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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 39 papers.

The papers presented in the number concentrate on many topics connected with organization and management. There are in the number papers about organizational behavior, entrepreneurship, services management, social capital, medical services management, the impact of COVID-19 pandemic on management, marketing, production management, human resource management, artificial intelligence in management, risk management, finances, lean management, green management, project management, business models, economics, strategic management, quality management, logistics, sustainable development, waste management, and environmental management.

Radosław Wolniak

ORGANISATIONAL CITIZENSHIP BEHAVIOURS AND WORK MOTIVATION OF EMPLOYEES IN FOR-PROFIT, PUBLIC AND NONPROFIT ORGANISATIONS

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Purpose: The purpose of the article is to determine the correlation that exists between OCB and work motivation among employees in for-profit, public, and nonprofit organisations.

Design/methodology/approach: The cross-sectoral study was conducted in 2022. The sample consisted of employees representing three types of organisations: for-profit, public and nonprofit, one hundred from each type of entity mentioned. The opinions of the respondents were collected using a Google form and by means of a printed version of the survey questionnaire. In the research there were used the 12-item OCB scale developed by Spector. Employee motivation was examined using the WEIMS-PL scale, which is a translated equivalent of the Canadian Work Extrinsic and Intrinsic Motivation Scale (WEIMS).

Findings: The correlations between the OCB-P subscale (towards people in the organisation) and the WEIMS-PL subscales were mostly positive but only negligible. Stronger correlations were observed between the WEIMS-PL and OCB-O (towards the organisation) subscales, particularly in the for-profit and nonprofit entities. In most cases they were positive and moderate in strength. A strong correlation was found between intrinsic motivation and OCB-O in NPOs and a slightly weaker one in for-profits. In public organisations this correlation was negligible. The correlations between OCB-O and 3 of the 4 subtypes of extrinsic motivation were also stronger in NPOs and for-profits than in public organisations: introjected regulation, identified regulation and integrated regulation.

Research limitations/implications: The study was only quantitative and not qualitative, relying solely on respondents' statements. The sample was purposively selected, which means that the results cannot be generalised, and the study only involved Polish organisations, which means that it was embedded in a specific cultural context that should be taken into account when formulating conclusions. In addition, the research was not longitudinal but cross-sectional. The results might be different in a longitudinal study. The data were lagged, which does not allow for strong causal inferences. Moreover, the use of questionnaire-based research may have triggered a common method bias.

Originality/value: The contribution of this study is that the OCB-WM correlation analysis was carried out in for-profit, public and nonprofit organisations, which has not been done before.

Keywords: organisational citizenship behaviours, work motivation, for-profit organisations, public organisations, nonprofit organisations.

Category of the paper: Research paper.

1. Introduction

From the classic Weberian perspective, an organisation is perceived as composed of a hierarchy of authority, division of labour and coordination mechanisms (regulations, procedures). At the end of the last century, the organisational citizenship dimension began to be more strongly emphasised (Bateman, Organ, 1983; Smith et al., 1983; Borman et al., 2001), even drawing parallels to political philosophy (Graham, 1991; Van Dyne et al., 1994). One of the concepts of organisational citizenship embraced by the literature is organisational citizenship behaviour (OCB).

Researchers dealing with the problem of citizenship behaviours in organisations point out that the success of an enterprise depends not only on how employees handle assigned tasks but also on whether they support the psychosocial context in which work takes place (Borman, Motowidlo, 1993; Organ, 1997; cf. Podsakoff et al., 2013; Podsakoff et al., 1997) - that is, whether they help their colleagues, interact with the organisation as a whole, participate in its functioning, voluntarily engage in work that does not formally enter the scope of their duties. Let us note that managers have a relatively high ability to control formal factors: tasks assigned to an employee occupying a specific post (often outlined in the job description) or the structure of positions. However, this is not so when it comes to engagement that goes beyond the scope of typical employee duties. These are more likely to be linked with factors that are, to a certain extent, beyond the direct control of managers: individual traits, professed values, displayed attitudes (cf. Smith et al., 1983; Farh et al., 1990; Williams, Anderson, 1991; McNeely, Meglino, 1992; Moorman et al., 1993; Organ, Lingl, 1995; Konovsky, Organ, 1996; Borman et al., 2001; Spector, Fox, 2002; Blakely, Andrews, Moorman, 2005; Blakely, Srivastava, Moorman, 2005; van Dick et al., 2006; Turnipseed, 2017; Urbini et al., 2020).

In the context of employees' citizenship behaviours within the organisation, the motivational aspect seems to play an important role. Rioux and Penner (2001), Finkelstein and Penner (2004; Finkelstein, 2006; cf. Finkelstein, 2008; Finkelstein et al., 2005) developed the area of research where motivators are approached as correlates of citizenship behaviours. We learn from the literature that OCB is a motivation-based behaviour, meaning that motivation spawns OCB (Davila, Finkelstein, 2013). In turn, the relationship between OCB and motivation has been examined, including as a mediating variable (Finkelstein, 2011; Ahmed, Khan, 2016; Shaaban, 2018; Margahana et al., 2018; Widarko, Anwarodin, 2022).

Research has shown that employees may differ depending on the type of the organisation. Cross-sectoral differences in work motivation, for instance, have been found among employees of for-profit and not-for-profit entities (De Cooman et al., 2011). A similar disparity was observed between public and nonprofit managers (Lee, Wilkins, 2011). Importantly, nonprofit entities rely on volunteers who differ from paid employees in the following areas: dispositions

(Elshaug, Metzger, 2001; Mitani, 2014) and attitudes (Laczo, Hanish, 1999; Pearce, 1993; cf. Liao-Troth, 2001).

As no publications were found that benchmarked OCB and motivation in organisations representing three major economic sectors, it was decided to undertake this research to fill this gap. The purpose of this article is to determine the correlation that exists between OCB and work motivation among employees in for-profit, public, and non-profit organisations. To this end, we conducted a survey.

The paper is divided into the following sections: introduction, literature review, methods, results, discussion, and conclusions. In the introduction, the research gap and the purpose are synthetically laid out. In the first main section, the results of the literature review on OCBs as well as work motivation were presented alongside the differences between for-profit, public and nonprofit organisations. Section two contains a description of research methodology, while section three is where the results are discussed. In section four, the findings were benchmarked with some of the findings of other authors. In the conclusion, implications for managers as well as limitations and future research suggestions were shared.

2. Literature review

2.1. Organisational citizenship behaviours

In the literature there are several concepts aiming to encapsulate behaviours geared towards helping colleagues and supporting organisations: Organizational citizenship behaviours (Bateman, Organ, 1983; Smith et al., 1983; Organ, 1988; Organ, Konovsky, 1989), Prosocial organizational behaviours (Brief, Motowidlo, 1986), Extra-role behaviours (Van Dyne et al., 1995), Contextual performance (Borman, Motowidlo, 1997), Citizenship performance (Borman et al., 2001).

According to Organ (1988), OCB is an individual behaviour that is discretionary, not explicitly recognized by the formal reward system, and that in the aggregate promotes the effective functioning of the organisation. Prompted to consider whether OCB covers extra-role behaviours as well, Organ modified his own definition stating that OCB supports the social and psychological environment in which task performance takes place (Organ, 1997; cf. Morrison, 1994; Van Dyne et al., 1994). It is worth noting that this support may benefit the organisation in general or specific people, in which case it indirectly contributes to organisation development (Williams, Anderson, 1991).

In the course of conceptualising the problem at hand, researchers identified dimensions of OCB. Smith et al. (1983) distinguished altruism and generalised compliance, while for Organ (1988) that was: altruism, conscientiousness, sportsmanship, courtesy, and civic virtue.

Podsakoff et al. (2000), based on examination of literature, singled out the following: helping behaviour, sportsmanship, organisational loyalty, organisational compliance, individual initiative, civic virtue, self-development.

2.2. Work extrinsic and intrinsic motivation

One of the most well-established theories of work motivation is Self-Determination Theory (SDT) (Deci, Ryan, 2000; Ryan, Deci, 2017, 2020). It suggests that ‘employees’ performance and their well-being are affected by the type of motivation they have for their job activities. SDT therefore differentiates types of motivation and maintains that different types of motivation have functionally different catalysers, concomitants, and consequences’ (Deci et al., 2017, p. 20).

SDT proposes that motivation lies on a continuum ranging from amotivation, extrinsic motivation to intrinsic motivation (Ryan, Deci, 2000). At the beginning of this continuum is amotivation which refers to the state of being unmotivated or lacking the willingness or intention to act (Ryan, Deci, 2000). It can occur, for instance, when an employee does not believe that he or she can perform in ways required of him or her (Deci, Ryan, 1985b). At the opposite end of the continuum is an intrinsic motivation which is characterised as the performance of an activity for its inherent satisfaction (Ryan, Deci, 2000). In between the extreme poles of the continuum there is an extrinsic motivation that can be controlled or autonomous (Chua, Ayoko, 2021). The SDT theory outlines four types of extrinsic motivation that differ in the degree to which the motivation has been internalised and assimilated with the self. The behaviours that follow from these four types of extrinsic motivation differ in their degree of autonomy. Those that have been more fully internalised will be the basis for more autonomous or self-determined actions. Thus, the degree of internalisation and the type of regulation that follows from these degrees of internalisation are ordered along a relative autonomy continuum’ (Deci, Ryan, 2009, p. 443).

According to Deci and Ryan (1985b, 2000; cf. Kotera et al., 2018) extrinsic motivation can be categorised into four subtypes: integrated regulation, identified regulation, introjected regulation and external regulation. They explain that employees with external regulation work only because that brings them an external reward. Introjected regulation arises when workers are motivated by self-image; they engage in work because they want other people to see them in a certain way. Identified regulation relates to employees who acknowledge the value of the work activity; they work because they understand that it is important for them. Integrated regulation arises when an employee has fully integrated a motivation within themselves; they work because they believe that work is a part of their identity.

The three lower forms of motivation (amotivation, external regulation, introjected regulation) are referred to as non-self-determined motivation or controlled motivation, while the three higher forms of motivation (identified regulation, integrated regulation, and intrinsic

motivation) are classified as self-determined motivation or autonomous motivation (Gagne, Forest, 2008).

2.3. Organisational citizenship behaviours and work motivation

The literature points out that motives may play an important role in OCB (Rioux, Penner, 2001). OCB is a motivation-based behaviour, which means OCB develops due to motivation (Davila, Finkelstein, 2013). The research also suggests that not all employees who engage in OCBs and other forms of voluntary helping behaviours expect recognition or some form of reward for their actions (Lyons et al., 2022).

According to other researchers, motivation and OCB are highly correlated (Organ, 1988; LePine et al., 2002; cf. Jacobsen, Beehr, 2022; Morgahana et al., 2018; Osman et al. 2015; Umar et al., 2022; Widarko, Anwarodin, 2022). Similarly, Tang and Ibrahim (1998) found a significant link between an individual's motivation and OCB, and Faria (2022) stated that three dimensions of work motivation (work structure motivation, commitment motivation, goal-setting motivation) have a significant effect on the organisational citizenship behaviours. Meanwhile, Wyche-Seawood (2019) conducted research among public-sector workers to determine that employees' levels of motivation may not result from citizenship behaviours alone, but rather employees' motives for citizenship behaviours.

Finkelstein (2011, p. 19) suggests that 'motives, and the types of OCB they foster, derive in part from individual differences in motivational orientation. Intrinsically-motivated individuals manifested internal, other-oriented motives for OCB, while those with extrinsic orientations were driven largely by external, self-focused objectives'. According to Widarko and Anwarodin (2022, p. 123) 'employees with high intrinsic motivation impact organisational citizenship behaviour (OCB) better because they show an attitude of working more than other employees as a form of their perspective of responsibility'.

Enwereuzor et al. (2015) observed that external regulation and intrinsic motivation contributed significantly in negative and positive directions to the prediction of OCB, respectively, whereas identified regulation, amotivation, integrated regulation and introjected regulation all failed to contribute significantly to OCB. Whereas, van der Broeck et al. (2021) found that identified regulation is more powerful in predicting organisational citizenship behaviours.

For the purposes of comparison, let us point out that Ahmed and Khan (2016) found that both extrinsic and intrinsic motivations affect employee commitment to organisational citizenship behaviours, and in the view of Shaaban (2018), OCB can be developed throughout the application of extrinsic motivation more than intrinsic motivation among employees. Barbuto and Story (2011; cf. Barbuto et al., 2001), however, found no relationships between intrinsic process motivation and organisational citizenship behaviours, but they did find a significant negative correlation between employees' instrumental motivation and OCB, also discovering that self-concept external motivation was negatively related to OCB,

self-concept internal motivation was positively related to OCB-total, and goal internalisation was not related to OCB.

The literature also points to factors which mediate the relationship between work motivation and OCB, e.g. job satisfaction, job involvement, psychological empowerment, perceived organisational support, employee engagement, organisational justice and reward matching with personal goals (Ahmed, Kahn, 2016; cf. Hidayah, Hendarsjah, 2021; Kim et al., 2020; Rumengan et al. 2022; Uliyah, Ariyanto, 2021).

The presented study was conducted in for-profit and/or public organisations. However, there are few studies concerning volunteers as a specific employee category (characteristic of nonprofit entities). Van Schie et al. (2015) found that, for them, general self-determined motivation enhanced work engagement, whereas OCB was solely linked to organisation-focused, self-determined motivation. No comparative studies were identified that examine the relationships between the dimensions of work motivation (via WEIMS) and OCB (OCB-O, OCB-P) in three types of organisations: for-profit, public, and nonprofit. The possibility of existence of such difference is nevertheless implied by comparative studies carried out in these listed entities.

2.4. Differences between for-profit, public and nonprofit organisations

Working conditions in the discussed organisations provide a context that may potentially relate to OCB. It is indicated that the differences between for-profit, public and nonprofit organisations concern two basic issues (Moore, 2000): defining source of revenues and the value produced by organisations. The analysis of available empirical comparative studies allows for flagging differences between entities in each of the three sectors also in several other areas: 1. motives, values and practices of managers (cf. Lee, Wilkins, 2011; LeRoux, Feeney, 2013; Miller-Stevens et al., 2015; Miller-Stevens et al., 2018), 2. motives, values and attitudes of employees (Borzaga, Tortia, 2006; De Cooman et al., 2011; Goulet, Frank, 2002; Hamann, Foster, 2014; Lyons et al., 2006; Miller-Stevens et al., 2015; Mirvis, 1992; Stater, Stater, 2019), 3. work organisation (Benevene et al., 2011; Ben-Ner, Ren, 2015; Kalleberg et al., 2006; Matz-Costa, Pitt-Catsouphes, 2010; McNamara et al., 2012), 4. organisational culture (Bercea et al., 2019; Emanuele, Higgins, 2000; Sarros et al., 2011; van der Wal et al., 2008), 5. production scope and service quality (Amirkhanyan et al., 2008; Larsson et al., 2022; Trætteberg, Fladmoe, 2020), 6. image and reputation of organisations and their employees (Pepermans, Peiffer, 2022; Peiffer et al., 2020).

The results of the literature analysis became the basis for formulating the research hypotheses. They were presented in Table 1.

Table 1.
Research hypotheses

H _{1a} : There is a strong correlation between intrinsic motivation and OCB-O in for-profit organisations.	H _{2a} : There is a strong correlation between intrinsic motivation and OCB-O in public organisations.	H _{3a} : There is a strong correlation between intrinsic motivation and OCB-O in nonprofit organisations.
H _{1b} : There is a strong correlation between intrinsic motivation and OCB-P in for-profit organisations.	H _{2b} : There is a strong correlation between intrinsic motivation and OCB-P in public organisations.	H _{3b} : There is a strong correlation between intrinsic motivation and OCB-P in nonprofit organisations.
H _{1c} : There is a strong correlation between extrinsic motivation and OCB-O in for-profit organisations.	H _{2c} : There is a strong correlation between extrinsic motivation and OCB-O in public organisations.	H _{3c} : There is a strong correlation between extrinsic motivation and OCB-O in nonprofit organisations.
H _{1d} : There is a strong correlation between extrinsic motivation and OCB-P in for-profit organisations.	H _{2d} : There is a strong correlation between extrinsic motivation and OCB-P in public organisations.	H _{3d} : There is a strong correlation between extrinsic motivation and OCB-P in nonprofit organisations.
H _{1e} : There is a strong correlation between amotivation and OCB-O in for-profit organisations.	H _{2e} : There is a strong correlation between amotivation and OCB-O in public organisations.	H _{3e} : There is a strong correlation between amotivation and OCB-O in nonprofit organisations.
H _{1f} : There is a strong correlation between amotivation and OCB-P in for-profit organisations.	H _{2f} : There is a strong correlation between amotivation and OCB-P in public organisations.	H _{3f} : There is a strong correlation between amotivation and OCB-P in nonprofit organisations.

Source: own study.

To verify the research hypotheses, a survey was conducted.

3. Methods

The research process consisted of the following stages: literature analysis, research gap identification, formulation of research problem and hypotheses, sample and research tools selection, data collection and analysis, formulation of conclusions, indication of research limitations and future directions.

The cross-sectoral study was conducted in 2022, in Poland's Lubuskie Voivodeship. Participation in the survey was voluntary. The sample consisted of employees representing three types of organisations: for-profit, public and nonprofit, one hundred from each type of entity mentioned. The sample was non-random as there was no list of employees working in the Lubuskie Voivodeship. The opinions of the respondents were collected using a Google form and by means of a printed version of the survey questionnaire, through direct contact and in cooperation with the Social Economy Support Centre in Zielona Góra (Ośrodek Wsparcia Ekonomii Społecznej).

3.1. Sample

There were more women (60.67%) than men among the respondents. The average age of the participants of the research was 37.9 years. Most (34.67%) had less than 3 years' work experience in their current organisation, slightly fewer had more than 10 years (33.33%) or between 4 and 10 years (32%).

Most representatives of profit and public entities held managerial positions (79.5%). More than a third (37.5%) worked in large organisations and more than a quarter (25.5%) in medium-sized ones. The least number worked in small (22.5%) or micro (14.5%) organisations. Most NPO representatives were board members (43%). One in four (26%) was a paid employee. Members of organisations (19%) and volunteers (12.00%) were less represented. They were mainly employed by associations (79%) or foundations (18%). More than one in three NPO representatives (38%) worked in an entity with 10 or fewer employees, and fewer respondents worked in an institution with 11 to 20 employees (31%) or more than 50 employees (22%). Those working in organisations with between 20 and 49 employees were the least likely (9%).

3.2. Measures

In the course of our own research we used the 12-item OCB scale developed by Spector (Organisational Citizenship Behaviour Checklist; Retrieved from: <http://shell.cas.usf.edu/~pspector/scales/ocbcp.html>, 26.01.2018). 6 items concerned behaviours directed toward the organisation (OCB-O), others 6 – behaviours toward people in the organisation (OCB-P). Respondents were asked to select one of the answers on a 5-point scale.

Employee motivation was examined using the WEIMS-PL scale (Chrupała-Pniak, Grabowski, 2016), which is a translated equivalent of the Canadian Work Extrinsic and Intrinsic Motivation Scale (WEIMS) developed by Tremblay et al. (2009) based on self-determination theory (Deci, Ryan, 2000). This tool consists of 18 statements measuring various types of work motivation, and more precisely: 6 subscales including 3 statements each: amotivation (AMO), extrinsic motivation (integrated regulation – INTEG, identified regulation – IDEN, introjected regulation – INTRO, external regulation – EXT), intrinsic motivation (IM). Respondents rated the statements using a 7-point Likert scale¹.

The questionnaire was sent out to three hundred employees representing one of three types of organisations: for-profit, public and nonprofit. Participation in the study was voluntary.

¹ Work self-determination index (W-SDI) can also be calculated using this scale through the following formula: $(+ 3 \times \text{IM}) + (+2 \times \text{INTEG}) + (+1 \times \text{IDEN}) + (-1 \times \text{INTRO}) + (-2 \times \text{EXT}) + (-3 \times \text{AMO})$. The range of possible scores on the W-SDI is between ± 36 for a 7-point Likert-type scale (and ± 24 for a 5-point Likert-type scale). The total score derived from this formula reflects individuals' relative level of self-determination. A positive score indicates a self-determined profile and a negative score - a nonself-determined profile (Tremblay et al., 2009).

3.3. Data analysis

The statistical analysis of the data was carried out using the Statistica software. The internal consistency was confirmed using the standard Cronbach's alpha coefficient (Cronbach, 1951). It adopted the following values: $\alpha = 0.804436776$ (OCB), while $\alpha = 0.857749793$ (WEIMS-PL)².


The performed analyses demonstrated that most of the variables were not distributed close to normal. This was confirmed by the results of the Shapiro-Wilk tests (Shapiro, Wilk, 1965)³ (Table 2).

Table 2.

Shapiro-Wilk test results for variables included in the OCB and WEIMS-PL scales

Variables	P		
	For-profit (N = 100)	Public (N = 100)	Nonprofit (N = 100)
OCB-O	.00697	.21005	.23868
OCB-P	.03042	.61166	.38331
Amotivation	.00012	.00089	.00001
External regulation	.00001	.00233	.00000
Introjected regulation	.16285	.18673	.02781
Identified regulation	.00052	.01488	.02839
Integrated regulation	.03164	.00069	.00005
Intrinsic motivation	.00120	.00230	.00000

Explanation:

 - rejection the hypothesis of normality

Source: own study.

As a result, subsequent analyses of variables were conducted using non-parametric statistics. In the case of correlation analysis, a rule was adopted (similarly to e.g. Paliga, 2021) that when the distribution of at least one of the variables in a pair deviates from the normal distribution, the analysis of the relationship is carried out using Spearman's rho coefficient⁴.

² The scales forming part of the tool should exhibit a value of the α -Cronbach's coefficient larger than 0.7. Questionnaires whose α -Cronbach's coefficient is smaller than 0.6 should not be used (Brzeziński, 2011).

³ If the p-value is less than the conventional level of 0.05, then we reject the hypothesis of normality (Dudley, 2012).

⁴ As the variables OCB-O, OCB-P and introjected regulation had distributions close to normal, the use of Pearson's r correlation coefficient was considered to analyse the relationships between them. However, the analyses undertaken excluded this possibility, as the relationships between these variables did not appear to be linear. Since the conditions for calculating Pearson's r correlation coefficient were not met, again, it became necessary to use its non-parametric counterpart, the Spearman rank correlation coefficient.

4. Results

Research participants used a 5-point Likert scale to respond to the statements included in the questionnaire used to assess OCB. The average ratings for both subscales of OCB in each of the three types of organisations: for-profit, public and nonprofit were compared (Table 3).

Table 3.
OCB-O and OCB-P in for-profit, public and nonprofit organisations

Organisational citizenship behaviours (OCB subscales)	Average		
	For-profit (N = 100)	Public (N = 100)	Nonprofit (N = 100)
OCB-O	2.8367	2.9250	3.1517
OCB-P	2.7433	2.8700	3.0367

Source: own study.

The lowest averages, both in OCB-O and OCB-P, were reported in for-profits (2.8367 and 2.7433, respectively). Meanwhile, the highest averages were noted in the case of NPOs (3.1517 and 3.0367, respectively).

Respondents also assessed their work motivation using the WEIMS-PL questionnaire. A 7-point Likert scale was used to provide the ratings. The obtained results are shown in Table 4.

Table 4.
Evaluation of work motivation - the perspective of research participants

Work motivation (WEIMS-PL subscales)	Average		
	For-profit (N = 100)	Public (N = 100)	Nonprofit (N = 100)
Amotivation	2.6767	2.8600	2.6900
External regulation	5.3700	4.5233	3.1033
Introjected regulation	4.2567	4.0967	4.2700
Identified regulation	4.6600	4.5000	4.6900
Integrated regulation	4.5367	4.8267	5.2267
Intrinsic motivation	4.8267	5.0267	5.3167

Source: own study.

The highest level of amotivation was found in public organisations (2.8600). External regulation (for which it is typical that employees work only because that brings them an external reward) was the most prevalent among representatives of for-profits (5.3700), and least prevalent in NPOs (3.1033). Introjected regulation, which arises when workers are motivated by self-image, was higher among employees of public organisations (4.0967) than among the rest (NPO: 4.2700; F-P: 4.2567). Identified regulation, integrated regulation and intrinsic motivation (which are classified as self-determined motivation or autonomous motivation) were highest in the case of employees of nonprofit entities.

In all three types of organisations, the WPAR index assumed positive values, which confirmed the existence of autonomous regulation in the performance of work among the analysed three respondent groups. It had the highest value among employees of NPOs (12.5467)

and was markedly lower in the other two groups: 7.5100 (public organisations) and 5.1867 (for- profits).

In order to verify the research hypotheses describing the correlation between OCB (OCB-O, OCB-P) and work motivation (amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation) in three types of organisation, a correlation analysis was performed using Spearman's rho coefficient. This decision, as already mentioned, was motivated by the failure of both analysed variables to meet the assumptions regarding the normality of distribution. The results of calculations concerning Spearman's rho coefficient were interpreted in accordance with the Dancey and Reidy (2004) classification⁵.

Spearman's rho values were analysed separately for 2 OCB subscales and for 6 WEIMS-PL subscales (Table 5).

Table 5.

Spearman's rho coefficient values for the variables: OCB-O, OCB-P and WEIMS-PL subscales

Variables	Spearman's rho		
	For-profit (N = 100)	Public (N = 100)	Nonprofit (N = 100)
	OCB-O		
Amotivation	-.000318	-.015376	-.114084
External regulation	-.011516	.078267	.001456
Introjected regulation	.461482	.189226	.364582
Identified regulation	.386466	.251554	.359514
Integrated regulation	.397350	.212898	.370762
Intrinsic motivation	.385293	.063751	.417530
	OCB-P		
Amotivation	.103052	.024313	-.145535
External regulation	-.110492	-.094700	-.062949
Introjected regulation	.288390	.060047	.148992
Identified regulation	.083256	.164430	.062105
Integrated regulation	.187254	.101587	.203752
Intrinsic motivation	.083497	-.080731	.148903

* $p < 0,05$.

Source: own study.

Most of the research hypotheses were rejected. Strong correlation was identified only in the case of the variables: intrinsic motivation and OCB-O in NPOs ($r = .417530$, $p < 0.05$; hypothesis H3a was confirmed). The correlation between introjected regulation and OCB-O in for-profits was also strong (hypothesis H_{1c} was partly confirmed). Some of the identified correlations were of moderate strength.

⁵ Interpretation of Spearman's rho: ≥ 0.70 (very strong correlation), 0.40-0.69 (strong correlation), 0.30-0.39 (moderate correlation), 0.20-0.29 (weak correlation), 0.01-0.19 (no or negligible correlation) (Dancey, Reidy, 2004).

The correlations between the OCB-P subscale and the WEIMS-PL subscales were mostly positive but negligible. Only in two cases Spearman's rho coefficient adopted values indicating a weak correlation: OCB-P and introjected regulation in for-profits ($r = .288390$, $p < 0.05$) and OCB-P and integrated regulation in nonprofits ($r = .203752$, $p < 0.05$).

Stronger correlations were observed between the WEIMS-PL and OCB-O subscales, particularly in for- profits and nonprofits (they were not as marked in public organisations). In most cases they had positive and of moderate strength. A strong correlation was identified for the intrinsic motivation and OCB-O in NPOs ($r = .417530$, $p < 0.05$), and a slightly lower one ($r = .385293$, $p < 0.05$) was recorded in for-profits. In public organisations this correlation was negligible. In nonprofits and for-profits, compared to public entities, the correlations between OCB-O and 3 out of 4 subtypes of extrinsic motivation were also more pronounced: introjected regulation, identified regulation and integrated regulation.

In for-profits, the most significant relationship was observed for OCB-O and introjected regulation ($r = .461482$, $p < 0.05$); in NPOs, between OCB-O and intrinsic motivation ($r = .417530$, $p < 0.05$). In both, the correlations were strong. In public organisations, the OCB-O correlated most strongly with identified regulation, although in this case the value of Spearman's coefficient showed only a weak correlation ($r = .251554$, $p < 0.05$).

5. Discussion

According to numerous researchers, motivation and OCB are strongly correlated (Organ, 1988; LePine et al., 2002; cf. Morgahana et al., 2018; Osman et al., 2015; Tang, Ibrahim, 1998; Umar et al., 2022; Widarko, Anwarodin, 2022). Many of the previous studies tackling this problem area concerned correlations between work motivation and OCB (e.g. Barbuto, Story, 2011; Enwereuzor et al., 2015; Margahana et al., 2018; Osman et al., 2015; Shaaban, 2018; Widarko, Anwarodin, 2022). However, the relationship between work motivation and OCB-P or OCB-O has rarely been explored (e.g. Barbuto et al., 2001; Finkelstein, 2011). In addition, such research was usually carried out in organisations of a select type [e.g. in public entities – Tang and Ibrahim (1998), Umar et al. (2022), Wyche-Seawood (2019); industry – Barbuto and Story (2011); Barbuto et al. (2001)]. This study contributes to expansion of current knowledge, including by issues related to the comparison of for-profit, nonprofit and public entities.

Based on the results of the conducted research, it can be generalised that work motivation correlates with OCB-O, but not with OCB-P. Note that van Schie et al. (2015) found a (slightly) different type of relationship, showing that in the case of volunteers, OCB-O correlates with organisation-focused motivation. It is noteworthy that Millette and Gagné (2008) did not find this type of relationship at all. However, in our study we show that work motivation (in subtypes: introjected regulation, identified regulation, integrated regulation, intrinsic

motivation) correlates with OCB-O (at least with moderate strength), and this applies to both NPO employees (not only volunteers) and for-profit employees. We learn after Morrison (1994) that citizenship behaviour is a function of how employees perceive their job responsibilities. It cannot be ruled out that supporting the organisation as a whole is more obvious to employees, and consequently, is more closely linked with work motivation. Or perhaps behaviours benefiting the organisation are more noticeable and more attractive as far as image is concerned?

Approaching this problem in more detail, there is clearly no relationship between OCB and external regulation. This corresponds to the findings of Barbuto and Scholl (1999), and an explanation for that may be that OCB involves behaviours that are not rewarded by a formal reward system. However, other types of regulation characteristic of extrinsic motivation may indeed be an important correlate of OCB. In the case of for-profit employees, the importance of introjected regulation comes to mind. Let us therefore stress the issue of image-related motivators. According to Rioux and Penner (2001), in some cases OCB may be motivated by the so-called impression management. In other words, these behaviours may serve to shape the image in the eyes of colleagues and superiors. Bolino (1999) goes as far as using the phrase 'good actor' in the context of OCB (as opposed to the concept of 'good soldier' – cf. Organ 1988). This would require us to consider whether the surveyed employees of commercial entities were particularly willing to engage in behaviour for the benefit of the organisation for instrumental reasons (cf. Barbuto, Story, 2011; Barbuto et al., 2001).

In employees of nonprofits, a very important correlate of OCB is intrinsic motivation, often identified among volunteer workers (Cappellari, Turati, 2004; Finkelstein, 2009; Fiorillo, 2011). However, a correlation between intrinsic motivation and OCB was also identified in employees of for-profits. The obtained results therefore differed from Barbuto and Story (2011; cf. Barbuto et al., 2001) who found no relationships between intrinsic process motivation and organisational citizenship behaviours in any of the four agricultural businesses. However, strong correlation between intrinsic motivation and OCB of teachers (as public-sector employees) were identified by Enwereuzor et al. (2015).

Another conclusion concerns the statement that, in the case of the correlation between motivation and OCB-O, differences were reported between employees of different types of organisations. Let us note that the correlation between the discussed variables did not apply to employees in the public sector. Similar results were obtained by Wyche-Seawood (2019) who found that employees' levels of motivation may not result from citizenship behaviours. Let us also recall that relationships between OCB and motivation can be mediated by different factors such as (Ahmed, Kahn, 2016): job satisfaction, job involvement, psychological empowerment, perceived organisational support, employee engagement, organisational justice, etc. Research indicates the three types of organisations differ in terms of motives (De Cooman et al., 2011) and job attitudes (including job satisfaction, organisational commitment, loyalty, social support) (Goulet, Frank, 2002; Borzaga, Tortia, 2006; Lyons et al., 2006; Hamann, Foster,

2014; Stater and Stater, 2019). It is therefore plausible that one of these factors accounts for the differences between the entities at hand. This will require thorough verification in subsequent research.

6. Conclusions

The main contribution arising from this study concerns the performance of the OCB-WM correlation analysis in for-profit, public and nonprofit organisations, something that has not been done before. The conducted research demonstrated that work motivation correlates more strongly with OCB-O than with OCB-P. However, strong correlation was reported only for the variables: intrinsic motivation and OCB-O in NPOs, as well as for introjected regulation and OCB-O in for-profits. Some of the identified relationships between OCB-O and WM were of moderate strength. Finally, the correlations between OCB-P and the subtypes of WM were mostly positive but negligible. Only in two cases weak correlation was found, namely: between OCB-P and introjected regulation in for-profits, and between OCB-P and integrated regulation in nonprofits.

The implications and practical research recommendations arising from this study are such that managers of any type of organisation should motivate employees to display OCBs (both OCB-O and OCB-P).

There are some limitations of this research. The study was only quantitative and not qualitative, relying solely on respondents' statements. The sample was purposively selected, which means that the results cannot be generalised, and the study only involved Polish organisations, which means that it was embedded in a specific cultural context that should be taken into account when formulating conclusions. In addition, the research was not longitudinal but cross-sectional. The results might be different in a longitudinal study. The data were lagged, which does not allow for strong causal inferences. Moreover, the use of questionnaire-based research may have triggered a common method bias.

A better understanding of this issue would require more in-depth qualitative research and the use of techniques based on direct contact, interviews, observation, case study, etc. which would help to capture its nuances more thoroughly. Future research using longitudinal data is also recommended. It is also worthwhile to continue studies on the differences between for-profit, public and non-profit organisations in the area of OCBs and work motivation, as well as to identify factors that mediate or moderate this relationship.

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METAPHORS OF ORGANIZATIONAL ENTREPRENEURSHIP PRE- AND POST-COVID COMPARATIVE ANALYSIS CONDUCTED AMONG POLISH MANAGERS

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Objective: The objective of this article is to identify intrapreneurship metaphors and answer the question whether Covid-19 changed the way organizational entrepreneurship is understood.

Research Design & Methods: Author decided to run both qualitative and quantitative research. In the first part managers were asked to give their metaphorical expressions on paper. The next step was to prepare a questionnaire. This questionnaire was run among two groups of managers pre and post Covid-19.

Findings: Results suggest that Covid-19 changed the way organizational entrepreneurship is understood.

Implications & Recommendations: The empirical findings serve as a starting point for further in-depth research in this area. It is recommended that in order to gain a complete picture of the issues underlying the results, both further qualitative and quantitative research on a bigger sample should be undertaken.

Contribution & Value Added: The originality of this work lies in comparing how intrapreneurship is viewed through the lens of metaphor pre and post covid-19, and how covid-19 changed understanding of intrapreneurship.

With regards to the research limitation, it must be highlighted that it was a pilot study and the results cannot be generalized.

Keywords: Metaphors of intrapreneurship, entrepreneurship, metaphors, research, entrepreneurship education, Poland.

Category of the paper: Research.

1. Introduction

The business environment is becoming increasingly complex and dynamic, making it difficult for firms worldwide to achieve growth, profitability, and competitiveness. The pressures of a globalized economy compounded the challenge of attaining these objectives. Mergers, acquisitions, and joint ventures are common strategies used to expand firms; however, creating growth within the organization remains a difficult task. To maintain competitive

advantage, corporate entrepreneurship is anticipated to become a vital aspect for companies worldwide. Therefore it is an important topic in management and economic discourse. The novelty of this article lies in comparing intrapreneurship metaphors before and after Covid-19.

The objective of this article is to identify intrapreneurship metaphors and answer the question whether Covid-19 changed the way intrapreneurship is understood that is whether there is a significant difference in choice of intrapreneurship metaphors before and after Covid-19?

This paper is divided into three main sections. First, the literature is discussed and special attention is paid to metaphors in economic discourse. The second part briefly presents the methodological assumptions of the study. Finally, the article elaborates on these results.

2. Literature review

Entrepreneurship has long been a driving force in the economy and continues to gain importance as a significant and relevant area of study. To stimulate entrepreneurship in various countries, policymakers are partnering with CEOs and company owners seeking entrepreneurial employees (Chmielecki, 2013). The popularity of start-up firms in high-technology industries, the expansion of venture capital financing, the success of regional clusters such as Silicon Valley, and the rise of crowdfunding have all contributed to this focus on entrepreneurship. Although management scholars and social scientists have studied metaphors of entrepreneurship, there is a lack of literature on this subject in the Polish context. Because culture plays a role in shaping entrepreneurship, different nations have unique concepts of entrepreneurs and entrepreneurship.

A detailed typology of entrepreneurship was proposed by Wach (2015), who tried to combine both economic and business studies, which resulted in distinguishing four primary and three secondary functions of entrepreneurship (Figure 1).

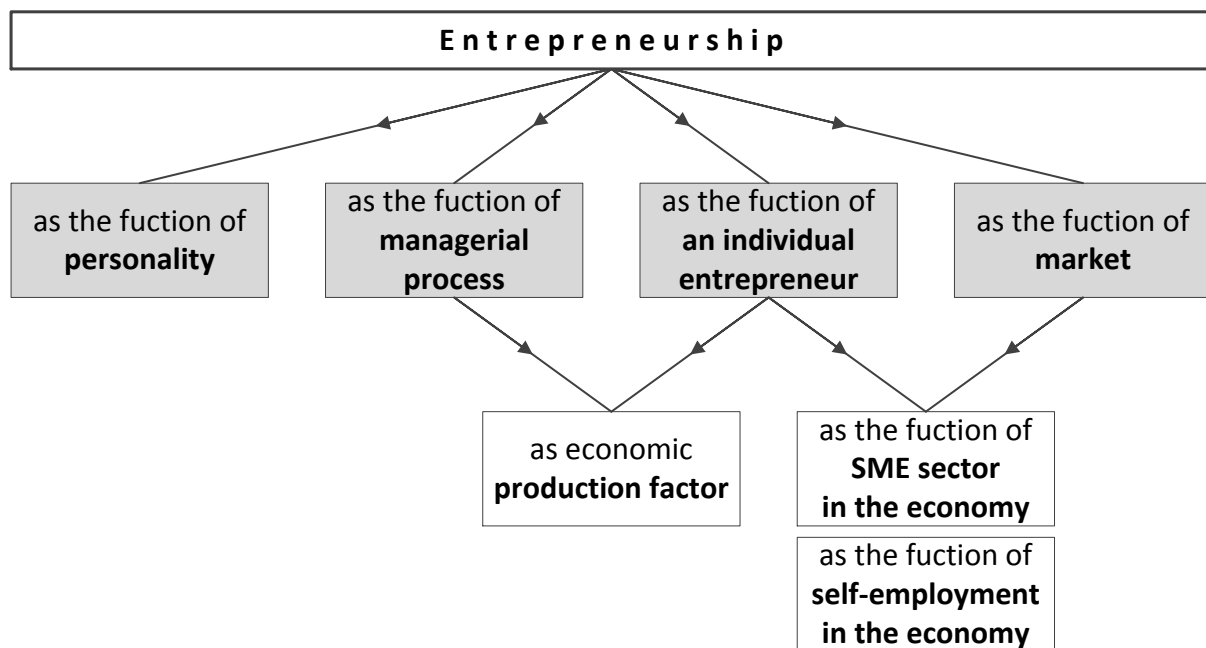


Figure 1. Basic functions of entrepreneurship in economics and business studies.

Source: Wach, 2015, p. 14.

Table 1.

