Table 7.
Craft-themed activities divided into groups to which they are addressed

<table>
<tr><th>Competitions for craft students</th><th>Competitions for craftsmen</th><th>Competitions for companies</th></tr>
<tr><td>Construction Tournament "Golden Trowel" [in Polish: Turniej Budowlany "Złota Kielnia"]. A three-stage construction tournament organized since 1972. Previously also known as the Construction Knowledge and Skills Olympiad.</td><td>Socially responsible craftsman [in Polish: Społecznie odpowiedzialny rzemieślnik]. Organizer: Greater Poland Chamber of Crafts in Poznań in partnership with the company Doradztwo Społeczne i Gospodarcze</td><td>“Reliable in Craftsmanship” [in Polish: “Wiarygodni w Rzemiośle”]. Organizer: Creditreform Wywiadownia Gospodarcza Sp. z o.o.</td></tr>
<tr><td colspan="2">SkillsPoland. Organizer: Foundation for the Development of the Education System</td><td></td></tr>
<tr><td colspan="2">Master of Beauty – Polish Open Hairdressing Championships [in Polish: Master of Beauty – Otwarte Mistrzostwa Fryzjerstwa Polskiego]. Organizer: National Hairdressing and Cosmetics Commission of the Polish Craft Association, Greater Poland Chamber of Crafts in Poznań, Poznań International Fair.</td><td></td></tr>
<tr><td>National Confectionery Tournament named after Wojciech Kandulski [in Polish: Ogólnopolski Turniej Cukierniczy im. Wojciecha Kandulskiego]. Organizer: Greater Poland Chamber of Crafts in Poznań, Confectioners' and Bakers' Guild in Poznań, Food Industry School Complex in Poznań</td><td></td><td></td></tr>
<tr><td>National Cooking Tournament [in Polish: Ogólnopolski Turniej Kucharski]. Organizer: Greater Poland Chamber of Crafts in Poznań, Guild of Confectioners and Bakers in Poznań, Complex of Food Industry Schools in Poznań</td><td></td><td></td></tr>
<tr><td>Anna Butka National Baking Tournament [in Polish: Ogólnopolski Turniej Piekarski im. Anny Butki]. Organizer: Greater Poland Chamber of Crafts in Poznań, Guild of Confectioners and Bakers in Poznań, Complex of Food Industry Schools in Poznań</td><td></td><td></td></tr>
</table>

Cont. table 7.

National Tournament for the Best Confectioner Student [in Polish: Ogólnopolski Turniej na Najlepszego Ucznia w Zawodzie Cukiernik]. Organizer: Lower Silesian Chamber of Crafts in Wrocław, Complex of Vocational Schools in Wrocław		
National Tournament for the Best Student in the Baker's Profession [in Polish: Ogólnopolski Turniej na Najlepszego Ucznia w Zawodzie Piekarz]. Organizer: Lower Silesian Chamber of Crafts in Wrocław, Complex of Vocational Schools in Wrocław		
National Occupational Health and Safety Knowledge Competition "Safely from the Start" [in Polish: Ogólnopolski Konkurs Wiedzy o Zasadach BHP „Bezpiecznie od startu”]. Organizer: Polish Craft Association and State Labor Inspectorate Two-stage competition on labor law and health and safety issues.		
National Goldsmiths' Competition - Gold and Silver in Crafts [in Polish: Ogólnopolski Konkurs Złotników – Złoto i srebro w rzemiośle]. Organizer: National Goldsmithing and Jewellery Commission of the Polish Craft Association		
“MAN-JEWELRY-WORLD” Photo Contest [in Polish: Konkurs fotograficzny „CZŁOWIEK-BIŻUTERIA-ŚWIAT”]. Organizer: Foundation for the Development of the Polish Jewellery Industry – organizer of the Polish Goldsmithing and Jewellery Fair GOLD EXPO, Polish Goldsmithing and Jewellery Commission ZRP, Phototechnical School Complex in Warsaw		

*The table is based on information available on the Internet, informing and advertising a given competition.

Source: own study.

Research conducted by P. Brännkärr and M. Porko-Hudd (2023) exploring Erasmus students’ expectations regarding craft courses in Finland show that these courses are expected to be fun, interesting and challenging, giving the opportunity to try, experience and learn new things. Participation in competitions dedicated to crafts meets these expectations. Moreover, apart from the promotional aspect, it plays an educational role. It allows students to develop skills and deepen knowledge, stimulate, among others, creativity and problem-solving skills, as well as influence their observers. Competitions also help to build a community around a given craft – people with similar interests or experiences. Competitions that engage the learning process, similar to simulations and educational games, case studies, team-based assignments, interactive quizzes and tests, mind mapping, role-playing, etc., belong to active learning methods. They support an understanding of the issues being learned and consolidation of knowledge. They focus on the learner, influence increasing the effectiveness of learning and interest in the topic being explored (Andrews et al., 2022). As noted by Greaves et al. (2023), active learning connects with the inhabited space and engages both local and incoming communities – immigrants. This learning method enables learners to create meanings and understand heritage based on their framework of understanding (Greaves et al., 2023).

It is worth mentioning that beyond the promotional aspect, active learning in the field of crafts has the potential and already fulfills its classically assigned roles, such as learning through practice, problem-solving tasks, collaboration, etc. These methods are applied in the dual system, vocational schools, institutions providing occupational training, as well as directly under the guidance of master craftsmen.

5. Summary

The promotion of urban crafts in Greater Poland is currently carried out primarily through the integration of city events with educational and entertainment elements, which increases community involvement and popularizes crafts both among consumers and young people choosing the path of education in this field. Innovative revitalization and promotional projects introduce new ways of arousing interest in crafts, emphasizing the experience gained and the sensations felt. This is important, among others, due to the fact that around 541,000 companies from the SME sector are involved in crafts nationwide (WARP, 2024) constituting endogenous potential, part of which is not fully utilized (Gałązka, 2017).

The article indicates five competitions organized in Greater Poland, of which the game LET'S PLAY CRAFT has the most links on the Internet. In addition, it describes several events (fairs and festivals) in which crafts were the main thematic axis. The visibility of the crafts of Greater Poland is increased visually not only in the Internet space. Crafts are more noticeable through investments in the urban space related to revitalization in the material and social dimension, in creating films about craftsmen practicing and enriching the cultural landscape of cities in this region (an example of the *Poznań craftsmen program*) and through other informational and educational campaigns (an examples of the program *Craftsmanship Alley*, the competition *Professional festival game,* and the city game *LET'S PLAY CRAFT*).

The suggestion resulting from the conducted study, addressed to entities developing programs intended for craftsmen or aimed at promoting craft (including local government authorities and craft organizations), is to take into account the active learning potential in their creation. Among others, by introducing subsidies/grants for craftsmen who "actively" promote craft, encouraging participation in training in the use of active learning methods in craft, creating programs for sharing good practices and activating the population in activities related to craft through dedicated competitions and games on craft topics.

Focusing on the development and involvement of the local community through crafts does not fully guarantee success, because much also depends on the craftsmen themselves, as well as on continuous market analysis, the adaptation of products and services and the further adjustment of promotional tools to developing possibilities (including technical ones) and adjusting to market expectations. These activities are worth undertaking to take care of the functioning of crafts. Thanks to it - in addition to the economic aspect - it becomes possible to: return to the history and traditions of ancestors, develop the region, stimulate creativity and creative inspiration of those interested, provide products and services, acquire a profession for young people, and finally, maintain balance within the dynamically developing reality.