Entrepreneurship concepts

Author	The concept of entrepreneurship
R.W. Griffin (Griffin, 1996, pp. 730-731)	The process of organizing and running a business and taking the risk involved and performing an active role in management.
St.P. Robbins D.A. DeCenzo (Robbins, DeCenzo 2002, 104)	The process of initiating business start up, organizing the necessary resources and take risks in pursuit of the prize.
R.D. Hisrich M.P. Peters (Hisrich, Peters, 1992, p. 10)	The process of creating something different, because of its value in the framework of which necessary time and effort is devoted to achieve this goal, assuming the accompanying financial, psychological and social risk, and expecting obtaining financial rewards and personal satisfaction.
B. Piasecki (Piasecki, 2001, p. 25).	Entrepreneurship is the process: <ul style="list-style-type: none"> ▪ which includes the action taken for the analysis of opportunities of start and development (or just development) of the venture, its financing and the possibility of meeting the effects of such action; ▪ which can take many different forms and shapes, including initiation of a venture, creativity and innovation in developing new products or services, managing an existing venture in such a way that it develops quickly and continuously, seeking financial and material supply sources for potentially growing number of ventures, accepting risk in the development of new or expansion of existing ventures (these elements are the part of the entrepreneurial process, although not all of them must participate in each activity).
F.L. Frey (Frey, 1993, pp. 27-28)	Starting a venture and (or) its growth, which occurs through the use of innovation, by management assuming the risk.
J. Penc (Penc, 1997, p. 335)	The behavior of a person or organization that relies on seeking and applying new solutions, which require more energy, initiative and resourcefulness and the ability to estimate the necessary effort and possible benefits available under existing constraints and opportunities, and the willingness to take risk and responsibility for their decisions and actions.

Cont. table 1.

J. Timmons (Timmons, 1990, p. 5)	The process of creating or identifying opportunities and using them despite of their current resources (...). It is an creative act of an entrepreneur who finds in him and devotes enough energy to initiate and build a company or organization, rather than just observe, analyze and describe it.
N. Churchill (Churchill, 1983, p. 27)	The process of discovery and development of capabilities to create new value through innovation, acquisition of necessary resources and managing the process of value creation.
J.A. Schumpeter (Schumpeter, 1960, p. 60)	Recognising opportunities for implementation of ventures that are profitable and risk-taking to implement them.
W. Adamczyk (Adamczyk, 1996, p. 23)	An organized sequential process oriented under certain circumstances at using innovative idea in order to generate benefits in the market.
S. Sudoł (Sudoł, 2002, p. 33)	Feature (way of behaving) of entrepreneurs and companies, that means the willingness and ability to undertake and solve creative and innovative new problems, while taking into consideration its risks, the ability to use the available opportunities and flexibility to adapt to changing conditions.
T. Kraśnicka (Kraśnicka, 1999, p. 98)	Entrepreneurship is an activity that stands out by: activity and dynamism, innovation, looking for changes and reacting to them, perceiving opportunities and their use, regardless of the resources (at the moment), willingness to take risks, which main motive is to multiply the capital.

Source: Sułkowski, 2012.

As Sułkowski (2012) states, the aspects of entrepreneurship highlighted in many of the definitions are as follows:

1. Entrepreneurship involves engaging in innovative and creative market activities or initiating organizational changes, including technological and organizational innovations.
2. It encompasses taking risks in business or tolerating uncertainty with the aim of developing a venture, reflecting a willingness to act under uncertainty.
3. Flexibility with regard to strategy and market activities, as well as the willingness to change and exhibit intra-organizational flexibility, are key aspects of entrepreneurship.
4. Entrepreneurship involves the exploration and exploitation of opportunities inherent in an organization's environment as well as the unique competitive advantages derived from organizational resources.
5. Entrepreneurial characteristics such as innovation, creativity, willingness to take risks, and propensity for change are all part of entrepreneurial personality.

“Intrapreneurship” is entrepreneurship that occurs within a corporation (Antoncic, Hisrich, 2003). The term was coined by Pinchot & Pinchot (1978) and these entrepreneurs were referred to as “intra-corporate entrepreneurs” or “intrapreneurs”. Corporations quickly realized the benefits of harnessing the entrepreneurial drive within their organizations and began to capitalize on the potential of their human resources. Pinchot (1985) described “intrapreneurs” as creative thinkers who are directly responsible for the creation of innovation within a corporation. Initiatives by an organization’s employees to take on new business activities are referred to as “intrapreneurship”. Although intrapreneurship is similar to corporate entrepreneurship, it is a different concept (Antoncic, Hisrich, 2003; Sharma, Chrisman, 1999). Corporate entrepreneurship is typically categorized by organizational levels and is a top-down process in which management cultivates initiatives in the workforce to develop innovative new

businesses. On the other hand, intrapreneurship refers to proactive bottom-up initiatives taken by employees at the individual level.

Corporate entrepreneurship encompasses two interconnected aspects: innovation and corporate venturing as well as renewal initiatives aimed at bolstering a company's competitive edge and risk tolerance (Guth, Ginsberg, 1990).

According to Narayanan et al. (2009), corporate venturing encompasses a set of processes and steps that are involved in creating and integrating new businesses into a company's overall business portfolio. Sharma and Chrisman (1999) suggest that corporate venturing can be divided into internal and external components. Internal corporate venturing involves creating new businesses that are typically housed within the company's existing structure. Kuratko (2007) explains that pre-existing organizational structures may accommodate these new ventures, or that new organizational entities may be established within the corporate structure. On the other hand, external corporate venturing involves investments in early stage businesses created by external parties such as Corporate Venture Capital (CVC), licensing, acquisitions, and joint ventures.

Furthermore, as mentioned, corporate entrepreneurship can encompass activities that enhance a corporation's ability to compete and take risks, which may or may not involve the addition of new businesses. Morris et al. (2008) and Kuratko and Audretsch (2009) define this aspect of corporate entrepreneurship as strategic entrepreneurship. It has also been defined as the identification and exploitation of opportunities while simultaneously creating and sustaining competitive advantage (Ireland et al., 2003).

These activities may involve strategic renewal, domain redefinition, sustained regeneration, business model reconstruction, and organizational rejuvenation (Covin, Miles, 1999). However, Dess et al. (2003) focused only on the first four of these in their review. Corporate entrepreneurship activities can take place at various levels, including the corporate, division (business), functional, spin-out venture, or project levels (Zahra, 1991). However, previous corporate venture research has primarily focused on the parent corporation level rather than on the venture unit or spin-out level (Narayanan et al., 2009).

Our language is rich in metaphors, as Cornelissen (2002) demonstrated. Furthermore, metaphors are prevalent in the business and organizational worlds. Metaphors are not only decorative elements; they are common, recurring, and pervasive aspects of communication. Various researchers have reported different results regarding the frequency of metaphor usage.

Table 2.*Findings on the frequency of use of metaphors by different authors*

Author(s)	Frequency in metaphor
Steen et al. (Steen, Dorst, Herrmann, Kaal, Krennmayr, Pasma, 2010, pp. 765-796)	13.6% of all lexical units in the corpus can be classified as being related to metaphor.
Gibbs (Gibbs, 1994)	5.7 metaphors per minute of speech.
Whalen et al. (Whalen, Paxmen, Gill, 2009, pp. 263-280)	3.69 nonliteral statements in past-oriented e-mails (average of 284,90 words) and 2.11 in future-oriented e-mails (average of 221,02 words).
Andriessen (Andriessen, 2006, pp. 93-110)	At least 95% of all statements about either knowledge or intellectual capital are based on metaphor.

Source: Wittink, RELIABLE METAPHOR ANALYSIS IN ORGANIZATIONAL RESEARCH, Towards a dual, dynamic approach, VU University Amsterdam, <http://dSPACE.uvu.vu.nl/>

Metaphors are implied comparisons that combine the two concepts. “Metaphor occurs when a unit of discourse is used to refer unconventionally to an object, process or concept, or colligates in an unconventional way. And when this unconventional act of reference or colligation is understood on the basis of similarity, matching or analogy involving the conventional referent or colligates of the unit and the actual unconventional referent or colligates” (Goatly, 1997, p. 8). Dickins, for instance, defines metaphors as “A figure of speech in which a word or phrase is used in a non-basic sense, this non-basic sense suggesting a likeness or analogy [...] with another more basic sense of the same word or phrase” (Dickins, 2005, p. 228). According to Deignan “A metaphor is a word or expression that is used to talk about an entity or quality other than that referred to by its core, or most basic meaning. This non-core use expresses a perceived relationship with the core meaning of the word, and in many cases between two semantic fields” (Deignan, 2005, p. 34).

3. Research methodology

The research goal of this exploratory study was to identify whether Covid-19 has changed the way intrapreneurship is perceived and understood. This study focuses on the metaphors of intrapreneurship. Qualitative and quantitative research procedures were employed. There were two stages of investigation (pre- and post-pandemic). The author reached entrepreneurs in late 2018 and 2024.

The author reached the managers with whom he conducts in-house trainings; therefore, it was not a random sample. Therefore, the results presented herein are not representative.

Table 3.
Research methods used in this study

Research metod	Stage	Type of research	Research sample
Desk research	Pre-covid	Qualitative	-
IDI	Pre-covid	Qualitative	112
Questionnaire	Pre-covid	Quantitatie	183
Questionnaire	Post-covid	Quantitatie	195

Source: Own study.

4. Results and discussion

In the qualitative part of the study, the author addressed 112 managers.

In the first stage, managers were asked to create metaphors of their own accord. They were encouraged to follow their first instincts in forming lexical associations depicting the essential characteristics of intrapreneurship. As far as sex was concerned, the group was diversified, as 61% of the respondents were female and 39% were male.

The average age of the respondents was 37 years, and the average number of years of employment among respondents was 12.4.

The metaphors were grouped into several clusters based on their semantic properties (Table 3).

Table 4.
The content analysis of the metaphors of entrepreneurship among surveyed managers

Metaphor for Intrapreneurship	Explanation
Gardening	Intrapreneurship is like gardening, where the intrapreneur nurtures and cultivates ideas (seeds) within a company (soil), providing them with resources (water and sunlight) to grow into successful innovations (plants).
Navigating unknown territories	This metaphor illustrates intrapreneurs as explorers, navigating uncharted areas within a company to discover new opportunities, solve unseen problems, and create value in innovative ways, much like discovering new lands.
Rebuilding a ship while sailing it	Intrapreneurship involves developing new projects and initiatives within an organization while adapting to changes and challenges, akin to building and improving a ship in the midst of a voyage.
Conducting an orchestra	An intrapreneur, like a conductor, harmonizes various elements within a company (instruments) to produce something beautiful and cohesive, orchestrating resources, teams, and processes to achieve innovative outcomes.
Redesigning a house	This metaphor sees intrapreneurs as architects working within the confines of an existing building, innovatively redesigning and repurposing spaces without altering the foundational structure, creating new value within pre-established limits.
Excavating precious resources	Intrapreneurs act like miners, digging deep within an organization to find hidden resources or ideas that can be transformed into valuable assets or products, much like extracting precious metals from the earth.
Igniting a spark	This metaphor suggests that intrapreneurship ignites a spark within the organization, generating warmth and light that spreads, symbolizing the initiation and propagation of innovative ideas that energize and illuminate the company's path.

Cont. table 4.

Waging a battle	Intrapreneurship can be likened to waging a battle or strategic campaign within a competitive battlefield, where intrapreneurs must navigate internal and external challenges, employ tactical maneuvers, and forge alliances to secure victories for their innovative projects, echoing the dynamics of military strategy in pursuit of corporate innovation.
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Source: Own study.

The second stage was divided into two separate sub-stages. Pre-pandemic substage and post-pandemic substage.

In the pre-pandemic stage, the research group comprised 183 managers. Respondents were asked to choose one metaphor that best described the concept of intrapreneurship. With regard to gender, 58% of the respondents were female and 42% were male.

The average age of the respondents was 36 years, and the average number of years of employment among respondents was 10.8.

In the post-pandemic stage, the research group comprised 195 managers. Respondents were asked to choose one metaphor that best described the concept of intrapreneurship. As far sex Regarding gender, 54% of the respondents were female and 46% were male.

The average age of the respondents was 38 years, and the average number of years of employment among respondents was 12.2.

The results of this study are presented in Table 4.

Table 5.

Chosen metaphors of intrapreneurship among surveyed managers

Metaphor	Before COVID-19	After COVID-19
Gardening	34	12
Navigating unknown territories	16	23
Rebuilding a ship while sailing it	12	34
Conducting an orchestra	44	12
Redesigning a house	22	36
Exacavating precious resources	34	12
Igniting a spark	9	32
Waging a battle	12	34
Total number of respondents	183	195

Source: Own study.

“Gardening” and “excavating for precious resources” both saw a significant decrease in preference, each dropping by about 12.43 percentage points. “Rebuilding a ship while sailing it” and “waging a battle” showed notable increases in preference, each by approximately 10.88 percentage points. “Conducting an orchestra” experienced the largest decrease in preference, by about 17.89 percentage points. “Redesigning a house” and “Igniting a spark” both saw significant increases in preference, by 6.44 and 11.49 percentage points, respectively.

“Navigating” unknown territories had a modest increase in preference, by about 3.05 percentage points.

These shifts indicate changes in intrapreneurship metaphor preferences before and after COVID, likely reflecting the impact of the pandemic on internal innovation and entrepreneurship within organizations.

The Chi-square test for intrapreneurship metaphor preferences before and after COVID produced the following results:

Chi-square statistic: 77.61.

p-value: < 0.05.

Degrees of freedom: 7.

Expected frequencies: An array showing the expected frequencies under the assumption of no association between time period and metaphor preference.

Given the extremely small p-value, I rejected the null hypothesis, indicating that there is a statistically significant difference in intrapreneurship metaphor preferences before and after COVID-19. This suggests that the pandemic has significantly influenced how individuals within organizations conceptualize intrapreneurship, reflecting perhaps shifts in priorities, challenges, and opportunities for innovation within these organizations during and after the pandemic.

The statistically significant shift in intrapreneurship metaphor preferences before and after COVID-19, as indicated by the Chi-square test, can be attributed to several factors influenced by the pandemic's global impact. Understanding why these shifts occurred involves considering the broader context of how organizations and their employees adapted to the challenges posed by COVID-19.

Below are some key factors that could explain these changes:

1. Increased Need for Innovation and Adaptability

The pandemic has forced organizations to rethink their operations, business models, and products/services. Metaphors that suggest flexibility, creativity, and resilience, such as "building a ship while sailing," might have become more popular because they capture the essence of navigating through uncertainty and continuous change.

2. Remote Work and Digital Transformation

The rapid acceleration of digital transformation and the shift to remote work have altered the dynamics of organizational innovation. Metaphors that resonate with virtual collaboration, digital innovation, and agility could have seen increased preference, reflecting new ways of working and the importance of technology in enabling intrapreneurship.

3. Focus on Resilience and Crisis Management

The crisis highlighted the importance of resilience at both the individual and organizational levels. Metaphors that embody overcoming challenges, such as "Waging a campaign," might have gained favor as they reflect proactive and strategic responses to the pandemic's challenges.

4. Changing Organizational Priorities

Organizations may have shifted their priorities to focus more on sustainability, employee well-being, and community support. This could explain a shift away from metaphors that emphasize control and precision, like "Conducting an orchestra", towards those that emphasize care, growth, and adaptation.

5. Empowerment and Autonomy

With the decentralization necessitated by remote work, there might have been a greater emphasis on empowering employees to take the initiative and act as intrapreneurs. Metaphors that suggest autonomy, exploration, and pioneering can resonate in such environments.

6. Psychological Impact of the Pandemic

The collective experience of navigating the pandemic could have led to a shift in how individuals conceptualize their roles within organizations. There may have been greater identification with metaphors that speak to resilience, adaptation, and collective effort in the face of adversity.

5. Conclusion

The shift in intrapreneurship metaphor preferences is likely a reflection of the complex interplay between changing work environments, organizational strategies, and individual psychological responses to the pandemic. These changes underscore the evolving nature of intrapreneurship as organizations and their members adapted to the unprecedented challenges posed by COVID-19. We must also stress that metaphors evolve. For instance, until very recently the information superhighway was a metaphor for the internet. But the word 'cyberspace' has now taken over (Barta-Smith, Hathaway, 1999, pp. 253-265).

Metaphors have a significant impact on how we comprehend business and related concepts, as well as the nuances of the various metaphors utilized in economic discourse. This influence extends to our choice of metaphors, as they shape the way we think and perceive the world. Gartner (1993, p. 231) emphasized that "the words we employ in discussing entrepreneurship have a direct influence on our capacity to contemplate this concept". Consequently, our thoughts and the discourse surrounding intrapreneurship can be transformed, ultimately leading to actions that promote entrepreneurial endeavors and impact culture by fostering entrepreneurial mindsets in organizational circles.

The main research limitation is the non-representativeness of the sample as well as the small sample ($n = 183$ at the first stage and $n = 195$ at the second stage). The results presented in the article are very preliminary and further investigations in this field are needed. It seems necessary to conduct in-depth interviews to include more explaining variables.

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CUSTOMER SERVICE IN THE COURIER SERVICES INDUSTRY - RESEARCH RESULTS

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Purpose: The aim of the article is to learn the research results regarding respondents' opinions on logistic customer service in the courier industry in its various aspects.

Design/methodology/approach: One of the quantitative methods was used, which is a diagnostic test. As a technique, a survey was used and the responses were surveys with open and closed questions.

Findings: The courier services market is well established, with few new entrants and frequent mergers through takeovers or consolidations. Most often, strong organizations on the market are absorbed by larger entities. The market movement in this area is very noticeable. The number of customers shapes the existence and functioning of this type of enterprise. The article is of a research nature. The study analyzed respondents' opinions related to logistic customer service in a selected courier company.

Research limitations/implications: There were no solutions or doubts in the research. A study may be conducted in the future for comparative analysis.

Practical implications: The purpose of the research was to assess the reliability of the services provided at the company under review, which received high ratings from customers. Positive evaluations were expressed towards the flexibility of services and availability of products, while communication and staff competence were considered adequate. Some respondents expressed concerns about prices. Although the vast majority expressed a desire to use the services again. Logistical customer service plays an important role in strengthening an organization's market position, due to the increasing awareness of today's consumers about their needs.

Social implications: The conducted research will allow us to notice what important aspects customers pay attention to when using courier services. There is no problem with the availability of data and information regarding handling specific matters and solving problems. The market is saturated with entities providing various services. The TSL industry, along with the KEP market, are particularly developing. Customers can choose from offers from parcel delivery companies. There may be various factors that determine the choice of this or that company.

Originality/value: The article is of a research nature, individual cases of individual clients and corporate clients.

Keywords: management, customer service, courier services, respondents, logistics.

1. Introduction

The subject of the research is logistic customer service in the courier services industry on the example of the management of courier company. In the case of the implemented issue, research problems take the form of questions addressed to customers using the services of a courier company. Therefore, the following research problems were adopted:

Main research problem:

- Do customers of the surveyed company from the KEP industry (Kurier, Ekspres, Paczka) rate the logistic customer service at a satisfactory level? Was the order fulfilled at the appropriate level (in the customer's eyes)?

Detailed research problems:

- What is the assessment of the reliability of the service provided in the surveyed company in the opinion of customers?
- Has the flexibility of service been defined by users at the appropriate level?
- How do customers evaluate product availability?
- Are the communication and competences of the service staff at an appropriate level in the opinion of the company's customers, in line with their expectations?

The study used one of the quantitative methods, which is a diagnostic survey. The technique used was a survey, and the tool was a survey questionnaire with open and closed questions.

2. Research group and course of study

The courier industry is constantly developing. He has great prospects ahead of him. The study attempted to assess the level of logistic evaluation of customer service in the courier services industry. A cooperating company has been selected with many business entities, and at the same time delivers to individual customers. It was therefore assumed that the data to be obtained would have different sources. And so it happened. The surveys were completed by individual customers and representatives of business entities. The research was carried out in February and March 2021.

148 people returned the correctly completed survey questionnaire. Answers were provided by individual clients and people employed by specific entities, as well as the owners of the companies themselves. The distribution of survey participants is presented in figure 1. The first criterion is the gender of the respondents.

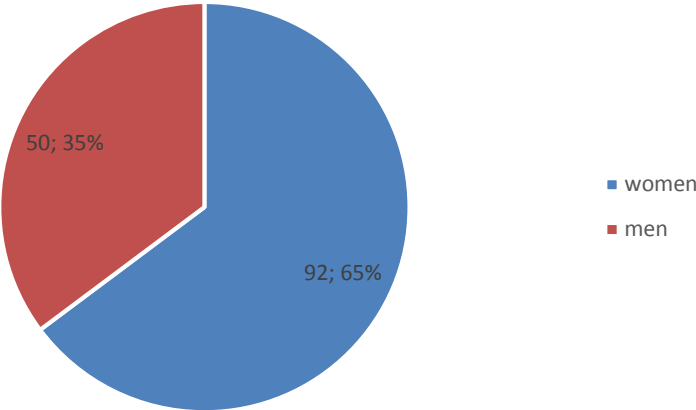


Figure 1. Division of respondents by gender.

Source: Own study based on conducted research.

Women showed greater interest in the online survey questionnaire, 65% of whom responded to the request to complete the survey. Women are usually more willing to participate in various types of survey research. Too in the case of the study carried out for the purposes of this work, this relationship was confirmed. The survey respondents were asked about their subjective sense of their financial status. Respondents were asked to rate their wealth on a ten-point scale. The results are presented in the figure below.

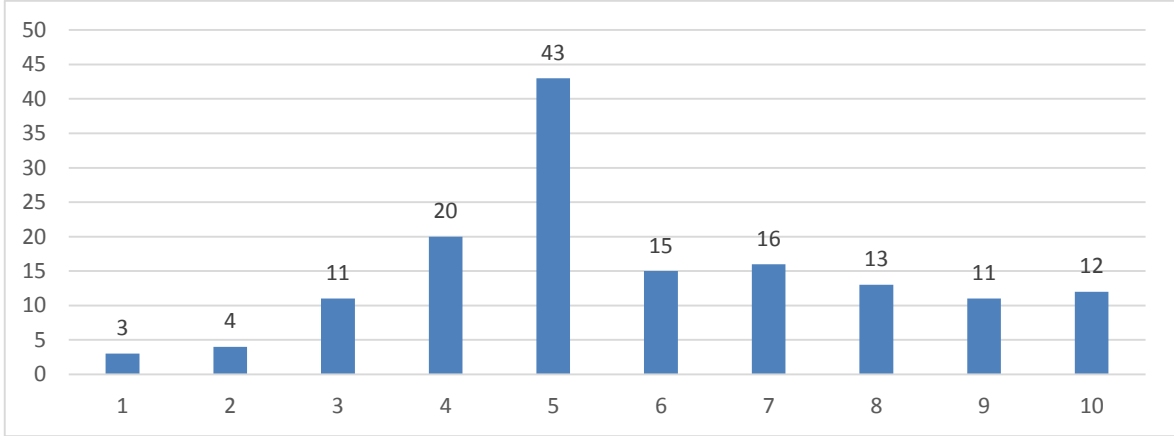


Figure 2. Subjective assessment of the level of wealth of the respondents.

Source: Own study based on conducted research.

The respondents assessed their financial situation as relatively good. No differentiating factors were introduced, and it is noted that 43 respondents consider their financial situation to be relatively good, giving it a score of 5. 28 people assessed their financial situation below this value, while the remaining respondents considered their situation better than 5.

The last question from the area of questions characterizing the research group concerns the type of client. The services of the courier company are used by both individual and commercial customers and business entities. A very attractive offer was created especially for the latter.

The company provides a wide range of TSL (transport-forwarding-logistics) services. Figure 3 contains answers regarding the type of client participating in the study.

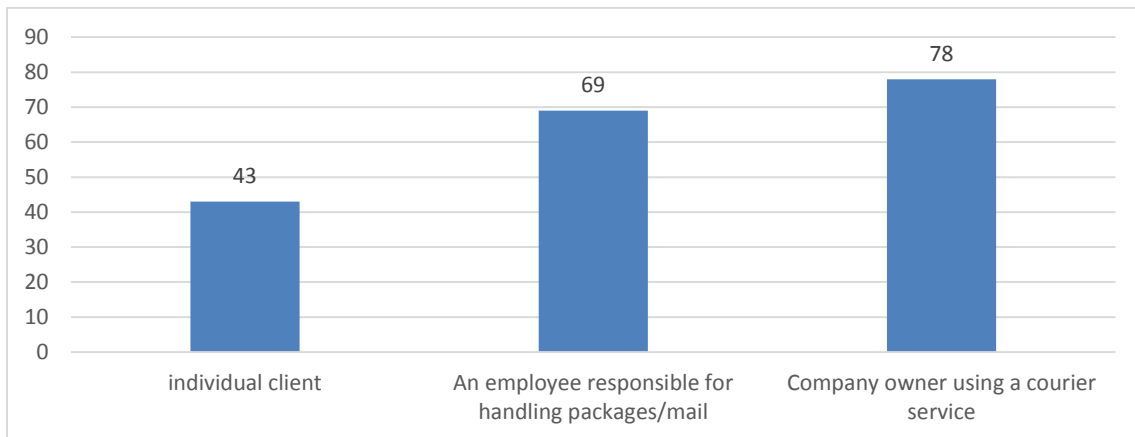


Figure 3. Characteristics of the customers of the tested courier company.

Source: Own study based on conducted research.

Respondents were asked about the frequency of using the services of the tested courier company. The answers are presented in figure 4. The differentiating factor will be the type of customer.

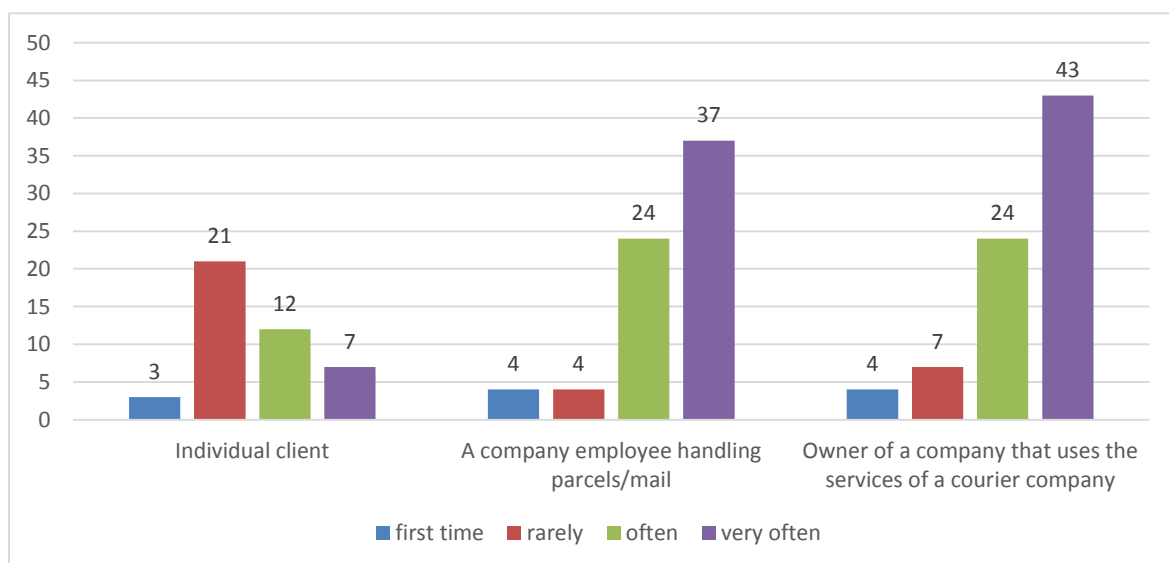


Figure 4. Frequency of using the services of the examined entity.

Source: Own study based on conducted research.

It is not possible to present the data as a percentage due to the fact that two answers are often marked in the survey forms. For example, the respondent used the services of a courier company as a private person and as a company employee. However, figure 4 undoubtedly shows that the company's offer is most often used by other business entities, whether they run their own business or are employed in companies and deal with order fulfillment. This is an important element of research. It can therefore be concluded that the largest group of study participants are business entities. They benefit too from the company's offer most often.

Individual customers use the services of courier companies less often compared to other respondents who declare frequent or very frequent use from the offer of the examined company. Respondents were also asked about the time they worked with her. When did the collaboration first begin? The results are presented in figure 5.

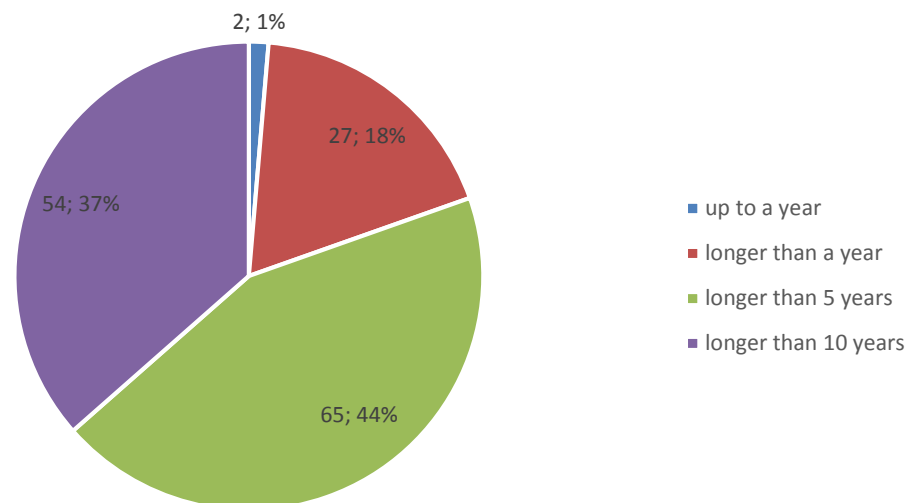


Figure 5. The period during which the respondent cooperates with the courier company.

Source: Own study based on conducted research.

The largest group of respondents are people who have been cooperating with the courier company for 5 to 10 years. The next group are people who have been cooperating with the courier company for more than 10 years. 18% of respondents cooperate for a shorter time and the remaining 1% are people who use the company's offer for less than a year.

The next question (figure 6) concerned the reasons why respondents choose this particular company. The question was semi-open. In addition to specific indications, respondents could also provide their answers. A separate question was addressed to individual customers and members/owners of a business organization. Employees and owners were asked to gradate the factors that determine the choice of an enterprise with which to cooperate. The next figures will concern specific factors that entrepreneurs pay attention to. There are 9 possible answers (closed directory) and one open answer. Each respondent could award from 1 to 10 points.

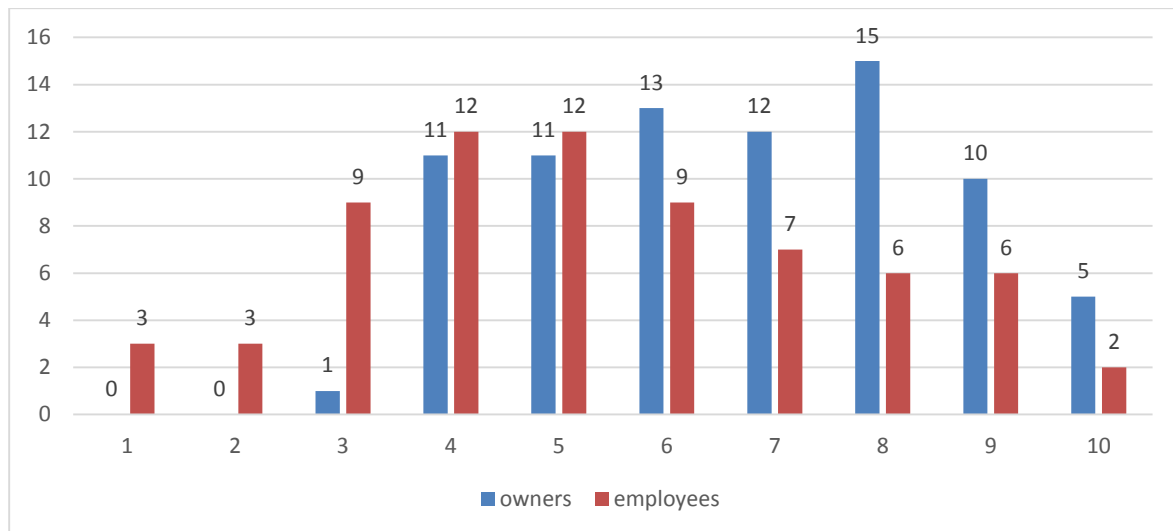


Figure 6. Assessment of order execution flexibility in the opinion of company owners and employees.

Source: Own study based on conducted research.

Flexibility in the implementation of the offer is more important for business owners. It can be assumed that many respondents run small organizations and have to provide materials, raw materials or production inputs themselves. There are the most small and medium-sized enterprises on the polish market, hence this assumption. In the case of employees of other entities who organize deliveries, order and send goods, flexibility places them in lower positions. Most indications were obtained at levels 3-6. Flexibility, which is one of the elements of logistic customer service, is particularly important for business owners and it is due to this factor that they decide, among others, for cooperation with the tested courier company.

Another element of customer logistics service is the speed of response. In today's reality, time is of great importance. Very often it determines many solutions and decisions made. Time translates into financial resources. Company owners responsible for their profitability must maintain continuity of production and systematically implement orders. This is possible by providing the means for this production. Therefore, respondents involved in cooperation with a courier company in the organization and company owners were asked about their opinion on the importance of the speed of orders (figure 7).

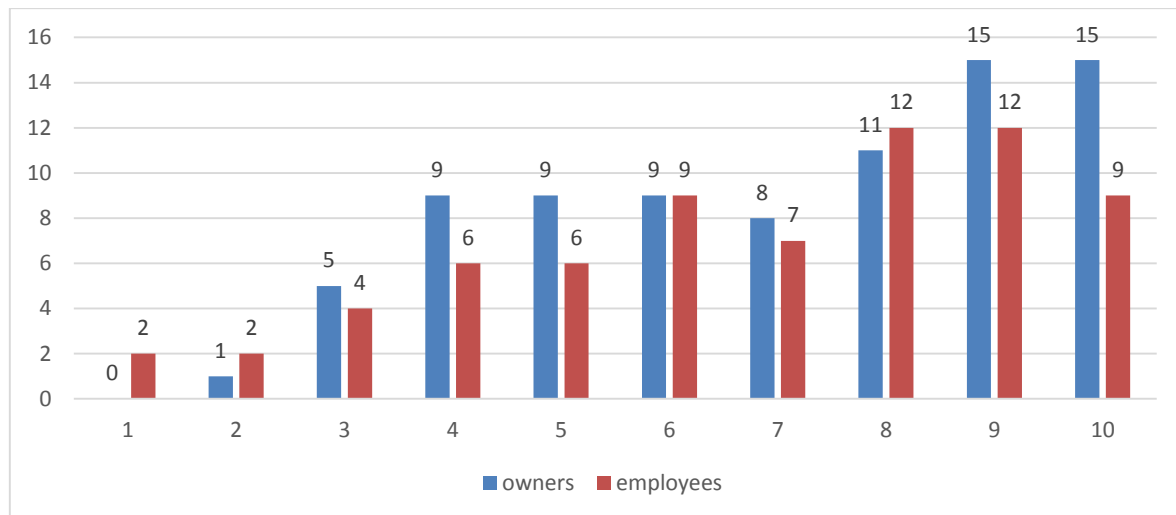


Figure 7. Assessment of order fulfillment speed in the opinions of company owners and employees.

Source: Own study based on conducted research.

Analyzing figure 7, it can be concluded that the speed of order fulfillment is particularly important for business owners. At these lowest levels, they did not provide many answers. From 4 and up, the number of responses from owners for whom time is a very important factor is constantly growing. The speed of response to an order is slightly less important for company employees. Perhaps this is related to the need to ensure minimum inventories in the company. Many entities do not use the Just in Time method and have stocks. The speed of order fulfillment is very important for business owners and people handling orders in companies. This factor determines the interest in the company among the survey participants.

Another component of logistic customer service is the level of communication. Contrary to appearances, this is a very important element of the transaction phase. Respondents were asked about the importance of communication with the company as a factor determining cooperation with the organization (figure 8).

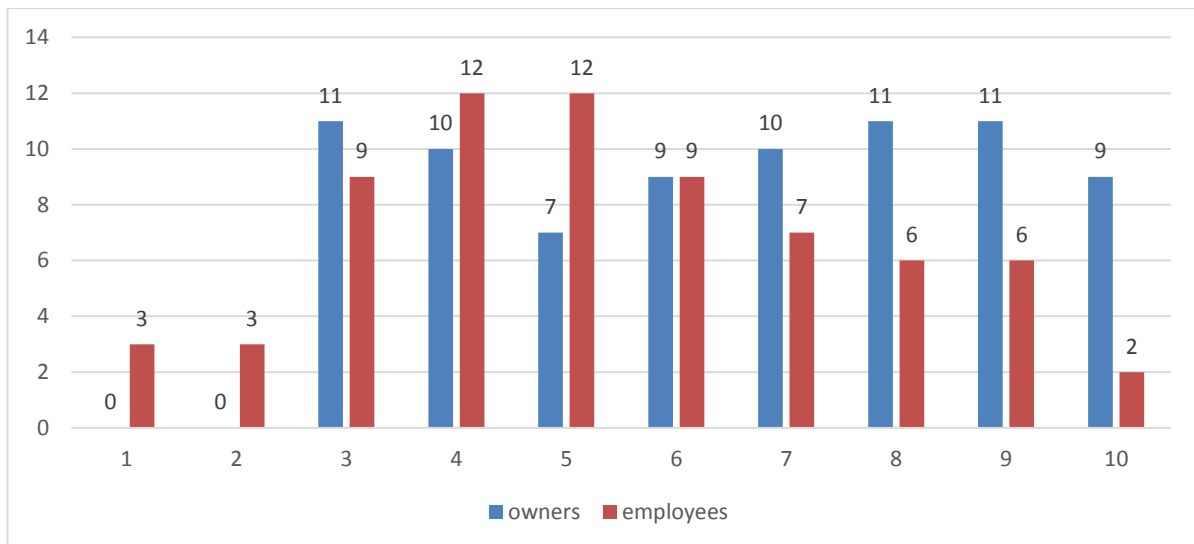


Figure 8. Assessment of communication with the courier company in the opinion of company owners and employees.

Source: Own study based on conducted research.

Business owners rank the importance of communication with customers at a higher level. They certainly have to deal directly with many issues related to order processing. In the case of larger business entities, it seems that cooperation is based on precise arrangements, agreements and principles that are established when establishing cooperation. If it lasts a long time, certain standards are developed. However, the knowledge that the shipment is under appropriate supervision in appropriate conditions and that the carrier is within reach of communication possibilities always reassures the customer.

Another factor that is taken into account in virtually all transactions is the price. Consumers, contractors and final customers are guided by it in their choices. However, price is usually not the only criterion. It is worth checking the respondents' answers regarding price as a factor determining the choice of a given courier company (figure 9).

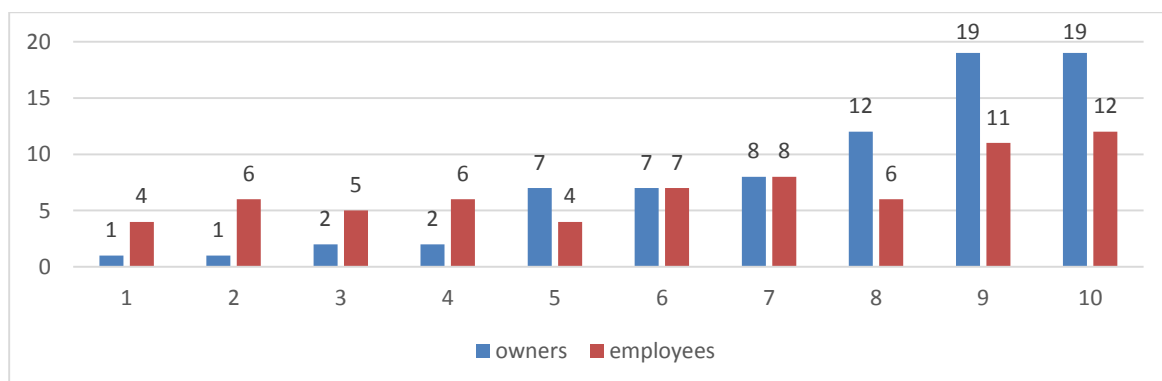


Figure 9. Assessment of the order price in the opinions of company owners and employees.