The study is not without its limitations, including the fact that it is based solely on the analysis of the content of articles obtained from a single Internet browser based on a selection algorithm unique to it. Another limitation is the use of the desk research method alone. In this case, this method allows for gaining insight into the issues being studied. It is the basis for future research, such as a questionnaire survey, the aim of which may be to more precisely analyze the relationship between the local community and the functioning of craft activities in the urban space. As well as to expand the territorial scope to other regions of Poland. Another limitation of the article is the focus on pro-craft initiatives organized in the main administrative center of the region - Poznań. This phenomenon results from the concentration of available information on the area of this specific administrative unit, which, however, leads to the marginalization of various urban initiatives implemented in other parts of the Greater Poland region. Such a perspective may contribute to a narrow perception of the role of crafts in the entire region, while omitting the wealth of activities and projects implemented in other cities that were not included in the analysis. It is also worth emphasizing that the article did not aim at the examination of long-term effects on craft enterprises or vocational education, which, due to their significance, should constitute a further research direction.

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References

1. Almevik, G., Groth, C., Westerlund, T. (2022). *Explorations in Craft Sciences*. In: T. Westerlund, C. Groth, G. Almevik (Eds.), *Craft Sciences* (pp. 2-18). Gothenburg Studies in Conservation. Gothenburg: Acta Universitatis Gothenburgensis.
2. Andrews, M., Prince, M., Finelli, C., Graham, M., Borrego, M., Husman, J. (2022). Explanation and Facilitation Strategies Reduce Student Resistance to Active Learning. *College Teaching, 70*(4), pp. 530-540. doi: 10.1080/87567555.2021.1987183.
3. Barański, Z. (1969). *Rzemiosło wielkopolskie 1919-1968: opracowanie materiałowe działalności organizacyjnej*. Poznań: Wydawnictwo Poznańskie.
4. Bednarowska, Z. (2015). Desk research — exploiting the potential of secondary data in market and social research. *Marketing i Rynek, 7*, pp. 17-26.
5. Benford, S., Koleva, B., Quinn, A., Thorn, E.-C., Glover, K., Preston, W., Hazzard, A., Rennick-Egglestone, S., Greenhalgh, C., Mortier, R. (2017). Crafting interactive decoration. *ACM Transactions on Computer-Human Interaction, 24*(4), pp. 1-39. doi: 10.1145/3058552.
6. Berta, O.G. (2023). Culture or commerce? Craft as an ambiguous construction between culture and economy. *Journal of Cultural Economy*. doi: 10.1080/17530350.2023. 2229335.
7. Biegańska J., Grzelak-Kostulska E., Środa-Murawska S. (2014). *Czy turystyka miejska może łączyć pokolenia?* In: J. Śledzińska, B. Włodarczyk (Eds.), *Międzypokoleniowe aspekty turystyki* (pp. 151-162). Warszawa: Wydawnictwo PTTK „Kraj".
8. Bondyra, K. (2010). Wielkopolskie rzemiosło a regionalizm ekonomiczny. *Przegląd Zachodni, 3*(334), pp. 19-33.
9. Bondyra, K., Sikora, J. (Eds.) (2008). *Wielkopolskie rzemiosło między tradycją a nowoczesnością.* Poznań: Wydawnictwo Wyższej Szkoły Bankowej.
10. Bondyra, K., Świdurska, A., Jagodziński, W. (2016). Wielkopolskie rzemiosło w procesie kształcenia kadr. *Przegląd Zachodni, 2*(359), pp. 131-151.
11. Borrus, K.S. (1988). Marketing crafts through museum shops. *Museum, Museums and crafts, 157, XL*(1), pp. 22-27.
12. Brännkärr, P., Porko-Hudd, M. (2023). Great expectations –A Finnish perspective on international students' choice of university-level craft courses. In: S. Davies, M. McLain, A. Hardy, D. Morrison-Love (Eds.). *The 40th International Pupils' Attitudes Towards Technology Conference Proceedings 2023, 1(1)* (pp. 1-9). doi: 10.24377/PATT40.2023.
13. Cech Rzemiosł Różnych w Koninie (n.d.). *Zarys dziejów konińskiego rzemiosła do 1953 r.* Retrieved from: https://www.cechkonin.pl/zarys-dziejow-koninskiego-rzemiosla/, 23.06.2024.
14. Cech Rzemiosł Rożnych w Pile (n.d. a.). *Złota odznaka „za zasługi w rozwoju rzemiosła wielkopolskiego".* Retrieved from: http://www.cechwpile.pl/?page_id=1041, 23.06.2024.

15. Cech Rzemiosł Rożnych w Pile (n.d. b.). *Srebrna odznaka" za zasługi w rozwoju rzemiosła wielkopolskiego*. Retrieved from: http://www.cechwpile.pl/?page_id=1035, 23.06.2024.
16. Cech Rzemiosł Rożnych w Pile (n.d., c.). *Honorowa odznaka rzemiosła*. Retrieved from: http://www.cechwpile.pl/?page_id=1043, 23.06.2024.
17. Croatiaweek (2022). *Croatian craft brewery wins marketing award in USA for retro branding*. Retrieved from: https://www.croatiaweek.com/croatian-craft-brewery-wins-marketing-award-in-usa-for-retro-branding/, 27.08.2024.
18. Cudny, W. (2011). Film festivals in Łódź as a main component of urban cultural tourism. *Bulletin of Geography Socio–economic Series, 15*, pp. 131-141. doi: 10.2478/v10089-011-0009-6.
19. Cudny, W., Ogórek, P. (2014). Segmentation and motivations of the attendees' of the Mediaschool Festival in Łódź, Poland. In: D. Szymańska, J. Biegańska (Eds.), *Bulletin of Geography. Socio-economic Series*, *24* (pp. 41-56). Toruń: Nicolaus Copernicus University Press. doi: 10.2478/bog-2014-0013
20. Czajkowski, M. (2011). Wizerunek rzemiosła w Internecie. In: *Wielkopolska Izba Rzemieślnicza, Cechy Wielkopolski. Rola rzemiosła w kształceniu zawodowym, Doradztwo społeczne i gospodarcze*, *Raport z badań* (pp. 156-168). Poznań: M-Druk Zakład Poligraficzno-Wydawniczy Janusz Muszyński.
21. Czerska, I., Michalczyk, R. (2017). Marketing nostalgiczny jako szansa dla renesansu rzemiosła na Dolnym Śląsku. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, Gospodarka miejska przyszłości. Perspektywa województwa dolnośląskiego, 490*, pp. 113-120. doi: 10.15611/pn.2017.490.10.
22. De Jong, A., Steadman, C. (2021). (Re)crafting belonging: culturalled regeneration, territorialization and craft beer events. *Social & Cultural Geography*. doi: 10.1080/14649365.2021.1939126
23. De Munck, B. (2019). Artisans as knowledge workers: Craft and creativity in a long term perspective. *Geoforum, 99*, pp. 227-237. doi: 10.1016/j.geoforum.2018.05.025.
24. Desticioğlu, Y.H., Gökmen, G.P. (2023). Rethinking Craft Neighbourhoods as Authentic Urban Places for Productive Cities of the Future: The Case of Galata, 30th Urban Design and Implementations Symposium. In: M. Birik (Ed.), *Future of Urban Design + Urban Design of Future* (pp. 168-201).
25. Dolczewska, B., Dolczewski, Z. (2011). *Rzemiosło artystyczne w Wielkopolsce.* Wydawnictwo WBPICAK.
26. Domański, B., Murzyn-Kurpisz, M. (2021). Krajobraz kulturowy a zmieniające się narracje tożsamości miasta – przypadek Gliwic. *Rozwój Regionalny i Polityka Regionalna, 54*, pp. 93-112. doi: 10.14746/rrpr.2021.54.06.
27. Dudek-Mańkowska, S. (2011). Koncepcja wizerunku miasta. In: A. Grzegorczyk, A. Kochaniec (Eds.), *Kreowanie wizerunku miast* (pp. 42-67). Warszawa: Wyższa Szkoła Promocji.

28. Eldin, R.M.B., Hammad, A.A. (2020). Marketing Egyptian Crafts Villages for Preserving the Cultural Heritage "Applied on the Nubian Village of Gharb Soheil". *International Journal of Heritage, Tourism and Hospitality, 14*(3), *Special Issue*, pp. 251-269. doi: 10.21608/IJHTH.2020.153623.
29. Feeney, A.E. (2017). Cultural heritage, sustainable development, and the impacts of craft breweries in Pennsylvania. *City, Culture and Society, 9*, pp. 21-30. doi:10.1016/j.ccs.2017.03.001.
30. Florida, R. (2010). *Narodziny klasy kreatywnej*. Warszawa: Narodowe Centrum Kultury.
31. Fryza, M. (1991). Dokumentacja i ekspozycja rzemiosł ludowych w Wielkopolskim Parku Etnograficznym. *Studia Lednickie II*, Poznań/Lednica, pp. 229-237.
32. Gałązka, A. (2017). Teoretyczne podstawy rozwoju regionalnego – wybrane teorie, czynniki i bariery rozwoju regionalnego. *Studia BAS, 1*(49), pp. 19-61.
33. Górka, R. (2013). *Rękodzieło ludowe i rzemiosło artystyczne w aspekcie tradycji i możliwości rozwojowych w przyszłości.* Pogórzańskie Stowarzyszenie Rozwoju.
34. Greaves, A.M., Öz, A., Yegen, G., Apaydın, V., Gilby, C. (2023). Heritage education and active learning: Developing community and promoting diversity in Turkey. *Journal of Community Archaeology & Heritage, 10*(2), pp. 144-161. doi: 10.1080/20518196.2023.2176087.
35. Groth, C., Townsend, K., Westerlund, T., Almevik, G. (2022). Craft is ubiquitous. *Craft Research, 13*(2), pp. 211-220.
36. Gullì, L., Zazzi, M. (2011). Renewal strategies for the environmental conversion of crafts districts in Italy. *2011 International Conference on Green Buildings and Sustainable Cities, Procedia Engineering, 21*, pp. 771-779. doi: 10.1016/j.proeng.2011.11.2077.
37. Herman, M. (2019). *Nowe rzemiosło.* Magazyn Miasta. Retrieved from: http://magazynmiasta.pl/2019/10/01/nowe-rzemioslo/, 18.08.2024.
38. Hu, W., Abindinhazir, Z. bin. (2024). Getting the Method of Reviving Traditional Crafts from Malaysian Modern Pewter Craftwork. *Pacific International Journal, 7(2),* pp. 59-67. doi: 10.55014/pij.v7i2.564.
39. Instytut Analizy Rynku Pracy (2020). *Kształcenie zawodowe w rzemiośle*. Raport tematyczny, PARP, System Rad ds. kompetencji. Retrieved from: https://www.parp.gov.pl/storage/publications/pdf/Ksztacenie-w-rzemiole_ostat.docx.pdf, 18.08.2024.
40. ITC/WIPO (2003). *Marketing Crafts and Visual Arts: The Role of Intellectual Property A practical guide*. Geneva: International Trade Centre UNCTAD/ WTO and World Intellectual Property Organization.
41. Jagodziński, W. (2011). Formy instytucjonalizacji rzemiosła i rozwiązań formalnoprawnych w zakresie kształcenia zawodowego. In: *Rola rzemiosła w kształceniu zawodowym, Doradztwo społeczne i gospodarcze*, *Raport z badań* (pp. 8-31). Wielkopolska Izba Rzemieślnicza, Cechy Wielkopolski. Poznań: M-Druk Zakład Poligraficzno-Wydawniczy Janusz Muszyński.

42. Kokko, S. (2021). Approaches to Craft Studies at Higher Education. *Form Akademisk, 14*(2), pp. 1-11. doi: 10.7577/formakademisk.4197.
43. Kokko, S. (2022). Finland Orientations on studying crafts in higher education. *Craft Research, 13*(2), pp. 411-432.
44. Komen, I.F., Mijatović, M. (2024). Marketing of craft producers: evaluation and implications for the future education. *Zbornik Veleučilišta u Rijeci. 12*(1), pp. 181-199.
45. Kosmaczewska, J. (2011). Rzemiosło użytkowe jako atrakcja turystyczna regionu na przykładzie fajkarstwa. In: D. Orłowski, J. Wylężałek (Eds.), *Związki polskiego dziedzictwa kulturowego z turystyką* (pp. 173-190). Warszawa: Wyższa Szkoła Turystyki i Języków Obcych w Warszawie.
46. Kulczyńska, K., Matykowski, R. (2011). Images of the urban spaces of Cieszyn. *Bulletin of Geography. Socio-Economic Series, 15*, pp. 83-94.
47. Kumar, A., Rohit, G.K. (2023). Promoting Clay Craft Education and Training through National Education Policy 2020. *Bharatiya Shiksha Shodh Patrika, 42*(1(i)), pp. 23-27.
48. Ladekarl, I.M., Pilgaard Harsaae, M., Bang, A.L., Kramer Pedersen, L., Bull Nielsen, T.C., Ege, A. (2023). From Craft to Industry. *FORM Akademics, 16*(4), BICCS 23, pp. 1-9. doi: 10.7577/formakademisk.5478.
49. Li, H., Liu, D. (2022). Innovative Development of Intangible Culture of Arts and Crafts in Artificial Intelligence Decision Support System. *Mobile Information Systems,* 1123356. doi: 10.1155/2022/1123356.
50. Lissowska, R., Postaremczak, D. (2011). Jak Cię piszą, tak Cię widzą. Wizerunek medialny szkolnictwa zawodowego w Wielkopolsce. In: *Rola rzemiosła w kształceniu zawodowym, Doradztwo społeczne i gospodarcze. Raport z badań* (pp. 45-64). Wielkopolska Izba Rzemieślnicza, Cechy Wielkopolski. Poznań: M-Druk Zakład Poligraficzno-Wydawniczy Janusz Muszyński.
51. Łuczak, C. et al. (1962). Rzemiosło wielkopolskie w okresie zaborów (1793-1918). In: Z. Grota, Z. (Ed.), *Położenie ekonomiczne rzemiosła wielkopolskiego w okresie zaborów (1793-1918).* Polskie Towarzystwo Historyczne. Oddział w Poznaniu, PWN.
52. Łukaniszyn-Domaszewska, K., Musialik, W., Mazur-Włodarczyk, K., Karaś, E. (2024). Cultural Heritage as a Development Potential According to the Regional Academic Community. *Studia Śląskie, XCIV.* Wydawnictwo Instytutu Śląskiego, pp. 275-310.
53. Machowska, M. (2016). Turystyka i niematerialne dziedzictwo kulturowe: przegląd szans i zagrożeń. Na przykładzie rzemiosła i rękodzieła tradycyjnego. *Łódzkie Studia Etnograficzne, 55*, pp. 161-192.
54. Maćkowski, T. (2021). Militarne powinności rzemieślników wobec z miasta w XVI-XVII wieku – na przykładzie obrony Gdańska przed Stefanem Batorym w 1577 roku. In: W. Musialik, K. Mazur-Włodarczyk, E. Said (Eds.), *Rzemiosło – stan i zmiany w wymiarze lokalnym, regionalnym i międzynarodowym* (pp. 177-198). Opole: Politechnika Opolska.