Source: Own study based on conducted research.

According to the analysis of the collected material, price is more important for business owners and they have to take it into account more carefully. Company employees are certainly not interested in financial issues if they are not directly obliged to look for company offers, taking into account only the price.

An important element in every business is the ability to discuss, establish certain common goals and negotiate terms. Each party should decide on the terms of cooperation through negotiations, compromises and arrangements. It will be different in the case of small businesses when sporadic orders are carried out. It is different when companies cooperate longer and more intensively (figure 10).

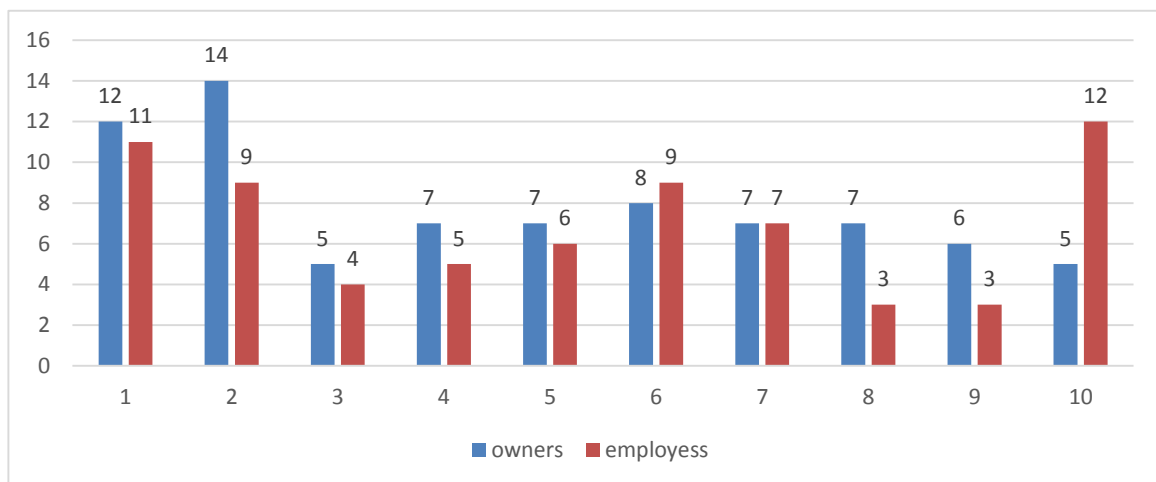


Figure 10. Assessment of the possibility of conducting negotiations with the company in the opinion of company owners and employees.

Source: Own study based on conducted research.

The ability to negotiate is more important for larger business entities. Employees of companies who are responsible for contacts with the courier company emphasize the importance of conducting negotiations or, as in the case of 11 other employees, they place this possibility at level 1, and 9 others at level 2.

Not all entities from the TSL industry offer the possibility of managing the company's supply chain. This is a modern solution that guarantees the company the consistency of orders, quality assurance and all other aspects related to order processing and transport (figure 11).

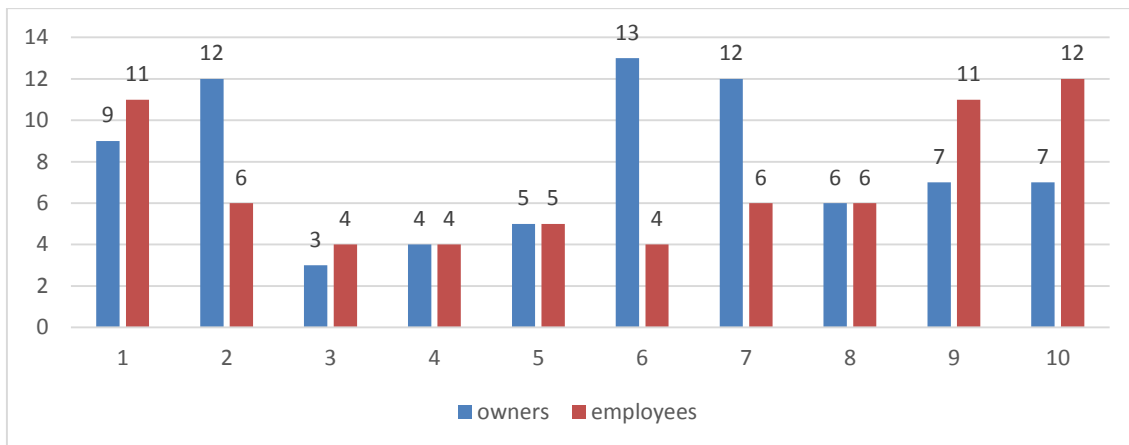


Figure 11. Assessment of supply chain management opportunities offered by the company in the opinion of company owners and employees.

Source: Own study based on conducted research.

The opportunity offered by the courier company under study, i.e. the implementation of the supply chain, is largely appreciated primarily by the company's employees. These are probably people professionally involved in logistics organization. There are also business owners who are not particularly interested in organizing the supply chain and for this reason they have certainly not decided to cooperate with the surveyed company. This factor determined the cooperation between company representatives.

The examined courier company is an organization operating all over the world. Provides services worldwide. It has all the solutions in terms of organizing transport, forwarding and logistics. There are no places that would be unavailable to the company that received the order from the client (figure 12).

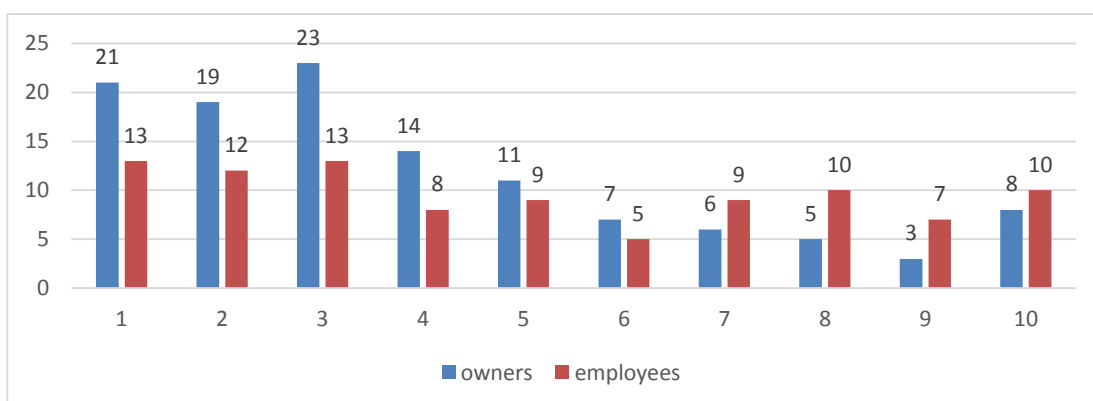


Figure 12. Assessing the importance of the global nature of the brand and the ability to complete orders regardless of location.

Source: Own study based on conducted research.

The fact that the examined courier company is an entity that can reach many places around the world and is an international company is important for a relatively small number of respondents. It seems that today it is standard that the shipment should reach the place he planned.

An important element of running a business is the issue of formal aspects of its operation. Formal issues are often problems that can be eliminated by outsourcing accounting and documentation to external entities (figure 13).

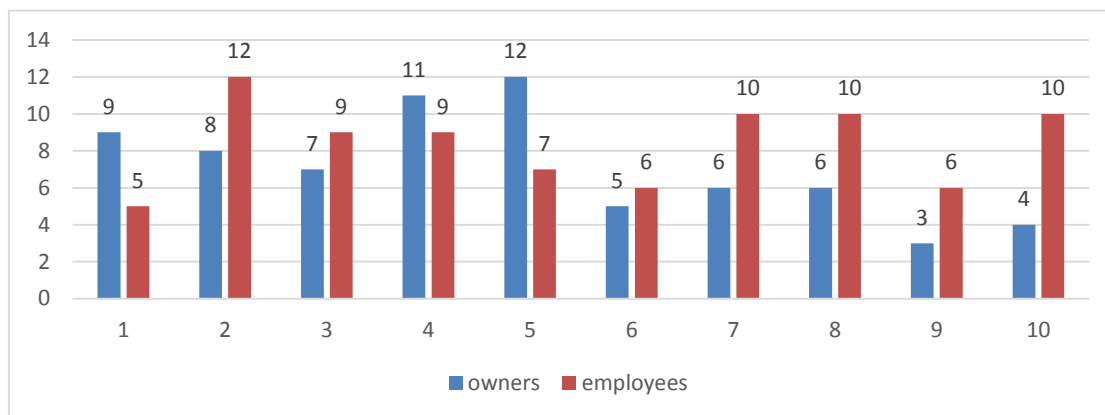


Figure 13. Assessment of the implementation of all formal aspects of order organization.

Source: Own study based on conducted research.

For 14 respondents, the ability of the surveyed unit to handle all administrative procedures was the most important factor. These are mainly employees of companies who, when deciding to cooperate with a network operator, expect a complete and comprehensive offer.

It is also worth mentioning that respondents had the opportunity to add a comment to the question. Three surveyed company employees wrote that the fact that they cooperate with the surveyed company results from a previously signed contract and was not influenced by the survey participant.

According to the respondents, the most valued features of the surveyed company are: price, speed of order fulfillment, and then the ability to manage the supply chain, the company's reach, and the ability to negotiate. The possibility of using solutions dedicated to the company, and right behind this indication there is the possibility of implementing formal aspects. The fewest answers were given to communication and flexibility. The indications with the lowest value for the survey participants were also summarized - 1. These factors do not influence the decisions made regarding the selection of a transport organizer. The answer with the lowest number of responses was that the surveyed company offers solutions dedicated strictly to companies. The company's global response also received few responses. As already mentioned, it seems that this is rather a standard in today's reality. The ability to negotiate and manage the supply chain was rated at the lowest level by 43 study participants. The lowest responses were given to price, communication, speed and flexibility.

The next question that will be analyzed was asked to individual customers who were asked to answer the factors determining the choice of the examined company as a courier company. The answers provided by individual customers are included in figure 14.

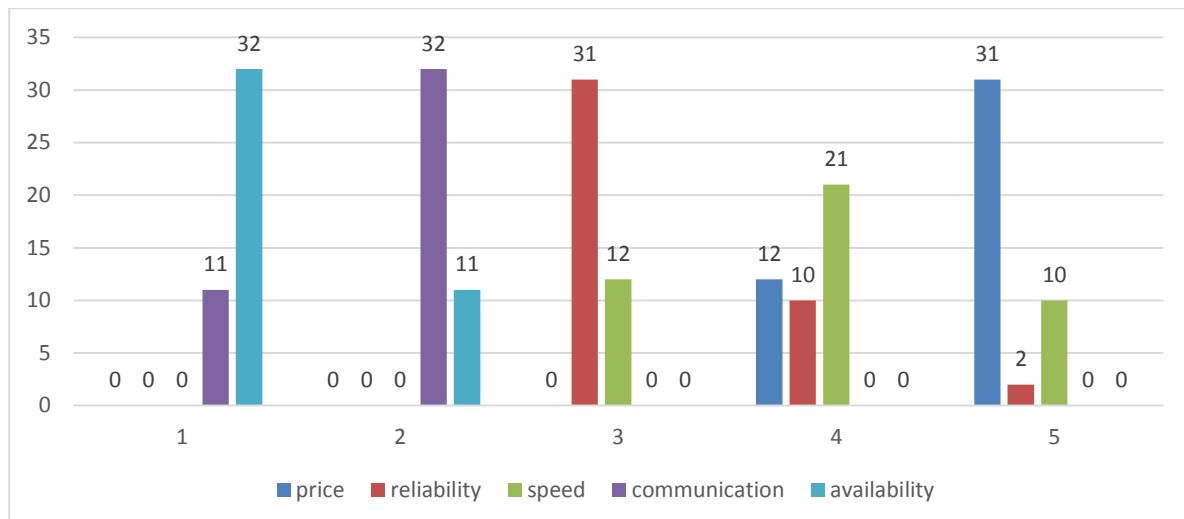


Figure 14. Factors determining the choice of a courier company for individual customers.

Source: Own study based on conducted research.

The respondents' answers are quite clear. They show that for individual customers, the most important thing is the price, followed by the speed of order fulfillment and reliability. The least important factor is availability, followed by communication.

One of the questions attempted to find out what subjective feelings accompany the process of order fulfillment by the courier company. A Likert scale was used in the study. The respondents had the opportunity to choose one of the indications. The course of the transaction itself is assessed. The answers are presented in figure 15.

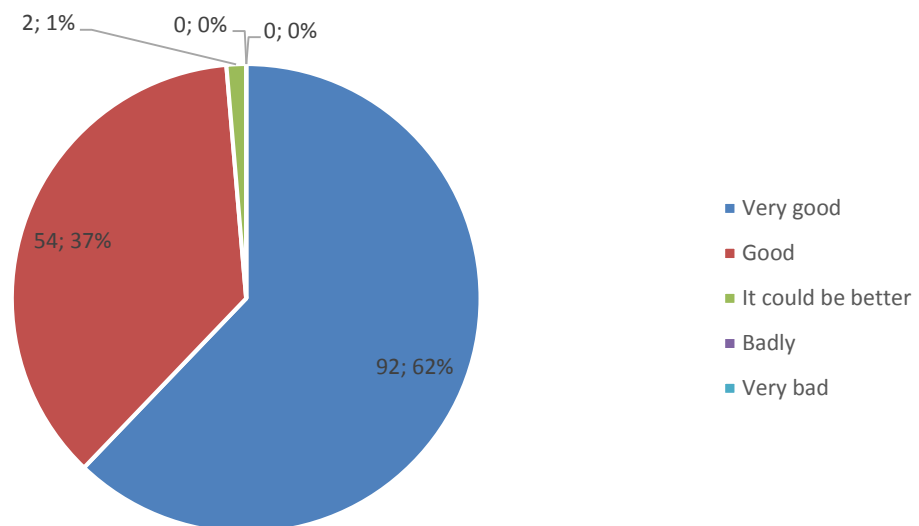


Figure 15. Subjective assessment of the order execution proces.

Source: Own study based on conducted research.

The study results are quite clear. 62% of survey participants believe that the order was completed at the highest level. Another 37% of survey participants gave the correct answer. 1% of the respondents (two people) thought that the order fulfillment could be better.

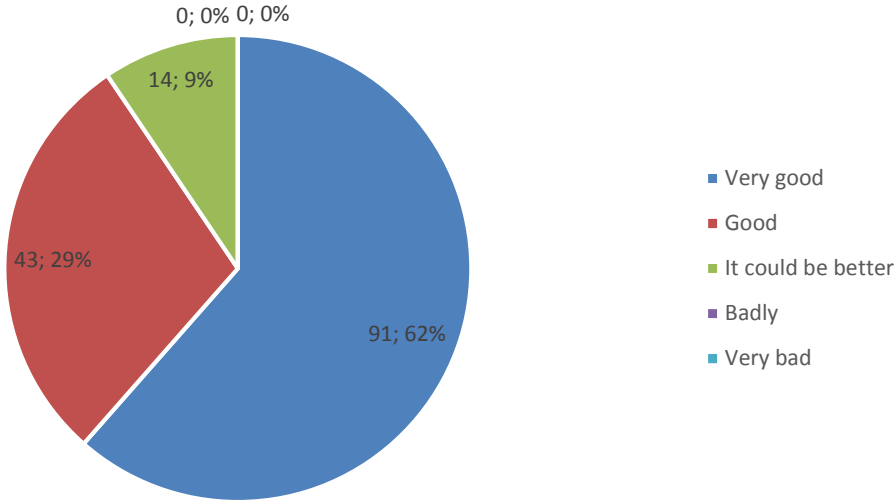


Figure 16. Assessment of the timeliness of order execution.

Source: Own study based on conducted research.

Time is an important factor not only for entrepreneurs, but also for every person. In today's reality, time determines many activities. It is a valuable good for probably every person living in the 21st century. The respondents also value their time 62% of survey participants rate the timeliness of the delivery by the surveyed company as being at the highest level 29% of survey participants rate the timely delivery as good. The remaining 9% of respondents believe that the timeliness of deliveries could be better.

Another factor examined are the costs of delivery by the surveyed company. The question about costs was asked to all respondents, which means that it was answered by both company employees, business owners and individual customers. The results are presented in figure 17.

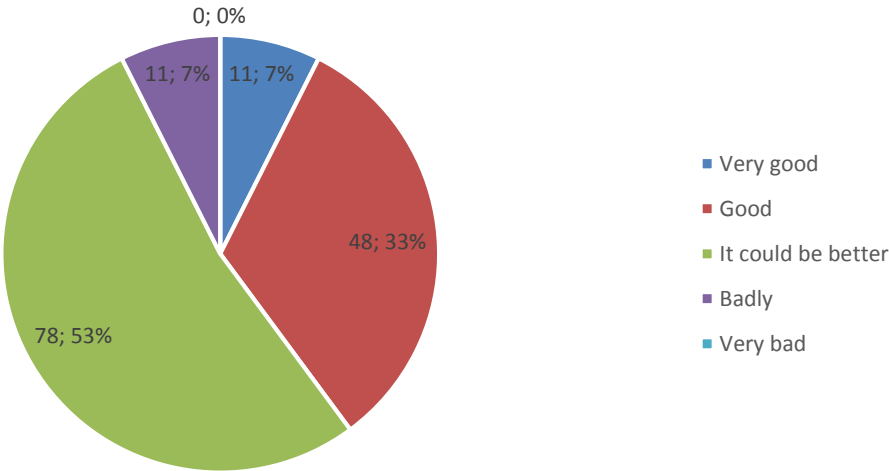


Figure 17. Assessment of the costs incurred in providing the service by the surveyed organization.

Source: Own study based on conducted research.

The issue of costs generated by order fulfillment no longer looks so optimistic in customer opinions. 53% of respondents, i.e. more than half, indicated the answer - it could be better 33% believe that the costs associated with order processing are good. The same number, i.e. 7% of the answers, indicated – bad and very good. Therefore, it seems that in terms of costs, the examined organization is not the cheapest entity. Therefore, non-financial factors must play a role.

Another element asked in the survey is the assessment of the level of transaction reliability. The results of the survey participants are presented in figure 18.

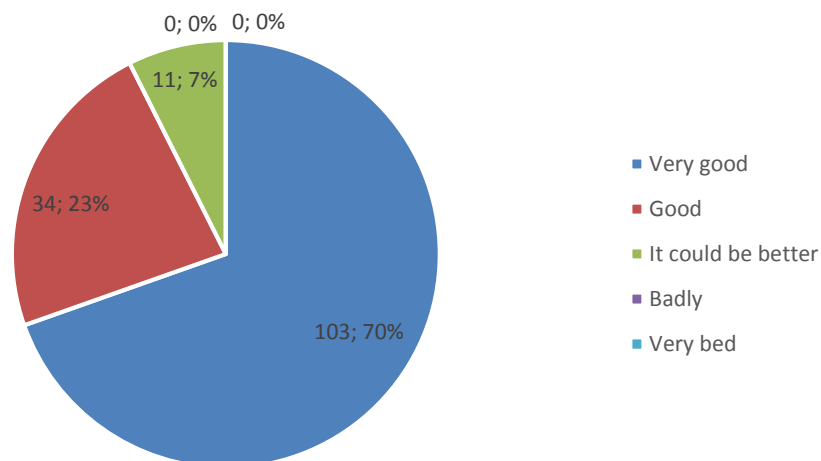


Figure 18. Assessment of the level of reliability of the company in the opinion of respondents.

Source: Own study based on conducted research.

The company's assessment in terms of service prices was, to say the least, surprising. When assessing the level of reliability of a company, as many as 70% of respondents believe it is very good. 23% said it was very good, and the remaining 7% of respondents thought it could be better. Therefore, this is definitely a strong point of the organization.

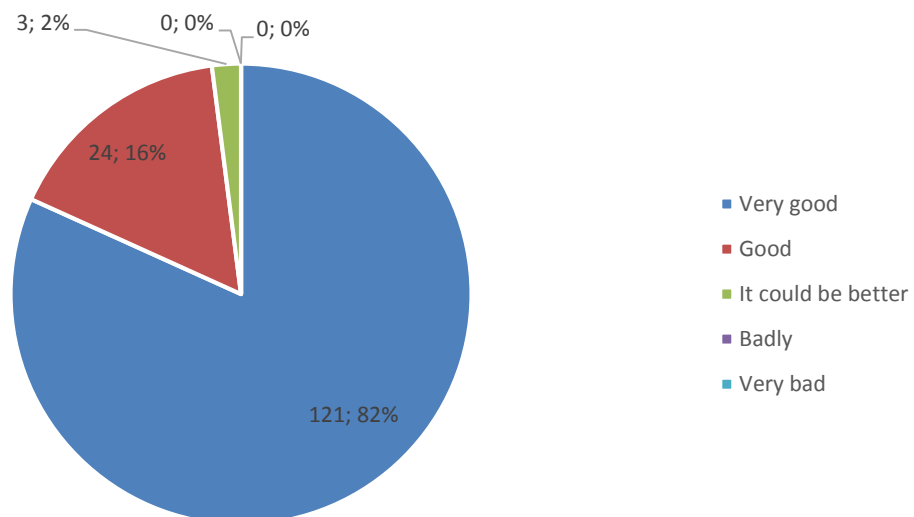


Figure 19. Assessment of service implementation in terms of flexibility.

Source: Own study based on conducted research.

The service was highly rated in terms of flexibility. 82% of respondents have no reservations regarding flexibility 16% think it is good, and 2% of respondents think it could be better.

The company therefore performs well in terms of flexibility in the opinion of customers or contractors (figure 19).

The quality of service also includes the so-called soft skills possessed by the company's staff. survey participants were asked about the level of communication and competences possessed by the organization's employees (figure 20).

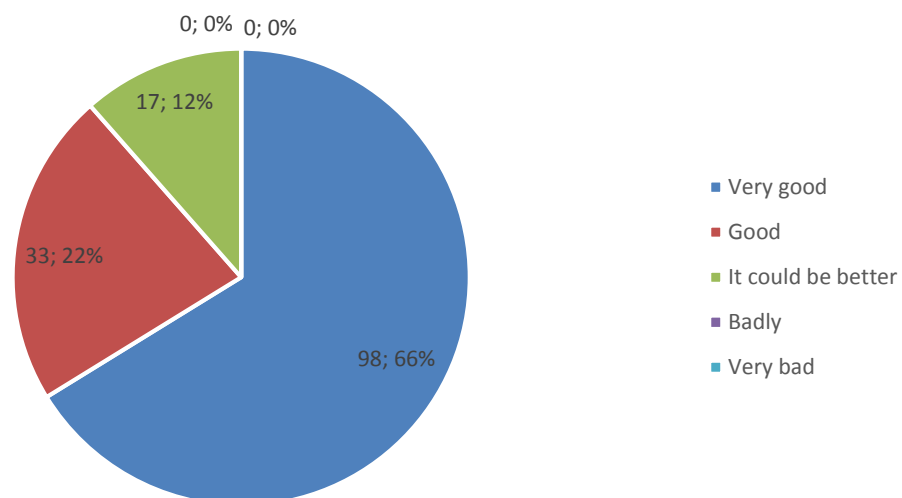


Figure 20. Assessment of the level of communication and competence of the organization's staff.

Source: Own study based on conducted research.

The analysis of the conducted research shows that the assessment of the level of communication and competences of the company's employees could be better. 66% believe that it is at the highest level, but 12% of respondents think that it could be better in terms of communication.

An important question was regarding the willingness to use the company's offer in the future, the results are included in figure 21.

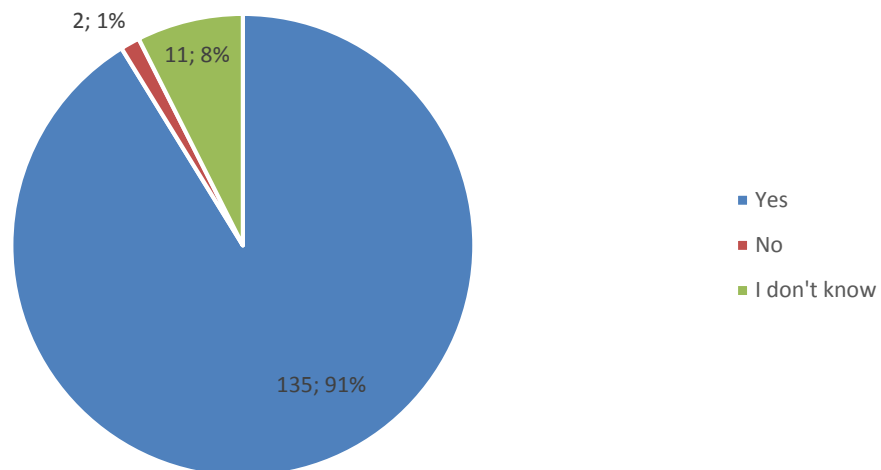


Figure 21. Declaration of willingness to use the company's offer.

Source: Own study based on conducted research.

The vast majority, 91% of survey participants, declare their willingness to use the company's offer again. Two respondents deny this and 8% of others have not made a decision yet. The research produced interesting results that can be successfully used in the organization when designing further activities regarding management strategy and those factors that play a crucial role.

3. End

Logistics customer service is an element of an organization's activity that may determine the company's market position. Modern customers are people aware of their needs. There is no problem with data availability and information on dealing with specific matters and solving problems. The market is saturated with entities providing various services. The TSL industry, along with the KEP market, are particularly developing. Customers can choose from offers from parcel delivery companies. There may be various factors that determine the choice of this or that company.

In the conducted research, attempts were made to reach as wide a group of various types of customers as possible. A selected courier company was chosen, which has a very wide offer addressed to enterprises. At the same time, it provides parcel transport services for individual customers. It was therefore assumed that they would participate in the study both representatives of business entities and individual clients. Assumptions were achieved. The study participants were divided into individual business owners and employees of enterprises.

The aim of the study was achieved. The respondents' opinions on logistic customer service in the case of a specific business entity were determined. The level of logistic customer service was rated very high. The vast majority of customers stated that the execution of orders was satisfactory and at an appropriate level in their opinion.

The research problem posed in the study was the assessment of the reliability of the service provided in the examined enterprise. It was very satisfactory in the eyes of customers. A similarly good opinion about the company was expressed in terms of service flexibility. The level of product availability was also highly rated. According to the company's customers, the communication and competences of the service staff are at an appropriate level. Respondents had reservations about the prices offered by the company. However, when asked about their willingness to use its services in the future, a very large percentage of respondents declared. Interesting results were obtained by analyzing the opinions of the study participants, who were divided into three groups. Individual customers appreciated prices, delivery time and reliability the most. Communication and availability of the offer were less important to them. In the case of entrepreneurs running their own businesses, similar indications were the most important. If company employees were surveyed, it can be seen that solutions intended for companies are important to them, i.e. organizing the supply chain, dealing with formal issues or any other solutions dedicated to companies. Each of the surveyed groups has different priorities in this regard. However, the most important observation is the high assessment of logistic customer service in the surveyed company and the willingness of respondents to continue to use its offer.

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MORE THAN BUSINESS: FAMILY ENTERPRISES AS A CREATIVE FORCE IN SOCIAL CAPITAL

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Purpose: This paper examines the role and significance of socio-emotional wealth (SEW) in family businesses, analyzing its contribution to the creation of social capital.

Design/methodology/approach: Empirical research conducted by the Polish Central Statistical Office (GUS) was analyzed to develop a set of indicators and measures of social capital generated by family businesses.

Findings: The integration of socio-emotional wealth and key success factors leads to distinctive management approaches that enhance social and economic stability. A set of metrics and indicators to assess the impact of family businesses on social capital is proposed.

Research limitations/implications: Further studies are required to validate the proposed indicators in diverse cultural and economic contexts.

Practical implications: The findings support the development of strategies and policies that leverage family businesses' unique resources to foster sustainable social and economic development.

Social implications: Highlighting the role of family businesses in building social capital emphasizes their potential contribution to societal well-being.

Originality/value: This paper introduces a novel framework linking socio-emotional wealth with social capital, offering valuable insights for researchers and policymakers.

Keywords: family business, socio-emotional wealth, social capital.

Category of the paper: Research paper.

1. Introduction

Research on family businesses has a long-standing tradition spanning several decades. The growing interest in this category of enterprises stems from their significant impact on both the economy and social life. However, there is a notable disparity between the economic importance of family businesses and the level of understanding of their operational models, behavioral specifics, and fundamental challenges. In academic literature, succession-related issues are most frequently addressed (Zajkowski, 2018), while studies focusing on the role of

socio-emotional indicators in shaping social capital - a cornerstone of stable national development - remain scarce.

The role of family businesses in building social capital is particularly evident during crises, when their commitments to local communities and intangible values become as important as financial goals. Therefore, it is crucial for researchers and policymakers to develop more precise metrics and indicators that reflect the impact of family businesses on social security. Such tools could facilitate a deeper understanding and better utilization of their potential in stabilizing societies.

The limited body of research on this group of enterprises is likely attributable to definitional challenges. The lack of precise definitions of family businesses results in their classification as a broad and diverse category. Despite extensive studies and significant contributions from academics, management practitioners, and consulting firms, a clear and universally accepted definition of the term "family business" (alternatively referred to as "family enterprise" or "family firm") has yet to be established. The need to account for dynamic changes in the economy, family structures, and the cultural and legal conditions of business operations remains a fundamental and difficult barrier to overcome.

The search for an adequate definition is accompanied by the belief that it should be broad enough to encompass various types of family businesses while being specific enough to clearly distinguish them from other enterprises (Niedbała, 2002). However, these expectations are difficult to meet. In 2009, a group of European Commission experts determined that there are over 90 different definitions of family enterprises across the European Union (Resolution, 2017). The basic validation of the proposed definitions' usefulness involves applying them to estimate the number of family enterprises within the business population of a given country or region, which demonstrates the limited applicability of most definitions. The majority of these definitions assume that the ownership structure of the enterprise is dominated by the family, and that the owners hold managerial and/or supervisory roles. More rigorous definitions additionally assume that the enterprise (family) has already undergone the succession process, typically within the family.

Family businesses represent a significant segment of national economies, characterized by long-term goals that often transcend purely economic calculations in favor of socio-emotional values. These values, known as socioemotional wealth (SEW), play a fundamental role in shaping the strategies and practices of these enterprises, influencing their sustainable development and their ability to create social security. According to forecasts by the consulting firm McKinsey, by 2025, the number of family businesses worldwide with revenues exceeding \$1 billion will increase from 8,000 to 15,000. Simultaneously, the share of family businesses compared to other legal and organizational forms will grow.

The Importance of Family Businesses for the Global and National Economies

According to a study conducted by the Bank of Korea, there are approximately 6000 companies worldwide that are over 200 years old: 56% in Japan, 15% in Germany, 4% in the Netherlands, and 3% in France. The majority of these companies are family-owned businesses. Some Japanese family firms, founded in the previous millennium, are still in operation today (primarily traditional hotel businesses, paper manufacturing, ritual goods production, etc.). In Europe, well-known family businesses established in the 16th and 17th centuries continue to operate successfully, such as Beretta (firearms manufacturing), Poschinger (glass production), Hahnemühle (paper production), Albrecht (metal production), and William Prym (family holding company), among others. Family businesses represent the dominant organizational structure worldwide, accounting for over 60% of global businesses, generating 50-75% of gross domestic product (GDP) and employment in each country. Family businesses are an integral part of the global economy. Approximately 30% of all companies with revenues exceeding \$1 billion are family-owned, meaning business dynasties account for one-third of global capital.

However, family businesses are more often small and medium-sized enterprises, frequently micro-enterprises. In the small business segment, family firms occupy key positions and can be regarded as the foundation of the economy. Family businesses represent over 80% of all enterprises in free-market countries and contribute 70-90% of global GDP. Among the largest taxpayers in the European Union, 40% are family businesses, and there are around 14 million family firms in the EU, 50% of which have shown steady sales growth over the past 10 years. In Europe, 70-80% of businesses are family-owned, providing 40-50% of jobs; in Italy, family businesses account for 90% of industrial enterprises, in Germany – 85%, in Spain – 70%, and in Poland – 34%.

Family businesses are often deeply embedded in local communities, which translates into strong social engagement and the building of social capital as a crucial element of social participation. Understanding the links between social values and social security is key to developing strategies that support both economic and social development. As one of the pioneering researchers of social capital in Poland, Aleksandra Skrabacz (2023), emphasizes, a high level of social capital is a *sine qua non* condition for the efficient and secure functioning of local communities, where local entrepreneurs play a significant role. For this reason, their impact on social security cannot be overlooked in studies on social development and in the development policies of national and local authorities.

2. Socio-Emotional Wealth Theory

In contemporary literature on the subject, the concept of "socio-emotional wealth" (SEW) is used concerning the social capital of family businesses. This term highlights the differences between family and non-family firms, emphasizing non-financial elements that shape identity, influence, and the continuity of family businesses across generations. (Gomez-Mejia et al., 2007). These values may include preserving the business as a family legacy, maintaining decision-making control within the family, and safeguarding family harmony and reputation. The SEW model, developed by Gomez-Mejia, Cruz, Barrone, and De Castro (Gomez-Mejia et al., 2011), is deeply rooted in traditional research paradigms from financial economics and strategic management, while also emerging from studies on family businesses.

The application of the SEW model in family business research is a relatively new approach, certainly requiring further study, yet it already introduces some methodological consistency and offers a new tool for examining family firms. Research paradigms designed for non-family organizations struggled to address the uniqueness of family businesses. The SEW model, as a new theoretical framework for family firms, provides research uniformity, common terminology, and consistent interpretation of results.

In a simplified view, the SEW model suggests that family businesses are generally motivated and committed to preserving their socio-emotional wealth, referring to the non-financial or "affective resources" of family owners. Within this framework, gains or losses in SEW serve as a key reference point that family businesses use when making important strategic and policy decisions.

One of the main characteristics of family businesses is their long-term perspective. The primary goal of family business owners is to remain on the market for as long as possible and pass the business on to future generations, in contrast to focusing on short-term profits. Focused on the long-term survival of the business, private companies shape their policies to endure across generations, weather new governments, crises, manage debts, recover, grow, and adapt to new tax systems and other changes that may initially shock and weaken the business. They aim to become a unifying force for the next generation.

Employee job satisfaction in family businesses is also higher than in non-family firms. This is because employees often interact not only with their direct supervisors but also with the owners. This can be a motivating factor, as it is often the owners who are the visionaries of the firm.

The intangible resources of family businesses include unique values that go beyond traditional definitions of intangible assets (Berrone et al., 2012). These values arise from the synergy and coexistence of the family and the enterprise in family firms. In addition to profit, family-run businesses can offer many intangible benefits, such as building trust and mutual support among colleagues who work towards a common goal, which leads to success.

The socio-emotional wealth model applied in this study encompasses five main dimensions known by the acronym FIBER: (Family Control and Influence, Identification with the firm, Binding social ties, Emotional attachment, and Renewal of family bonds through succession). These dimensions will be discussed in detail in the research section of the paper.

Social capital and family values serve as the "driving force" of family businesses and are key sources of their competitive advantage (Sirmon, Hitt, 2003).

3. Social Capital: A Theoretical Analysis

Social capital can serve as a valuable tool for studying socio-economic realities that are not always easily captured by traditional research methods. However, it is important to note that the concept of social capital contains many underdeveloped elements and ambiguities, particularly in the area of methodology. The complexity and multi-faceted nature of this issue mean that social capital is defined in various ways. Francis Fukuyama emphasizes the relationship between social capital and economic, social, and political activity (Fukuyama, 2000). His definition of social capital is based on informal values and ethical norms shared by members of a given group, which enable mutual cooperation. A key element that enhances the efficiency of a group's functioning is increasing trust. According to Fukuyama, social capital is built from the family level through social groups to institutions, with the involvement of traditions, culture, history, religion, customs, and market activities.

Robert Putnam highlights three core values as elements of social capital, arguing that "social capital refers to those features of social life networks, norms, and trust that enable participants to act together more effectively to pursue shared objectives" (Putnam, 1995).

This approach integrates various aspects of social capital with social needs and development, similar to Fukuyama's considerations, which highlight the relationship between social capital and economic activity.

Family businesses, due to their unique structure and culture, can play a key role in building and maintaining social capital. Trust, a central element of social capital, also forms the foundation of social security. In a society where mutual trust prevails, it is easier to build a stable and secure environment. In family businesses, trust is often stronger than in other types of enterprises, which can contribute to better risk and security management. The role of trust as a component of social capital is emphasized by both Putnam and Fukuyama. The latter writes, "social capital refers to the strength of a community derived from the widespread dissemination of trust within the society or its segments".

Social networks, which facilitate the exchange of information and resources, are crucial to both concepts. In the context of social security, these networks can serve as communication and support channels during crises.

Social capital as a value is prominently featured in successive medium- and long-term national development strategies. In “The Report Poland 2030”, which serves as a reference framework for the Long-Term and Medium-Term National Development Strategies, the enhancement of social capital is identified as one of the ten key developmental challenges for the country. Significant attention is given to the role of engagement in non-governmental organizations, which facilitates collaboration at the local level, as well as to general interpersonal trust - an essential factor in building social capital.

4. Research methodology

The analyses conducted in this article are based on selected results from a questionnaire survey carried out by the Central Statistical Office of Poland (GUS) across the entire country (GUS, 2022), the results of social cohesion studies (GUS, 2020), and data from reports by the Department of Economic and Social Affairs (UN DESA) and the Organisation for Economic Cooperation and Development (OECD). Based on the alignment of key success factors identified in the GUS survey with the dimensions of SEW, an attempt was made to define social capital indicators contributed by family businesses, which could serve as a basis for studying social security.

The GUS survey focused on non-financial sector enterprises in Poland employing 10-249 people (i.e., small and medium-sized enterprises). The analysis of the situation of family businesses covered areas that, according to the literature, are considered specific and distinctive compared to the broader small and medium-sized enterprise (SME) sector. The sample comprised 44.9 thousand Polish enterprises in total. Of all respondents, approximately 14.7 thousand, or 33.9%, identified their companies as family businesses. Among the surveyed entities employing between 10 and 49 people, family businesses accounted for 35.4%, while for larger entities employing 50-249 people, they constituted 27.4%.

The share of family businesses varied across regions, with the highest percentages (among surveyed enterprises) identified in the Wielkopolskie, Łódzkie, and Podlaskie voivodeships.

One of the key distinguishing features of family businesses are their unique success factors. In the GUS study (GUS, 2023), respondents were asked about success factors grouped into four categories: Emphasis on continuous development (1), Resource and Process organization (2,3), and a Specific approach to the external environment (4). These categories allow for mapping the dimensions of SEW within each category and identifying corresponding social security indicators.

The SEW model is not yet widely applied in research, but it can serve as an effective analytical tool for interpreting a broad spectrum of phenomena related to family businesses, including the study of social capital built by family firms, which serves as the foundation for social security.

5. Research findings

In the analysis conducted for this study, the specific success factor categories developed by the Central Statistical Office (GUS) in its research on family businesses were mapped against the dimensions of socio-emotional wealth in family firms. This comparison enabled the identification of indicators of social capital built by family businesses. The analysis utilized data from “The Quality of Life and Social Capital” report prepared by GUS, as well as reports from the Department of Economic and Social Affairs (UN DESA) and the Organisation for Economic Cooperation and Development (OECD).

Table 1.
Mapping of SEW Dimension and Success Factors

Sew (socio-emotional wealth of the firm)/ success factor	Continuous development	Company resources	Internal processes	Market environment and approach toward it
Identification with the Firm		Employment Stability Indicator		
Binding Social Ties	Community Investment Indicator			Local Engagement and Participation Indicator
Emotional Attachment			Transfer of Values and Traditions Indicator	

Source: own materials.

Family businesses also have their own specific sources of success, distinct from the characteristics of non-family enterprises, which allow them to improve their market position more consistently than non-family firms. Moreover, the larger the family business, the greater the advantage. For the purposes of this analysis, the definition provided by the Central Statistical Office (GUS) has been adopted, which, due to the general nature of its research, considers success factors to be key stimulants of enterprise development processes. These stimulants have been grouped into four categories: 1. Emphasis on Continuous Development, 2. Resource Organization, 3. Process Organization, and 4. A Specific Approach to the External Environment.

The category of Continuous Development is understood as the constant search for growth opportunities, the structuring of development directions, and reliance on market information. This category allows for the assessment of a company's outlook on the future, including indicators of optimism and acceptable levels of risk. The uniqueness of family businesses is particularly evident in this area, with 57.6% indicating that they utilize competitive analysis in shaping their actions and place great importance on actively seeking market niches (50.3%). Additionally, family businesses demonstrate a higher willingness to change fundamental development directions compared to non-family firms.

The Company Resources Category focuses on the owner, employees (human resources), and tangible investments (including financial resources). In family businesses, due to the scale of operations and the ownership structure, the key resource is the leader, whose role, competencies, and skills are crucial. GUS research indicates that 56% of family businesses build their success on the dominant role of the leader, with 60.8% of respondents evaluating the leader's influence as a critical factor for the firm's success.

According to respondents' opinions, the key personality and competency determinants of the leader include market knowledge, self-confidence, ambition, determination, consistency, and extensive management experience. In the internal resources category, special attention should be given to the relational capital of family businesses, as expressed in the business relationships between the company and its clients. The research results show that long-term relationships with clients were considered crucial for the success of family businesses by 74.4% of respondents.

Internal Processes primarily involve risk management and processes that support market expansion. A key aspect of analyzing internal processes is the company's approach to financial risk. According to GUS research, the propensity to take risks among family businesses was significantly higher than among non-family firms.

The Market Environment and Approach Toward It reflects openness to collaboration with external institutions and companies, seeking partnerships and establishing connections, and viewing legal barriers as a natural part of the market landscape. A key element of family business operations is the importance of the local environment for market success. Regardless of size, family businesses were more likely to exhibit a strong local orientation compared to non-family firms.

The success factors identified represent a unique source of competitive advantage for family businesses compared to non-family enterprises. The concept of studying the sources of such an advantage whether through actions, resources, processes, or the environment stems from the traditional, behaviorally grounded approach in both Polish and international literature on enterprise performance.

The mapping of family business success factors with socio-emotional wealth values is an attempt to adopt a comprehensive approach that incorporates both the business and family spheres. As a result of this alignment, indicators of the social capital generated by family

businesses that contribute to social development in local communities have been identified. The next task will be to further develop and design a set of elements that will serve as a useful foundation for conducting research through questionnaires, specifically designed to capture the measurable contribution of family businesses to the creation of social capital.

6. Discussion

The SEW model applied in this analysis, includes five main dimensions summarized by the acronym FIBER: Family control and influence, Identification with the firm, Binding social ties, Emotional attachment, and Renewal of family bonds through succession. For the purpose of mapping success factors, three values that, according to GUS research, have the greatest impact on the external environment were selected. These values are Identification with the firm, Binding social ties, and Emotional attachment. Each will be discussed in detail below.

Family Control and Influence – This dimension refers to the control and influence that family members exert over the company's operations. A distinguishing feature of family businesses is that family members maintain control over strategic decisions, often independent of financial considerations (Gomez-Mejia et al., 2007). This is a fundamental condition for preserving the firm's SEW. This dimension can be measured by the number of positions held by family members or the number of family members on the company's board. However, it does not directly relate to social capital or social security, nor does it impact the quality of life in the local community, which is why this dimension was not selected for analysis.

Family Members' Identification with the Firm – The second dimension concerns the close identification of the family with the business. Researchers of family firms assert that the unique identity of family businesses stems from the intertwining of family and business interests (Berrone et al., 2010). The identity of the owner is often inseparable from the enterprise, which usually bears the family name. This leads to the company being perceived by both internal and external stakeholders as an extension of the family itself. Internally, this likely has a significant influence on attitudes toward employees, as well as other internal processes and the quality of services and products provided (Carrigan, Buckley, 2008). Externally, it makes family members highly sensitive to the image of the company, as presented to clients, suppliers, and other stakeholders (Micelotta, Raynard, 2011). Family businesses also tend to exhibit higher levels of social responsibility and engagement with the local community (Berrone et al., 2010). These characteristics were key factors in selecting this SEW dimension for mapping with success factors.

Binding Social Ties – The third dimension relates to the social relationships within family businesses. Research on family firms globally and in Poland (Więcek-Janka, 2013; Cruz, Justo, De Castro, 2012) suggests that family ties provide some of the same collective benefits seen in

closed networks, such as collective social capital, relational trust (Coleman, 1990), and a sense of closeness and interpersonal solidarity (Uzzi, 1997). The reciprocal ties in family businesses are not limited to family members but likely extend to a broad range of stakeholders, such as long-term suppliers, who may be viewed as or actually be family members (Uhlener, 2006). A sense of belonging, identity, and identification with the family firm is often shared by non-family employees, promoting stability and commitment to the business.

Family ties, extending from family members to employees and external stakeholders, likely create strong social bonds with the broader community as well. Family businesses are deeply rooted in their communities and often sponsor community-valued associations and activities, such as charities, local events. They may do this for altruistic reasons, for the pleasure of being recognized for their actions (Schulze et al., 2003), or for both reasons. Due to the strong and direct connection between this SEW dimension and its impact on the local community, it was selected for analysis.

Emotional Attachment – The fourth dimension refers to the role of emotions in family business contexts. While emotions are an integral part of everyday organizational life (Więcek-Janka, 2006), they are especially strong in organizations where family relationships dominate, as these relationships are shaped by shared past experiences and events that influence current actions, decisions, and relationships. Some researchers consider the blending of emotional factors from family involvement with business factors as a distinguishing feature of family firms, as well as the intertwining of family and business interests.

Since the boundaries between the family and the corporation are typically blurred in family firms (Berrone et al., 2010), emotions permeate the organization, influencing the decision-making process in the family business (Baron, 2008).

Emotions in family businesses are often discussed indirectly, relating to issues that affect the business, such as family conflicts (Więcek-Janka, 2019), personal relationships, family culture, trust (Steier, 2001), altruism (Zahra, 2003), and philanthropy (Cruz et al., 2010). However, emotions can also have negative effects, leading to dysfunctional family relationships. In contrast to non-family firms, where dysfunctional relationships and persistent conflicts often end with the termination of employment, in family firms, where emotional attachment is high, conflicts are maintained, perhaps involuntarily, with the hope that they will eventually resolve themselves. Given the direct impact of this dimension on the local community, it was also selected for analysis.

Renewal of Family Bonds to the Firm Through Dynastic Succession – The fifth and final SEW dimension refers to the intention of passing the business to future generations. This intergenerational continuity is one of the central aspects of SEW. The sense of succession continuity has temporal implications in the decision-making process. From a family shareholder's perspective, the firm is not simply an asset to be sold, as it symbolizes the family's legacy and tradition (Casson, 1999). Consequently, family members view the business as a long-term family investment meant to be passed on to descendants (Berrone et al., 2010).

Maintaining the business for future generations is widely seen as a key goal for the existence of family firms (Kets de Vries, 1993), and family businesses are known to plan over longer time horizons (Sirmon, Hitt, 2003). Although the long-term perspective may lead to undesirable consequences, such as managerial entrenchment or conflicts related to succession, the continuation of family values through the business and succession supports an "intergenerational investment strategy that creates patient capital" (Sirmon, Hitt, 2003, p. 343), fostering capacity building and learning.

Indicators of Social Capital Building by Family Businesses

As shown by GUS research, the discussed success factors characterize the largest group of family businesses in Poland. On the other hand, SEW values a priori apply to any company that is family-owned. Therefore, the social capital indicators derived from mapping these two elements can serve as a new tool for studying family businesses and effectively measuring their impact on the level of local social capital. In research on quality of life, indicators are numerical exemplifications of various aspects of societal functioning and its components. Family businesses are a vital part of societies, and measuring the level of social capital through indicators that assess and monitor the activities of family businesses is a new proposition that will be further developed by the author.

Assessing the impact of family businesses on social capital can be a complex task, involving both indicators and metrics. Table 2 presents the categories of social capital indicators built by family businesses, resulting from the alignment of SEW indicators and success factors.

Table 2.

Indicators of the Impact of Family Business on Social Capital

INDICATOR	DESCRIPTION	MEASUREMENT METHOD
Employment Stability	Evaluation of how stable employment is in family businesses and its impact on the economic security of employees.	<ul style="list-style-type: none"> • Employee turnover in family businesses. • Percentage of long-term employment contracts.
Local Engagement and Participation	Analysis of how family businesses engage in activities benefiting the local community.	<ul style="list-style-type: none"> • Number and quality of social initiatives supported by family businesses. • Participation of family businesses in local charitable projects.
Investment in the Community	How family businesses contribute to building and maintaining social ties in local communities.	<ul style="list-style-type: none"> • Number of employees from the same local community. • Family businesses' involvement in social and cultural events.
Transmission of Values and Traditions	How family businesses promote family values and traditions, potentially influencing social stability.	<ul style="list-style-type: none"> • Percentage of family businesses passed down through generations. • Employee satisfaction with the work environment and the values promoted by the company.

Source: own materials.

The indicators resulting from mapping of SEW values and family business success factors are: 1. local engagement and participation indicator, 2. community investment indicator -forms of financial support for social organizations' activities, 3. employment stability indicator, 4. transmission of values and traditions indicator. They are described in detail below.

1. Local Engagement and Participation Indicator is measured by the number of jobs created within the local community. This indicator shows how the company contributes to reducing local unemployment.
2. Community Investment Indicator reflects the forms of financial support for social organizations' activities and is measured as the percentage of company revenue allocated to social initiatives. It includes investments in education, health, local culture, infrastructure, etc.
3. Employment Stability Indicator represents the ratio of long-term employment contracts to the total number of contracts. A higher percentage of long-term contracts may indicate stable employment, which translates into greater economic security for employees.
4. Transmission of Values and Traditions Indicator is measured by the percentage of family businesses passed down through generations. It also includes employee satisfaction with the work environment and the values promoted by the company.

Family businesses often invest in local communities, creating stable jobs and supporting local social and educational projects. In doing so, they not only strengthen the economic foundation of the region but also build strong, lasting social relationships, contributing to a general sense of security and social belonging. The unique ability of family businesses to think in terms of generations can foster long-term investments in the community that go beyond the typical investment cycles of non-family businesses. Assessing the impact of family businesses on social capital can be a complex task, involving both indicators and metrics. The impact of family businesses on social capital can be measured using impact metrics, which have also been derived from the alignment of SEW values with the success factors of family businesses (Table 3).

Table 3.

Metrics of the Impact of Family Businesses on Social Capital

No.	METRIC NAME	DESCRIPTION	METRIC
1.	Number of Jobs Created by Family Businesses	Specific measurement of the number of people employed by family businesses.	• Number of full-time and part-time jobs created by family businesses in a given region.
2.	Percentage of Employees with Long-Term Employment	Measurement of employment stability in family businesses.	• Percentage of employees who have been employed by the family business for at least 5 years.
3.	Investments in Local Social Infrastructure	Amount and frequency of family business investments in social projects such as schools, hospitals, or other public services.	• Amount spent on infrastructure projects within a year.

Cont. table 3.

4.	Employee Satisfaction Level	Measurement of how satisfied employees are with working conditions in family businesses, which may affect their stability and social security.	<ul style="list-style-type: none"> • Results of employee satisfaction surveys.
5.	Family Businesses' Contribution to Local Community Income	Measurement of the contribution of family businesses to the local economy.	<ul style="list-style-type: none"> • Percentage share of income generated by family businesses in the total income of the local community.

Source: own materials.

The issue of social capital can be analyzed through three established theoretical research approaches: based on the level of happiness, based on resources and services, and based on existential needs. Given that social capital is inherently a dynamic variable, measuring it involves the process of searching for and applying various types of indicators. These indicators can be derived from statistical research data used to describe and evaluate social phenomena, one of which is the phenomenon of family entrepreneurship. The use of family business activities to establish new social capital indicators aligns with this process of indicator development.

7. Conclusions

In the context of social development, the presence and growth of family businesses in society can significantly support the level of social capital. A key aspect of this support is the ability to measure social capital through various indicators. In this regard, research on family businesses can prove valuable, as their number and influence in a given area may serve as a crucial indicator of the satisfaction of basic existential needs in local communities. These indicators can be applied to describe and assess social phenomena, serving as a measure of the quality of social capital or quality of life at the local level.

The author of this study plan to further verify their hypothesis through quantitative research. If subsequent studies confirm the hypothesis, family businesses may be considered an additional indicator of social capital at both national and global levels.

This article makes a significant contribution to the existing literature in two ways. First, it proposes a systematic set of metrics and indicators to study the impact of family businesses on social capital. Until now, family businesses have been examined using universal tools borrowed from other disciplines, mainly financial economics and strategic management, where the primary focus was on large, publicly traded corporations with widely dispersed ownership. The proposed set of SEW dimensions represents a new tool that requires operationalization. The attempt to combine SEW dimensions with the success factors of family businesses has allowed for the proposal of a set of metrics and indicators, which we have

termed: 1. local engagement and participation indicator, 2. community investment indicator, 3. employment stability indicator, and 4. transmission of values and traditions indicator.

Second, our research provides an interdisciplinary integration of the latest findings on family businesses with the field of social capital. By doing so, we initiate a discussion on critical elements of social development, whose contribution could be the development of strategies for regional socio-economic policy. Scientific discourse on this subject will allow for a better understanding of how the stability and growth of family businesses affect the cohesion and development of local communities. Such an analysis could also contribute to the creation of more sustainable management strategies and policies that support both family businesses and broader social capital frameworks.

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ANALYSIS OF FACTORS INFLUENCING THE BALANCE BETWEEN WORK AND PRIVATE LIFE OF MEDICAL STAFF

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Purpose: Work-life balance (WLB) refers to the ability to combine work with other aspects of life, such as family life, social activities, or personal interests. The topic of WLB appears to be particularly relevant for medical personnel, who face exceptionally high levels of stress, irregular working hours, and emotional strain. Maintaining a balance between work and personal life can contribute to improving employees' well-being, quality of life, and patient care, as well as help reduce staff turnover in the healthcare system, which is a significant sector in the European Union economy. The aim of this article is to identify the factors that are positively and negatively influencing the balance between work and private life of medical staff.

Design/methodology/approach: The study was conducted in the first quarter of 2024 in Polish medical institutions. A paper-based survey questionnaire was used as a research tool to collect data consisting of answers to closed questions. The questionnaire was discussed during interviews with experts, i.e., medical staff. Also, literature review was a key to understand the topic and point out the positive and negative factors.

Findings: Based on the conducted empirical research, we can conclude that medical personnel appreciate a wide range of solutions supporting work-life balance, such as additional days off, reduced working hours, flexible hours tailored to individual needs, accommodations for pregnant women, training to enhance skills, and attention to employees' mental health. The greatest negative impact on work-life balance among medical personnel comes from mobbing and hate.

Research limitations/implications: The limitations of the study stem mainly from the sample selection and the design of the research tool, which allowed for quick completion but may have overlooked important issues. In the future, it would be beneficial to increase the sample size and focus on a single medical profession. Nevertheless, the analysis of factors affecting work-life balance provides a foundation for further research among medical personnel.

Originality/value: The article provides a new outlook on factors affecting maintaining work-life balance. It is a valuable analysis for managers, HR professionals, medical organization leaders and medical staff who want to raise awareness about maintaining work-life balance in their companies and discover new ways to achieve WLB.

Keywords: Work-life balance, WLB, medical staff.

Category of the paper: Research paper.

1. Introduction

The topic of work-life balance (WLB) is currently of great interest among employees, employers and researchers (Czerwińska-Lubszczyk, Byrtek, 2023). It is particularly important for medical staff who face extremely high levels of stress, irregular working hours and emotional strain (Łuczak et al., 2018).

Medical personnel include doctors, nurses, midwives, paramedics at various levels, dieticians, therapists, speech therapists, psychologists, pharmacists, dentists, etc., as well as core business employees employed in medical entities but not practicing medical professions, as well as interns and residents (Ustawa z dnia 8 czerwca 2017 r..., 2017; Ustawa z 5 grudnia 1996 r..., 1996).

Maintaining WLB can significantly improve the well-being and quality of life of medical workers, and at the same time have a positive impact on the quality of patient care and reduce turnover in the health sector, one of the main areas of the European Union economy (Rabiej, 2015). The majority of medical staff are women (GUS, 2022), who should take particular care of their WLB. Over the years, there has been a clear evolution of the family model - more and more women take up paid work, which changes their position in the social and family structure (Siemieniak, Rembiasz, 2018).

The transformation of the family model leads to the redefinition of traditional roles, including the role of the „breadwinner” in the family, which was previously almost unambiguously assigned to men (Guja, 2016; Gałęska, 2015). Global and economic changes mean that women often combine work and private life, which creates numerous challenges in achieving WLB (Batineh, 2019).

In order to understand the specific position of women in this process, it is worth recalling the issue of *the concept of transitioning between cognitive roles* as written by A. Smoder (Smoder, 2020). Women involved in professional life often experience conflict resulting from competing personal and professional responsibilities, which can be difficult to reconcile and may rob both work and family life of their satisfactions (Lakshmi, Sai Prasanth, 2018; Adamska-Chudzińska, 2020; Hildt-Ciupińska, 2017).

One of the reasons for continuing research on the WLB of medical staff in Poland are also legal changes. Directive (EU) 2019/1152 of the European Parliament and of the Council of 20 June 2019 on transparent and predictable working conditions in the European Union (Dyrektywa Parlamentu Europejskiego i Rady (UE) 2019/1152..., 2019) and Directive (EU) 2019/1158 of the European Parliament and of the Council of 20 June 2019 on the balance between work and private life of parents and guardians and repealing Council Directive 2010/18/EU (Dyrektywa Parlamentu Europejskiego i Rady (UE) 2019/1158..., 2019), are aimed at improving the quality of working conditions and facilitating the reconciliation of work and private life, as well as supporting the having and raising of children.

In response to the directives, changes were introduced to the Polish Labor Code (Kodeks Pracy, 1974; GOV, 2023), which entered into force on April 26, 2023. Changes were introduced regarding fixed-term and trial period employment contracts, a new leave from work for urgent family matters and a new carer's leave.

The changes also included regulations related to the right to request a change to an indefinite contract or more predictable and stable working conditions. New employer information obligations, flexible work organization, as well as changes in protection against dismissal due to parenthood and parental leave have been added (PARP, 2023).

The aim of this research is to analyze the factors determining the WLB of medical staff. It is worth looking at this issue from the perspective of factors that influence maintaining this balance - both those that have a positive and negative impact on WLB.

2. Work-life balance

WLB is currently a key issue that arouses great interest among researcher (Żemigła, 2013; Czerwińska-Lubszczyk, Byrtek, 2024) due to its significant impact on the health and quality of life of employees. Table 1 presents exemplary results of empirical research in the field of WLB. E. Robak and A. Słocińska draw attention to the broad dimension of life outside of work, defining work-life balance as *an ability to join work with other aspects of a human life, such as home, family, social activity and interests* (Robak, Słocińska, 2015, pp. 139-140).

The topic of WLB is often analyzed in the context of work-family conflict, which is a major area of tension. It is indicated that people who devote more time to family life more often achieve better WLB and feel more fulfilled than those who are fully engaged in professional work (Kornaszewska-Polak, 2021).

WLB is the ability to simultaneously separate and harmoniously combine these spheres, which helps maintain health and well-being. Imbalance often leads to negative health effects, which in turn affects work efficiency and the overall quality of life of employees (Kozar, Oleksiak, 2022).

The situation has been further complicated by the COVID-19 pandemic, which has particularly exposed challenges related in particular to maintaining balance, leading to an increase in health problems such as depression, cardiovascular and musculoskeletal diseases (Łuczak et al., 2018).

Table 1.
Selected results of empirical research in the field of WLB

Item	Author (year of publication)	Information about the study
1.	Tomaszuk A., Olszewski P. (2023)	A quantitative study conducted using a survey questionnaire, taking into account the generational affiliation of respondents. The aim of the article was to analyze the differences in the perception of the concept of WLB by representatives of different generations. The study results also indicate factors influencing WLB, such as: no overtime work, no need for constant availability, flexibility of working hours, a satisfactory amount of free time, no mandatory delegations and the ability to combine professional and non-professional duties.
2.	Aslan T., Burucu R., Akdoğan Y. (2023)	Quantitative research conducted using an online survey questionnaire. The aim of the study was to investigate the factors influencing WLB behavior and the level of psychological resilience of nurses working in internal wards of hospitals in Turkey during the COVID-19 pandemic. The analyzed factors included, among others: work-related stress, support from the employer, working conditions, and ways of coping with difficulties in the face of a health crisis.
3.	Marecki Ł. (2023)	The research included an analysis of available articles, the aim of which was to examine the relationship between WLB, employee performance and their well-being. The analysis revealed key aspects such as stress, health, communication and teamwork, work and schedule flexibility, as well as overall job satisfaction.
4.	Skrok J., Strońska-Szymanek A., Kolemba M., Surzykiewicz J. (2023)	The study was conducted using a quantitative method using a survey questionnaire. Its aim was to examine the relationship between the types of motivation regulation and the satisfaction of needs at work, WLB and life satisfaction. The results suggest that there is a positive relationship between intrinsic motivation and life satisfaction and between WLB and life satisfaction. Satisfying the need for autonomy also emerged as important in the context of WLB.
5.	Rao A., Shailashri V.T., (2021)	The quantitative study was conducted using a survey questionnaire in hospitals located in Dakshina Kannada district, India. Its aim was to identify factors influencing WLB among doctors and nurses. The results indicate that practices such as providing appropriate working conditions, flexible hours and strong family support play a key role in maintaining WLB in this occupational group.
6.	Wolor C., Solikhah S., Fadillah N., Lestari D. (2020)	A quantitative study that aimed to assess the effectiveness of e-training, e-leadership and WLB on employee performance during the COVID-19 pandemic. The study was conducted among people belonging to Generation Y, employees of a Honda motorcycle showroom in Jakarta, Indonesia. The factors analyzed included employee performance, stress level and motivation.
7.	Szczygieł E. (2019)	The research is part of the project <i>Cross-sector cooperation to reconcile work and family life based on cooperation models and tools taken from the UK</i> . The aim of the article was to characterize the interinstitutional cooperation system, based on pilot studies conducted in the form of surveys and focused interviews. The results suggest areas requiring changes for more effective implementation of WLB, such as: introducing flexible forms of employment, organizing training and thematic cooperation platforms, enabling care for dependent people, promoting the idea of reconciling private and professional life, as well as overcoming bureaucratic barriers and lack of willingness to cooperation.
8.	Gulewicz M.M. (2019)	The study was conducted using a quantitative method using a survey questionnaire in which bank employees participated. The aim of the article was to determine whether banking sector employees maintain WLB. The study considered aspects such as working overtime and the level of satisfaction with various areas of life, such as health and relationships with a partner.
9.	Türker T. (2017)	Quantitative research conducted using an online survey questionnaire. The aim of the study was to examine the impact of WLB and social support on burnout. The study included aspects such as emotional exhaustion, depersonalization and personal achievements.
10.	Gilley A., Waddell K., Hall A., Jackson S.L., Gilley J.W. (2015)	The quantitative study, conducted using a survey questionnaire, included American graduates of master's and doctoral studies in the field of MBA and organizational development, who usually already had professional experience. The aim of the study was to examine the impact of the behavior and leadership style of team managers on maintaining WLB by employees and to identify factors that can improve this situation.

Source: Own study.

Based on Table 1, we can conclude that research in the field of WLB is conducted mainly using a survey questionnaire as a research tool. Studies have examined various aspects of WLB and their impact on job satisfaction, employee performance, stress, burnout, and other factors. The research covered a wide range of professional groups, from nurses to bank employees to managers, as well as various contexts, such as the COVID-19 pandemic and different generations of employees.

Factors that positively influence WLB include: the possibility of remote work, flexible work organization, as well as the availability of paternity, parental and care leave (Sadowska-Snarska, 2023). Initiatives supporting employee well-being are also of key importance (Marecki, 2023), which affects their overall satisfaction and work-life balance. Satisfaction not only with work, but also with other aspects of life, such as relationships with children, partners or friends, has a significant impact on maintaining WLB (Gulewicz, 2019).

The literature often points to the relationship between maintaining balance and various types of employee motivation, which translate into a sense of life satisfaction. Meeting basic needs, such as the need for relationships, autonomy and competence at work, is considered crucial in the context of maintaining life satisfaction (Skrok et al., 2023). What is also important for many modern employees is the opportunity to spend time with loved ones, not having to be constantly available and being able to fulfill themselves in life outside of work (Tomaszuk, Olszewski, 2023).

Hypothesis 1 was adopted: Flexible working hours (e.g. adapting the schedule to individual needs) are the factor that has the strongest impact on maintaining WLB by medical staff. The specific nature of the work of medical staff is characterized by high variability of schedules and unpredictability of duties. Working in hospitals and other medical facilities often requires long, irregular shifts, night shifts and quick response to crisis situations, which makes planning one's personal life difficult. The ability to adjust the schedule to individual needs allows medical staff to manage time more effectively, providing space for regeneration, family care and other activities outside of work. This, in turn, can have a positive impact on their well-being and reduce stress levels, and in the long run contribute to maintaining WLB.

Factors that negatively impact WLB include: exposure to negative emotions (Frąckowiak-Sochańska et al.), role conflicts (Mleczek et al., 2019) and lack of separation between work and personal life (Mroczkowska et al., 2023). Extended working hours, demographic changes in society and increasing demands on employees pose additional challenges in maintaining WLB (Gulewicz, 2019). Problems related to establishing cooperation, including lack of willingness to cooperate, bureaucracy, poor access to information about WLB opportunities and the employer's lack of competence in shaping WLB policy, also constitute significant barriers (Szczygieł, 2019).

Lack of WLB leads to increased susceptibility to stress, reduced quality of life outside of work and reduced quality of childcare. Organizations that do not care about work-life balance experience problems with work efficiency and quality, and the number of absences increases. Additionally, an increase in employee turnover affects commitment to professional duties and reduces investments in human capital. As a result, it may also negatively affect relationships with customers and, in the case of medical staff, patients (Nowak-Lewandowska, 2013).

Because medical staff face exceptionally high levels of stress and emotional burden, the following hypothesis 2 was adopted: Stress and excessive emotions are the factor that has the strongest negative impact on maintaining WLB by medical staff. Working in conditions in which medical staff are constantly exposed to the suffering of patients, are responsible for their health and lives, and perform physically and mentally demanding tasks, means that daily professional duties may constitute a significant strain on their mental health and WLB.

3. Methodology and characteristics of the sample

The research results presented in this publication are part of a broader project on the WLB of medical staff.

A paper survey questionnaire consisting of closed questions was used as a research tool. This format was suitable for collecting information, considering the specific nature of medics' work. The questionnaire was discussed with experts, i.e., medical staff, during interviews. On their basis, the final version of the questionnaire was prepared. Then, after the interviews, the final version of the survey questionnaire was prepared. The survey was conducted in 2024. When conducting the survey, the focus was on selecting respondents according to the following criteria:

- diversity criterion: diverse workplace: hospital, clinic, health center.
- data availability criteria: consent of the institution to participate in the research.

In Table 2 shows the distribution of respondents in the research sample that was analyzed during the research.

Table 2.

Characteristics of the sample

Respondent's gender	Number of respondents	Percentage of respondents
Female	65	79,3%
Male	16	19,5%
None of the above	0	0%
No consent to answer	1	1,2%
Total	82	100%

Cont. table 2.

Respondent's age	Number of respondents	Percentage of respondents
Under 30 years	10	12,20%
30-40 years	20	24,39%
41-50 years	33	40,24%
51-60 years	18	21,95%
Above 60 years	1	1,2%
Total	82	100%
Respondent's education	Number of respondents	Percentage of respondents
Secondary education	67	81,71%
Higher education		
Higher education with a Ph.D	12	14,63%
Higher education with a habilitation degree	3	3,66%
Total	82	100%

Source: Own study (Juraszek, Czerwińska-Lubszczyk, 2024).

Table 2 shows that the largest percentage of the research sample (N = 82) are women, 65 of whom constitute 79.3% of the total. In the age category, the largest share is held by people aged 41-50, which corresponds to 33 respondents - 40.24% of the entire sample. People aged 30-40 and 51-60 have a similar share in the sample, amounting to 24.39% and 21.95%, respectively. People with secondary or higher education constitute 81.71% of the entire sample.

4. Results

Based on the analysis of literature and interviews, factors positively influencing WLB were identified, such as: hybrid work, additional days off, shortened working hours, flexible working hours (e.g. adapting the schedule to individual needs), programs encouraging paternity leave, facilities for pregnant women, facilities for people caring for dependent people, training to expand competences or promote physical activity, taking care of employees' mental health.

Negatively influencing factors were also identified, such as: conflicts in the workplace, mobbing, burnout, sense of isolation, lack of professional development opportunities, lack of well-organized work, disturbed interpersonal contacts in the workplace, organizational culture unfavorable for work-life balance, unequal treatment (e.g. due to gender), stress and excessive emotions, as well as hate and negative attitude of society. Individual factors influencing WLB are presented in Tables 3 and 4.

Each statement regarding factors that have a positive impact on maintaining WLB among medical staff was rated by respondents on a five-point scale (1 - definitely has a negative impact, 2 - has a rather negative impact, 3 - hard to say, 4 - has a rather positive impact, 5 - definitely has a positive impact). The results are presented in the form of median and mode. The number of medical staff in Table 3. differs from the sum of women and men due to the fact that one person did not provide an answer regarding gender.

Table 3.
Factors positively influencing WLB among medical staff

Selected factors	Medical staff (N=82)		Medical staff - female (N=65)		Medical staff - male (N=16)	
	M	D	M	D	M	D
Hybrid work	3	3	3	3	2	1
Additional days off	4	5	4	5	3	2
Shortened working time	4	5	4	5	4	5
Flexible working hours (e.g. adapting the schedule to individual needs)	4	5	4	5	3,5	5
Programs encouraging paternity leave	4	3	4	3	3	3
Facilities for pregnant women	4	5	4	5	3	3
Facilities for people caring for dependent people	4	4	4	4	3	4
Competence- expanding training	4	5	4	5	3,5	4
Promoting physical activity	4	4	4	4	3	3
Taking care of employee mental health	4	5	4	5	4	3

Note: Letter D in table 3 means dominant (mode) and M means median.

Source: own study.

According to respondents, hybrid work has the least impact on maintaining WLB among medical staff. This may be due to the fact that performing a medical profession involves limited opportunities to work "at home", which is usually limited to activities related only to office work.

Respondents note the importance of a wide range of solutions supporting WLB. These include additional days off, shortened working hours, flexible working hours that can be adjusted to individual needs, facilities for pregnant women, training to expand competences, and taking care of employee mental health (the median is 4, the dominant is 5). Men attach lower importance to individual factors than do women. Only the shortening of working time is assessed relatively highly (the median is 4, the dominant is 5).

Individual factors that have a negative impact on maintaining WLB among medical staff (median and dominant) are presented in Table 4. Each statement regarding changes was rated by the respondents on a five-point scale (1 - definitely has no impact, 2 - rather has no impact, 3 - hard to say, 4 - rather has a negative impact, 5 - definitely has a negative impact).

Table 4.
Factors negatively influencing WLB among medical staff

Selected factors	Medical staff (N=82)		Medical staff - female (N=65)		Medical staff - male (N=16)	
	M	D	M	D	M	D
Conflicts in the workplace	4	5	4	5	3,5	5
Mobbing	5	5	5	5	4	5
Burnout	4	5	4	5	4	5
Feeling isolated	4	5	4	5	3,5	5
No opportunities for professional development	4	4	4	5	4	4
Lack of well-organized work	4	5	4	5	4	4
Disturbed interpersonal contacts in the workplace	4	5	4	5	4	4
An organizational culture that does not support WLB	4	4	4	4	3,5	4
Unequal treatment (e.g. due to gender)	4	5	4	5	4	4
Stress, excessive emotions	4	5	5	5	4	5
Hate and negative attitude of society	4,5	5	5	5	4	5

Note: Letter D in table 4 means dominant (mode) and M means median.

Source: own study.

Respondents draw attention to the importance of a wide range of factors that negatively affect the WLB among medical staff. However, it can be noted that two factors have the greatest impact on maintaining WLB among medical staff:

- mobbing,
- hate and negative attitude of society.

Mobbing reached a median and dominant value of 5 in the entire research sample, which suggests that this is a factor requiring special attention. High values may result from the proximity of the problem or from the personal experiences of the respondents. The second factor, „hate and negative attitude of society", reached a median of 4.5 and a dominant of 5. Such a high result may be the result of events that took place during the Covid-19 pandemic, when medical staff were exposed to intense hate and were often subjected to negative attitudes from other members of society. The remaining factors assessed reached a median value of 4, but they do not stand out as clearly as the previously mentioned factors.

Men attach less importance to individual factors than do women, but the results do not differ as significantly as in the case of factors having a positive impact on WLB.

5. Summary

Work-life balance (WLB), in other words - the balance between professional and private life - is a topic of interest to among employees, employers and researchers. WLB refers to the ability to combine work with other aspects of life, such as family life, social life or personal interests.

The topic of WLB seems to be particularly important for medical staff, who struggle with extremely high levels of stress, irregular working hours and emotional strain. Taking care of WLB can contribute to improving employee well-being, quality of life and patient care, as well as help reduce turnover of medical staff in the healthcare system, which is an important area of the European Union economy. The aim of the empirical research undertaken is to analyze the factors determining the WLB of medical staff. The factors that have a positive impact as well as those having a negative impact on maintaining this balance are considered. The research results presented in this publication are part of a broader project on the issue of WLB in the context of medical staff (Juraszek, Czerwińska-Lubszczyk, 2024).

The research findings presented in this publication are part of a broader project focused on the issue of WLB in the context of medical personnel. The aim of the research undertaken in this publication is to analyze the factors that determine WLB of medical staff. The factors with a positive impact and those with a negative impact on maintaining this balance were considered. Based on a review of the literature, two hypotheses were adopted:

H1: Flexible working hours (e.g., adjusting the schedule to individual needs) are the strongest factor influencing the maintenance of WLB for medical personnel.

H2: Stress and excessive emotions are the strongest negative factors influencing the maintenance of WLB for medical personnel.

Based on the empirical research conducted, we can conclude that:

- Medical personnel appreciate a wide range of solutions that support WLB: additional days off, reduced working hours, flexible working hours that can be adjusted to individual needs, accommodations for pregnant women, training to enhance skills, and attention to employee mental health. The research findings partially supported Hypothesis 1.
- Compared to women, men attach less importance to the individual factors supporting WLB.
- Respondents pointed to the significance of a wide range of factors that negatively affect the WLB of medical personnel.
- The greatest negative impact on maintaining WLB among medical staff is mobbing and online abuse (hate). The research findings did not support Hypothesis 2.

The limitations of the research presented in this paper include, among others, the sample selection. Future research should aim to increase the sample size and focus on a specific medical profession, as these vary in terms of job specifics. Another limitation is the design of the research tool, which was created to allow for quick completion by medical staff. Unfortunately, this choice may have led to the omission of issues that could have proved to be of value had they been included in the study. Nevertheless, the analysis of factors positively and negatively influencing WLB provides a foundation for further research in this area among medical personnel.

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DIVIDEND POLICY IN TURBULENT TIMES: POLISH FIRMS DURING THE COVID-19 PANDEMIC

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Purpose: This paper investigates changes in dividend policies of Polish firms during the COVID-19 pandemic. It focuses on whether firms were more likely to cut or omit dividends during this period compared with pre-pandemic times and what are the factors influencing dividend policy choices in times of economic uncertainty.

Design/methodology/approach: The study includes firms listed on the Warsaw Stock Exchange that paid dividends between 2010 and 2023. First we present trends in dividend policy changes. Then, using logistic regression, we examine the factors influencing these decisions.

Findings: Our findings reveal a significant increase in dividend cuts and omissions in 2020, but this trend reversed quickly in subsequent years. The logistic regression analysis could not definitively identify the specific factors driving these changes.

Research limitations/implications: The study offers new insights into corporate financial management during crises, it also underscores the need for further research to provide a comprehensive explanation of the observed phenomena.

Originality/value: We were unable to find any research on the dividend policy of Polish firms during the COVID-19 pandemic. This significant gap in the literature motivated our research.

Keywords: dividend, payout policy, COVID-19, capital market.

Category of the paper: Research paper.

1. Introduction

Dividend policy plays a crucial role in financial management as it directly impacts a company's shareholder value. Dividends represent a portion of a company's profits that are distributed to its shareholders. This distribution can influence investor sentiment, stock price, and the overall financial health of a firm. By understanding and effectively managing dividend policy, companies can optimize their capital structure, attract investors, and enhance their long-term financial performance.

It is understandable that dividend policy was one of the first research areas in corporate finance explored by academic researchers. However, despite many changes that have occurred in the global economy over the past few decades, firms today face similar challenges, when making dividend policy decisions, to those identified by Lintner (1956) in the mid-1950s. Although many of the significant issues related to the dividend policy remain unresolved, some of the claims have gained widespread support. One such claim is that managers are generally reluctant to reduce dividends, as such a reduction, especially if not previously announced, typically leads to a decline in share price (e.g., Kreiger et al., 2021). This phenomenon is explained in various ways, the most important are agency theory and signaling theory.

According to agency theory, the dividend policy is particularly significant due to the separation of ownership and management. If a firm generates cash flows, managers find many ways to use them for their own purposes, even inefficient ones, rather than distributing them to shareholders (Jensen, 1986). The capital market reacts to this by lowering share prices when dividends are reduced and raising them when dividends are increased. Signaling theory, on the other hand, suggests that dividends act as a means for managers to convey information to investors about the firm's condition under conditions of information asymmetry (e.g., Bhattacharya, 1979; John, Williams, 1985; Megginson, 1996). Since this is a costly signaling mechanism, only firms in good financial position are able to use dividends to signal their true condition. Therefore, a high dividend is interpreted by the market as a signal of the firm's strong financial position, resulting in an increase in the share price when dividends are raised and a decrease when they are lowered. As a result, managers are reluctant to cut dividends, expecting that such a decision will lead to a decline in the share price. This can explain why, according to numerous empirical studies of developed markets, only a relatively small proportion of dividend-paying firms decide to cut dividends from one period to the next in "normal times". However, this situation changes significantly during economic crises or when a firm faces financial difficulties (Krieger et al., 2021). In such cases, dividend cuts become much more common, which can be seen as a rational action motivated by the desire for the firm's survival.

While extensive research has examined dividend policy in developed markets, studies on emerging markets, particularly during crises, are relatively limited. To address this gap, this paper aims to present whether and how dividend payments of Polish public firms changed during the pandemic. In particular, the focus is on whether, during the COVID-19 pandemic in Poland, there was a tendency to omit or cut dividends. The study covers firms listed on the Warsaw Stock Exchange (WSE) that paid dividends in the years 2010-2023. By examining dividend changes, omissions, and cuts during this period, we seek to provide empirical evidence on the factors influencing dividend policy choices in times of economic uncertainty.