55. Makhitha, K.M. (2016). Marketing Strategies Of Small Craft Producers In South Africa: Practices And Challenges. *The Journal of Applied Business Research, 32*(3), pp. 663-680.
56. Mathews, V. (2023). Planning for craft breweries: neolocalism, third places and gentrification. *Urban Geography, 44*(8), pp. 1768-1793. doi: 10.1080/02723638.2022.2126143.
57. Mathews, V., Picton, R.M. (2014). Intoxifying gentrification: brew pubs and the geography of post-industrial heritage. *Urban Geography, 35*(3), pp. 337-356. doi: 10.1080/02723638.2014.887298.
58. Mathews, V., Picton, R.M. (2023). Craft breweries as hermit crabs: Adaptive reuse and the revaluation of place. *Local Development & Society, 4*(2), pp. 326-347. doi: 10.1080/26883597.2022.2163918.
59. Matuszczak, W. (2024). *II Festiwal Rzemiosła w Poznaniu. Będą konkursy, pokazy i degustacja*. Retrieved from: https://zwielkopolski24.pl/wiadomosci/ii-festiwal-rzemiosla-w-poznaniu-beda-konkursy-pokazy-i-degustacja/HzqQHQYuFyzHcThuiBHB, 23.06.2024.
60. Mazur-Włodarczyk, K. (2024a). *Active learning as a tool for promoting craftsmanship – examples from Poland*. Valorificarea neuroştiinţelor în dezvoltarea personal, Materialele conferinței științifice internaționale organizate în cadrul subprogramului instituțional de cercetare „Modele de valorificare a neuroștiințelor în dezvoltarea personală", pp. 183-198, Chişinău, Moldova, 7-8 noiembrie 2024. doi: 10.46727/c.7-8-11-2024.p183-198.
61. Mazur-Włodarczyk, K. (2024b). Promocja rzemiosła i poprzez rzemiosło na przykładzie Śląska Opolskiego. *Marketing i Rynek, XXX, 6*, pp. 28-39. doi: 10.33226/1231-7853.2024.6.3.
62. Mazur-Włodarczyk, K., Drosik, I. (2020). Uwarunkowania popytu na rynku rzemiosła pieczęci chińskich na przestrzeni lat. In: W. Musialik, R. Śmietański (Eds.), *Rzemiosło w wymiarze lokalnym, regionalnym i międzynarodowym* (pp. 135-155). Opole: Politechnika Opolska.
63. Mazur-Włodarczyk, K., Drosik, I. (2022). Rzemiosło w kulturze ekonomicznej Chin. *Studia i Monografie. Politechnika Opolska, nr 572.* Opole: Oficyna Wydawnicza Politechniki Opolskiej.
64. Meyer, K. (2023). Next Generation Small Urban Manufacturing: Apprentices' Perspective on Location Factors, Mixed-Use, and Shared Spaces. *Urban Planning, 8*(4), pp. 236-248. doi: 10.17645/up.v8i4.7040.
65. MICET (2021). *Tips For Craft Beer Marketing*. Retrieved from: https://www.micetcraft.com/tips-for-craft-beer-marketing/, 27.08.2024.
66. Moczyński. T. (Ed.) (2003). *Rzemiosło Południowej Wielkopolski: wydane z okazji 40-lecia Izby Rzemieślniczej w Kaliszu.* Izba Rzemieślnicza w Kaliszu.
67. Montana-Hoyos, C., Scharoun, L. (2014). Adaptive Reuse in Craft, Design, and Art in the City, Common Ground. *The International Journal of Architectonic, Spatial, and Environmental Design, 8*(2), pp. 1-20.

68. Murator (2024). *52 lata Turnieju Budowlanego „Złota Kielnia" - krótka historia*. Retrieved from: https://www.muratorplus.pl/biznes/firmy-i-ludzie/52-lata-turnieju-budowlanego-zlota-kielnia-krotka-historia-aa-J3By-8sRs-pT4w.html, 25.06.2024.
69. Murzyn-Kupisz, M., Działek, J. (2013). Cultural Heritage in Building and Enhancing Social Capital. *Journal of Cultural Heritage Management and Sustainable Development, 3*(1), pp. 35-54. doi: 10.1108/20441261311317392.
70. Murzyn-Kupisz, M., Hołuj, D., Działek, J. (2022). Społeczno-ekonomiczne oddziaływanie dziedzictwa. Stan badań oraz perspektywy i potrzeby nadawcze w kontekście polskim. *Dziedzictwo kulturowe w badaniach, vol. III*. Warszawa/Kraków: Narodowy Instytut Dziedzictwa.
71. Musialik, W. (2019). Tworzenie system bezpieczeństwa i higieny pracy w rzemiośle. In: W, Musialik, R. Śmietański (Eds.), *Rzemiosło w wymiarze regionalnym, krajowym i międzynarodowym* (pp. 283-292). Opole: Politechnika Opolska.
72. Namyślak, B. (2015). The meaning and prospects of cultural sector development. Problems and challenges of cultural policy in Poland, ECREG STUDIES. *Economic and Regional Studies, 8*(3), pp. 51-66.
73. Nilsson, I., Reid, N. (2019). The value of a craft brewery: On the relationship between craft breweries and property values. *Growth and Change. 50*, pp. 689-704. doi: 10.1111/grow.12292.
74. Nofitasari, D., Bramasthana, S.P., Larasati, A.S., Yani, T.T.L. (2023). The Promotion Mix Strategy of Craft Business: A Case Study In Naturalan.id. *TUMATA Journal of Arts and Cultural Management, 1*(1), pp. 3-9.
75. Nzei, J.A. (2024). Role of Handicraft in Tourism Promotion and Economic Empowerment in Nigeria. *International Journal of Social Science and Education Research Studies, 4*(8), pp. 829-835. doi: 10.55677/ijssers/V04I8Y2024-01.
76. Obeyesekere, S.V. (1988). The role of a craft museum in marketing/ promoting crafts and the Lakpahana experience. *Museum, Museums and crafts, 157*, *XL(1),* pp. 10-17.
77. Pakuła, L. (1994). *Rola przemysłu i rzemiosła w życiu gospodarczym ludności Podhala, Studia nad przemianami Podhala* (pp. 177-200). In: B. Górza (Ed.). Kraków: Wydawnictwo Naukowe Wyższej Szkoły Pedagogicznej.
78. Pech, M., Kopova, A. (2022). Competition, promotion, and activities of microbreweries during the Covid-19 pandemic. *DETUROPE – The Central European Journal of Regional Development And Tourism, 14*(1), pp. 65-86.
79. Poznań (2022a). *Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/zaulek-rzemiosla/, 20.08.2024.
80. Poznań (2022b). Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-lutnik-benedykt-niewczyk/, 20.08.2024.
81. Poznań (2022c). *Poznańscy rzemieślnicy - Introligatornia Lewandowscy*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-introligatornia-lewandowscy/, 20.08.2024.

82. Poznań (2022d). *Poznańscy rzemieślnicy - Sir. B Fancy Buttons*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-sir-b-fancy-buttons/, 20.08.2024.
83. Poznań (2023a). *Poznańscy rzemieślnicy - Krawiectwo Miarowe Krupa i Rzeszutko*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-krawiectwo-miarowe-krupa-rzeszutko/, 20.08.2024.
84. Poznań (2023b). *Poznańscy rzemieślnicy – Neonowe Serce Wielkopolski*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-neonowe-serce-wielkopolski/, 20.08.2024.
85. Poznań (2023c). *Poznańscy rzemieślnicy - HELLO Calligraphy*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-hello-caligraphy/, 20.08.2024.
86. Poznań (2023d). *Poznańscy rzemieślnicy – relacja z Design Festiwal 2023*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/poznanscy-rzemieslnicy-relacja-z-festiwalu-2023/, 20.08.2024.
87. Poznań (2024a). *Studio Artystyczne Małachowscy – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/studio-artystyczne-malachowscy-zaulek-rzemiosla/, 20.08.2024
88. Poznań (2024b). *Pracownia Fotograficzna Dark – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/pracownia-fotograficzna-dark-zaulek-rzemiosla/, 20.08.2024.
89. Poznań (2024c). *Szumidło – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/szumidlo-zaulek-rzemiosla/, 20.08.2024.
90. Poznań (2024d). *Pracownia OYCA – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/pracownia-oyca-zaulek-rzemiosla/, 20.08.2024.
91. Poznań (2024e). *Ceramika Kopiczko – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/ceramika-kopiczko-zaulek-rzemiosla/, 20.08.2024.
92. Poznań (2024f). *Klinika Starych Zegarów – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/klinika-starych-zegarow-zaulek-rzemiosla/, 20.08.2024.
93. Poznań (2024g). *Greenowacja – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/greenowacja-zaulek-rzemiosla/, 20.08.2024.
94. Poznań (2024h). *Wytwórnia Bakcyl – Zaułek rzemiosła*. Retrieved from: https://video.poznan.pl/wideo/odkryj-poznan/wytwornia-bakcyl-zaulek-rzemiosla/, 20.08.2024.
95. Poznań (n.d. a). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/cukiernia-weber,p,40244,59380,75261.html, 20.08.2024.

96. Poznań (n.d. b). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/pracownia-szycia-kolder-i-czyszczenia-pierza,p,40244,59380,75330.html, 20.08.2024.
97. Poznań (n.d. c). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/pracownia-lutnicza-niewczyk-i-synowie,p,40244,59380,75329.html, 20.08.2024.
98. Poznań (n.d. d). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/pracownia-szewska-bernard-jakubowski,p,40244,59380,75327.html, 20.08.2024.
99. Poznań (n.d. e). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/artisan-pracownia-zegarmistrzowska,p,40244,59380,76208.html, 20.08.2024.
100. Poznań (n.d. f). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/piorko-czyszczenie-pierza,p,40244,59380,76209.html, 20.08.2024.
101. Poznań (n.d. g). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/retro-folk,p,40244,59380,76941.html, 20.08.2024.
102. Poznań (n.d. h). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/dr-shoes,p,40244,59380,76283.html, 20.08.2024.
103. Poznań (n.d. i). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/etazerka,p,40244,59380,76282.html, 20.08.2024.
104. Poznań (n.d. j). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/geccobag,p,40244,59380,76225.html, 20.08.2024.
105. Poznań (n.d. k). *Zaułek rzemiosła*. Retrieved from: https://www.poznan.pl/mim/wortals/wortal,884/pgip,p,40244,59380,76943.html, 20.08.2024.
106. Purnomo, V.D. (2023). Analysis of the Marketing Strategy for Iron Crafts in an Effort to Increase Welding Workshop Income in Sanggrahan Hamlet, Bendungan Village. *Formosa Journal of Science and Technology (FJST), 2*(1), pp. 319-332. doi: 10.55927/fjst.v2i1.2635.
107. Radio Poznań (2017). *Rzemieślnicy są siła*. Retrieved from: https://radiopoznan.fm/informacje/publicystyka/rzemieslnicy-sa-sila, 23.06.2024.
108. RC (2017). *Rzemiosło w modzie*. Retrieved from: https://m.rc.fm/news/pleszew-rzemioslo-w-modzie.html, 24.05.2024.
109. Reid, N. (2018). Craft breweries, adaptive reuse, and neighborhood revitalization. *Urban Development Issues, 57*, pp. 5-14. doi: 10.2478/udi-2018-0013.
110. Rogatka, K., Środa-Murawska, S, Biegańska, J., Grzelak-Kostulska, E., Chodkowska-Miszczuk, J. (2014). Środowisko przyrodnicze a planowanie przestrzenne. *Nierówności Społeczne a Wzrost Gospodarczy, 43*(3), pp. 302-312. doi: 10.15584/nsawg.2015.3.24.
111. Sanetra-Szeliga, J. (2013). *Sektor kultury a rozwój gospodarczy miasta*. In: J. Hausner, A. Karwińska, J. Purchla. (Eds.), *Kultura a rozwój* (pp. 413-433). Warszawa.
112. Sanetra-Szeliga, J. (2017). Kultura jako element składowy jakości życia w mieście. *Kultura i Rozwój, 1*(2). doi: 10.7366/KIR.2017.1.2.03.

113. Sanetra-Szeliga, J. (2018). Kultura jako element ekonomii społecznej. *Ekonomia Społeczna, 2*, pp. 50-58. doi: 10.15678/ES.2018.2.06.
114. Sheppy, L. (2023). An industrial craft reinstated: A printmaker's perspective on tissue transferware. *IMPACT Printmaking Journal*, pp. 1-13.
115. Srivastav, D.K. (2017). Significance of tourist shopping in promotion of a destination along-with empowering craftsmen. *Humanities India ICHSS, VIII(I).* BHU, Varanasi, INDIA, pp. 11-20.
116. Starczewska-Wojnar, A. (2021). W mieście i na wsi. Symbole działalności rzemieślniczej i zawodowej na wybranych pieczęciach z zasobu Archiwum Państwowego w Opolu (XVI-1 poł. XX w.). In: W. Musialik, K. Mazur-Włodarczyk, E. Said (Eds.), *Rzemiosło – stan i zmiany w wymiarze lokalnym, regionalnym i międzynarodowym* (pp. 147-176). Opole: Politechnika Opolska.
117. Suarmaja, I.B.K., Cipta, I.W., Yulianthini, N.N., Yudiaatmaja, F. (2021). The Impact of Digital Marketing System on Weaving Crafts Sales Growth in Buleleng Regency. *Advances in Economics, Business and Management Research, 197*, pp. 343-347.
118. Szymańskim, A. (2015). *Rzemiosło i przemysł miejski w Wielkopolsce w drugiej połowie XVIII wieku.* Polskie Towarzystwo Kulturalne. Poznań: Muzeum regionalne w Pleszewie.
119. Thangam, T.G., Bharathi, R.P., Selvanithya, P. (2023). Marketing of local made handicraft business in implementing promotion strategies for their products. *YMER, 22*(4), pp. 458-474.
120. Traiyarach, S., Banjongprasert, J. (2022a). Craft Product Export Promotion Competitiveness: The Mediating Effect between Niche Differentiation Strategy and Export Performance. *Journal of Marine Science and Engineering, 10*, 999. doi: 10.3390/jmse10070999.
121. Traiyarach, S., Banjongprasert, J. (2022b). The Impact of Export Promotion Programs on Export Competitiveness and Export Performance of Craft Products. *Journal of Marine Science and Engineering, 10*, 892. doi: 10.3390/jmse10070892.
122. TVP3 Poznań (2023). *Wielkopolski Festiwal Rzemiosła* (14.04.2023). Retrieved from: https://poznan.tvp.pl/69181548/wielkopolski-festiwal-rzemiosla-14042023, 23.06.2024.
123. UNESCO (2023). *Monitoring and Reporting*. Retrieved from: https://www.unesco.org/en/creative-cities/monitoring-and-reporting?hub=80094, 22.08.2024.
124. WARP (2024). *Rzemiosło w Polsce*. Retrieved from: https://warp.org.pl/rzemioslo-w-polsce/, 09.09.2024.
125. Wielkopolska Izba Rzemieślnicza w Poznaniu (2024). *Za nami wspaniałe wydarzenie promujące rzemiosło*. Retrieved from: https://www.irpoznan.com.pl/wiadomosc,za-nami-wspaniale-wydarzenie-promujace-rzemioslo.html, 22.06.2024.
126. Wielkopolska Izba Rzemieślnicza w Poznaniu (n.d. a). *Wiadomości*. Retrieved from: https://www.irpoznan.com.pl/tagi,rzemioslo.html, 25.06.2024.