A two-stage approach was used in the study. The first stage involved presenting quantitative summaries of all dividend-paying firms, with a specific focus on those that cut or omitted dividend payments between 2010 and 2023. In the second stage of the study, logistic regression was used to examine the factors influencing the omission or cut of dividend payments.

The remainder of the paper is organized as follows. Section 2 reviews literature on dividend policy during financial crises. Section 3 introduces research methodology and data description. Section 4 provides results, and Section 5 discussion. Conclusion summarizes the paper.

2. Literature Review

Firm's dividend policy is determined by both its financial situation and the overall state of the economy. DeAngelo and DeAngelo (1990) showed that a firm's financial situation has a very strong impact on its dividend policy. In a sample of US companies studied in the years 1980-1985, almost all of the firms that reported losses during that period decided to cut dividends. However, managers of firms with long dividend histories appeared particularly reluctant to omit dividends.

In recent years, Poland has witnessed several events that could be considered as having symptoms of a crisis threatening the state of the economy and reducing the sense of security. One of the most significant events of this kind was the COVID-19 pandemic, which officially began in Poland in March 2020 when a state of epidemic was declared and ended in May 2022 when it was lifted.

Since economic crises typically lead to a rise in the number of loss-making firms, numerous studies have confirmed a negative relationship between crises and dividend payouts. Floyd et al. (2015) found that during the 2008-2009 financial crisis, the number of firms cutting dividends in the financial sector increased. Similarly, Basse et al. (2013) demonstrated that during the financial crisis, the number of banks paying dividends in European countries decreased. Kirkulak and Kurt (2003) examined the situation during the Istanbul stock market crisis in 2001 and found that the number of firms paying dividends decreased significantly. Ali (2022) tested the impact of the COVID-19 pandemic on the dividend policy of firms in G-12 countries and found that the proportion of firms omitting or reducing dividend payments increased significantly during the pandemic. However, he noted that most firms tried to maintain or slightly reduce the dividend level, thus signaling to investors their financial condition. Krieger et al. (2021) also noted an increased proportion of publicly traded firms in the US that had either omitted or reduced dividends during the COVID-19 pandemic. Theri et al. (2023) observed a similar trend in France, where dividends per share declined during the pandemic. Finally, Ntantamis and Zhou (2022), examining the impact of the coronavirus pandemic on the adjustments of dividends and share repurchases of publicly listed firms in the G-7 countries, found that firms generally reduced payouts to shareholders during this period, but did so in different ways. Firms in the United Kingdom, Germany, France, and Italy experienced a widespread cut in dividends, while firms in the United States and Canada cut payout more via share repurchases, with Japanese firms in between.

While the impact of crises on corporate dividend policy has been extensively studied in various countries, there is a notable gap in research on the Polish market. To the best of our knowledge only one study, Witkowski (2012), has examined the effects of the 2008-2009 financial crisis on Polish listed firms. Although Witkowski found evidence that the crisis influenced dividend policy, the relationship was weaker than expected. Surprisingly, we were unable to find any research on the dividend policy of Polish firms during the COVID-19 pandemic. This significant gap in the literature motivated our research. Understanding how firms adjust their dividend policies during economic crises is crucial for investors who consider dividends a key factor in their investment decisions.

3. Methods and Data

To assess the frequency and magnitude of dividend cuts and omissions data was collected for firms listed on the Warsaw Stock Exchange that paid dividends between 2010 and 2023¹. Following Krieger et al. (2021) this study adopted a two-stage approach. The first stage involved presenting quantitative summaries of all dividend-paying firms, with a specific focus on those that cut or omitted dividend payments between 2010 and 2023.

A firm was classified as enacting a dividend omission in year t if it paid dividend in year $t-1$ but ceased to do so in year t . A firm was classified as enacting a dividend cut in year t if the dividend per share in year $t-1$ was higher than that in year t (if dividend in year t was reduced to 0, it was defined as a dividend omission, however, it was also considered as a dividend cut). In case of stock split the dividend was not taken into account.

In the second stage of the study, logistic regression was used to examine the factors influencing the omission or cut of dividend payments in the pre-COVID-19 period (2010-2019) and in the first year of the pandemic in Poland, i.e., 2020². Two logistic regression models were used, both with binary dependent variables. In Model 1, the dependent variable "dividend omission" took the value of 1 for firms enacting dividend omission and 0 for those that did not. In Model 2, the dependent variable "dividend cut" took the value of 1 for firms enacting dividend cut and 0 for those that did not cut dividend payment. Explanatory variables potentially predictive of dividend cut or omission include: firm size, profitability, liquidity, debt, listing age, and growth opportunities. These control variables were previously found to be significant determinants of corporate dividend policy by Brav et al. (2012), Fama and French (2005), and Krieger et al. (2021). All variable measurements are presented in Table 1.

¹ Data for the study was obtained from the Biznesradar database.

² Given that a significant increase in the proportion of firms cutting or omitting dividend payment during the COVID-19 pandemic (see the following section) occurred only in 2020, the logistic regression aimed at identifying factors contributing to increase solely on 2020 data.

Table 1.
Variables description

Variable	Abbreviation	Measurement
dividend cut	DIV_CUT	binary variable: 1 – dividend cut, 0 – all the rest
dividend omission	DIV_OMIT	binary variable: 1 – dividend omission, 0 – all the rest
size of firm	SIZE	logarithm of assets in thousands
profitability	ROA	net profit / assets
liquidity	LIQ	cash / assets
debt	DEBT	(long- and short-term debt) / assets
age	AGE	years since IPO
growth opportunities	PBV	price / book value

Source: own elaboration.

The regression models are given as follows:

Model 1, dividend cut:

$$DIV_CUT_t = \alpha_0 + \alpha_1 SIZE_{it-1} + \alpha_2 ROA_{it-1} + \alpha_3 LIQ_{it-1} + \alpha_4 DEBT_{it-1} + \alpha_5 AGE_{it} + \alpha_6 PBV_{it-1} + e_{it} \quad (1)$$

Model 2, dividend omission:

$$DIV_OMIT_t = \alpha_0 + \alpha_1 SIZE_{it-1} + \alpha_2 ROA_{it-1} + \alpha_3 LIQ_{it-1} + \alpha_4 DEBT_{it-1} + \alpha_5 AGE_{it} + \alpha_6 PBV_{it-1} + e_{it} \quad (2)$$

4. Results

4.1. Quantitative Analysis of Dividend Cuts and Omissions (2010-2023)

Table 2 presents the number and proportion of dividend omission in comparison to the prior year for years 2010-2023.

Table 2.
Historical frequency of dividend omissions

Year	Omit	No Omit	Total	Omit / Total
2010	5	52	57	8,8%
2011	5	61	66	7,6%
2012	8	72	80	10,0%
2013	7	79	86	8,1%
2014	6	87	93	6,5%
2015	12	90	102	11,8%
2016	10	103	113	8,8%
2017	13	109	122	10,7%
2018	18	107	125	14,4%
2019	11	115	126	8,7%
2020	38	91	129	29,5%
2021	3	126	129	2,3%
2022	11	118	129	8,5%
2023	12	117	129	9,3%

This table reports the historical frequency of dividend omissions. A firm was classified as enacting a dividend omission in year t if it had paid dividend in year $t-1$ but ceased to do so in year t . The Year column refers to the dividend paid in a given year. For instance, the dividend for 2015 is the dividend paid in 2015 from the net income earned in 2014. The Omit column refers to the firms that omitted dividend in a given year.

Source: own elaboration.

Table 2 shows that the ratio of firms omitting dividend payments to those paying dividends was significantly lower in the pre-pandemic period (2010-2019) compared to the first year of the pandemic (2020). Before the pandemic, around 9.5% of firms on average omitted dividend payment, but this figure skyrocketed to almost 30% in 2020. This trend is similar to what Krieger et al. (2021) found in their study of publicly traded firms in the US. However, this phenomenon did not persist in subsequent years of the pandemic. On the contrary, in 2021, although the pandemic was still ongoing, firms almost completely ceased omitting dividend payments, with the lowest proportion ever recorded at just 2.3%. In 2022 and 2023, the proportion returned to levels closer to the pre-pandemic average.

The next question is whether these changes in dividend policies affected all sectors of the economy or just certain ones. Table 3 breaks down dividend omissions by sector, giving a clearer picture.

Table 3a.

Historical frequency of dividend omissions in sectors

Year	Finance			Energy			Chemicals and materials		
	O	N	Omit / Total	O	N	Omit / Total	O	N	Omit / Total
2010	0	10	0,0%	0	4	0,0%	1	5	16,7%
2011	0	13	0,0%	0	4	0,0%	0	7	0,0%
2012	2	12	14,3%	0	4	0,0%	1	7	12,5%
2013	0	15	0,0%	1	4	20,0%	0	8	0,0%
2014	2	15	11,8%	0	5	0,0%	1	7	12,5%
2015	4	15	21,1%	0	5	0,0%	1	9	10,0%
2016	0	24	0,0%	1	4	20,0%	2	8	20,0%
2017	1	26	3,7%	1	4	20,0%	2	9	18,2%
2018	2	25	7,4%	1	4	20,0%	2	9	18,2%
2019	2	25	7,4%	1	5	16,7%	2	9	18,2%
2020	12	16	42,9%	1	5	16,7%	3	8	27,3%
2021	1	27	3,6%	0	6	0,0%	0	11	0,0%
2022	0	28	0,0%	1	5	16,7%	0	11	0,0%
2023	3	25	10,7%	0	6	0,0%	0	11	0,0%

Column O refers to dividend omission, column N refers to no dividend omission.

Source: own elaboration.

Table 3b.

Historical frequency of dividend omissions in sectors (continued)

Year	Industrials			Consumer goods			Trade and services		
	O	N	Omit / Total	O	N	Omit / Total	O	N	Omit / Total
2010	3	16	15,8%	0	6	0,0%	0	7	0,0%
2011	3	19	13,6%	0	7	0,0%	1	7	12,5%
2012	4	24	14,3%	1	7	12,5%	0	10	0,0%
2013	3	25	10,7%	1	8	11,1%	1	11	8,3%
2014	1	30	3,2%	0	9	0,0%	2	10	16,7%
2015	4	30	11,8%	0	10	0,0%	2	10	16,7%

Cont. table 3b.

2016	3	33	8,3%	0	13	0,0%	2	11	15,4%
2017	4	34	10,5%	1	12	7,7%	3	12	20,0%
2018	6	32	15,8%	2	13	13,3%	1	15	6,3%
2019	3	35	7,9%	0	15	0,0%	2	14	12,5%
2020	10	28	26,3%	5	10	33,3%	7	10	41,2%
2021	1	37	2,6%	0	15	0,0%	0	17	0,0%
2022	3	35	7,9%	3	12	20,0%	2	15	11,8%
2023	2	36	5,3%	6	9	40,0%	0	17	0,0%

Source: own elaboration

Table 3c.*Historical frequency of dividend omissions in sectors (continued)*

Year	Healthcare			Technology		
	O	N	Omit / Total	O	N	Omit / Total
2010				1	4	20,0%
2011				1	4	20,0%
2012	0	1	0,0%	0	7	0,0%
2013	1	1	50,0%	0	7	0,0%
2014	0	3	0,0%	0	8	0,0%
2015	0	3	0,0%	1	8	11,1%
2016	2	1	66,7%	0	9	0,0%
2017	0	3	0,0%	1	9	10,0%
2018	1	2	33,3%	3	7	30,0%
2019	1	2	33,3%	0	10	0,0%
2020	0	3	0,0%	0	11	0,0%
2021	1	2	33,3%	0	11	0,0%
2022	0	3	0,0%	2	9	18,2%
2023	0	3	0,0%	1	10	9,1%

Source: own elaboration.

Table 3 shows that more firms stopped paying dividends in the first year of the COVID-19 pandemic, i.e., 2020, especially in: industrial, trade and services, and financial sectors. However, this trend was not observed in the healthcare and technology sectors. This can be economically justified, as the pandemic increased the demand for healthcare products and services, which likely prevented firms from stopping dividend payments (although the small number of firms in this sector does not allow for broader generalization). Similarly, the technology sector, largely related to the Internet, saw increased demand for its products and services, which may have kept dividend payments steady. Interestingly, even though many sectors saw a big increase in omitting dividends in 2020, the number usually dropped sharply in 2021.

When we compare these results to the US study by Krieger et al. (2021), we see an important difference. In the US, industrials were more likely to stop paying dividends in 2020, while the financial and utilities sectors didn't. However, in Poland, the financial sector was among those that significantly omitted dividend payments.

Shifting our focus from dividend omissions, Table 4 provides an analysis of dividend cuts.

Table 4.
Historical frequency of dividend cuts

Year	Cut	No Cut	Total	Cut / Total
2010	12	45	57	21,1%
2011	12	54	66	18,2%
2012	18	62	80	22,5%
2013	23	63	86	26,7%
2014	25	68	93	26,9%
2015	28	74	102	27,5%
2016	30	83	113	26,5%
2017	38	84	122	31,1%
2018	36	89	125	28,8%
2019	20	106	126	15,9%
2020	60	69	129	46,5%
2021	12	117	129	9,3%
2022	31	98	129	24,0%
2023	30	99	129	23,3%

This table reports the historical frequency of dividend cuts. A firm was classified as enacting a dividend cut in year t if the dividend per share in year t-1 was higher than that in year t (dividend reduced to 0 was also considered as a dividend cut). The Year column refers to the dividend paid in a given year. For instance, the dividend for 2015 is the dividend paid in 2015 from the net income earned in 2014. The Cut column refers to the firms that cut dividend in a given year.

Source: own elaboration.

Table 4 shows a similar pattern to dividend omissions. The share of firms cutting dividends among all dividend-paying firms also increased sharply in the first year of the pandemic, i.e., in 2020, reaching over 46%, compared to the pre-pandemic average of 24.5%. Similar to dividend omissions, the share of firms cutting dividends was lowest in 2021. However, in 2022 returned to a level close to the pre-pandemic average. To give a clear overview of this analysis table 5 breaks down dividend cuts by sector.

Table 5a.
Historical frequency of dividend cuts in sectors

Year	Finance			Energy			Chemicals and materials		
	C	T	C / T	C	T	C / T	C	T	C / T
2010	0	10	0,0%	1	4	25,0%	2	6	33,3%
2011	0	13	0,0%	1	4	25,0%	1	7	14,3%
2012	7	14	50,0%	0	4	0,0%	1	8	12,5%
2013	4	15	26,7%	3	5	60,0%	2	8	25,0%
2014	5	17	29,4%	2	5	40,0%	5	8	62,5%
2015	8	19	42,1%	2	5	40,0%	3	10	30,0%
2016	6	24	25,0%	2	5	40,0%	4	10	40,0%
2017	12	27	44,4%	1	5	20,0%	4	11	36,4%
2018	7	27	25,9%	1	5	20,0%	3	11	27,3%
2019	5	27	18,5%	1	6	16,7%	2	11	18,2%
2020	18	28	64,3%	2	6	33,3%	5	11	45,5%
2021	3	28	10,7%	0	6	0,0%	0	11	0,0%
2022	3	28	10,7%	1	6	16,7%	1	11	9,1%
2023	9	28	32,1%	0	6	0,0%	1	11	9,1%

Column C refers to dividend cuts, column T refers to total dividend payment in a given year.

Source: own elaboration.

Table 5b.*Historical frequency of dividend cuts in sectors (continued)*

Year	Industrials			Consumer goods			Trade and services		
	C	T	C / T	C	T	C / T	C	T	C / T
2010	5	19	26,3%	0	6	0,0%	2	7	28,6%
2011	6	22	27,3%	1	7	14,3%	2	8	25,0%
2012	6	28	21,4%	1	8	12,5%	2	10	20,0%
2013	6	28	21,4%	2	9	22,2%	2	12	16,7%
2014	6	31	19,4%	1	9	11,1%	6	12	50,0%
2015	10	34	29,4%	2	10	20,0%	2	12	16,7%
2016	9	36	25,0%	2	13	15,4%	2	13	15,4%
2017	10	38	26,3%	4	13	30,8%	5	15	33,3%
2018	10	38	26,3%	6	15	40,0%	4	16	25,0%
2019	5	38	13,2%	2	15	13,3%	3	16	18,8%
2020	17	38	44,7%	8	15	53,3%	8	17	47,1%
2021	3	38	7,9%	4	15	26,7%	1	17	5,9%
2022	11	38	28,9%	8	15	53,3%	5	17	29,4%
2023	11	38	28,9%	7	15	46,7%	1	17	5,9%

Source: own elaboration.

Table 5c.*Historical frequency of dividend cuts in sectors (continued)*

Year	Healthcare			Technology		
	C	T	C / T	C	T	C / T
2010				2	5	40,0%
2011				1	5	20,0%
2012	0	1	0,0%	1	7	14,3%
2013	1	2	50,0%	3	7	42,9%
2014	0	3	0,0%	0	8	0,0%
2015	0	3	0,0%	1	9	11,1%
2016	2	3	66,7%	3	9	33,3%
2017	0	3	0,0%	2	10	20,0%
2018	2	3	66,7%	3	10	30,0%
2019	1	3	33,3%	1	10	10,0%
2020	0	3	0,0%	2	11	18,2%
2021	1	3	33,3%	0	11	0,0%
2022	0	3	0,0%	2	11	18,2%
2023	0	3	0,0%	1	11	9,1%

Source: own elaboration.

Results showed similar trends in dividend cuts as in omissions, i.e., in most sectors 2020 was the year with the highest number of firms cutting dividends, while 2021 generally had a very low proportion of such firm. However, the healthcare sector was the most notable exception, with no dividend cuts in 2020.

4.2. Determinants of Dividend Omissions and Cuts

Table 6 and 7 report the estimation results of model 1, where the dependent variable was dividend omission for the periods before the COVID-19 pandemic (2010-2019), and in the year of the pandemic outbreak (2020).

Table 6.*Logistic regression predicting dividend omissions, before COVID*

	B	standard error	Wald statistic	p-value	
Const	-2,568	0,922	7,749	0,005	***
SIZE	0,118	0,064	3,399	0,065	*
ROA	-5,954	1,640	13,187	0,000	***
LIQ	-0,098	1,684	0,003	0,953	
DEBT	-0,057	0,737	0,006	0,938	
AGE	-0,065	0,024	7,223	0,007	***
PBV	-0,098	0,100	0,966	0,326	

*** denotes significance at 1% level; ** denotes significance at 5% level.

Source: own elaboration.

Table 7.*Logistic regression predicting dividend omissions, COVID (only 2020)*

	B	standard error	Wald statistic	p-value	
Const	-4,366	2,453	3,167	0,075	*
SIZE	0,094	0,165	0,323	0,570	
ROA	6,257	5,221	1,436	0,231	
LIQ	-0,897	3,840	0,055	0,815	
DEBT	2,619	1,830	2,048	0,152	
AGE	0,019	0,056	0,111	0,739	
PBV	0,133	0,118	1,271	0,260	

*** denotes significance at 1% level; ** denotes significance at 5% level.

Source: own elaboration.

The analysis shows that the statistically significant factors for the decision to omit dividends in the pre-pandemic period were: firm size, profitability (return on assets), and age of the firm on the market. Larger, less profitable firms that had been listed for a shorter time were more likely to omit dividend payments in the pre-pandemic period. This is partly in line with Krieger et al. (2021), where profitability and age were also significant variables (although in addition to these factors, debt and growth opportunities were also significant). However, in the first year of the pandemic in Poland, i.e., in 2020, the situation changed fundamentally. None of the studied factors were significant in Poland, unlike in the US where debt and growth opportunities proved to be statistically significant.

Table 8 and 9 report the estimation results of model 2, where the dependent variable was dividend cut for the periods before the COVID-19 pandemic (2010-2019), and in the year of the pandemic outbreak (2020).

Table 8.*Logistic regression predicting dividend cut, before COVID*

	B	standard error	Wald statistic	p-value	
Const	-1,425	0,657	4,701	0,030	**
SIZE	0,099	0,048	4,241	0,039	**
ROA	-3,688	1,293	8,135	0,004	***
LIQ	0,612	1,100	0,310	0,578	
DEBT	-1,059	0,541	3,833	0,050	**
AGE	-0,043	0,017	6,591	0,010	**
PBV	0,043	0,055	0,605	0,437	

*** denotes significance at 1% level; ** denotes significance at 5% level.

Source: own elaboration.

Table 9.*Logistic regression predicting dividend cut, COVID (only 2020)*

	B	standard error	Wald statistic	p-value	
Const	-2,094	2,193	0,912	0,340	
SIZE	0,011	0,152	0,005	0,944	
ROA	12,921	6,346	4,146	0,042	**
LIQ	-3,199	3,163	1,023	0,312	
DEBT	0,219	1,573	0,019	0,889	
AGE	0,076	0,051	2,258	0,133	
PBV	0,051	0,133	0,148	0,700	

*** denotes significance at 1% level; ** denotes significance at 5% level.

Source: own elaboration.

Table 8 shows that for the pre-pandemic period, firm size, profitability, debt, and age were statistically significant factors. These were the same factors as in our first model (dividend omission), with the additional inclusion of the debt factor. In contrast, for 2020, the first year of the pandemic, only the estimate for profitability was statistically significant. Surprisingly, firms that were more profitable were more likely to cut their dividends.

5. Discussion

Our study reveals that Polish firms listed on the stock exchange made significant changes to their dividend policies during the COVID-19 pandemic. These changes, primarily related to the frequency of dividend omissions and cuts, are consistent with the results of other studies. In "normal" times, managers generally try to avoid cutting dividends, this position may change radically during a crisis. As a result during the first year of the pandemic crisis, in 2020, there was a sharp increase in dividend cuts and omissions compared to the pre-pandemic period. However, not all sectors were affected equally; healthcare and technology, for example, did not experience this trend.

Our analysis of the factors influencing dividend cuts and omissions indicates that while, in the pre-pandemic period, these factors were largely consistent with the predictions of theories and other studies, in the first year of the pandemic, this situation changed fundamentally. As a result, in 2020, none of the tested factors proved to be statistically significant in the case of dividend omissions. For dividend cuts, statistical significance was found only for one factor – profitability, but the positive sign of the coefficient, indicating that more profitable firms were more likely to cut dividends, does not appear to be consistent with theory. The pandemic clearly disrupted dividend policies of Polish firms, but the reasons for these changes are not fully understood and require further research.

There are multiple ways to justify the research findings for the first year of the pandemic.

The influence of unknown, 2020-specific factors: The unprecedented shock of the COVID-19 pandemic in 2020 may have overshadowed the impact of traditional financial indicators on dividend decisions such as debt, P/BV ratio, profitability, or firm size. Factors such as increased uncertainty, regulatory changes, and operational disruptions could have played a more significant role. These factors, not captured in our model, may explain why traditional indicators were less predictive in 2020.

Non-financial motivations for management decisions: The pandemic may have led management to prioritize non-financial factors in their dividend decisions, based on factors other than those normally considered. Strategic considerations, such as preserving liquidity for future uncertainties, could have outweighed traditional financial metrics. This suggests that the pandemic's unpredictability made financial indicators less reliable.

Changes in corporate behavior in response to macroeconomic conditions: The 2020 pandemic prompted many firms to adopt a more conservative approach to dividends and capital management. Even when financial metrics allowed for dividend payments, firms often opted for dividend cuts due to future uncertainties, supply chain disruptions, and operational challenges, or recommendations from regulatory bodies. This suggests that dividend decisions were influenced more by broader economic concerns than by current financial performance.

Dividend omissions and financial independence: In the unique circumstances of 2020, dividend decisions may have been less influenced by traditional financial metrics such as liquidity, debt, or growth opportunities. This would imply that traditional models for predicting dividend behavior may have been less reliable during the pandemic, as firms were forced to respond to unprecedented external factors.

Overall, the results indicate that in 2020, the first year of the pandemic, decisions by Polish firms to omit dividend payments were less dependent on traditional financial indicators, suggesting the influence of factors directly related to the pandemic, such as market uncertainty, changes in management priorities, or other macroeconomic factors difficult to capture in traditional models. Interestingly, the impact of the pandemic on dividend policies in Polish firms was short-lived. As a result, in 2021, the second year of the pandemic, the number of dividend omissions and cuts was record-low, and in 2022 and 2023, it returned to a level similar to the pre-pandemic average. This suggests a brief period of disruption on dividend payments. It is difficult to say whether the cause of this was the anti-crisis measures taken by the authorities, or whether the reasons for this should be sought in other areas. However, further research is needed to confirm this.

6. Conclusion

Dividend policy plays a crucial role in financial management as it directly impacts a company's shareholder value. This paper examines dividend policy changes during economic crises, focusing primarily on dividend cuts and omissions by Polish firms listed on Warsaw Stock Exchange before and during the COVID-19 pandemic. These findings have significant implications for investors who place a high value on dividends when making stock investment decisions.

Our findings reveal a significant increase in dividend cuts and omissions in 2020, but this trend reversed quickly in subsequent years. The logistic regression analysis could not definitively identify the specific factors driving these changes. The results highlight a significant shift in dividend practices during the pandemic, which conventional theories struggle to fully explain. Notably, these changes were transient, primarily confined to the 2020-2021 period, as dividend policies reverted to pre-pandemic levels after 2021.

While this study offers valuable insights into dividend policy during the COVID-19 pandemic, it is important to acknowledge its temporal limitations. The study focuses solely on Polish firms listed on the Warsaw Stock Exchange. This limits the generalizability of the findings to other emerging market. While the study observes a significant increase in dividend cuts and omissions in 2020, the logistic regression analysis could not pinpoint the specific factors driving these changes. This suggests the need for further research to provide a comprehensive explanation of the observed phenomena, which has significant implications for investors, particularly for those who give considerable importance to dividends in their investment decisions regarding stocks.

The study contributes to a broader understanding of corporate financial management during crises. It sheds light on how companies adapt their dividend strategies in response to unexpected events like a pandemic. This can help policymakers and regulators develop more effective measures to support businesses and ensure financial stability during future crises. Understanding how firms adjust their dividend policies during economic crises is also crucial for investors who rely on dividends as a key factor in their investment choices.

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LUXURY BRAND EQUITY AND ITS ROLE IN LUXURY MARKETING AND BRANDING

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Purpose: Today, the importance of luxury brands is growing. In this context, the aim of the study was to determine the extent to which the research area on luxury brand equity (LBE) has developed and the importance of this issue in luxury marketing and branding.

Design/methodology/approach: Five steps – design, compilation, analysis, visualization, and interpretation – were used in a bibliometric analysis. A thorough search of the Scopus database indexed a total of 138 publications. In the examined research, science mapping and performance indicators pertaining to publications and citations were employed.

Findings: 138 publications with 6549 citations have been published since the first article on LBE was indexed in 2000. These publications were mostly indexed in business, management, and accounting. The United States, France, and Italy were the most affiliated countries. Keyword analysis was used to find 538 items, and the science mapping revealed 10 clusters, such as: analysis of luxury brand marketing strategies and consumer behavior; brand building and management strategies; strategic brand management in retail; cultural aspects of luxury consumption; and branding strategies with heritage and retro elements.

Research limitations/implications: The study has several limitations. Firstly, individual brands with the highest levels of elegance, prestige and perceived value were not analyzed. Secondly, sub-periods were not identified in the analysis of the full period 2000-2024. Thirdly, no analysis of LBE by product category was conducted.

Practical implications: Practical suggestions were developed in multiple ways. First, activities should highlight the brand's distinctiveness through high-level personalization of goods and services and exclusive events. Second, it is important to leverage contemporary technologies to improve marketing communications and the customer experience. Third, in order to strengthen the brand's authenticity, communication should be done, emphasizing its legacy, history, and core values.

Originality/value: There were no studies demonstrating the present level of development of this field of study, hence this bibliometric analysis study on LBE has filled the research gap. The originality of this study is the identification of clusters that represent current research areas in the field of LBE.

Keywords: luxury brand equity, luxury branding, luxury marketing, bibliometric analysis.

Category of the paper: literature review.

1. Introduction

Luxury branding has been an increasingly important marketing area recently (Li, 2021; Quamina et al., 2023; Yihan Wang, 2021). Various issues were analyzed including sales incentives for luxury brands in emerging markets (Kootenaiea, Kootenaiea, 2021), the role of advertising in luxury brand marketing (Brioschi, 2006), and legitimizing luxury by creating authentic luxury brands (Goldstein, Carpenter, 2022). Issues of establishing and maintaining long-lasting and sustainable relationships with customers and other business partners have been studied, increasing customer brand loyalty (Li, 2021). The relationship perceived value of brand heritage, brand luxury management and brand strength has also been pointed out (Wiedmann et al., 2012) as well as the impact of value perceptions on luxury consumption and purchase intentions (Chattalas, Shukla, 2015). In this context, the authenticity of luxury brands proved to be important (Chattalas, Shukla, 2015). Single luxury brands (Gan, 2022; Peng, Chen, 2012) and entire product categories (Miller, Mills, 2012) have been studied.

In luxury branding, the customer-luxury brand relationship emerged as an important issue. In addition, the motivation of customers to engage with luxury brands on social media was identified, pointing 13 motivations grouped into six macro-dimensions: brand-customer relationship (brand love, and brand ethereality), perceived relevance of content (brand news, quality of posts, and celebrity endorsement), hedonic (entertainment), aesthetic (design appeal), socio-psychological (actual self-congruency, status signaling, and face enhancement and maintenance), brand equity (perceived brand quality), and technological factors (ease of convenience and use) (Bazi et al., 2020). In the context of consumer behavior, the impact of luxury brands' social media marketing efforts and their influence on brand equity, consumer behavior (Godey et al., 2016) and customer equity (Kim, Ko, 2012) have also been studied. Luxury consumption in the context of the rarity principle (Phau, Prendergast, 2000) and luxury brand equity (Husain et al., 2022; Kim, Kim, 2005; Liu et al., 2017) have also been analyzed.

A research gap was identified regarding luxury brand equity due to the lack of bibliometric analyses and systematic literature reviews in this area. This gap was identified during searches in the Scopus and Web of Science databases using the keywords 'brand equity', 'luxury' and 'bibliometric analysis' or 'systematic literature review'. Based on the above arguments, the purpose of this study was to analyse the current state of LBE using bibliometric analysis. Three research questions were proposed:

1. How is the expansion of the knowledge field in LBE progressing?
2. Which research subjects are being looked at in connection with LBE?
3. What is the importance of LBE in luxury marketing and branding?

2. Literature review

The issue of a luxury brand is complex and lacks a widely agreed-upon definition. According to one definition, luxury brands are cultural phenomena that are influenced by marketing activities and country image (Peng, Chen, 2012). To preserve their high prestige and attractiveness, luxury brands are frequently characterized by their exclusivity and uniqueness. Despite ongoing pressure from non-luxury goods that provide comparable value for less, luxury brands remain extraordinary. The fundamental characteristics of luxury have not changed: individuals purchase luxury brands to feel unique and different from the crowd, to feel privileged and superior, and to feel important and valuable. In this sense, luxury is frequently described in terms of the attributes of a product or brand (Herman, 2008).

High quality and craftsmanship (Wang, 2022; Suyoto, Tannady, 2022), high prices (Suyoto, Tannady, 2022; Karatzas et al., 2019), and symbolic and emotional value (Herman, 2008; Wang, 2022) are further criteria used to evaluate luxury brands.

Accordingly, the core characteristics of luxury brands are outstanding craftsmanship, great quality, and elegant design (Wang, 2022). While ethicality is primarily defined by factors like human, environmental, and animal welfare, among others, luxury brands are mostly defined by constructions like price, quality, and aesthetic qualities (Karatzas et al., 2019). Luxury is a very personal concept that can range greatly throughout cultures and personal experiences (Gan, 2022; Lee, Watkins, 2016; Wang, 2021). Luxury brands frequently evoke strong emotional responses in consumers, which may affect their loyalty and buying patterns (Suyoto, Tannady, 2022).

To communicate their symbolic meanings and uphold their exclusive status, luxury firms employ complex marketing techniques, such as enhanced and abstract advertising (Gurzki et al., 2019). Luxury brands have expanded their reach and become more widely available while retaining their essential characteristics of exclusivity and rarity because of globalization. Maintaining exclusivity has become more difficult as premium goods have become more widely available. In order to bolster their premium status, brands are implementing novel tactics, such as working with artists and developing distinctive retail experiences (Manlow, 2019).

When it comes to luxury branding, brand equity is a significant concern. The value derived from consumer attitudes, behaviors, and impressions of a brand is known as brand equity. It consists of elements that are essential for luxury brands to sustain their market position and boost financial performance, such as perceived quality, brand loyalty, and brand image (Kim, Kim, 2005). Consumer associations with the brand, including its marketing assets and market fundamentals, are another way to describe brand equity. These components aid in setting one brand apart from another and generate demand or a premium price for the branded goods (Tiwari, 2010). Emotional and transformative qualities are important in the context of luxury

brands. Customers look for deep ties with luxury brands, frequently motivated by the charisma of the brand (Ashill et al., 2020).

Luxury brand equity significantly influences consumer attitudes and behaviors. High brand equity, characterized by strong brand image and awareness, positively affects consumer satisfaction and loyalty, especially in online environments (Hyun et al., 2019; Badawi, Basif, 2003). Luxury brand equity is vital for ensuring consumer loyalty, enhancing financial performance, and maintaining competitiveness in the market. It influences consumer behavior, drives long-term profitability, and requires strategic management to adapt to changing market dynamics while preserving the brand's core value (Badawi, Basif, 2023; Blazquez et al., 2019; Kim, Ko, 2012; Nia, Lynne Zaichkowsky, 2000).

3. Methodology

The study's goal was to apply bibliometric analysis to indicate the extent to which the research area on luxury brand equity (LBE) has developed and the importance of this issue in luxury marketing and branding. The use of this method of analysis is growing in popularity (Donthu et al., 2021). Zupic & Čater (2015) provided the approach for the bibliometric analysis with five steps: design, compilation, analysis, visualization, and interpretation (Zupic, Čater, 2015).

First, the study design and research questions were developed. Then, bibliometric data in the form of 138 publications were extracted from the Scopus database. The search was conducted on 10 November 2024, within time constraints, using the status as of 31 October 2024. The search path was applied as follows: (TITLE-ABS-KEY ("brand equity") AND TITLE-ABS-KEY (luxury) AND (LIMIT-TO (LANGUAGE, "English"))).

Science mapping and performance analysis were part of the data analysis. Publication-related indicators, including the number of publications and lead authors, and citation-related indicators, including the total number of citations and the average number of citations annually, were used (Donthu et al., 2021). The bibliometric analysis examines the subjects discussed in LBE publications using the bibliometric counting method of science mapping. By mapping the bibliometric counts of LBE article authors, the number of clusters was ascertained. Through keyword analysis, the total number of keywords and the order of the most popular terms were disclosed. Using mapping approaches, a co-occurrence analysis was discovered. A counting approach covered at least five keyword occurrences. VOSviewer (Nees Jan van Eck and Ludo Waltman, Leiden University, version 1.6.17) was used to prepare the co-occurrence analysis and bibliometric counting. The discussion part offers an overview of the answers to the research questions, bringing the bibliometric study to a close.

4. Results

4.1. Number of LBE publications and citations

By the end of October 2024, there were 138 publications on LBE with, an average of 5.52 papers each year. Eleven studies were published by 2010, 80 studies between 2011 and 2020, and 47 papers between 2021 and 2024 (Figure 1).

The first publication indexed in the Scopus database is the article ‘*Do counterfeits devalue the ownership of luxury brands*’ published in 2000 in the Journal of Product and Brand Management (Nia, Lynne Zaichkowsky, 2000). The purpose of this study was to explore the perceptions and attitudes of original luxury brand owners towards counterfeit luxury goods. The results indicated that 70% of respondents felt that the value, satisfaction, and status of original luxury brands were not diminished by the widespread availability of counterfeits. Most respondents did not agree that the availability of counterfeits negatively affected their purchase intentions of original luxury brands.

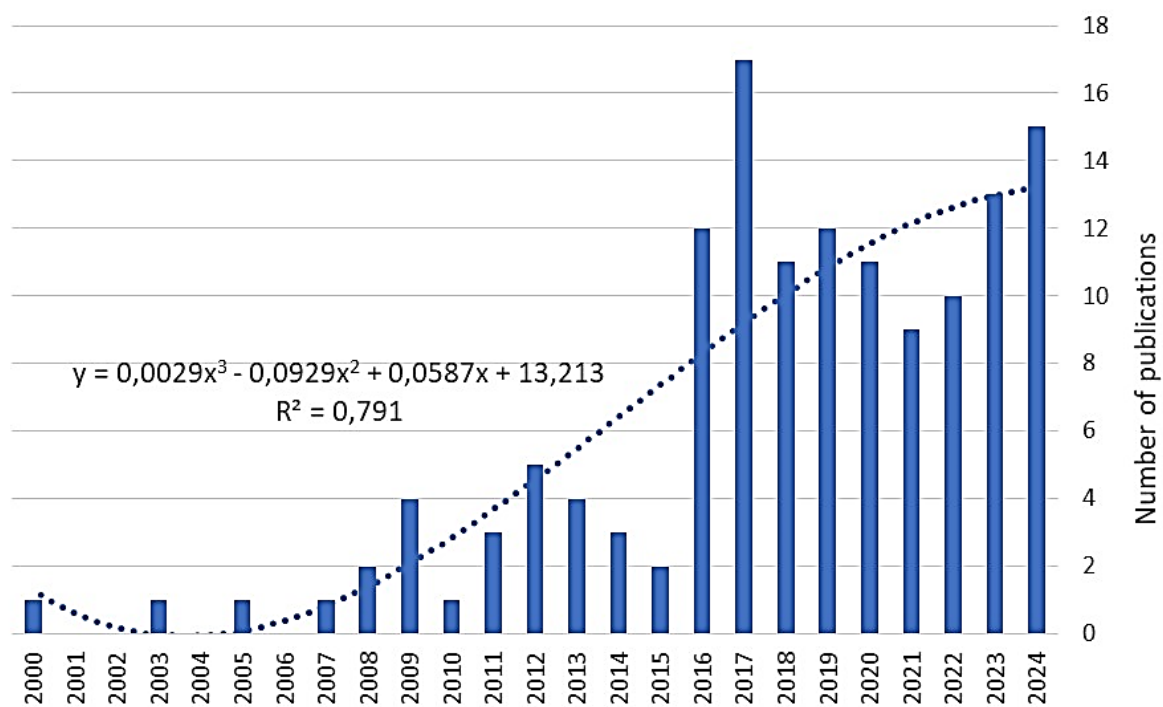


Figure 1. Number of LBE publications between 2000 and 2024.

Source: Scopus data with trend line, as of 31.10.2024.

The LBE studies that were part of this bibliometric study have 6549 citations in total. There are 261.96 citations on average per year. Almost 110 (109) of the 138 LBE publications had an h-index of 32. There were 126 citations between 2000 and 2010, and 2788 citations between 2011 and 2020. 3633 citations were observed to the research between 2021 and 2024 (Figure 2).

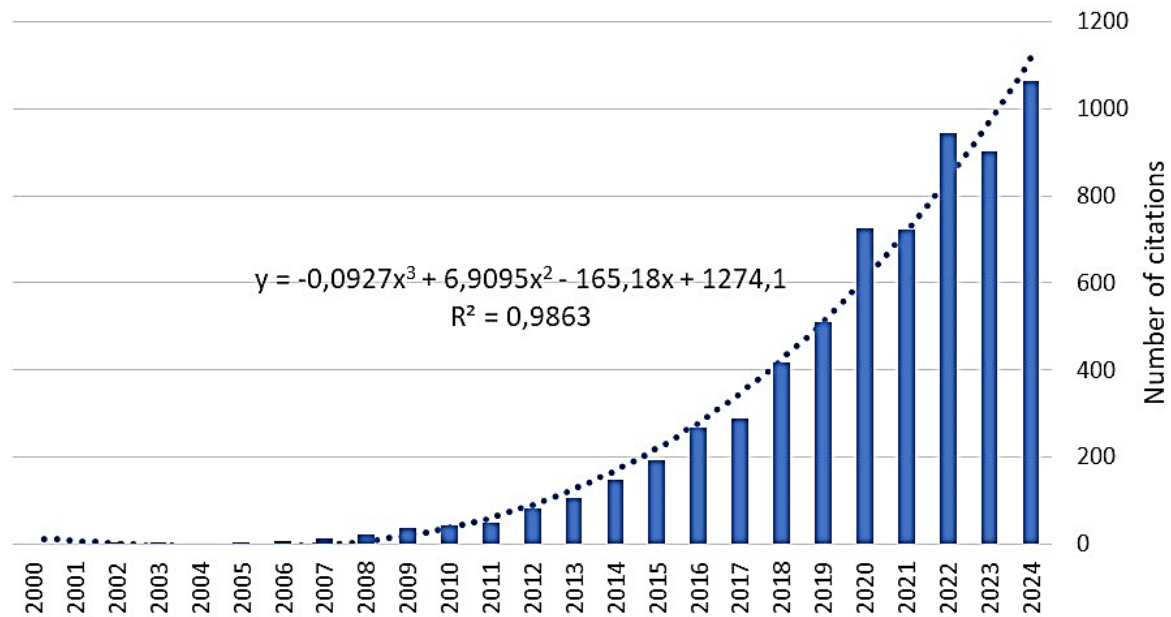


Figure 2. Number of LBE citations between 2000 and 2024.

Source: Scopus data with trend line, as of 31.10.2024.

The article *'Do social media marketing activities enhance customer equity? An empirical study of luxury fashion brand'* published in the *Journal of Business Research* in 2012 received the highest number of citations (A.J. Kim, Ko, 2012). By the end of October 2024, this article had received 1,358 citations. This number of citations represents 20.7% of all citations and is 77.7% more than the next publication (Table 1). The aim of the study was to identify attributes of social media marketing (SMM) activities and explore the relationship between these perceived activities, value equity, relationship equity, brand equity, customer equity, and purchase intention using a structural equation model. Five constructs of perceived SMM activities of luxury fashion brands were identified, including entertainment, interaction, trendiness, personalisation, and word-of-mouth. The study proved their positive impact on value equity, relationship equity and brand equity. In addition, value equity and relationship equity influenced purchase intentions.

Table 1.
Most cited LBE publications

No.	Title	Authors	Journal	Year	Number of citations
1.	Do social media marketing activities enhance customer equity? An empirical study of luxury fashion brand	Kim, A.J., Ko, E.	<i>Journal of Business Research</i> , 65(10), pp. 1480-1486	2012	1358
2.	Social media marketing efforts of luxury brands: Influence on brand equity and consumer behavior	Godey, B., Manthiou, A., Pederzoli, D., Donvito, R., Singh, R.	<i>Journal of Business Research</i> , 69(12), pp. 5833-5841	2016	764

Cont. table 1.

3.	The relationship between brand equity and firms' performance in luxury hotels and chain restaurants	Kim, H.-B., Kim, W.G.	Tourism Management, 26(4), pp. 549-560	2005	402
4.	Do counterfeits devalue the ownership of luxury brands?	Nia, A., Lynne Zaichkowsky, J.	Journal of Product & Brand Management, 9(7), pp. 485-497	2000	356
5.	The effect of consumer-based brand equity on firms' financial performance	Kim, H.-B., Kim, W.G., An, J.A.	Journal of Consumer Marketing, 20(4-5), pp. 335-351	2003	298
6.	Unpacking the relationship between social media marketing and brand equity: The mediating role of consumers' benefits and experience	Zollo, L., Filiari, R., Rialti, R., Yoon, S.	Journal of Business Research, 117, pp. 256- 267	2020	205
7.	Abundant rarity: The key to luxury growth	Kapferer, J.-N.	Business Horizons, 55(5), pp. 453-462	2012	199
8.	Managing the growth tradeoff: Challenges and opportunities in luxury branding	Keller, K.L.	Journal of Brand Management, 16(5-6), pp. 290-301	2009	196
9.	Mining brand perceptions from twitter social networks	Culotta, A., Cutler, J.	Marketing Science, 35(3), pp. 343-362	2016	188
10.	Social media and luxury brand management: The case of Burberry	Phan, M., Thomas, R., Heine, K.	Journal of Global Fashion Marketing, 2(4), pp. 213-222	2011	176
11.	Customers' motivation to engage with luxury brands on social media	Bazi, S., Filiari, R., Gorton, M.	Journal of Business Research, 112, pp. 223-235	2020	171
12.	Applying consumer-based brand equity in luxury hotel branding	Liu, M.T., Wong, I.A., Tseng, T.-H., Chang, A.W.- Y., Phau, I.	Journal of Business Research, 81, pp. 192-202	2017	163
13.	Service brand equity and employee brand commitment	Kimpakorn, N., Tocquer, G.	Journal of Services Marketing, 24(5), pp. 378-388	2010	161
14.	Employees' commitment to brands in the service sector: Luxury hotel chains in Thailand	Kimpakorn, N., Tocquer, G.	Journal of Brand Management, 16(8), pp. 532-544	2009	134
15.	Increasing customer equity of luxury fashion brands through nurturing consumer attitude	Kim, K.H., Ko, E., Xu, B., Han, Y.	Journal of Business Research, 65(10), pp. 1495-1499	2012	113

Publications with the highest number of citations (above 100).

Source: Scopus data, as of 31.10.2024.

4.2. Subject areas and authors of LBE publications

There were 122 publications in the subject area of '*business, management, and accounting*' (Table 2). This is followed by '*social sciences*' and '*economics, econometrics, and finance*' with 25 and 17 publications, respectively. Further subject areas contain between 5 and 10 publications. These are '*decision sciences*', '*arts and humanities*', '*engineering*', '*computer science*', and '*psychology*'. The remaining subject areas included one or two publications.

Table 2.
Subject areas of LBE publications

Subject areas	Frequencies
Business, management, and accounting	122
Social sciences	25
Economics, econometrics, and finance	17
Decision sciences	9
Arts and humanities	8
Engineering	8
Computer science	6
Psychology	6

Each publication can be classified in the Scopus database into several subject areas.

Source: Scopus data, as of 31.10.2024.

The author with the highest number of publications is Valette-Florence P. (4 publications), followed by Rokka J., Park J., Kumagai K., Hyun H., Grappi S., Godey B., Gabrielli V., and Cedrola E. (three studies each). 25 authors wrote 2 studies each. These are: Ahmad A., Ahn J., Aiello G., Appiah-Nimo K., Baghi I., Cohen-Cheminet G., Dion D., Donvito R., Filieri R., Hemonnet-Goujot A., Husain R., Khan B.M., Kim H.B., Kim W.G., Kimpakorn N., Ko E., Manthiou A., Mase S., Nagasawa S., Oswald L.R., Pederzoli D., Phau I., Pitt L., Powell S.M., Tocquer G., Vogel A.T., and Watchravesringkan K. The others were authors or co-authors of single publications.

4.3. Countries and sources of DigBE publications

The largest group of authors or co-authors came from the United States (36 studies) and France (21) (Table 3). These two countries were the authors or co-authors of 41.3% of the publications. Italy was represented by the authors and co-authors of 16 publications. Authors and co-authors of 52.9% of the publications came from these three countries.

Table 3.
Affiliate countries of LBE publications

Countries	Frequencies
United States	36
France	21
Italy	16
United Kingdom	9
South Korea	9
India	9
Australia	8
Portugal	6
China	6
Spain	4
South Africa	4
Hong Kong	4
Germany	4
Canada	4

Table does not include countries that have been affiliated 3 times or less.

Source: Scopus data, as of 31.10.2024.

The bibliographic coupling identified 43 countries. Using the minimum number of documents at level 2, 25 countries were identified in 6 clusters (Figure 4). Eight countries (China, Egypt, Hong Kong, Portugal, South Korea, Spain, Taiwan, and the United States) were classified into the first cluster (red); five countries (France, Germany, Italy, Japan, and Switzerland) in cluster No. 2 (green); four countries (Indonesia, Pakistan, Saudi Arabia, and United Arab Emirates) in cluster No. 3 (blue); three countries (Canada, South Africa, and Sweden) in cluster No. 4 (yellow); three countries (Australia, India, and the United Kingdom) in cluster No. 5 (violet); and two countries (Morocco and Turkey) in cluster No. 6 (black).

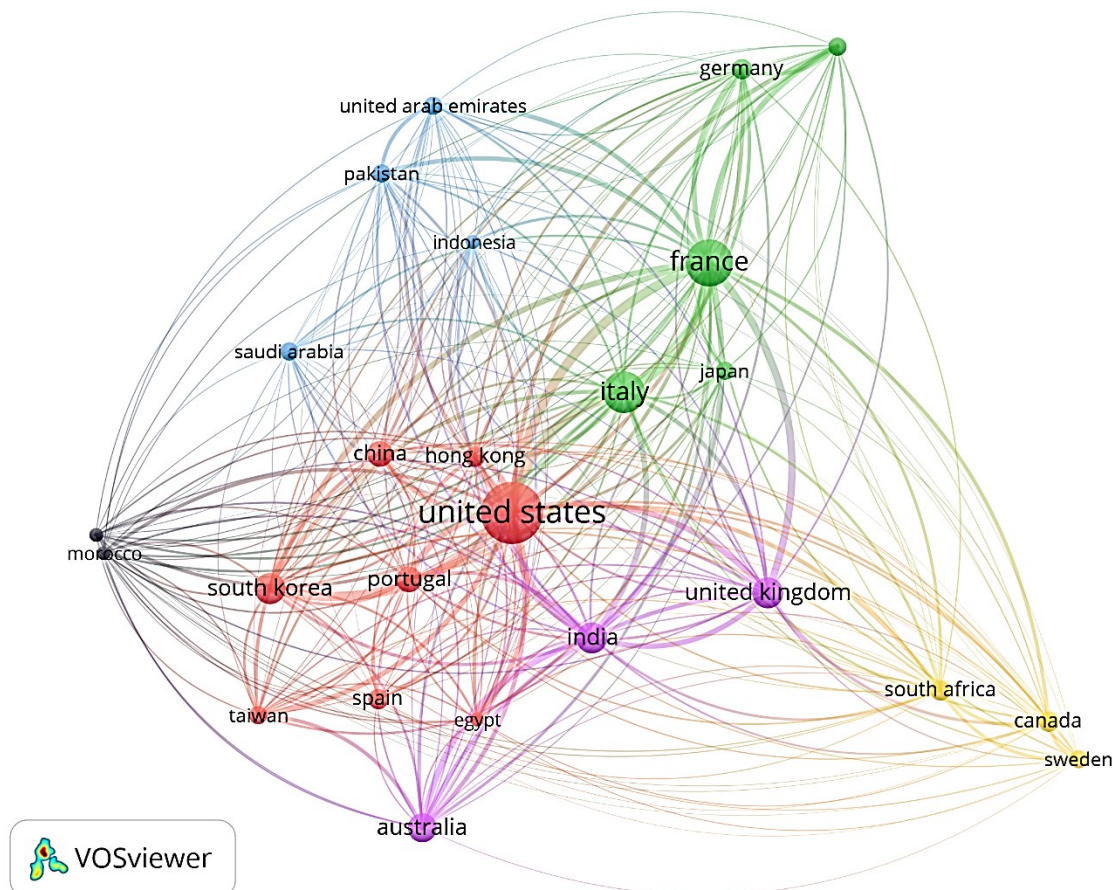


Figure 4. Bibliometric coupling of countries for LBE publications.

Source: VOSviewer based on Scopus data, as of 31.10.2024.

In terms of the number of publications, the most numerous were the Journal of Business Research (13), Developments in Marketing Science Proceedings of the Academy of Marketing Science (12), and Journal of Brand Management (8). A total of 23.9% of publications appeared in these three sources. A further 2 journals published 10.9% of the publications; these were the Journal of Product and Brand Management (8 studies) and the Journal of Global Fashion Marketing (7). In total, almost 35% of the publications appeared in the five sources. Further sources were Psychology and Marketing, Journal of Retailing and Consumer Services, Journal of Fashion Marketing and Management, Journal of Consumer Marketing, and Cogent Business and Management. The remaining sources each had one or two publications.

4.4. Thematic areas of LBE publications

LBE-related publications contained 538 keywords. *'Brand equity'* was mentioned in 58 publications (Table 4). Further keywords such as *'luxury'*, *'social media'*, *'luxury brands'*, *'purchase intention'*, *'marketing'*, *'luxury branding'*, and *'luxury brand'* were mentioned in 15-10 studies. The keywords *'brand loyalty'*, *'brand management'*, *'brand image'*, and *'brand awareness'* appeared in 9 and 8 publications. Further keywords *'retailing'*, *'social media marketing'*, *'customer-based brand equity'*, *'consumer behavior'*, and *'brands'* were present in 5-7 publications.

Table 4.

The most frequently occurring keywords in LBE publications

Keywords	Frequencies
Brand equity	58
Luxury	14
Social media	13
Luxury brands	13
Purchase intention	12
Marketing	11
Luxury branding	11
Luxury brand	11
Brand loyalty	9
Brand management	8
Brand image	8
Brand awareness	8
Retailing	7
Social media marketing	6
Customer-based brand equity	6
Consumer behaviour	5
Brands	5

Table does not include keywords that have been mentioned 4 times or less.

Source: Scopus data, as of 31.10.2024.

Analysis of keyword co-occurrence at the level of two discovered 10 clusters using the full counting approach with the minimal number of keyword occurrences (Figure 5).

Cluster No. 1 (red), entitled *'analysis of consumer behavior and marketing strategies of luxury brands'*, contains 17 keywords, including *'user-generated content'*, *'social networking (online)'*, *'sales'*, *'quality'*, *'perception'*, *'fashion brand'*, *'customer loyalty'*, *'consumer behavior'*, *'commerce'*, *'brands'*, *'brand extension'*, *'brand attitude'*, and *'artificial intelligence'*. Publications in this cluster analyze perceptions of luxury brands, customer loyalty to brands, and purchase behavior. Understanding the impact of user-generated content (UGC) on brand perception and sales was investigated. A correlation was found between online recommendations and purchasing decisions in the luxury sector. To this end, artificial intelligence was used to personalize the customer experience. In addition, the publications in the cluster are oriented towards the study of the interaction between consumers, luxury brands, and digital technologies. They allowed for deepening the knowledge on building positive brand attitudes, increasing customer loyalty, and the effective use of technologies in marketing strategies, such as AI and social network analysis.

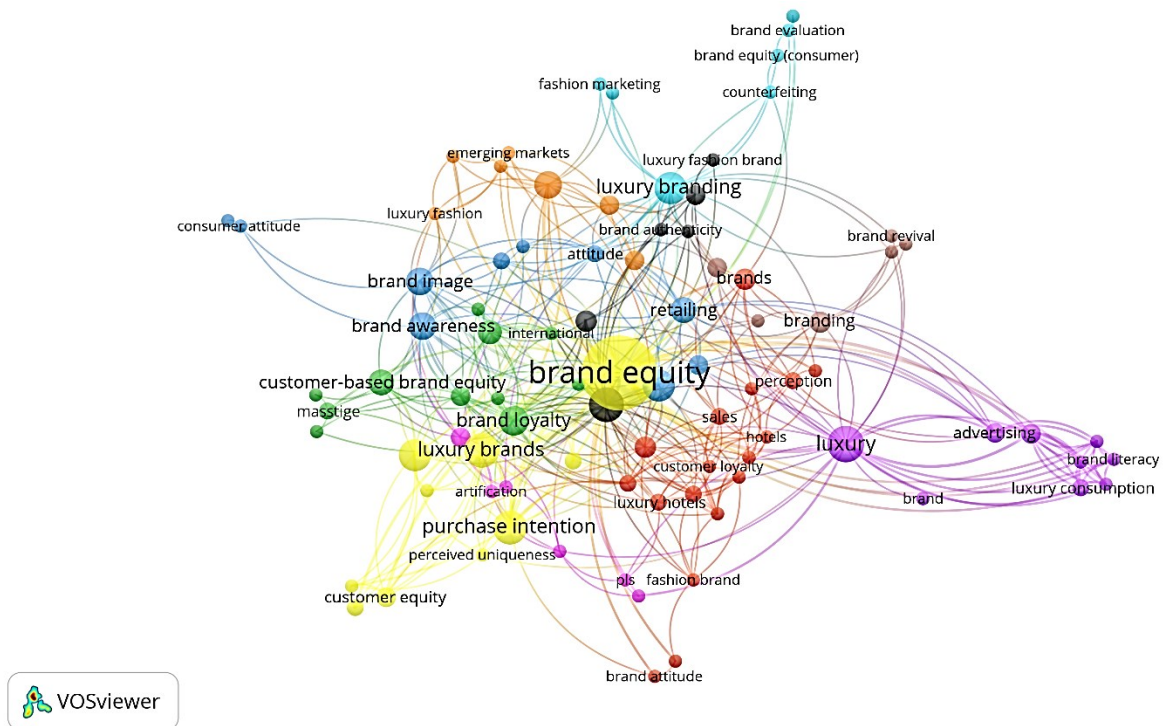


Figure 5. Keyword co-occurrence presentation using bibliometric mapping of LBE publications.

Source: VOSviewer based on Scopus data, as of 31.10.2024.

Cluster No. 2 (green), defined as *'strategies for building and managing brands in the context of modern marketing tools'*, contains 11 keywords, including *'social media marketing'*, *'price premium'*, *'perceived quality'*, *'masstige'*, *'customer-based brand equity'*, *'consumer perception'*, *'co-branding'*, *'brand loyalty'*, *'brand love'*, and *'brand association'*. The publications focus on understanding how perceived quality, emotional connections to a brand, and co-branding influence brand equity creation and customer loyalty. They address the issue of masstige (the combination of mass market and prestige), which points to the study of brands balancing luxury and accessibility. Co-branding was also studied in the context of brand collaboration and its impact on consumers' perception of quality, equity, and appeal. The impact of consumer emotions was analyzed, indicating how social media interactions influence brand love and loyalty. Consumers' emotional connections to the brand as an element that builds long-term loyalty and the importance of positive brand associations for building brand equity were examined. Brand management in international markets was analyzed in the context of the challenges of adapting strategies to different cultures and perceptions. Brand equity in different countries was also pointed out in the context of answering the question of how quality perception and brand loyalty differ from region to region. In summary, the theme of the publication focuses on the emotional and qualitative aspects of brand management, with an emphasis on modern communication channels, and value-building strategies in different segments and international markets. A key objective was to understand how brands can build lasting relationships with customers through loyalty, quality, and relevant associations.

Cluster No. 3 (dark blue), titled as *'strategic brand management in retail'* contains 10 keywords: *'retailing'*, *'marketing'*, *'customer-based brand equity'*, *'consumption behavior'*, *'consumer brand equity'*, *'consumer attitude'*, *'brand preference'*, *'brand image'*, *'brand awareness'*, and *'attitude'*. The publications consider building customer-based brand equity, consumer preferences, and their attitudes towards brands. They focus on brand perception and brand awareness and the links between marketing, brand image, and customer loyalty. Consumer attitude refers to analyses related to perceptions of brands based on their values, quality, and price-quality relationship. Consumption behavior research analyzed factors influencing consumer purchasing decisions in a retail environment. In addition, customer relationship management was studied in the context of how to build lasting relationships with customers based on their attitudes and preferences. Central to the publications in this cluster was the identification of factors that allow brands to compete effectively, build equity for consumers, and increase their loyalty through appropriate marketing strategies and image management.

Cluster No. 4 (yellow), defined as *'the strategic management of luxury brands with consideration of relationship equity and brand equity'* contains 10 keywords: *'value equity'*, *'relationship equity'*, *'purchase intention'*, *'perceived uniqueness'*, *'luxury brands'*, *'customer relationship management'*, *'customer equity'*, *'customer engagement'*, and *'brand equity'*. The themes of the publication concern research in the field of luxury brand management and the analysis of consumer behavior in the context of building engagement, loyalty, and perception of the uniqueness of luxury brands. Building lasting relationships with customers and creating value for customers were analyzed. Understanding how perceived brand uniqueness, customer engagement, and relationship equity influence purchase intention for luxury products and long-term brand value proved to be an important issue. Brand equity was analyzed through the lens of how luxury brands build their equity through exclusivity, quality, and prestige. Relationship equity, on the other hand, was based on a focus on long-term relationships between luxury brands and their customers, based on trust, loyalty, and commitment. Perceived uniqueness was examined in the context of exclusivity and rarity of products. In this context, purchase intention was examined through the lens of factors influencing customers' willingness to purchase luxury products. The publications explored the unique combination of equity, relationship, and exclusivity in luxury brand management. Mechanisms for building the unique position of luxury brands in the marketplace and their impact on consumer behavior, particularly in the context of loyalty and commitment, were pointed out.

Cluster No. 5 (purple), identified as *'cultural aspects of luxury consumption in the context of global branding'* contains 9 keywords such as *'global branding'*, *'luxury consumption'*, *'China'*, *'brand literacy'*, *'advertising'*, *'brand'*, and *'affluent consumers'*. The publications analyzed the role of advertising, brand awareness, and affluent consumer behavior in dynamic markets such as China. In addition, the symbolism and messages associated with luxury and

luxury brands in different cultural and geographical contexts were examined. Particular attention was paid to how luxury brands communicate their values and uniqueness to affluent consumers through branding and advertising. In this context, it was analyzed how the signs, symbols, and messages used by luxury brands build their prestige, uniqueness, and desirability for consumers. It also examined how luxury brands manage their image in global markets. Differences in the perception of luxury in Western and Eastern countries and their impact on global brand strategies were indicated to be important. The balance between global and local was also pointed out in the context of adapting branding strategies to changing market conditions.

Cluster No. 6 (light blue), defined as *'strategic aspects of marketing and branding in the luxury goods sector'*, contains 7 keywords, such as *'marketing strategy'*, *'luxury branding'*, *'fashion marketing'*, *'country of origin'*, *'counterfeiting'*, *'brand evaluation'*, and *'brand'*. The publications in the cluster focus on the analysis of marketing strategies used in the industry of luxury, with a particular focus on the importance of luxury branding, fashion marketing, and consumer perceptions in the context of the country of product origin. At the same time, the challenges of counterfeiting of luxury goods and its impact on the evaluation and value of the brand were addressed. In the area of luxury branding, it was analyzed how luxury brands build their identity by positioning themselves as exclusive and prestigious. In this context, perceptions of LBE was explored based on their prestige, quality, and emotional impact. Attention was paid to the importance of authenticity through the prism of country of origin and the construction of brand credibility and authenticity. Counterfeiting of luxury brands was analyzed through consumers' evaluation and perception of luxury brands. Strategies to counteract and combat counterfeiting while maintaining equity and exclusivity were pointed out. Why some consumers accept counterfeits as an alternative to luxury brands was explored. The challenges of counterfeiting, which can negatively affect the prestige of brands, were analyzed. In addition, research in this area focused on helping luxury brands to build sustainable value and equity as well as customer relationships through effective marketing strategies.

Cluster No. 7 (orange), entitled *'the impact of emerging markets on the development of luxury fashion brands'* included 7 keywords such as *'emerging markets'*, *'luxury fashion'*, *'luxury fashion brands'*, *'premium price'*, *'brand management'*, and *'consumer-based brand equity'*. The publications analyzed how consumer-based brand equity, brand management, and premium pricing strategy influence perceptions of luxury fashion brands. The role of luxury fashion in shaping new consumption preferences in developing economies was explored. In this context, emerging markets were identified as a growth prospect for luxury brands. The social and economic characteristics of emerging markets, such as the growing affluence of the middle class, changing consumer preferences, and increasing acceptance of luxury brands, were studied. The pricing strategies of luxury fashion brands for building their equity and meeting consumer needs in emerging markets were examined. In this context, perceptions of luxury in relation to price, taking into account the valuation of luxury brands and factors

influencing price acceptance, proved to be relevant. In addition, luxury fashion was embraced as an element of aspiration and a tool for building consumer loyalty and long-term commitment. In addition, research in this area focused on understanding how premium brands adapt their pricing, branding, and marketing strategies to meet the increasing demands of consumers in the context of dynamic economic, social, and cultural changes.

Cluster No. 8 (brown), identified as *'branding strategies using retro and heritage elements'*, includes 6 keywords such as *'retrobranding'*, *'heritage brands'*, *'competitiveness'*, *'fashion'*, *'branding'*, and *'brand revival'*. Publications in the cluster refer to strategies that use the heritage of a brand and its history to revive the brand and increase competitiveness in the contemporary market. In the fashion and apparel industry, branding based on elements of the past strengthens the emotional equity and identity of the brand. The activities undertaken in this area reinforce the brand's identity by referring to tradition, history, and culture while matching contemporary consumer expectations. Retrobranding was seen as a strategy that uses elements of the past to renew and enhance the contemporary brand image. In the context of retrobranding, a heritage brand refers to a long-standing presence in the market and tradition, often having strong cultural and emotional roots associated with its history. Such brands have been used to create a bond with consumers who remember them from the past or are looking for valuable, tried-and-tested products. The fashion industry has proven to be one of the most common areas for the use of retrobranding. The retro style and inspiration of fashion from the past allowed brands to relate to nostalgia and uniqueness. The use of retrobranding strategies proved useful in differentiating the brand from the competition through the addition of uniqueness. At the same time, through retrobranding, the brand was able to build an emotional connection with consumers who felt a nostalgic connection to the past. Furthermore, the retro culture was able to attract different age groups, both those who remember the original products and those discovering them for the first time. Present in this cluster retrobranding, heritage brands, competitiveness, and fashion, which focus on ways to use the past and the brand's traditions to revive its image in a competitive world. In the fashion industry, retrobranding has proven to be an effective tool that allows brands to find their identity, attract new consumers, and strengthen their position in the market by connecting the past to the present.

Cluster No. 9 (black) has been identified as *'a sustainability strategy that integrates aspects of social media, luxury fashion brands, brand experience, authenticity, and employee engagement'*. The cluster contains 6 keywords, including *'sustainability'*, *'social media'*, *'luxury fashion brand'*, *'employees'*, *'brand experience'*, and *'brand authenticity'*. This indicates a balance between environmental and social responsibility and marketing and branding strategies in the context of luxury fashion brands that strive for sustainability and authenticity in their communication with consumers. Sustainability was analyzed with social media, allowing luxury fashion brands to engage consumers on corporate social responsibility (CSR) issues and to promote sustainable practices in the fashion production and distribution process. Brand authenticity and experience were key elements that help fashion brands build

deeper connections with consumers, especially those who were increasingly interested in values related to environmental and social responsibility. The involvement of employees in sustainability processes underlined the authenticity of the brand's actions. The fashion industry is a sector where sustainability includes responsible production, fair trade, minimizing environmental impact, and taking care of working conditions. Luxury fashion brands used social media to promote their sustainability efforts. They enable fashion brands not only to advertise their products but also to engage consumers in investing in values that align with sustainability. By interacting with users, brands can educate about green trends, support CSR initiatives, and demonstrate the authenticity of their actions. In this context, authenticity was seen as a key element of luxury brands.

Cluster No. 10 (pink), identified as *'an analysis of the value of brands, combining luxury, perceived uniqueness, and prestige'*, contains 6 keywords such as *'rarity'*, *'prestige'*, *'Louis Vuitton'*, *'cbbe'* (consumer-based brand equity), and *'artification'*. The publications analyzed rarity as one of the key elements determining the prestige of luxury brands. This understanding of rarity included limited editions or unique features contributing to a brand's appeal and perceived prestige. In the case of luxury brands such as Louis Vuitton, rarity becomes an important factor in building consumer desire and loyalty. Prestige was approached through the lens of brand associations with high quality, uniqueness, and exclusivity. In this sense, brand prestige influenced the perceived value of products for consumers, creating an impression of luxury and elitism. The exclusivity strategies analyzed enabled the brand to build a strong, positive reputation and be perceived as unique and desirable by consumers.

5. Discussion of results and implications

The aim of this study was to determine the extent to which the research space on LBE has developed and the importance of this issue in luxury marketing and branding. The three research questions addressed the current state of knowledge on the topic of LBE, the research subjects, and the importance of LBE in luxury marketing and branding.

The first question related to the expansion of the knowledge field of the LBE research. The first study was published in 2000, and by the end of October of 2024, 138 studies had been indexed in the Scopus database. The average annual number of publications was 5.52, and the trend line shows further growth. The number of citations of LBE studies was 6549, with an average annual number of citations of 261.96. There was an upward trend in the number of citations.

The analysis of keywords' co-occurrence identified 10 clusters, providing an answer to second research question. The largest cluster concerned the analysis of consumer behaviour in the context of marketing strategies for luxury brands. The next clusters concerned brand

building and management strategies in the context of modern marketing tools and strategic brand management. This issue was studied in the context of retail and brand and relationship equity. Other clusters looked at cultural aspects of luxury consumption, the impact of emerging markets on the development of luxury fashion brands, and sustainability strategy that integrates aspects of social media, luxury fashion brands, brand experience, authenticity, and employee engagement. Separate clusters addressed issues such as strategic aspects of marketing and branding in the luxury goods sector, branding strategies using retro and heritage elements, and the value of brands, combining luxury, perceived uniqueness, and prestige.

In answering the third question on the importance of LBE for luxury branding and marketing, it should be noted that in each of the clusters, different issues were analysed to confirm this importance. For example, in cluster one on consumer behaviour and marketing strategies of luxury brands, the impact of user-generated content (UGC) on brand perception and sales, factors building a positive brand attitude leading to increased consumer loyalty, and the use of modern technology in marketing strategies were examined. In subsequent clusters, strategies for building and managing luxury brands and aspects of marketing and branding in the luxury goods sector were analysed. Brand experience, brand preference, brand image, brand awareness, brand perceived quality, brand marketing communication, and brand sustainability were highlighted. The importance of co-branding and *masstige* was explored in the context of the functional, symbolic, and emotional aspects determining luxury brand choices. Marketing activities leading to brand loyalty and brand love for emphasising perceived uniqueness proved to be important. In the area of luxury branding and marketing, retrobranding and marketing strategies using retro and heritage elements also proved interesting. Furthermore, it was pointed out that brand authenticity and brand experience were key elements that help fashion brands build deeper relationships with consumers, especially those who are increasingly interested in values concerning environmental and social responsibility.

This bibliometric analysis on LBE fills a research gap in the context of the importance of brand equity for luxury brands and the significance of LBE in luxury branding and marketing. Based on the analysis, recommendations can be formulated in several directions. First, strategies should be put in place to emphasise the uniqueness of the brand, such as exclusive events and high-level personalisation of products and services. Secondly, modern technologies should be used to enrich the customer experience and enhance marketing communications. Third, communication should be carried out, highlighting the history, heritage, and values of the brand to reinforce its authenticity. This is because the authenticity of a brand is a key element in building its credibility and consumer trust.

Conclusions, limitations, and future research

LBE is an important area of research and importance for luxury branding and marketing. The number of publications and citations is increasing, and the research topics cover a wide range relating to luxury brand management, consumer behaviour, marketing strategies, branding, brand image, identity, and experience. The research topics also include functional, symbolic, and emotional aspects determining luxury brand choices as well as marketing activities leading to brand loyalty and brand love. Issues of brand authenticity and retrobranding are also important.

This study also has limitations. Firstly, LBE was analysed in general, without going into the types of luxury brands and without analysing individual brands characterised by the highest prestige, elegance, and high perceived value. Secondly, the entire period 2000-2024 was analysed without indicating sub-periods. Thirdly, LBE by product category was not examined.

Directions for future research could address the inclusion of the most luxurious brands, indicating selected product categories. Furthermore, it would have been interesting to analyse the determinants of the choice of luxury brands and to identify the determinants of their high capital and high value. Differences in perception between luxury brands and between product categories could be identified.

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OPPORTUNITIES AND THREATS TO THE DEVELOPMENT STRATEGY OF THE HORECA INDUSTRY ENTERPRISE

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Purpose: The purpose of the study was to identify improvements in the process of implementing a new product into the company's operations and then marketing it to the HoReCa industry.

Design/methodology/approach: The fundamental sources of information analyzed are: the results of participant observation by the authors of the article, a case study based on a face-to-face interview with the owners of companies making the introduction of new products (services) to their portfolio. A literature review was also conducted.

Findings: Based on the conducted research among HoReCa companies, it can be concluded that there is a need for constant analysis of the key features of a new product (service) for its promotion. It is also important to remember to analyze the channels of reaching the customer and the benefits of changes made to the product portfolio.

Research limitations/implications: In the future, it is suggested to conduct similar research on a larger scale. The research should be conducted among organizations where there is no conviction to diversify products (services), in order to remove the effects caused by the Covid-19 pandemic in 2020-2022. There are also intentions to conduct research in the analyzed area in organizations belonging to the large enterprise sector. The case study was made on the basis of companies operating in the SME sector. Surveys in the environment of companies belonging to the large enterprise sector are planned for the third quarter of 2025.

Practical implications: Owners of Polish companies operating in the HoReCa industry should continuously implement the process of diversifying the products they offer. This process should be adapted to the business environment in the region, the country and even in Europe. A detailed understanding of the implementation of the portfolio diversification process, will have an impact on eliminating or reducing the barriers associated with such an activity.

Originality/value: The analysis carried out in the article responds to the need to reduce the impact of the covid-19 pandemic on hotels, restaurants, catering or event companies. The value of the article is also to make entrepreneurs in the analyzed industry aware of the advantages of a development strategy that supports the adaptation of the organization to the ongoing transformation of the environment.

Keywords: development strategy, portfolio diversification, HoReCa industry.

Category of the paper: Research paper.

1. Introduction

At the present time, organizations operating in the HoReCa (Hotel, Restaurant, Catering) industry are facing the need to implement changes within their operations, with the aim of adapting their structures and processes to the requirements of the changing market. Development strategy in an organization has been recognized for many years as a particularly important management concept. Nowadays, both in the literature and in business practice, there is an increasing emphasis on the importance of knowing the development strategy and using it to diversify the company's product portfolio (Maulana, Syarif, Taryana, 2023). Therefore, development strategy is the primary mechanism that prepares an organization for the successful implementation of changes related to new products (services). For modern companies, the implementation of a development strategy is both a major challenge and an opportunity to reduce wrong decisions related to the launch of new yet innovative solutions. The success of the implementation is undoubtedly determined by the awareness of the processes of (innovative) change in the organization, but also by the maturity of the employees of companies for systematic change (Sprong, Driessen, Hillebrand, Molner, 2021).

2. Method

The materials collected and presented in the article provide a synthetic description of the practical application of the development strategy and its importance in the implementation process of new products. The research activities, which were carried out at the beginning of 2024, resulted from personal interviews conducted among owners of small and medium-sized HoReCa enterprises and at the same time with an expert in the implementation of financial solutions to support the industry under study (case study). For the case study, 15 face-to-face interviews were conducted. The selection of the group of 15 enterprises for the study was made using the purposive method, and the selected research subjects were enterprises that consciously took advantage of EU financial support for the implementation of new products on the Polish market. They were also enterprises served by the expert.

3. Enterprise development strategies

Development is generally a process of change that occurs over time. These are mainly qualitative rather than quantitative changes, but the latter also constitute development and are manifested in the expansion of the organization's internal potential (Beliczyński, 2016). The development of an organization should be considered from a holistic point of view, which refers to a number of changes in the various systems of an enterprise, where the result is its growth (Pierścionek, 1996). It is also correct to say that development can have both internal and external dimensions (Krzos, Piwoni-Krzeszowska, 2018).

It should also be noted that the development of any enterprise is periodically characterized by progress, regression or stagnation. Thus, it is assumed that development can be progressive, and this is when it is associated with progress, that is, moving toward a desired state. Development can also be regressive, and this occurs when there is a movement of the enterprise away from the desired state. And finally, the manifestation of development can be stagnation, that is, a period when changes occur, the effects of which are compensating. Adopting this position does not conflict with the claim that development defines the difference between the state of affairs at the beginning and at the end of a given period (Rokita, 1991).

In conclusion, therefore, it can be assumed that the development of an enterprise is an ongoing process of qualitative and quantitative changes of a progressive, regressive or stagnant nature over time (Tokhirov, Abdurakhimjanov, 2021).

In this article, the main attention is paid to the methodological problems of creating an enterprise development strategy, understood, among other things, as combinations of activities that will create a synergistic effect and contribute to the maintenance and development of enterprises in the market (Basco, Rodríguez-Escudero, Martín Cruz, Barros-Contreras, 2021).

When introducing a development strategy into an organization, it is important to keep in mind the function of such a strategy. The fundamental functions are (AlQershhi, 2021):

- the concentration function, which forces activities to focus on the most important things and to allocate limited resources in such a way as to ensure their optimal efficiency,
- the orientation function, which is the mutual alignment and orientation in the strategy of current and future activities,
- the coherence function implies the essence of the strategy to be understood and accepted, so that it is a means of mitigating conflicts and harmonizing the activities of those involved in the development process,
- the function of flexibility, which is related to the ability (to recognize in advance the future conditions of action, adapt to them the actions undertaken on an ongoing basis, possibly modify the nature of actions depending on the realization of any of the anticipated scenarios of the future.

Creating an enterprise development strategy is not a simple task. Adequate observation of external factors, knowledge of the organization's resources and adequate strategic planning make it possible to determine the goals that the enterprise intends to achieve (Tomashuk, Tomashuk, 2021).

In many companies including those in the HoReCa industry, the correct development process should consist of interweaving incremental changes with innovations or larger-scale investments. Therefore, “continuous improvement” is an enterprise development strategy that is more than Kaizen. It is a system that combines in a coordinated way comprehensive changes in the organization carried out in both a planned and incremental but sustainable manner. Excluded from this system are changes in the nature of reengineering or enterprise-wide restructuring, which for obvious reasons cannot be carried out too often. Thus, considering the scope of impact of this system according to the Rummler and Brache model (Walentynowicz, 2022), “continuous improvement” applies to processes or sub-processes of the organization or individual jobs (meso- and micro-organizational system), while it does not apply to the level of the entire enterprise (macro-organizational level). Another example of such an activity could be the continuous diversion of product portfolios. This means that diversification becomes an enterprise process.

The main methods of continuous organizational improvement include (Ackerman, 2023):

- conducting team improvement projects, usually at monthly intervals,
- small activity groups, set up in individual business units depending on the initiatives reported,
- quality circles, as voluntary, unpaid meetings of employees after working hours, which is a little-used “continuous improvement” method in Western conditions,
- the suggestion system, one of the basic elements of an enterprise CI (Continuous Integration) system, the popularity of the use of which has been growing in Poland in recent years.

A very important aspect of the successful operation of a “continuous improvement” system are issues related to motivating employees, especially rank-and-file employees, to engage in the organization's development processes (Zighan, Ruel, 2023). The very issue of motivating employees in general is already very complicated. At the same time, without a new management approach (the use of new management concepts in a manner tailored to situational conditions) and continuous improvement, the company has nothing to look for in today's market. In summary, one of the key success factors and factors for evaluating the effectiveness of the implementation of a continuous improvement system in an enterprise is the highest possible level of involvement of everyone in the organization in the process (Errida, Lotfi, 2021).

Innovation as a very important factor for continuous development in organizations is identified with new products, or product innovations. It is important not only to create new products that are valuable, from the point of view of the recipient, but also to create them faster than market competitors (Baruk, 2021). Sometimes new markets emerge with the created new

products, which in turn attract other providers. This results in the appearance of many similar items. This, in turn, causes the initial competitive advantages to begin to fade. This requires companies to have a certain constancy in updating their offerings for new products. Which boils down to the “continuous improvement” method.