127. Wielkopolska Izba Rzemieślnicza w Poznaniu (n.d. b.). *Marketing internetowy nową siłą rzemiosła.* Retrieved from: https://www.irpoznan.com.pl/strona,marketing-internetowy-nowa-sila-rzemiosla.html, 27.08.2024.
128. Wielkopolski Urząd Wojewódzki w Poznaniu (2011). *Międzychodzkie Dni Rzemiosła.* Retrieved from: https://poznan.uw.gov.pl/wydarzenia-archiwalne/miedzychodzkie-dni-rzemiosla, 23.06.24.
129. Wirtualna (2024). *Promocja tradycji i kreatywności, czyli I Festiwal Rzemiosła*. Retrieved from: https://wirtualna.scenatodziwna.eu/2024/05/08/promocja-tradycji-i-kreatywnosci-czyli-i-festiwal-rzemiosla/, 9.09.2024.
130. Wojewódzki Urząd Pracy w Poznaniu (n.d.). *Poznański program promocji i wsparcia rzemiosł unikatowych, „Zaułek Rzemiosła". Regulamin*. Retrieved from: https://wuppoznan.praca.gov.pl/documents/161065/21454602/Regulamin%20programu%20/2a22cc35-91fe-496e-b415-0c4cc0c1e748?t=1689760154714, 17.08.2024.
131. Wu, J., Guo, L., Jiang, J., Sun, Y. (2021). The Digital Protection and Practice of Intangible Cultural Heritage Crafts in the context of New Technology. *E3S Web of Conferences, 236*, 05024. doi: 10.1051/e3sconf/202123605024.
132. Zabłocka, M. (2019). *Rzemiosło w przestrzeni kulturowej.* Izba Rzemiosła i Przedsiębiorczości w Lubinie. Lublin: „MULTIPRESS" G. Wodecki, D. Wodecka, B. Wodecki Spółka jawna.
133. Zbuchea, A. (2014). Territorial marketing based on cultural heritage. *Management & Marketing, XII*(2), pp. 135-151.
134. Zespół Szkół Usługowo-Gospodarczych w Pleszewie (2023). *11 maja rusza Wielkopolski Festiwal Rzemiosła*. Retrieved from: https://www.zsug.pl/681-11-maja-rusza-wielkopolski-festiwal-rzemios%C5%82a, 23.06.2024.
135. Związek Rzemiosła Polskiego (2022). *Wykaz regulaminów konkursów zawodowych o zasięgu ogólnopolskim zatwierdzonych przez Związek Rzemiosła Polskiego*. Retrieved from: https://zrp.pl/dzialalnosc-zrp/oswiata-zawodowa/egzaminy/wykaz-regulaminow-konkursow-zawodowych-o-zasiegu-ogolnopolskim/, 25.06.2024.
136. Związek Rzemiosła Polskiego (n.d.). *Aktualności*. Retrieved from: https://zrp.pl/kategoria/aktualnosci/, 25.06.2024.

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INTELLIGENT TRANSPORT SYSTEMS IN PUBLIC TRANSPORTATION – A CASE STUDY

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Purpose: The study aimed to assess the effectiveness of implementing modern ticket distribution channels in Bydgoszcz's public transportation, with research questions regarding the ticket distribution channels most frequently used by passengers and the impact of new technologies on single-use and periodic ticket sales.
Design/methodology/approach: The study employed a case study method and analysis of the documentation provided by the Municipal Roads and Public Transportation Authority [Polish: Zarząd Dróg Miejskich i Komunikacji Publicznej] in Bydgoszcz. It covered ticket sales data for 2019-2022. Statistical methods and data visualizations were used to identify trends and compare the sales results.
Findings: A dynamic increase in e-ticket sales, particularly via mobile applications and the Bydgoszcz City Card [Polish: Bydgoską Karta Miejska (BKM)], has been noted in 2019-2022. Single-use ticket sales via vending machines increased by 25%, and periodic ticket sales by 15%. The impact of the COVID-19 pandemic was particularly evident in 2020, when passengers shifted *en masse* to remote channels. The research has confirmed that passengers value the convenience and accessibility of modern ticket purchasing methods. Sales process automation and procedure simplification have significantly increased the attractiveness of public transportation.
Originality/value: The study has confirmed that the implementation of modern technologies has contributed to the increase in ticket sales in Bydgoszcz, while e-ticketing and mobile applications have alleviated the barriers to ticket accessibility. It is therefore recommended to expand the function of the Bydgoszcz City Card, by, e.g., integrating it with additional city services, and promoting mobile applications as the primary ticketing channel.
Keywords: public transportation, ticket distribution, intelligent transport systems.
Category of the paper: case study.

1. Introduction

In today's dynamic urban environment, the complex challenges of public transportation call for innovative and effective solutions. One of the key aspects of improving the quality of urban transportation entails optimization of the process involved in facilitating dynamic information on its operation, as well as improvement of ticket distribution channels, affecting directly the comfort of passengers and the availability of public transportation services (Bogacki, Bździuch, 2017). The present study is centered on a general presentation of the subject of urban public transportation, with particular emphasis on the application of modern technology in transportation, in this case, with regard to ticket distribution in public transportation as an element contributing to increased numbers of passenger, on the example of the city of Bydgoszcz (Goras, Gadziński, 2019)

As one of the country's major dynamic urban centers, Bydgoszcz has been targeting ambitious urban mobility goals. The city and its local transportation agency - the Municipal Roads and Public Transportation Authority [Polish: Zarząd Dróg Miejskich i Komunikacji Publicznej (ZDMiKP)] – need to ongoingly respond to the constant challenges involved in increasing the efficiency and attractiveness of public transportation through implementation of modern ITSs, including DPI (Dynamic Passenger Information systems) and single-use and periodic ticket distribution systems. It is the online public transport search engines and the systems facilitating the purchase of tickets which are the first elements residents, prospective bus or trolley passengers, interact with.

The trigger for an in-depth study of ticket sales levels in the various distribution channels came from the noticeable changes in passengers' ticket purchase preferences, the widely introduced cashless payment, and the uptake of single-use and periodic e-tickets. One additional stimulus noticeably affecting ticket distribution channels was the COVID coronavirus pandemic, which effected an evolution throughout the entire public transportation system, indicating that adequate introduction of innovative ticket distribution solutions holds potential (Grzegorzewski, 2020). New ticket distribution technologies, as well as new e-ticket offers, such as cards, in-app tokens, and QR codes, not only have streamlined the process of consuming the service of transportation, but also increased the attractiveness of public transportation for the residents of Bydgoszcz (Krawiec K., Krawiec S., 2019).

2. Public transportation and modern ticketing technologies

Basic transportation infrastructure constitutes a key component of the world's economic structure. It comprises the fundamental means and institutions essential to the movement of people and the transfer of material goods. Transportation entails a complex system, encompassing all activities involved in the movement of people and goods, including cargo management and essential logistics. Transportation infrastructure consists of a variety of engineering elements, such as roads, railroads, ports, airports, intermodal terminals, and advanced technologies essential in traffic flow optimization, e.g., traffic signals, transmission stations, power supply facilities, transshipment and forwarding sites. In shaping the development of transportation infrastructure, the institutions managing transport organization play an important role by ensuring safe, efficient and sustainable transportation of people and goods (Gadziński, Goras, 2019).