When analyzing meaningful information on new product creation strategies (product group development strategies), it is imperative to keep in mind the fundamental criteria such as: technological novelty of the product, novelty of the customer/market, novelty for the manufacturer, originality and competitive advantage, which allow the company to choose a specific strategy for creating a new product (sustaining strategy, improvement, substitution, remerchandising, refinement, line extension, new application, modification, and original product strategy). Details about product development strategies are shown in Table 1.

Table 1.

New product development strategies

Type of strategy	Characteristics
Sustaining strategy	New products sustaining the company's business, no technological changes, directed to the existing market, apparent external changes (packaging, label, brand).
Improvement strategy	New improvement products with minor quality changes, revised exterior design, offered to existing buyers.
Replacement strategy	New products replacing the existing ones, new materials, ingredients were used, offered to the current market.
Remerchandising strategy	Product changes are in the way of distribution, promotion, related to pricing policy or branding.
Refinement strategy	Refined products, significant quality changes, improved usability, marketability of the product.
Line expansion strategy	New products to expand offerings, manufactured with new materials based on new technology; revised exterior design, targeting the existing market as well as new segments.
New application strategy	Renamed product, modified distribution, promotion and price; products that have found use with new users.
Modification strategy	New products modified, with improved quality, with higher competitiveness, adapted to new market segments.
Diversification strategy	Completely new products, made from the latest materials, ingredients, produced with the latest technology, targeting specific markets.

Source: own compilation based on (Rutkowski, 2013).

There is a relationship between the choice of a particular new product strategy and the level of its market success. Companies are relatively more likely to use reactive product innovation strategies. As a result, new secondary (derivative) products are created. On the other hand, there is less tendency among entrepreneurs to use proactive ways of developing new products. High success rates (64-70%) include offering new products aimed at new market segments (67%), being first to market with an innovative product that meets buyers' needs (64%), or providing more value to the customer through a new product (70%) (Białoskurski, Wróblewska, 2023).

4. Diversification of service portfolio as a growth strategy for HoReCa enterprise

Prior to 2019, the conditions in which companies were operating were described as turbulent or turbulent. However, in 2020, under the impact of the global COVID-19 pandemic, global business conditions were further exacerbated. Influenced by successive lockdowns, sanitary restrictions, changes in demand in markets or even major disruptions in various types of industries (aviation, tourism, hospitality, catering or leisure), the conditions for conducting global business have changed greatly (Drammeh, 2024). This can now be felt through sharp changes in energy and raw material prices, the disruption of some supply chains, drastic reductions in supply in some markets, rising inflation or global political instability. Since it is difficult to predict further changes, today's economic conditions can even be described as highly turbulent. This raises the question: what strategies should modern companies adopt in anticipation of normalization or improvement of operating conditions? What mechanisms of operation should be the basis of such a strategy? It is difficult to give a general answer to the first question, each enterprise should develop an individual development strategy based on the analysis and forecast of changes in individual situational conditions (Mahasin, Hasbullah, 2024). However, the second question can already be attempted with a concrete answer.

Based on the opinions of experts gathered in qualitative studies placed in reports assessing the situation of the HoReCa (Hotel, Restaurant, Catering) industry in Poland for 2020-2023 are the basis for assessing the economic situation of companies operating in it. In general, the COVID-19 pandemic has caused negative changes in companies, e.g.: a reduction in the number of customers (72%), a significant decrease in orders (59%), or a shaky financial liquidity (49%). Also noticeable are the changes that have occurred in companies as a result of actions taken by individual industries to survive in the new realities. The 2020 United Nations Report identified five priorities for the re-development of tourism (PARP, Report, 2022):

- mitigating socio-economic impacts on livelihoods,
- enhancing competitiveness and building resilience, including by diversifying product portfolios and introducing an enabling business environment for small and medium-sized enterprises,
- supporting innovation and digital transformation of the tourism industry, including promoting innovation and investment in developing digital skills,
- supporting sustainable development and green growth facilitating,
- ensuring coordination and forging partnerships for the relaunch and transformation of tourism to support the achievement of the Sustainable Development Goals and put people first when rebuilding the economy, and working together to ease and lift travel restrictions in a responsible and coordinated manner.

Based on a survey of 15 companies seeking growth after the negative effects of the Covid-19 pandemic, they have consciously taken the step of constantly introducing new products (services) to their offerings. This demonstrates a conscious choice of a growth strategy using the mechanism of portfolio diversification. One of the main barriers to such development appeared in the aspect related to the availability of resources, more specifically, financial resources. The answer to overcoming this barrier was the possibility of obtaining funding from the European Union (EU) for the HoReCa industry. The companies selected for the applied case study method received such support. As part of the research, the structure of resources used to implement new products was determined:

- financial resources - to launch the new service will come from the subsidy in accordance with its amount indicated in the EU application, and own contribution as a supplement to the subsidy to the full amount of the investment,
- human resources - the necessary employees for the implementation of the new service will be those already working. They will receive training in technological operation and other activities necessary for the creation of the new product (service),
- physical resources - for the implementation of the new service will be involved space already in place. In the case of the equipment necessary to start the production of the new product (service) of the organization of meetings, it will be largely purchased from the EU funding received.

A great potential in the development of a new product (service) lies in competence resources (indicated by 86% of respondents). The key strengths and skills to win over the competition lie in the learning process, the creation and management of knowledge in the organization, the sharing of knowledge by team members, in the ways of communication, self-motivation and motivational systems that truly involve employees in the activities performed and actions to achieve the goals of the organization, subordinated to value creation.

Another important feature of the new products (services) of hotels, restaurants and catering companies are the so-called aesthetic stimuli that build the background, the mood of the service. They significantly affect the evaluation of the consumption value of the product (service). Therefore, it can be said that the success of a café will depend not so much on the traditional model of marketing activities, but on the ability to create a new marketing philosophy of its own, leading to an original image of the service provider created in the context of the customer's aesthetic experience. In this approach, aesthetics should be referred not only to the visual identity of the café, but should also be understood in the context of odor, touch or sound stimuli that are attractive to customers, since the perception of a service seems to be a kind of holistic response to numerous environmental stimuli and messages. Another feature understood in this way is intended to be used by 73% of the face-to-face interviews conducted.

The following chart presents information (collected using a face-to-face interview) that relates to barriers that discourage the use of restaurants, cafes and hotels. These can be used to begin work on determining the characteristics that will encourage the use of HoReCa services and at the same time become a tool to combat the barriers that have arisen.

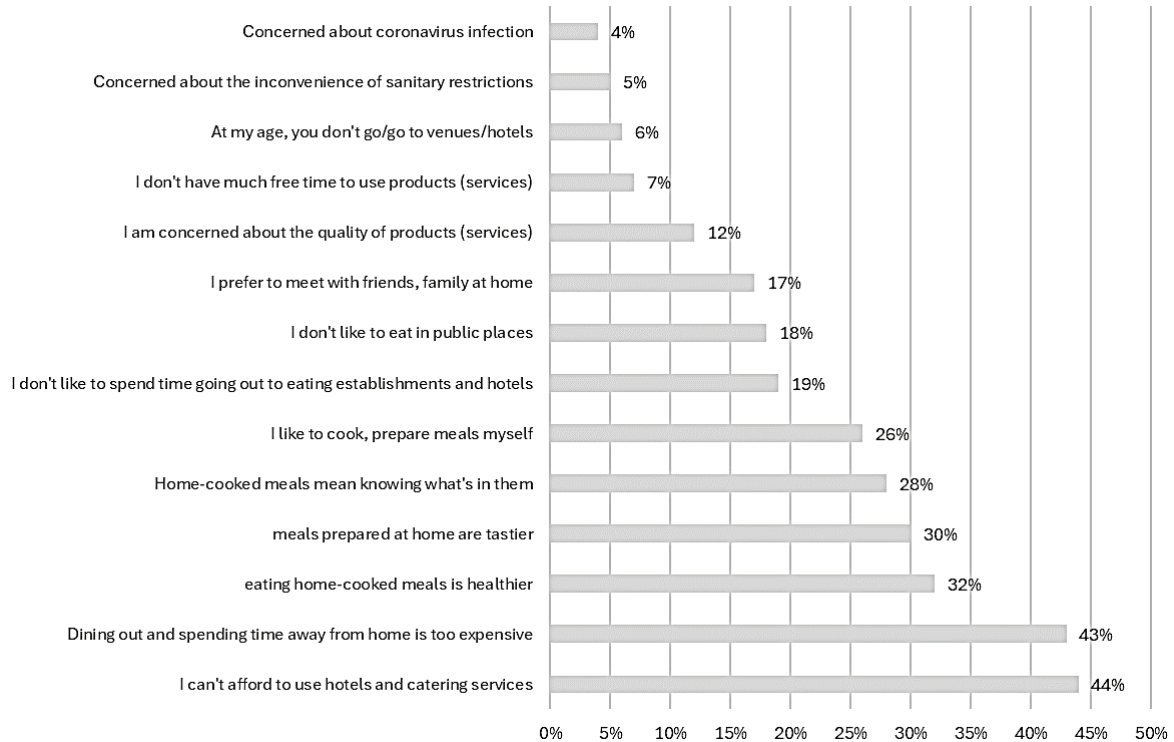


Figure 1. Barriers to the use of services of restaurants, cafes and hotels.

Source: Personal analysis of the data gathered in the study.

The HoReCa industry, when diversifying its portfolio, mainly pays attention to food services. Even hotels often choose this type of service. Therefore, below are the results of our own research on the factors that are important when choosing an on-site dish at a restaurant, café or hotel. This line of research can indicate what to pay attention to when creating or developing a new (food service).

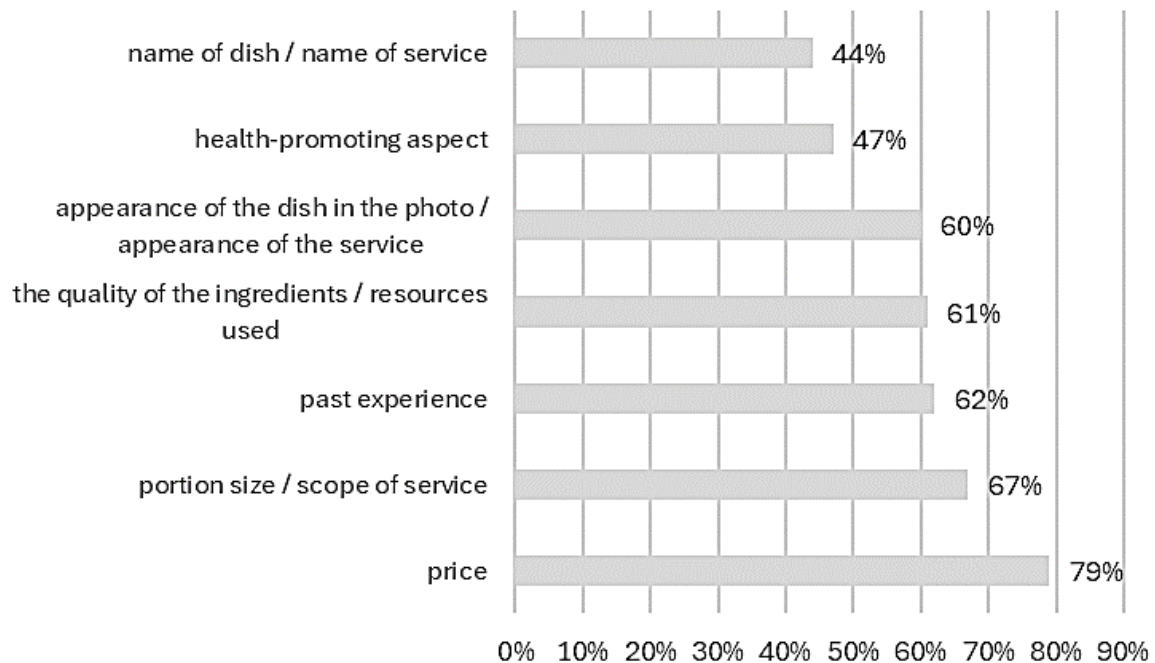


Figure 2. Criteria for selecting a food service in a restaurant, cafe, hotel.

Source: Personal analysis of the data gathered in the study.

In response to the needs of gastrotourism, many hotels, restaurants, cafes are focusing on creating unique culinary experiences, if only by showcasing local ingredients and regional cuisine (food services). Another equally important new service of primarily hotels, is organizing various types of events.

Another important feature of product development is the alignment of the right marketing process. The most important step in this process indicated by respondents is building favorable and lasting relationships with customers. This is the foundation for building loyalty. Customer satisfaction, or “the degree to which the usefulness of the product in the eyes of the purchaser corresponds to his expectations”, is the most important element of a company and an indicator of a job well done (service provided) by the company. By doing so, long-term relationships are formed, which translates into stability for the company. A loyal customer can bring in more customers, as a result, the number of collaborations increases.

In summary, the most important relationship-building marketing ideas that HoReCa companies can benefit from include:

- relations between the brand and customers should be permanent and partnership,
- the company should guarantee high-quality services (products),
- the company should create value not for the buyer, but together with him.

It is worth noting that there are special tools to help build and maintain customer relationships. CRM (Customer Relationship Management), is a holistic process of building and maintaining mutually beneficial relationships with customers by delivering superior value and satisfaction to them.

5. Conclusion

The article cites the company's own research in early 2024 as a case study and literature research. The case study was based on an analysis of 15 Polish small and medium-sized HoReCa companies and a direct interview with an expert. It shows unequivocally that Polish HoReCa companies are becoming aware of the need to adapt their product offerings to changes both dictated by the environment and resulting from the internal conditions of the organization. For the implementation of the indicated tasks, it is absolutely necessary to reach for the mechanisms of development strategy, and more specifically, diversification of the portfolio in order to improve the attractiveness of the company. Development strategy relating to products (services), should become a continuous process.

The research is also a source of knowledge for managers of hotels, restaurants, catering companies struggling with problems arising after the COVID-19 pandemic. The considerations presented in the article have both cognitive and applied value.

At the stage of creating and designing the implementation of a new product (service) in the HoReCa market, competency resources play a huge role. Competencies integrate the totality of elements in a company that enable the generation of added value, which is a kind of economic return for having them and being able to use them in a unique way. For this reason, they take on the character of core competencies. Typical key competencies are: uniqueness, difficulty of imitation, ability to agree with consumers on functional scopes of goods and services offered, acquisition and possession of relevant knowledge, generation of diversity in the area of processes and products (Parra, Espinosa, Espinosa, Ávalos, 2023).

Based on studies of the HoReCa industry, it can be concluded that personnel creating and introducing a new product (service) have an important ability to influence the emotions of customers and, consequently, the perception of the product (service). Therefore, it is necessary to create such conditions and circumstances of the product (service) production process to consciously involve the customer and skillfully stimulate his participation in the creation of his own and other people's experiences. So that, as a result, these experiences are enriched, including with new emotions and impressions, and approach or exceed the level expected by the buyer.

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AN ITERATIVE METHOD FOR SURVEY IMPROVEMENT USING STATISTICAL ANALYSIS

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Purpose: The purpose is to develop an iterative method for improving surveys (research questionnaire forms) using statistical analysis.

Design/methodology/approach: The method was developed based on a defined set of possible responses and their frequency, in order to identify questions that are incorrectly formulated or those for which the rating scale does not meet the assumed measurement criteria in subsequent stages. The process of survey analysis was automated, based on the average ratings, standard deviation, and properties of the normal distribution. Four main propositions were formed, methodically justified, and tested through an example.

Findings: Mapping customer requirements using the Likert scale may lead to data loss and bias in customer opinions in certain cases. Using a weighted, centred rating scale may cause excessive fragmentation of respondents' answers. Variance in the standard deviation of a sample analysed for a single point on the Likert scale leads to the loss of information.

Research limitations/implications: The method ensures the improvement of surveys before they are presented to a representative research group, increasing the chances of obtaining reliable and useful results. The proposed method can be successfully applied to analyse responses from any research questionnaires, especially in the early stages of their development.

Practical implications: The method helps identify potential errors during the development of preliminary versions of research questionnaires. Therefore, the method allows surveys to be adjusted before their use in obtaining a representative research sample. This increases the chances of obtaining reliable and useful results. This method can be applied by any survey designer in practice.

Social implications: The improved survey, according to this method, supports the process of obtaining respondent feedback in later stages of research, particularly during the main studies conducted among the target research sample. Respondents, when providing answers, have the opportunity to express their opinions more precisely, leading to the collection of accurate results.

Originality/value: The developed method, which is iterative in nature, dynamically identifies inconsistencies in respondents' answers and proposes alternative solutions for selecting rating scales or analysing respondents' answers.

Keywords: survey improvement, Likert scale, automated data analysis, rating scale design, production engineering.

Category of the paper: research paper.

1. Introduction

One of the key challenges in product improvement is capturing customer expectations, also known as the Voice of the Customer (VoC) (Siwiec et al., 2023). This stems from the general concept of the product design and improvement process, which involves identifying customer needs and taking further developmental actions based on them. This is traditionally carried out by gathering requirements, followed by their processing (analysis) and evaluation from, for example, a product quality perspective (Ma et al., 2017). Customer expectations are understood as their needs, opinions, and all requirements related to customer satisfaction with the usability of the product. At the same time, customer satisfaction is equated with product quality because it ranges from satisfaction to dissatisfaction with the product (Piasecka, Kłós, 2024; Sakao, 2007). Therefore, the higher the satisfaction, the higher the quality. The goal of businesses is to reduce the gap between satisfaction and dissatisfaction by adjusting product quality to meet both current and future market demands (Geng et al., 2021). To achieve this, it is initially essential to properly gather customer expectations in order to effectively guide further actions in designing new products or improving existing ones on the market (Szyjewski, 2018).

Customer preferences regarding a product focus on its attributes (features, criteria), often their importance to the customer and the level of satisfaction with their quality. Capturing and analysing these requirements can assist in determining the product that customers need. This approach also helps maintain a competitive position in the market (Qin et al., 2021; Siwiec et al., 2019). However, customer requirements are personalized and often diverse, especially in the case of mass-produced products. Another limitation is the varied terminology and semantics, which complicate mapping customer opinions during the design or improvement process. Additionally, new products often have new architectures, whose interpretation may be misinterpreted or imprecisely understood by customers. Ambiguous customer requirements are difficult to translate into design specifications (appropriate and understandable for designers) (Ma et al., 2017). Therefore, it is important that the initial stages of the design process, concerning the gathering of customer requirements, be carried out not only efficiently but also cost- and time-effective (Pacana, Siwiec, 2023; Wei et al., 2015). Defining what customers need is closely related to the need to use various techniques to support this process.

There are different techniques for gathering customer preferences. The choice of technique depends on the specific product being studied, including the research discipline. Requirement gathering techniques can be used individually or in an integrated manner, if necessary (Ma et al., 2017; Pacana, Siwiec, 2021). Some popular actions include, for example, market and customer research, including obtaining information about customers, consumer behaviour, or economic conditions (Huang et al., 2011). Therefore, customer requirements can be gathered directly from customers or through expert opinions from the respective industry (Geng et al., 2021; Xie et al., 2017). This is often done using surveys and interviews (Shan, Chen, 2011). Examples of applications of these techniques are presented in the literature, e.g. (Anuar, Mohd Yusuff, 2011; Jussani et al., 2018; Ostasz et al., 2022; Pacana et al., 2023; Schoenwitz et al., 2017; Sellitto et al., 2018). The Kano model is also popular, as it allows for the transformation of customer requirements into specialized language (Hwangbo et al., 2020; J. Li, Kim, 2023; X. Li et al., 2020; Neira-Rodado et al., 2020), or the technique of joint analysis (Qin et al., 2021), although these techniques require product evaluation by the customer. New emerging tools such as crowdsourcing platforms, which provide access to customer requirement gathering techniques and allow access to most customers worldwide, are also used (Ma et al., 2017).

Surveys, although widely used, are not without limitations. Even at the design stage, the knowledge and assumptions of the creators can influence the content, which may impact the construction of questions and suggest answers. For example, questions about colour preferences for product, limited to a closed set of options, may overlook colours that are truly desired by respondents, distorting the results.

Even a survey prepared with the utmost care—regarding semantic precision, scale suitability, or question complexity—may prove ineffective if the surveyed group lacks the necessary knowledge or competencies to correctly interpret the questions. In such cases, participants may provide incorrect answers, for example, choosing extreme or neutral options on the scale when they lack the possibility of providing a fully accurate response.

Conversely, incorrect survey design, such as improper question selection, inappropriate answer scales, or misalignment with the respondents' knowledge level, can lead to data that is not only useless but potentially harmful. The risk increases when the results of such surveys become the basis for strategic decisions, involving significant organizational resources.

This article presents an example of an iterative method for improving surveys, which can help identify potential errors at the stage of developing their initial versions. This allows for adjusting surveys before they are presented to a representative research group, thus increasing the chances of obtaining reliable and useful results.

2. Survey Research: Form, Scale, Advantages, and Limitations

As part of a synthetic literature review, it has been observed that the most popular techniques for capturing the Voice of the Customer (VoC) are survey studies (Anuar, Mohd Yusuff, 2011; Jussani et al., 2018; Ostasz et al., 2022; Schoenwitz et al., 2017). A significant tool supporting the survey process is the questionnaire, which facilitates data collection. Its preparation is characterized by strictly defined construction principles (Alwin, Krosick, 1991), including the method of data collection, such as qualitative methods, which involve answering questions like "how?" and "why?" or quantitative methods, which involve responding to questions like "how much?" and "how often?" (Krok, 2015). Ensuring the ability to obtain information from respondents is essential, while also tailoring the number and specificity of questions, maintaining clarity and precision in phrasing, and adjusting the response scale to the subject under study. This approach not only helps achieve reliable results but also maintains respondent engagement and prevents fatigue during the survey process (Szyjewski, 2018).

The first part of a survey typically serves as a brief introduction for respondents, explaining the purpose of the survey, the method of answering questions, the duration, anonymity of respondents, and access to anonymized survey results. The second part, known as the demographic section, helps to broadly identify who the respondent is, based on characteristics such as gender, age, residence, occupation, or interaction with the product (e.g., usage frequency) when the survey focuses on customer satisfaction with products. The third section contains the core questions developed to address the research questions posed (Krok, 2015; Szyjewski, 2018).

Proper formulation of research questions should follow these principles: ensuring grammatical, stylistic, and orthographic correctness; selecting appropriate vocabulary understandable to the target respondent group; minimizing the risk of misinterpretation; and avoiding leading questions. Survey responses are typically open-ended or closed-ended (Ponto, 2015). Open-ended questions allow respondents freedom of expression but should be constructed to elicit precise answers that do not pose challenges during result interpretation. Open-ended questions often take the form of brief (around two sentences) or extended responses (Szyjewski, 2018). Closed-ended questions, on the other hand, are so-called test questions. They present several possible answers, from which respondents can choose one (or more) according to their preferences. Closed-ended questions facilitate further analysis of survey data and contribute to increased objectivity (Memon et al., 2020). They also allow respondents not only to choose a preferred answer but also to determine its significance (Krok, 2015). This approach is used for alternative questions, where responses involve confirming or denying a given statement, such as "yes" or "no" or "true" or "false." A commonly used closed-ended question format is the Likert scale, often five- or seven-point (Konarski, Połomski, 2021).

The main advantages of surveys include the straightforward process of collecting customer expectations, low cost of obtaining a large volume of data, and ease of achieving satisfactory results. However, these advantages can also pose risks of obtaining inaccurate survey results, primarily due to human factors—the respondents participating in the survey. Additionally, errors during survey preparation, such as poorly formulated questions leading to misunderstandings or an inadequately designed response scale, may result in overly fragmented data (Krok, 2015; Szyjewski, 2018).

One common dilemma in designing survey questionnaires is the choice of a response scale. A poorly chosen scale can lead to excessive fragmentation or narrowing of survey results, impacting the reliability and credibility of measurements (Tarka, 2015; Wierzbinski et al., 2014).

Among the most popular rating scales in survey research is the Likert scale, frequently five- or seven-point (Cavaillé et al., 2024). Likert's original intent was to analyse latent phenomena and address limitations of simple scales by introducing multiple levels. This format allows assessment of not just a single test item but a series of aggregated items forming a construct. Consequently, the Likert scale ensures indirect measurement. It is particularly useful in studies examining attitudes, capturing their direction and strength, such as internal human thought processes, which are complex constructs not suitable for single-level scales. Furthermore, indirect measurement using a simple scale (single response) would yield less reliable results in such cases (Tarka, 2015; Weijters et al., 2021; Wierzbinski et al., 2014).

The Likert scale enables researchers to detect subtle differences, and its results do not significantly affect the final measurement outcome. This means that the scale items balance each other, unlike simple scales, where a single response can heavily influence the outcome (Tarka, 2015).

Common types of Likert scales include five- or seven-point scales (Dolnicar, 2021). Scales with two, three, or even nine levels are also possible. Depending on the needs, an appropriate scale can be selected; however, an overly extensive range may negatively impact the precision of respondent answers (Solis et al., 2022). Additionally, the greater the number of response options, the harder it is for typical respondents to discern differences between them, potentially leading to "response flattening", where scale points are merged and interpreted collectively (Capuano et al., 2016; Tarka, 2015).

3. Method

3.1. Determining the Set of Responses and Its Cardinality

A survey containing only closed-ended questions, where the possible responses are expressed using a scale (e.g., Likert scale), will have a finite number of possible answers. This allows for defining a finite set of all possible response combinations, the cardinality of which, denoted as $\mathbf{card(A)}$, indicates the total number of possible responses.

The cardinality is significant for interpreting results. Too small a cardinality might omit crucial information, while too large a cardinality complicates data analysis, even with advanced computational tools. For example, let's consider survey questions about the safety of shipping methods:

1. Is air freight safe? NO/ YES
2. Is rail freight safe? NO/ YES

We can define the set of responses for question 1 (x_1) and question 2 (x_2) (1):

$$\begin{aligned} x_1 &= \{NO, YES\} \\ x_2 &= \{NO, YES\} \end{aligned} \tag{1}$$

Thus, the set of all possible responses A consists of pairs of answers: (2):

$$A = \{\{NO, NO\}, \{NO, YES\}, \{YES, NO\}, \{YES, YES\}\} \tag{2}$$

The number of possible responses in this case is (3):

$$\mathbf{card(A)} = \mathbf{card(x_1)} \cdot \mathbf{card(x_2)} = 2 \cdot 2 = 4 \tag{3}$$

This is an example of a survey where the questions are independent, meaning one cannot directly interpret responses to infer preferences (e.g., assuming customers prefer rail over air freight). However, analysis of results can reveal insights, such as "most respondents do not prefer rail freight while a majority prefer air freight". It is also possible to compute a correlation coefficient to determine whether a dependency exists between the responses.

Using the Likert scale expands the response set for each question to 5 options. Reformulating the example:

1. Is air freight safe? $\langle 1,5 \rangle$,
where 1 = STRONGLY DISAGREE, 5 = STRONGLY AGREE
2. Is rail freight safe? $\langle 1,5 \rangle$,
where 1 = STRONGLY DISAGREE, 5 = STRONGLY AGREE

The response sets for question 1 (x_1) and question 2 (x_2) become (4):

$$\begin{aligned} x_1 &= \{1,2,3,4,5\} \\ x_2 &= \{1,2,3,4,5\} \end{aligned} \tag{4}$$

The number of possible responses is (5):

$$\mathbf{card(A)} = \mathbf{card(x_1)} \cdot \mathbf{card(x_2)} = 5 \cdot 5 = 25 \tag{5}$$

For the given example a set of all possible elements (potential answers) of set A has been shown in the table 1.

Table 1.
A set A elements with corresponding possible answers

	A_1	A_2	A_3	A_4	A_5	A_6	A_7	A_8	A_9	A_{10}	A_{11}	A_{12}	A_{13}	A_{14}	A_{15}	A_{16}
x_1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4
x_2	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1
	A_{17}	A_{18}	A_{19}	A_{20}	A_{21}	A_{22}	A_{23}	A_{24}	A_{25}							
x_1	4	4	4	4	5	5	5	5	5							
x_2	2	3	4	5	1	2	3	4	5							

The greater the number of independent questions and the more granular the scale, the larger the cardinality of A . For example, a survey with 80 Likert-scale questions yields (6):

$$card(A) = \prod_{i=1}^{80} card(x_i) = card(x_1) \cdot card(x_2) \cdot \dots \cdot card(x_{80}) = 5^{80} \approx 8.271e + 55 \tag{6}$$

Replacing 10 questions with a binary scale reduces the cardinality to (7):

$$card(A) = \prod_{i=1}^{80-10} card(x_i) \cdot \prod_{i=1}^{10} card(y_i) = 5^{70} \cdot 2^{10} \approx 8.67361e + 51 \tag{7}$$

Using a binary scale for all questions gives (8):

$$card(A) = \prod_{i=1}^{80} card(y_i) = 2^{80} \approx 1.2089e + 24 \tag{8}$$

Reducing the number of Likert-scale questions to 30 results in (9):

$$card(A) = \prod_{i=1}^{30} card(x_i) = 5^{30} \approx 9.31322574615e + 20 \tag{9}$$

Cardinality can be significantly reduced by carefully choosing scales and limiting the number of questions (e.g., reducing 80 to 30). This optimization is essential for computational efficiency in analysing correlations between survey responses. Reducing the number of questions also shortens the time required to complete the survey, saving respondents' time.

The main challenge is deciding which questions to retain or modify and how to adjust scales. These decisions cannot be made solely during the survey's design phase. A critical step is conducting preliminary validation, such as testing the survey on a smaller group of respondents and analysing their responses through pilot studies.

3.2. Automated survey analysis – initial assumptions

Automating the survey analysis process is crucial when dealing with a large number of questions. This article adopts the following assumptions for refining surveys:

1. Remove questions that do not provide any non-obvious insights to the surveyor based on the analysis of results.
2. Remove questions that respondents do not understand.
3. Remove questions containing propositions that, regardless of the respondent's answer, can be used to draw conclusions (e.g., the question: "Will you stop using biohazard materials in the production process?" with possible answers YES/NO allows the surveyor to infer that 100% of respondents previously used biohazard materials in the production process, regardless of their answers).

Additionally, to ensure the analysis process remains accurate, the following types of completed surveys should be excluded from the dataset:

1. Surveys filled out carelessly, such as marking the maximum value on the scale for every question.

Responses that deviate significantly from the majority but demonstrate internal consistency in justification (e.g., due to a respondent's extraordinary insight) should be examined in detail.

It is evident that performing such an analysis requires defining a function (10):

$$f: X \rightarrow Y \quad (10)$$

This function maps survey responses to numerical values, for example, for the set (11):

$$B = \{\{NO,NO\}, \{NO,YES\}, \{YES,NO\}, \{YES,YES\}\} \quad (11)$$

Table 2 presents an example of such mapping.

Table 2.

Example of assigning numerical values to survey responses in binary scale

x	f(x)
NO	0
YES	1

Transforming the data using this function produces the set C with the following possible responses (12):

$$C = \{\{0,0\}, \{0,1\}, \{1,0\}, \{1,1\}\} \quad (12)$$

During such transformations, it is crucial to avoid distortions that could affect further analysis. Table 3 demonstrates an example of two functions, $f(x)$ and $g(x)$, where the calculated mean values differ significantly despite identical input values x .

Table 3.

Example of assigning numerical values to survey responses using functions

x	f(x)	g(x)
Strongly disagree	1	0
Disagree	2	1
Neutral	3	2
Agree	4	3
Strongly agree	5	5

Assuming the set of responses (13):

$$E = \{\text{Strongly disagree, Disagree, Neutral, Agree, Strongly agree}\} \quad (13)$$

Transforming the set using f yields (14):

$$F = \{1,2,3,4,5\} \quad (14)$$

The mean value for this transformed set is (15):

$$S_F = 3 \quad (15)$$

Transforming the set using g yields (16):

$$G = \{0,1,2,3,5\} \quad (16)$$

The mean value for this set is (17):

$$S_G = 2.2 \quad (17)$$

For subsequent considerations, it is assumed that the transformation function h , which maps response sets to numerical values, is linear. It is also assumed that the response set inherently reflects the respondent's agreement level with the survey proposition in a linear fashion and excludes responses that could skew the mean value. An example of an improperly constructed scale would be the set (18):

$$E = \{\text{Neutral, Rather agree, Agree, Highly Agree, Strongly agree}\} \quad (18)$$

3.3. Automated Analysis – Survey Assessment Tools

It is proposed that, during analysis, the initial assumption should be that survey questions are independent (no correlation between responses) and linear. In this case, the **mean** of respondents' answers is expressed by formula (19):

$$S_i = \frac{1}{N} \sum_{j=1}^N x_j \quad (19)$$

where:

S_i – the mean value for responses to the ***i-th*** question in the survey,

N – the total number of responses to the ***i-th*** question in the survey,

x_j – the value of the response to the ***i-th*** question by the ***j-th*** respondent.

This formula represents one of the simple, widely-used mathematical tools to evaluate the central tendency.

Another mathematical tool applied in further analysis is the **standard deviation from the mean**, expressed by formula (20):

$$\sigma_i = \sqrt{\frac{\sum_{j=1}^N x_j^2}{N} - \mu_i} \quad (20)$$

where:

σ – the standard deviation from the mean,

N – the total number of responses to the *i-th* question in the survey,

x_j – the value of the response to the *i-th* question by the *j-th* respondent,

μ_i – the expected value of responses to the *i-th* question in the survey.

When creating survey questions along with the available answer options for respondents, the survey creator defines the set of possible responses and, consequently, the scale midpoint. Assuming the distribution of responses can be approximated using a normal distribution, the assumption can be made that (21):

$$S_i = \mu_i \quad (21)$$

where:

μ_i – the expected value of responses to the *i-th* question in the survey,

S_i – the mean value for responses to the *i-th* question in the survey.

At the same time, the calculated mean S_i based on responses from test surveys, may deviate from the expected value μ_i . This leads to the formulation of the following postulate:

Postulate 1: Analyse questions for which the mean value of survey responses deviates from the expected value assumed by the survey creator.

Justification: For a normal distribution, 99.7% of responses should fall within a range of $3 \cdot \sigma$ from the expected value (the so-called three-sigma rule). If the mean value is not at the midpoint of the scale (i.e., it differs from the expected value μ), this could indicate that the function h is not properly defined, the set of responses does not fully reflect respondents' preferences (as it might not allow responses beyond the predefined scale), or responses cannot be described using a normal distribution.

Another important issue to address, considering the properties of a normal distribution, arises when the calculated value of $3 \cdot \sigma$ indicates that the assumed maximum of the response set U (22):

$$\max(U) \ll S_i + 3 \cdot \sigma \quad (22)$$

Postulate 2: Analyse questions for which $S_i + 3 \cdot \sigma_i$ significantly exceeds the maximum scale value $\max(U)$.

Justification: Similar to the previous point, for a normal distribution, 99.7% of responses should fall within $3 \cdot \sigma_i$ of the expected value. If this value exceeds the maximum scale, it suggests that responses exceeding the predefined scale could be overlooked during the actual survey.

Conversely, there is also the possibility that the scale used is excessively granular. Such a situation would be indicated by the standard deviation (23):

$$\mathit{max}(U) \gg S_i + 3 \cdot \sigma \quad (23)$$

Postulate 3: Analyse questions for which the maximum scale value $\mathit{max}(U)$ is significantly greater than $S_i + 3 \cdot \sigma$. This indicates that the majority of respondents do not utilize the full scale, necessitating its adjustment.

Justification: Failure to fully utilise the scale suggests that the scale should be modified. It may be possible to reduce unused scale elements, decreasing the set of possible response combinations for the survey questions.

Considering that both mean values and standard deviations are influenced by respondents who may not complete the survey diligently, such instances of unreliability can be detected by analysing response results for individual questions in the context of the mean value and standard deviation.

Postulate 4: Since 95% of responses should fall within $S_i \pm 2 \cdot \sigma_i$, define a transformation function $x_j \rightarrow v_j$ such that (24):

$$v_j = \begin{cases} 0, & \text{if } S_i - 2 \cdot \sigma_i < x_j < S_i + 2 \cdot \sigma_i \\ 1, & \text{if } S_i - 2 \cdot \sigma_i > x_j \cup S_i + 2 \cdot \sigma_i < x_j \end{cases} \quad (24)$$

Then for the j -th respondent, given their set of responses X_j , create the set of transformed elements V_j . If the majority of elements in this set equal 1, it indicates that the respondent's answers do not align with the central tendency for most questions. Consequently, their survey responses should be reviewed in detail.

Justification: Respondents whose answers deviate significantly from the central tendency might either have deep insights and form unconventional conclusions based on logical reasoning, or they might have completed the survey carelessly (e.g., always selecting the maximum or minimum response).

4. Results

The developed iterative survey improvement method was tested using preliminary research. A questionnaire with a five-point Likert scale was used to survey 25 customers. The survey included two main questions, resulting in a total of 80 possible single-choice responses. Due to the illustrative nature of the study and method testing, the results are presented in an anonymised form.

Using formulas (19-21), the mean of the respondents' answers and the standard deviation from the mean were calculated. It was subsequently assumed that the distribution of responses could be approximated using a normal distribution. Following Postulate 1, questions for which the mean value of the survey results deviated from the expected value assumed by the survey

creator were analysed. Then, according to formula (22), the maximum of the response set was estimated. The results are presented in Table 4.

Table 4.

Fragment of the results of an anonymised research survey with a Likert scale

No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	4	3	2	2	3	3	2	2	4	2
2	4	3	3	3	5	3	2	3	4	1
3	4	2	3	3	5	4	2	3	5	2
4	3	2	3	4	4	3	2	2	5	2
5	5	5	5	5	5	4	2	1	2	2
6	3	3	3	3	3	3	3	3	3	3
7	4	2	2	3	5	4	3	2	4	2
8	4	2	3	4	3	4	5	2	5	3
9	2	2	2	2	4	3	1	2	3	2
10	5	4	4	5	5	3	2	2	5	2
11	2	1	2	2	4	3	2	1	5	1
12	5	5	5	5	2	2	2	2	5	2
13	2	2	2	2	2	1	4	2	2	2
14	4	4	4	4	2	1	1	1	2	1
15	2	2	2	2	2	2	2	2	2	2
16	2	1	1	2	3	3	3	1	2	2
17	4	2	3	2	3	2	1	2	5	2
18	4	2	3	4	5	4	2	1	5	2
19	4	3	3	2	5	4	3	2	3	2
20	4	2	2	3	5	3	2	3	5	1
21	3	2	4	3	3	3	2	2	4	3
22	4	2	2	3	3	2	1	2	3	2
23	5	1	1	3	4	3	2	2	4	2
24	3	3	2	4	4	4	3	3	3	3
25	4	3	2	2	4	3	2	2	5	1
S	3.60	2.52	2.72	3.08	3.72	2.96	2.24	2.00	3.80	1.96
σ	1.00	1.08	1.06	1.04	1.10	0.89	0.93	0.65	1.19	0.61
3σ	6.60	5.77	5.90	6.19	7.02	5.63	5.02	2.00	3.80	1.96

where: Q1-Q10 – responses to the survey questions, S – the mean value for the response to the *i*-th question in the survey, σ – the standard deviation from the mean, 3σ – three sigma value.

Analysing the values of question Q5 (highlighted in red), it can be noted that the design does not match the mean value of 3.72. A deeper analysis of the responses suggests that none of the respondents chose answer 1, while there are an equally large number of responses for answers 4 and 5. This raises the question of whether the scale was set properly and if it should be modified. As shown for questions Q8 and Q10 (highlighted in yellow), respondents did not use the full scale designed to answer the questions; therefore, the scale could potentially be reduced, limiting the set of possible answers.