Efficient management of transport and mobility in urban areas has become one of the most important policy issues for local governments. Modern cities are places characterized by particularly highly-concentrated movement of people and goods within a small area. This causes significant exacerbation of transportation problems. Typically, the needs and expectations of different traffic participants, businesses or residents vary greatly. Also, the effects of transport activities can substantially affect the environment - the natural environment, public space, urban development. It is therefore imperative today to carry out transportation development policies in the most sustainable manner possible (Szubra, 2017; Obserwatorium Polityki…, 2021).

Mobile technologies have become a permanent aspect of our daily lives, and the use of a combination of such technological features as Wi-Fi, cell phone networks, GPS, RFID, as well as the widespread availability of the Internet, open up new pathways of obtaining and communicating information relevant to various aspects of our lives (Kumar Singh, Singh, Zear, 2016). One area in which the above-mentioned technologies can substantially improve our information needs is public transportation. The various technological solutions employed in this sector not only can expedite and facilitate traveling by public transportation, but also render it more enjoyable. In specific cases, they can even contribute to improved travel comfort and safety.

The nature of public transportation dictates the movement of the means of transport in accordance with a fixed timetable providing key information to passengers regarding the planned route and hours. Traditionally, passengers acquire this knowledge from paper placards displayed by the carriers at bus stops. Despite the widespread use of this solution, it does come with some inconveniences. First, in order to obtain timetable information, passengers need to visit a given stop in person. Second, the timeliness of the information displayed at bus stops depends on the regularity of the carriers' activity in this regard. Even temporary timetable changes oblige them to update the placards at each stop. When changes are not physically posted on bus stop placards, passengers are presented with outdated information. Third, placards in public places are exposed to vandalism. It is well known that passengers are obliged to pay the fares for the public transport vehicle service when using public transportation. The traditional fare payment procedure is to purchase and validate a ticket, but this classic method entails certain inconveniences. To purchase a ticket, passengers must first locate an active ticket outlet. Another inconvenience lies in the need to pay in cash for the ticket, and when purchased from the bus driver, exact change is often requested. Moreover, a paper ticket is subject to damage, such as crushing, tearing or dampening.

One solution to the above problems is to render timetable information independent of its physical representation in the form of traditional bus stop placards, by posting it on the Internet. This solution comes with a number of advantages, including up-to-dateness of the timetables displayed, owing to the feasibility of simple modification, as well as accessibility anyplace Internet service is available. Standard placards can also be replaced by variable message boards displaying dynamic public transportation schedule information directly at bus stops (Miller, 2012).

The road infrastructure investment constraints widely encountered at the turn of the last few years, as well as the terrain limitations on the expansion and construction of new urban transportation infrastructure, with a simultaneous rapid increase in the rate of motorization, have led to increased development of road telematics systems. The availability and spread of road telematics has been positively received by road managers and transportation authorities, who have launched investment activities in this area. Modern traffic management systems, utilizing the broad concept of telematics, have also found application in Poland over the past dozen or so years, especially on urban roads, the multifaceted functions of which can thereby be combined with existing smart city solutions, yielding tangible benefits by utilizing the maximum capabilities of the existing transportation infrastructure.

The idea of solutions generally referred to as Intelligent Transportation Systems (ITSs) was officially endorsed at the inaugural World Congress on Intelligent Transport Systems held in Paris in 1994. ITSs are complex systems employing a variety of technologies to optimize traffic and transportation, improve safety, environmental protection and the ability to actively manage transportation systems using reliable data. They are characterized by high efficiency, flexibility and, most importantly, adaptability to changing traffic conditions (Wałek, 2021).

3. Research methodology

The article aimed to analyze and assess the application of modern technologies in public transportation ticket distribution in Bydgoszcz, including its impact on the increase in passenger numerosity. In achieving this objective, the focus was on the analysis of the source materials providing data on ticket sales in individual ticket distribution channels across the territory of the city of Bydgoszcz, acquired from the local transportation authority - the Municipal Roads and Public Transportation Authority in Bydgoszcz (Mennica Polska..., 2023). The study has also analyzed the level of ticket sales via the available distribution channels in 2019-2022. As a background to the analysis, a general characteristic of urban transportation and the qualitative and quantitative changes affecting it is presented, describing in particular the ticket distribution channels available in Bydgoszcz.

4. Research results

The city of Bydgoszcz is located in the central part of Poland. It forms a robust industrial, commercial, academic and cultural center. Currently, Bydgoszcz, due to its decreasing in size and aging population, is facing an unfavorable demographic situation, affecting its socio-economic development. The trend of population decline in Bydgoszcz results mainly from the observed suburbanization of Polish metropolitan areas, with residents of such cities as Bydgoszcz moving to the outskirts or the neighboring sparser municipalities serving as suburbs. With the creation of optimal working conditions and the optimization of the city's transportation development, the percentage of registered unemployed residents decreased in 2001-2022. The difference between 2001 and 2022 totaled as much as 7 percentage points. As one of the largest economic centers in the country, Bydgoszcz too maintains a well-developed transportation network within the city. The foundation of a sound transportation system within a city is a well-developed road and track infrastructure system.

The ongoing study of traffic volumes, the implementation of measure-appropriate road system modernization as well as the application of proven and repeatable engineering solutions contribute to traffic safety improvement and encourage the use of the infrastructure. Today, systematic monitoring of the changing traffic realities and road users' behavior is facilitated by modern measuring devices and the widely used video monitoring. One example of modern solutions in automatic traffic monitoring, traffic management and public transport optimization is the ITS implemented in 2015 as ‘Intelligent Transport Systems in Bydgoszcz [Polish: Inteligentny Systemy Transportowe w Bydgoszczy].’ The various subsystems comprising it have been implemented under a single master application serving as a specialized tool enabling visualization of the events occurring in the city's transportation system at the Traffic and Transportation Management Center [Polish: Centrum Zarzadzania Ruchem i Transportem] of the Municipal Roads and Public Transportation Authority [Polish: Zarząd Dróg Miejskich i Komunikacji Publicznej] in Bydgoszcz.

Owing to the modernization of bus and trolley fleets in many Polish cities, a steady increase in passenger satisfaction with the quality of public transportation services has been observed. This is attributable to, inter alia, the equipment of new vehicles with additional devices and systems.

Nowadays, a growing number of public transport passengers expect solutions improving travel comfort, providing access to current transport service information, as well as facilitating access to transport services via modern mobile devices, Internet-based access channels, cashless payments and virtual tickets. People today, most of whom own smartphones and payment cards, seek to maximize the use of these functionalities in the process of daily commuting.

Active use of the transportation services provided by urban public transportation entails possession of a fare ticket. A ticket represents a type of contract, between a passenger and a carrier, for a specific route, including the conditions under which the trip is to be realized. The number of single-use and periodic ticket sales reflects, so to speak, the degree of growth in the interest in a given city's public transportation services, i.e., it characterizes directly the increase in the number of passengers.

Both traditional (paper) and electronic tickets are operable in Bydgoszcz. The most popular form of e-ticketing is the Bydgoszcz City Card, on which periodic tickets are encoded. In addition to encoding tickets on the so-called BKM [Polish: Bydgoska Karta Miejska], tickets can also be encoded in electronic form on payment cards and electronic student ID cards. This varied form of public transport tickets has forced the introduction of different types of ticket distribution channels.

To acquire information on the changes in seasonal revenues from the sale of single-use and periodic tickets, taking the differentiation into available ticket distribution channels during the period 2019-2022 into account, data from the transportation authority – ZDMiKP - in Bydgoszcz was obtained.

In the analyzed period, i.e., 2019-2022, a change has been observed in the ticket purchasing method preferences, caused by the spread of new distribution channels employing modern IT solutions, the progressive abandonment of traditional paper tickets in favor of virtual tickets encoded on various types of media, e.g., the Bydgoszcz City Card, or in the applications available on mobile devices and smartphones. The move towards the use of new digital ticketing technologies, in many aspects of daily life, has been an inevitable and desirable process for the majority of the population.

The Covid pandemic, which in Poland began in late February/early March 2020, also contributed significantly to the change in consumers' ticket purchasing practices. The event of this magnitude, global in scope, was the first since the outbreak of World War II. The sudden imposition of numerous restrictions on the population, including restrictions on the use of public transportation, and the general widespread fear of coming into close contact with anything and anyone caused a sudden drop in ticket sales.

The results of the survey indicate significant changes in the single-use ticket purchasing method offered in available distribution channels during 2019-2022. The previously widely used channels of single-use ticketing, i.e., ticket vending machines, mobile ticket machines or information kiosks, were displaced by more modern distribution channels utilizing internet-based, cashless payments, including the Open Payment System (OPS) enabling contactless in-vehicle payments, launched at the end of 2018. The turning-point year in the distribution of single-use tickets was 2020, when as many as 5 out of 6 distribution channels recorded ticket sales declines. The only channel with further increases was the OPS cashless, contactless sales, processed in public transportation vehicles directly. The sales declines in the remaining distribution channels, ranging in volume from 26% to as much as 54%, coincided with the coronavirus pandemic and the restrictions imposed on the use of public transportation. In 2021, ticket sales significantly increased in two modern channels: OPS and mobile phone applications. Other channels either saw minor increases or continued declines; or, as in the case of information kiosks, sales via such devices were discontinued altogether. By the end of 2022, only 4 channels of single-use ticket distribution survived on the Bydgoszcz market: one of the old type, i.e., ticket vending machines, with 3 modern channels geared up for electronic ticket distribution (QR code, token): OPS, terminals, and mobile phone applications, which dominated the sales.

In the case of periodic tickets, no such significant intensification of the purchasing trend, e.g., as the one observed in the sale of single-use tickets, has been noted in modern distribution channels. Periodic tickets have been for years available in electronic form exclusively, encoded on various types of media: city cards, payment cards, student IDs. Periodic tickets have been around for a long time in the digital world, thus are less sensitive to the changes presently offered by modern distribution channels. In analyzing the source data on the proceeds from the sale of periodic tickets via different distribution channels in different years, and referencing it against the level of ticket sales in 2019, a variation in the sales has been observed. The largest decrease in sales occurred in 2020, as in the case of single-use tickets. This decline was caused by the restrictions of the Covid coronavirus pandemic and the limitations in the use of public transportation. Immediately after the largest sales declines in the third quarter of 2020, an additional new distribution channel, linking periodic tickets with payment cards, was introduced, which was welcomed by passengers. In 2021, a rebound in sales has been noted, shifting to an upward trend in most of the available distribution channels, reaching, in 2022, a sales increase in all five channels enabling the purchase of periodic tickets today. The largest increases in 2022 have been noted in ticket purchases via the Internet (44%), using payment cards (47%) and at the transport authority's ticket counters, which saw a sales increase of up to 61%, owing to the introduction of new-user price preferences for the purchase of periodic tickets (for people who have not used periodic transport tickets for at least a year), available only at the ZDMiKP ticket counters in Bydgoszcz.

Public transport passengers, through their choice of new distribution channels relying on electronic (virtual) ticketing and electronically encoded periodic tickets, have indicated a clear direction of their preferred further growth of public transport fare collection in Bydgoszcz. The passengers' choice of ticket purchasing at locations in the immediate vicinity of the means of transport, via an app or at the ticket machines installed in the vehicles, is now an indication of a new trend in the city's transportation system, as evident from the analysis. Further expansion of modern ICT-based distribution channels has been gaining passengers' acceptance. One example of a swiftly accepted novelty in the city's public transportation system was the implementation, in 2018, of the OPS - direct payment for travel using payment cards, which quickly became a leading modern ticket purchase channel, as confirmed by the continually growing number of users purchasing tickets via the OPS.

Conclusion

The study indicated that the sales of single-use and periodic tickets via modern distribution channels, such as OPS, mobile apps and the Internet, shows an upward trend, compared to traditional methods involving stationary devices or sales at ticket counters. The introduction of these channels contributed to halting the decline in public transport ticket sales triggered by the Covid-19 pandemic, bringing the sales back to pre-pandemic levels. Modern solutions, employing remote and online sales, have been received positively both by passengers purchasing single-use tickets as well as periodic ticket users.

Ticket machines have been observed to be location-dependent in their popularity - interest in devices installed directly in vehicles and allowing contactless payments has been growing, while stationary ticket vending machines, located outside vehicles, have been losing momentum. After the Covid-19 pandemic, the trend in using modern distribution channels has solidified, indicating this change to be permanent. Moreover, distribution channels relying on cashless flows and ticket virtualization, such as QR codes or other forms of coding, may benefit transport authorities in the long run, by reducing the cost of maintaining these systems.

In conclusion, the increased revenues from ticket sales via modern distribution channels indicate a growing interest in such purchases, which translates into an increase in the number of public transport passengers utilizing these solutions.

References

1. Bogacki, M., Bździuch, P. (2017). *Transport miejski i regionalny*. Warsaw: Stowarzyszenie Inżynierów i Techników Komunikacji Rzeczypospolitej Polskiej.
2. Gadziński, J., Goras, E. (2019). *Obserwatorium Polityki Miejskiej "Raport o stanie polskich miast – Transport i mobilność miejska".* Warsaw: Instytut Rozwoju Miast i Regionów, p. 8.
3. Goras, E., Gadzinski, J. (2019). *Raport o stanie polskich miast - Transport i mobilność miejska.* Warsaw: Instytut rozwoju Miast i Regionów.
4. Grzegorzewski, R. (2020). Wpływ pandemii na zmianę zachowań komunikacyjnych, poziom sprzedaży biltów i preferencji wyboru kanałów dystrybucji biletów. *Biuletyn komunikacji miejskiej*.
5. Krawiec, K., Krawiec, S. (2019). *Transport Miejski i Regionalny*.
6. Kumar Singh, P, Singh, Y., Zear, A. (2016). Intelligent Transport System: A Progressive Review. *Indian Journal of Science and Technology*.
7. Mennica Polska S.A, in cooperation with ZDMiKP in Bydgoszcz (2023). *Koncepcja wdrożenia internetowego systemu sprzedaży biletów okresowych komunikacji miejskiej, których identyfikatorem jest bankowa zbliżeniowa karta płatnicza.*
8. Miller, P. (2012). *Technologie mobilne usprawniające korzystanie ze środków komunikacji publicznej na przykładzie rozwiązań stosowanych w miejskim przedsiębiorstwie komunikacyjnym*. Studia i Materiały Polskiego Stowarzyszenia Zarządzania Wiedzą. Łódź.
9. Szruba, M. (2017). *Rozwój budowy dróg i nawierzchni drogowych*, pp. 46-48.
10. Wałek, T. (2021). *Inteligentne Systemy Transportowe jako instrument poprawy bezpieczeństwa.* Security, Economy & Law.

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