Considering that the mean values and standard deviations are influenced by responses from respondents who may not have filled out the survey in a reliable manner, an attempt was made to detect such cases of unreliability by analysing the answers to individual questions in the context of the mean and standard deviation values. Formula (24) was used for this purpose. The result, which checks whether the results fall within 2σ of the standard deviation (0 = yes, 1 = no), is presented in Table 5.

Table 5.*The result checking the survey results according to postulate 4*

No.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0
5	0	1	1	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	1	0	0	0
9	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0
12	0	1	1	0	0	0	0	0	0	0
13	0	0	0	0	0	1	0	0	0	0
14	0	0	0	0	0	1	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0
Sum of deviations	0	2	2	0	0	2	1	0	0	0
Acceptable number of responses	2	2	2	2	2	2	2	2	2	2
Max. rating in the survey	5	5	5	5	5	5	5	5	5	5
Min. rating in the survey	1	1	1	1	1	1	1	1	1	1
Automatically determined max. ratings in the survey	5	5	5	5	6	4	3	3	6	3
Automatically determined min. ratings in the survey	3	1	1	1	2	2	1	1	2	1
Is the scale appropriate?	Analyse			OK	Analyse					
Proposed max.	5	5	5	5	5	4	5	3	5	3
Proposed min.	2	1	1	2	2	1	1	1	2	1

where: Q1-Q10 – responses to the survey questions.

As assumed, if the majority of elements in the analysed set of responses were equal to 1, it was considered that the respondent did not provide answers consistent with the central tendency for most of the questions. Therefore, a detailed analysis of the survey results for such a respondent was recommended. These respondents may be providing answers based on a deep understanding of the issue and formulating non-standard conclusions based on their reasoning

process, or they may indicate respondents who completed the survey carelessly (e.g., always selecting the maximum or minimum answer). Such a phenomenon was observed in the example answers (responses to questions: Q1-Q3, Q5-Q10). Then, according to the automated analysis, the proposed maximum and minimum scores should be considered for these types of responses. Based on the degrees of freedom derived from the new range of assigned scores (max. and min.), the adequacy of the rating scale is checked for five-point, four-point, and three-point scales. Even with the presence of deviations, the potential of the previously adopted rating scale is observed without the need for its change/narrowing, e.g., for Q2, Q3, Q7. In other cases, it is proposed to change the scale to a four-point or three-point scale. This confirms the effectiveness of the proposed method.

5. Discussion and Conclusion

The process of gathering customer expectations through survey questionnaires, while widely regarded as the most popular method, still faces certain limitations (Krok, 2015; Szyjewski, 2018). Challenges arise not only during the design phase of the survey but also after its completion—during the interpretation of results. The survey design and the reliability of responses provided by respondents are closely interrelated. Even with the utmost care in designing the questionnaire, such as systematic question selection or response options, inadequate answers may result from respondents' lack of knowledge, competence, or low engagement during the survey process (Tarka, 2015; Weijters et al., 2021; Wierzbński et al., 2014). This leads to unreliable data, creating challenges for subsequent decision-making processes based on this data.

To mitigate these limitations from the initial stages of survey development, an iterative method was designed to improve questionnaires using statistical analysis. This method helps identify potential errors during the preparation of preliminary survey versions.

The method was tested using a pilot survey that included two main questions, with 80 possible responses. The survey was conducted on a preliminary sample of 25 respondents.

Analysing the results of the proposed method, including comparisons of its efficiency with other studies (e.g., Dolnicar, 2021; Solis et al., 2022; Weijters et al., 2021; Westland, 2022), yielded the following conclusions and observations:

1. Mapping customer requirements using a Likert scale may result in data loss and biased customer opinions in certain cases.
2. Using a weighted, centred rating scale, such as a five-point scale, does not always provide reliable results, occasionally leading to excessive fragmentation of respondents' answers.

3. The occurrence of variance in the standard deviation of a sample analysed for a single point on the Likert scale generates information loss.
4. When respondents' opinions are polarized, and they are uncertain about their stance (e.g., strongly agreeing or strongly disagreeing with a given statement), they tend to choose the midpoint of the Likert scale.
5. Strongly held beliefs, whether positive or negative, that deviate significantly from other data may indicate either hasty (or inaccurate) responses from respondents or the presence of an ideal case, often referred to as the "genius" solution dedicated to the studied phenomenon.

It has been suggested that in preliminary surveys, the degree of question comprehension can be assessed by asking an additional question, such as: "Is the question clear to you, and do the answers allow you to express your opinion on the topic?" However, there is concern that respondents may prioritize quickly completing the survey, leading to a careless approach where most questions and/or answers are deemed unclear.

The developed iterative method has been shown to support questionnaire refinement before presenting it to a representative research group, increasing the likelihood of obtaining reliable and useful results. The proposed questionnaire can be successfully applied to analyse responses from various research surveys, particularly during their early development stages.

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UNPAID WORK IN POLISH ORGANISATIONS

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Objectives of the article: to understand perceptions of jobs as unpaid, to identify their characteristics and motivations for these jobs.

Design/methodology/approach: the paper was guided by the tenets of critical management studies, used the case study method, and conducted categorised interviews.

Subject scope of the article: perceptions, attributes and functions of unpaid work, motivation for unpaid work.

Conclusions: the survey confirmed the performance of unpaid work in organisations. As unpaid work, respondents perceived the performance of tasks outside their formal job descriptions. The alleged primary function of such work was cost savings. Employees were motivated by rational arguments, manipulation and even coercion.

Research limitations/implications: limitations arise from the case study methodology - limited opportunities for theory formulation. The research can be taken as a starting point for quantitative research on unpaid work: motives and consequences.

Practical implications: the article makes managers aware of the apparent and ad hoc nature of the benefits of unpaid work, pointing out the potential costs of this practice. It provides an incentive to make employees aware of the importance of organisational flexibility and the role of performing a wider range of tasks in providing it. In addition, it should prompt recognition and appreciation of employees' performance of additional tasks.

Social implications: the article reveals phenomena from the so-called dark side of intra-organisational relations, exposes reprehensible practices of managers and, consequently, broadens the knowledge on the situation of employees in some Polish organisations. It may be a stimulus for reflection and correction of managers' behaviours resulting in the improvement of employees' well-being.

Originality/value: the article is located outside the mainstream of contemporary reflections on management in organisations, addressing the issue of employees' perceptions of their situation when they are instructed to perform tasks outside their job description and their feelings about it. It is aimed at both management theorists and practitioners.

Keywords: work, remuneration, exploitation, manipulation.

Category of the paper: case study.

Introduction

Work is necessary for people, it gives fulfilment, it allows one to experience the satisfaction of achievement, it satisfies the need for companionship. Work is not an Old Testament curse (Gen 3, p. 17) or a necessary evil to be avoided at all costs. It determines people's lives and social contacts, both in a positive and negative sense (Lucassen, 2023). Four functions can be attributed to work: economic, income, social and developmental. From the employee's point of view, the income function is of primary importance, which does not mean that the others are unimportant. However, it is only when the employee feels that the income function of work is sufficiently fulfilled that he or she pays more attention to the other roles. One of the limiting factors of job satisfaction is the limitation or even lack of remuneration for certain tasks performed by employees. Performing such work can be seen as conflicting with the primary motive for undertaking paid work, i.e. providing income.

Numerous varieties of unpaid work can be distinguished: working for oneself, housework, maintenance or repair work, caring for the elderly, sick or children, voluntary community work, political or NGO activism, subsistence farming, helping in a family business. The listed types of work have one thing in common: they could be replaced by paid products (goods or services) (Drela, 2018). In addition, a distinction is made between unpaid work related to consumption and for one's own education (Bruyn-Hundt, 1996).

Unpaid work can be considered, among other things, in a micro context - at the level of a household or a single organisation (as the article does).

In organisations, unpaid work can take various forms, including work placements, unpaid internships, work experience and unpaid trial periods. An unpaid work contract may be entered into for reasons such as: gaining experience in a particular job or industry, testing a particular person's professional skills, dedicating time and effort to work for a non-profit organisation. However, it should be noted that the types of unpaid work listed are such, so to speak, *ex definitione* and the worker is fully aware that he or she will not be paid for the work. As a specific form of unpaid work, one can point to the need to perform numerous additional works of an administrative nature, unrelated to the employee's core duties (Majcherek, 2022). One can also see a specific aspect of unpaid work - employment in positions but for low or even very low wages, as illustrated by data from the USA (Kauflin, 2017).

Nowadays, with widespread declarations of the need for respect and subjective treatment of employees, it may be questionable whether the phenomenon of unpaid work in organisations exists at all, or whether there is a contradiction between declarations and practice. The sad reality is illustrated by observations. K. Markowska (2024) found that one in five Polish employees (21.7 per cent) admit to working for free between 6 and 10 hours per week. On average, Poles work 4 hours and 43 minutes of unpaid overtime each week.

The typology of unpaid work cited in the article by D. Grant-Smith and P. McDonald (2017) does not capture unpaid work performed by employees after they have entered into a contract with their employer. Nonetheless, the article adopts the thesis, derived from readings and interviews with employees, that there are jobs performed in organisations that are **perceived** (author's subclause) by employees as ones for which they are not adequately paid, which have been identified as unpaid work. The text does not prejudge whether this view of the workers is justified from the point of view of labour law, as this would require a judicial decision. What is considered important is the workers' perception of the situation. The essence of it, is that they perform tasks that they believe they are not adequately paid for.

The article deals with employees who have entered into an employment contract under the Labour Code. The situation of persons performing work under other contracts is not of interest to the author. Persons performing work as apprentices, interns or volunteers have also been omitted. Illegal situations of abuse of the institution of the probationary day at work have also not been included.

The importance of the subject matter of the article stems from the functions attributed to human labour, including paid labour, the fulfilment of which is nullified by unpaid work.

The presumption of unpaid work raises a number of fundamental issues: whether workers are indeed performing unpaid work, what determines whether a particular job is considered unpaid, what are the characteristics and types of unpaid work, how workers are motivated to perform unpaid work, which allow for the formulate the objectives of the article:

1. understanding and explaining the ways in which workers perceive work as unpaid,
2. identifying the characteristics of unpaid work,
3. identifying the roles attributed to unpaid work,
4. identifying ways to motivate employees to perform unpaid work.

The article reviews publications on the subject of unpaid work, refers to the provisions of the Polish labour law, from which conclusions can be drawn relating to the tasks that employees should perform in their positions and for which they should receive remuneration. Moreover, the statements of the respondents were quoted referring to four basic phenomena related to the indicated objectives of the article: 1) ways of perceiving unpaid work, 2) attributes and types of unpaid work, 3) functions ascribed to unpaid work, 4) ways of motivating to perform unpaid work. On the basis of these contributions, generalisations were made in conclusion, in which the objectives of the article were realised.

The relative newness of the topic of unpaid work performed in organisations, as evidenced by the lack of coverage by D. Grant-Smith and P. McDonald (2017), influenced the choice of a qualitative approach. Categorical interviews were conducted in March and April 2024 with a group of thirteen respondents employed under contract in a variety of institutions. An invitation to participate in the study was extended to about 80 people. Of these, only seven responded positively. The remaining respondents were invited to the survey individually. Efforts were made to ensure that they were diverse in terms of demographic characteristics,

occupation and nature of place of employment. Interviews were conducted via the MS Teams platform. The interviews were coded and then transcriptions were made and analyzed. The study used *a priori* coding (Miles, Huberman, 2000). Codes were deductively superimposed on the content of the transcriptions after which they were completed or corrected (Czernek, 2016, p. 182). However, in describing the results of the survey, the masculine gender is used for the respondents mainly due to the desire to ensure their anonymity.

The article can be located in the stream of critical management studies because of its intention to question the organisational order and managerial power, its description of the oppressive actions of managers and its desire to uncover the interests of groups exercising power in organisations (Sułkowski, 2011).

1. Views on unpaid work

1.1. Types of unpaid work

There are specific strands in research on unpaid work. The first refers to the broader context in which it is situated. In it, one can locate M.A. Duran (2015), who pointed out that this type of work has only received special attention since 1995, when the United Nations proposed a reform of the System of National Accounts to include unpaid work. Since then, research on the topic in question has intensified. In the aforementioned text, M. A. Duran dealt in particular with the links between paid and unpaid work, welfare and globalisation, and the differences in the use of these terms in different production and cultural contexts. Also I. Hirway (2015) analysed unpaid work in the context of macroeconomics, including neoliberal ideology, and argued that the strong links between unpaid work and the economy make it necessary to expand the scope of conventional economics and include unpaid work in its analysis. A study of the reasons for the need for unpaid work and the factors influencing its extent and form among different types of digital platforms was conducted by D. Baines and I. Cunningham (2020). They found that digital freelancers show a lower extent of unpaid work under relatively 'open' worker autonomy platform systems. In contrast, 'closed' systems limit unpaid work on food delivery platforms, providing relative security for workers who are easily replaced in an overcrowded sector requiring few skills.

Another strand in research on unpaid work is the observations linking this type of work to gender. This is largely due to the fact that work described as 'care' is almost always unequally distributed between men and women, and when both paid and unpaid work is taken into account, women bear a much greater burden of work than men. This unequal division of labour is unjust and amounts to a violation of women's basic human rights (Hirway, 2015). Included in this trend are D. Baines and P. Armstrong (2019). have been concerned with gender

functioning and social relations in long-term care or nursing homes, examining mainly the female workforce. In women's experiences, one of the strongest themes was unpaid work. Drawing on gendered organisational theory, the article introduced the concept of non-work tasks and suggests the existence of needs and gendered expectations of residents, families and the care workers themselves.

An article by L.R. Shade and J. Jacobson (2015), who dealt with the experiences of young Canadian women undertaking unpaid internships in the creative sector, can also be situated in the gendered stream. The results of their study confirmed the class privilege of such internships, which could be undertaken by those with sufficient wealth. Female respondents, participants in unpaid internships, articulated a desire to gain meaningful, secure and paid employment.

In a subsequent publication with a focus on women, T.H. Coventry, SE. Maslin-Prothero and G. Smith (2015) noted the reluctance of nurses to leave clinical settings to participate in continuing professional development due to, among other things, the possibility of unpaid sabbatical leave or the need to use personal time to complete mandatory training. This implies that the limited opportunities for unpaid work (during internship) limit the enhancement of competence.

To some extent, the negative phenomenon of the wage gap concerning women is linked to women's unpaid work, and this is despite the fact that, in many fields of study, the number of female graduates exceeds the number of male graduates (Mazur-Wierzbicka, Ziembowska, 2024).

The unequal distribution of unpaid work by gender lies at the heart of gender inequality and also implies suboptimal use of the national labour force (Hirway, 2015).

In the critical current, one can situate F. Genko and R. Korschak (1999), who, while describing and analysing the assumptions and practice of lean management, although they did not use the phrase 'unpaid work', concluded that in connection with the additional activities performed by employees of Japanese companies (e.g. inspecting materials and products, tidying the workplace, attending quality circle meetings), it is not about job enrichment, but the opposite. Each additional activity creates resentment and irritation in the workers instead of the expected increase in motivation. The described burdening of employees is in fact unpaid work performed by them, resulting in the cost reduction expected of their superiors by higher levels of management.

A significant contribution to research on the phenomenon of unpaid work has been made by D. Grant-Smith and P. McDonald (2017), who conducted an extensive literature review on this type of work. They explained the terminology associated with unpaid work and synthesised the findings of their research on this topic into a matrix in which, using the two dimensions of purpose of experience and participatory discretion, they identified four forms of unpaid work, as shown in the table below.

Table 1.*Four types of unpaid work*

		Participatory discretion	
		Mandatory	Elective
Purpose of experience	Education	Mandatory educational Unpaid work that is a formal requirement of completing a course of study or qualification (e.g. service learning or practicum)	Elective educational Unpaid work that is pedagogically oriented but not required to complete, or additional, to a course of study or qualification (e.g. industry attachments)
	Productive work	Mandatory productive work Unpaid work imposed by the state (e.g. work-based welfare) or employers prior to entering into a formal paid employment relationship (e.g. work trials)	Elective producing work Unpaid work which involves undertaking productive work but is not linked to educational outcomes (e.g. volunteering, unpaid internships or unpaid professional work)

Source: Grant-Smith, McDonald (2017).

The table provides a clear idea of the types of unpaid work discussed in the literature and, consequently, suggests possible options for management decisions and practices in organisations where unpaid workers form part of their workforce.

1.2. The legal perspective of unpaid work

In today's organisations, there are varying trends in the area of shaping the relationship between employer (superiors) and employees. On the one hand, so-called fruit Thursdays, team-building meetings or trips, medical packages as well as sports cards and additional leave for employees in connection with the birth of a child are well-known. It is postulated that empathy and attentiveness have a permanent place in management (jk, 2024). On the other hand, works have been published (e.g. Januszewska, 2024) exposing pathological interpersonal relations in some organisations or treating of the so-called "manor" organisational culture (Hryniewicz, 2007) or the fuck up culture (pol. zapieprzu) (Szymanik, 2022) or even fuck up culture (pol. zapierdolu) (Smełka-Leszczynska, 2024). The terms exploitation and exploitation (Kim et al., 2020), slavery (Crane, 2013) are also used to describe the relationship between workers and managers in companies. This raises the question of whether the aforementioned terms are mere exhibits from the open-air museum of intra-organisational relations or, nevertheless, phenomena that contemporary employees actually face? Or can the situations indicated be seen as extremes of a specific spectrum describing the state of relations between employees and their superiors in organisations? The picture is probably not black and white, it is expressed in various shades of grey. An important element of the supervisor-employee relationship is the behaviour of the former in assigning tasks to employees and determining remuneration for these jobs. This is regulated by labour law.

In Article 13 of the 1974 Labour Code, the provision "An employee has the right to fair remuneration for work. The conditions for the realisation of this right shall be determined by the provisions of the labour law and the state policy in the field of wages (...)" clearly defines the workers' entitlement to remuneration. In turn, Article 78, §1 of the said Code establishes

that the amount of remuneration should correspond to the type of work, the employee's qualifications and must be determined taking into account the quantity and quality of the work provided. In another provision, Article 94(1) of the Labour Code, it is required that before the employee is allowed to work, the employer must inform the employee of the scope of his or her duties, how to perform the work in the designated position and basic rights. The scope of duties is a description of the activities performed in the position, which should be consistent with the type of work specified in the employment contract.

Familiarising the employee with the scope of his or her duties under the contracted type of work and instructing him or her on how to perform the work in the designated position are among the employer's most important duties (Liszczyński, 2019). It is understood that the employer should draw up the terms of reference before familiarising the employee with them. Acquainting the employee with the scope of duties for the position he or she occupies most often takes the form of providing him or her with the so-called "terms of reference" in writing, which should take place at the conclusion of the employment contract or at the first admission to work and in the event of reorganisation or transfer to another position. However, T. Liszczyński (2019) emphasises: '... there is no general legal requirement to hand employees written scopes of activities. Apart from cases where separate regulations establish such a requirement, it is only a matter of proper work organisation'. On the other hand, as part of the obligation to provide work, in Article 100 of the Labour Code, an employee is in particular obliged to: a) perform the tasks entrusted to him/her diligently and conscientiously, b) perform the instructions of his/her superiors, provided that they do not contradict the law or the employment contract, but also c) take care of the good of the workplace (employer), in particular protect and keep secret certain types of information.

The scope of duties may include an obligation for an employee to carry out orders and other activities than those specified in the scope, which the employee is obliged to perform if: a) they are issued by a competent superior or an authorised employee and in accordance with his/her scope of authority, b) they are in accordance with the applicable law, c) they correspond to the type of work specified in the employment contract (Suknarowska-Drzewiecka, 2011). On the phenomenon of "carrying out other orders" a different view was presented by Cz. Sikorski (1988), who emphasised, especially important for management system designers, the avoidance of the phrase "all other work ordered by the superior". He considers the introduction of such a provision illogical, as it questions the sense of enumerating other activities. This difference of opinion is explained by the different disciplines represented by the authors cited. The scope of activities should be in accordance with the employment contract, accepted and signed by the employee (Suknarowska-Drzewiecka, 2011).

The employee, by remaining ready for the notion of work, secures the interests of the employer, as, due to the possibility of difficulties in the process of the organisation's functioning, the employee's readiness for work constitutes a value for the employer - it ensures

the possibility of disposing of the employee's work when the obstacles to the organisation's activity cease to exist (Zwolińska, 2021).

Article 22 par. 1 of the Labour Code lists several key features of the employment relationship, the most important of which are: 1) performance of work of a specific type, 2) performance of work for remuneration. The first of these means that the boundaries of the employee's duty to work are set by the agreed type of work, thus excluding the 'existence of an omnibus obligation of the employee' to provide work (Zwolińska, 2021) which is important in the context of the phrase 'all other work ordered by the supervisor'. However, the understanding of work as an activity adopted in labour law prejudices the impossibility of specifying all the activities that an employee undertakes to perform at the time of the employment relationship. From the work of the employee, which is only defined in a generic manner - at the establishment of the employment relationship - the need for its continuous concretisation arises, which in turn justifies the existence of employee subordination, and this determines the manner of fulfilment of the employee's labour obligation (Zwolińska, 2021).

Remuneration can be treated as an equivalent for the work performed by the employee therefore, the chargeability of work is a key feature of the employment relationship and employment *sensu largo*. Labour law uses the term 'remuneration for work' in two senses: 1) primary wage entitlement (payment as an element of the employment relationship), 2) secondary wage entitlement (wage claim for work performed) (Zwolińska, 2021).

An employee entering into an employment relationship with a particular employer commits to perform regularly repeated activities under the direction of the employer and secures the employer's interests. Due to unpredictable phenomena in the organisational functioning process, the employee's willingness to work represents a value for the employer (Zwolińska, 2021).

The views outlined above show that it is difficult to establish unequivocally what work and tasks an employee should perform in return for the remuneration he or she receives and which, despite being ordered to do so by a supervisor, he or she is not obliged to perform. Hence, there is subjectivity in the perception by employees of certain tasks as unpaid.

2. Results of the study

2.1. Perception of unpaid work

Respondents' experiences of carrying out unpaid work range from not doing such work at all to doing it very often. Furthermore, those who stated that they perform such work differ in their views on what characterises unpaid work.

The respondent characterised such work as "(...) done to compensate for less than adequate (according to the respondent, author's note) productivity in nominal working time". Furthermore, he added that in such a situation he performs these jobs voluntarily. However, this view does not describe the essence of unpaid work, but indicates the justification for doing such work. It is a kind of form of its legitimisation. Another respondent confirmed the fact of doing unpaid work and added that it is often unforced, natural to help another person employed in the same position or to do some work for such a person. A similar opinion was formulated by another respondent, stating that he does unpaid work, but that there is "not this imposed, it is just my own will to support a colleague". The next respondent defined unpaid work as additional tasks related to his field of expertise, but of a different nature. This is due to an independent interpretation of the remit leading to additional work complementary to the core remit e.g. cleaning work. The respondent pointed to the vagueness of the formal terms of reference as a factor that makes it difficult to determine what tasks he is paid to perform. He added that he instinctively performs work related to providing efficient customer service, although he believes it is not part of his duties, but feels responsible for the satisfaction of the buyers.

Another respondent stated that the criterion for considering a particular job as unpaid was that it did not fall within his job description. He supplemented this by stating that unpaid work was tasks performed by him at times when his supervisor did not provide him with work specific to his position i.e. other than that which fell within his job description. To another respondent, when there are no tasks that are assigned to his position, supervisors do not charge him with additional work.

Another respondent found it difficult to determine whether he performs unpaid work understood as going beyond the scope of his duties because the scope of his duties is of a "top-down" nature, it was drawn up to comply with labour law, and he performs tasks that are necessary at a given time due to the company's projects. He is not in a position to determine "whether he is doing something that is done for free, excessively" because his superiors do not specify his working hours or tasks.

Another respondent understood unpaid work in two ways: 1) a job where no remuneration is received at all for the tasks performed, 2) a job for which remuneration is inadequate to the type of work and competences used by the employee. The first type was seen by the respondent primarily in professional services firms, where jobs are perceived to be so attractive that there is strong competition between applicants. This results in "an atmosphere being created everywhere in such companies that makes the employee feel remorse for not dedicating himself or herself 100 per cent to the job". However, practices related to the first type of unpaid work also occur in larger entities: "In larger companies, it is often the case that one gets time off in exchange for overtime, but not to the extent that is stipulated by the Labour Code, that is, not 150 per cent or 200, but one to one".

Other respondents limited themselves to stating that they do unpaid work, without detailing their understanding.

The spectrum of statements related to the fact of doing unpaid work ranges from no such experience (a rare answer) to frequent performance. The motives for undertaking unpaid work are interesting. Slightly surprising is the voluntary, spontaneous performance (e.g. helping a colleague) of the jobs analysed. On the other hand, it is not surprising to perform them on the orders of superiors.

2.2. Features and types of unpaid work

A corollary to the finding of unpaid work was the intention to identify the attributes of work/tasks considered by respondents to be unpaid.

The respondent stated that unpaid work is standard tasks but performed after working hours, including at home. The unpaid nature, in his case, is a consequence of insufficient work done in nominal time and the need to supplement it at home. Another respondent stated that, in his case, the unpaid work is work of an auxiliary nature, housekeeping and spontaneous help shown to people performing the same tasks. Another respondent indicated that unpaid work is generally work of a periodic nature, e.g. participation in various committees, task forces or projects aimed at the organisation's environment. Another respondent indicated that he was expected to operate equipment and perform work of the same type and complexity as that which he performed as standard.

One respondent raised a different aspect of unpaid work - the expectation on the part of superiors for an employee to use competences that were not required during recruitment for his or her position (e.g. using more foreign language skills during the course of work than were set out in the qualification requirements for a particular position). The same respondent, in the context of unpaid work, drew attention to the performance of work that went beyond the tasks included in the job description in terms of its nature and degree of difficulty: "I point out imperfections in the process, and theoretically that shouldn't be my role. I should be filling in a process that is good and prepared, just filling in, just doing it from A to Z". This person was further required to manage the work of the team: "it happens very often that I distribute the work or do such organisational things and, for example, act on behalf of my teammates towards the manager." The respondent, who initially stated that he did not do unpaid work, however, realised during the interview that he was providing training and coaching to new employees, which was not within his job description. Periodically, he began to fulfil a new function within the organisation - he became an internal trainer. "These are the kinds of things that (...) are not really part of my responsibilities. But they kind of came in through the back door". In the case of this respondent, it is worth noting the impulse that led to doing some of the unpaid work - the desire to help other employees from below, spontaneously, who have more work to do at any given time. The respondent in question also undertakes to coordinate - without the involvement of a supervisor - the performance of tasks, which is essentially self-coordination.

This person concluded that spontaneous, bottom-up, involvement turns into constantly performed tasks, and the employee, who is not able to look at his or her work from a distance, starts to treat it as a normality.

The most glaring case of unpaid work was presented by a respondent to whom the management of the entire organisation had been delegated and who in fact performed the duties of a superior (in his absence), which went beyond the tasks he routinely dealt with. Moreover, he performed work that belonged to positions situated at a lower hierarchical level. The respondent in question performed both tasks of higher difficulty and complexity and tasks that were simpler than those of his position.

Of separate note is the respondent who stated: "in fact, for 90% of what I do, I did not find a single line (...) in my job description". This is a situation he accepts is due to events in the environment, but also due to management negligence: "... the American regulator came up with something two years ago, but only now (supervisors) mentioned that it has to be done. It needs to be done quickly'. Such tasks are sometimes simple, but also complex, requiring teamwork. The respondent takes the performance of such work for granted and as appropriate, even though it is not in his or her area of responsibility.

From the respondents' statements on the attributes of unpaid work, one constitutive feature of this type of work emerges: going beyond the formal scope of employees' duties. In contrast, other attributes of such work are: 1) in terms of complexity and complexity, work that is simpler than standard work, but also work that is comparable and also more complex and demanding, 2) from the point of view of the level of management to which the work in question formally belonged, there is also variation, ranging from work that should be carried out at a lower level of management, to work that is specific to the same level in the hierarchy, to tasks of higher levels of management. All this points to a wide variation in the work perceived by respondents as unpaid.

2.3. Functions of unpaid work

An important issue is the respondents' perceived sense of unpaid work, the functions attributed to it in the organisation and any positive effects brought to the company. Not all respondents were able to directly indicate benefits of this kind, but it was possible to deduce them from other statements.

The unpaid work carried out by the respondent provides assistance to other employees in carrying out their tasks. The results of the unpaid work are used by other units - they enable them to complete their tasks earlier: "For example, if I prepare a presentation for the sales department, they have it at their place earlier. If I do it at the weekend, instead of sitting down to it on Monday, they have more time to review it". Furthermore, the effect of the unpaid work of the respondent in question is observed trends or phenomena in the environment, knowledge of which is indispensable for the company. Another respondent also pointed out the benefits that the whole organisation has from his unpaid work - replacing a superior ensures continuity

of management. This person pointed out additional positive effects of unpaid assignments: "(...) they made deep sense because they served to retain customers and grow the company". Respondents pointed out that it is not only the organisation as a whole that benefits from their work, but also individuals - usually their supervisors, managers: the benefit is "(...) the organisation, but certainly my supervisor has less work. He gets certainly a managerial salary. And he has less work and he has some of the things done well, because he wouldn't be able to do them well himself. It's just, I'll do it better. He has some resource for free".

The benefit to the organisation of unpaid work, otherwise, was employees prepared "(...) at the same level as us. New girls or new employees in general who come and join the team, if they are trained by us, our team will work even better together." The respondent emphasised that the benefits gained by the team are also benefits gained by the organisation as a whole: "It seems to me that if it benefits us, it should also benefit the whole company. Well, because it is logical". Another respondent pointed out that having them do unpaid work makes it possible to dispense with possible additional employment, which results in cost savings for the organisation. An interesting point of view was used by one respondent, who saw his performance of unpaid work as a way of educating his children (the thing took place in a kindergarten): "Children also learn by observation, so if they see adults cleaning up and doing some activities, they are also happy to participate themselves. It is education by example". A key benefit of unpaid work identified by another respondent was increased organisational flexibility, quicker adaptation to changed conditions in the environment.

The benefits of unpaid work need to be considered in the context of the nature and specificity of the jobs in which the employees performing it are employed. The benefits identified by respondents were enjoyed by clients (e.g. children in the nursery), other employees (e.g. easier performance of tasks by them) and the organisation as a whole (e.g. greater flexibility, better trained employees). A separate category of benefits seems to be the greater ease of task performance by some supervisors, for whom selected tasks are performed by subordinates. The study allows us to see a regularity, which is rather unsurprising, in that employees employed at higher levels of management or performing more complex work necessarily produced positive effects of greater magnitude than those employed at executive level and performing relatively simple tasks. The nature of the tasks performed by the respondents also influenced the specificity of the positive impacts caused by unpaid work.

The implicit rationale for charging employees for unpaid work is the desire to achieve cost savings. The majority of respondents explicitly indicated such a motive. One respondent gave the following answer: "Of course it was. That was the main motive". Other respondents tried to describe the mechanism of the alleged cost savings, such as: "Some unpaid work is outsourced to employees instead of being outsourced". Another respondent, through a comparison with a previous workplace, indicated a different mechanism for achieving savings: "It was also a corporation, but there was a trainer position and it was just a person employed by the company who trained new employees. I think nowadays, with the outsourcing of employee training,

it's all about cost". Still another respondent, from previous jobs, was aware of instances where the scopes of work of those positions where there were vacancies and no one had been hired had been passed on to current employees. Another respondent indicated that if unpaid work were to be abandoned, additional tasks would need to be formally assigned and employees paid for them, which is what happens with some out-of-scope work, but on a much smaller scale. Another respondent perceived that the commissioning of unpaid work is also driven by individual managers' motives: "(...) in these situations what the supervisor is thinking about is to ask as little of themselves as possible and to pass on as many things as possible to someone below them". On the other hand, outsourcing unpaid work, in the context of cost savings, the respondent whose views are presented believes: "There are people who have bonuses depending on their performance, on how much money they bring to the company, or how much their team brings to the company, for example. This encourages them to outsource unpaid work". The same respondent identified factors that encourage such savings: 1) the small size of the organisation, 2) the personal interest of managers in the bottom line. Only one respondent did not see cost saving intentions as a motive for outsourcing unpaid work. In the organisation where he is employed the priority is to ensure flexibility.

From the statements made, there is a widespread belief in the desire to reduce costs for organisations as the overriding motive for commissioning unpaid work. It is also important to note the selfish rationale attributed to some supervisors charging their subordinates.

2.4. Motivation for unpaid work

Unpaid work is ambiguous in nature. On the one hand, it brings certain benefits to organisations, while on the other, it can be perceived by employees as an unjustified, personal inconvenience. It is therefore interesting to see how the requirement or expectation is formulated for employees to do some unpaid work.

The mildest form of such communication was information about the necessity to perform a certain task, without specifying the conditions for its execution, e.g. giving a deadline. The respondent interpreted this signal as the superior's expectation that the employee would understand the allusion and perform a certain task on his or her own. It seems that a variation of informing is - indicated by another respondent - the mention of a 'certain task' combined with the suggestion that it is worth doing. For another respondent, messages about completing additional tasks raised concerns about the possible consequences of refusing to complete them. However, these were not caused by the orderer, but rather anticipated by the employee himself. Another formulation of the expectation of unpaid work was discussed by another respondent. It was a message, not even a suggestion or a command, from which the employee was expected to deduce what was implicit in it - the expectation that subordinates would themselves pick up the initiative to do the extra work: 'It was kind of a message: did you see this, can you help him?' It's just a masterpiece (...). I laugh that my team leader must be after some kind of management psychology". The same respondent also pointed to a gradual and unnoticeable

increase in the number of unpaid tasks someone performs - e.g. a gradually increasing number of clients or processes being handled. Additional tasks are sometimes commissioned as temporary, ad hoc tasks. They may relate to the provision of training (not part of the job description) - the supervisor asks for extra work for one day and then this period is extended. Subordinates are left free to decide how to organise and divide the extra work among themselves. A more pronounced form of unpaid workload is to employ an employee in a position formally lower in the job hierarchy (and less well paid), and have them perform tasks specific to a position with more complex and demanding tasks.

To order unpaid work, some supervisors used manipulation, e.g. appealing to the employee's professional ethos, making him feel that he was in a coercive situation. One respondent was given instructions, suggestions were made to him, but also appealed to his professional ethos, especially when the work expected to be done belonged to employees at lower levels: "Yes, this pressure was exerted by sending messages, for example, via instant messaging, Messenger or other applications and demanding that I address these issues even after hours, even in the late evening and night hours." Another respondent identified two main ways of delegating unpaid tasks: 1) a task imposed on the whole team, e.g. the development of a project or part of a project - and each member of the team has some part of this task to perform, 2) the employee takes the initiative himself, spontaneously identifies for himself tasks of an improvement nature, e.g. of the processes in progress.

Supervisors used a variety of ways to communicate to respondents the expectation of unpaid work. The methods of formulating the requirement to carry out this work can be presented as a spectrum of forms varying in their degree of relativity to workers, ranging from soft forms, appealing to the default or goodwill of workers, through manipulation of workers to coercion. Respondents rarely saw any form of commissioning of a formal nature, much less in writing.

One can see a spectrum of motivators used by superiors in different situations. At one extreme of this spectrum there is even a lack of suggestion by the supervisor for such tasks. In this case, the performance of unpaid tasks is the result of the employee's own conviction to do so. The next point on the spectrum is a "small request" from the superior to perform additional tasks and the next one is a rational explanation by the superior of the sense and need to perform an unpaid task, e.g. giving arguments related to benefits for the organisation and individual benefits in the form of a higher employee evaluation. The observation made by the next respondent is similar to those already presented: "It was such an emotional, and businesslike explanation of it, so to speak. He was explaining, saying why we were doing it, what the benefits would be for the company, like for us, or why we were doing something totally pointless, for example". Further forms of argumentation were perceived by respondents to be related to the use of various forms of manipulation against them. One of these was the use of the argument of downplaying the amount of work that would have to be done while discharging unpaid tasks (replacements): " (...) 'but that's actually almost nothing, there's actually nothing to do there'. And these were things that theoretically this person

(who was supposed to be deputised, author's note) was doing full time". Also perceived by the respondent as a form of manipulation was the argument about the possibility of learning and broadening one's competences:

(...) I was to take over, alongside my own, the responsibilities of the person who was leaving. This was presented as an opportunity for me to learn. Indeed, the bet was that I would learn a lot, I could gain some knowledge and experience. But what my employer would have gained is that they wouldn't have had to pay someone who I'm sure would have earned a lot more than me, because they would have been an experienced employee, in a higher position.

Another respondent also perceived attempts at manipulation "The supervisor cleverly expressed that: 'because, after all, you guys have experience, you're so capable. And, of course, that it should be distributed within working time, so that it doesn't interfere with our duties, so that it doesn't hinder us". The supervisor suggested that, for the duration of the unpaid work, the employee's standard tasks should be taken over by another employee. This was in fact a cascade initiative of unpaid work.

On the contractual spectrum of justifications for doing unpaid work, the next place is occupied when there is a lack of explanation or justification for the need to do unpaid tasks. This is when the command 'you must do it' is used. Extreme in nature is the explanation identified by the respondent as "An unequivocal command to do unpaid work". The argument used by the supervisor is: "because there is no one to do it". Another respondent described a situation where an argument of a similar nature was used:

I was only in a team with my supervisor (...) and our team of two couldn't really find their way around the company. She felt such pressure that she had to find some budgeting for the team and was coming up with various projects that she was implementing with my hands. They were disconnected from everything and not really feasible, also technically. She could use such strong passive aggression. But at times she would switch to a more active aggression.

It is difficult not to agree with the respondents who saw such incidents as a violation of their dignity.

Justifying the need for unpaid work can be understood as an additional form of motivating respondents to perform such work. The cited explanations used by the respondents' superiors testify, on the one hand, to the characteristics of the superiors and, on the other hand, are an expression of the organisational culture prevailing in the entities employing the respondents, which in some cases is oppressive towards employees.

The use of orders to carry out unpaid work raises the question of respondents' perceptions of the possible consequences of not accepting such requirements or even not carrying them out. Therefore, the observations and views of respondents about the potential consequences of doing or not doing unpaid work are important. Furthermore, it also seems interesting whether the possible consequences would only be implied, suggested by superiors or explicitly announced. The responses of the respondents can be presented as a palette of varied experiences of agreeing or not agreeing to the type of work in question.

At the first extreme of such a set can be located the situation of a respondent who believes that his or her commitment and willingness to develop (expressed by doing unpaid work) will be recognised by superiors and translate into a pay rise. Another respondent, whose observations can be situated around this end of the spectrum, stated that there was no concern that not doing unpaid work would affect employees. Another respondent expressed that he had not encountered such situations and consequently had not experienced pressure. Here it should be added that this respondent was not fully aware that he or she was doing unpaid work - he or she became aware of this during the survey and this is probably why he or she did not perceive the impact of doing unpaid work on his or her situation. One respondent stated that he currently had no reason to believe that he would face any negative consequences for refusing to do unpaid work. However, he added that in the past he had been bullied in this type of situation, but that this appeared to have been the result of his supervisor's personality traits rather than company policy. Another respondent replied that *expressis verbis* threats were not formulated in relation to not doing unpaid work, but the respondent was concerned that the rule "ten are waiting for your place" could be applied to those refusing to do unpaid work. It can therefore be concluded that the possible consequences were implicit and based on the respondent's experience or that of other workers of which he was aware.

The experiences of further respondents with agreeing or not agreeing to unpaid work differ significantly from those already discussed. One of these respondents stated that he was convinced that doing unpaid work affects the employee's appraisal: doing it facilitates a positive appraisal and not doing it results in a negative appraisal: "If you do it, you get a positive evaluation, or if you don't do it, you get a negative evaluation, so it works both ways". However, the respondent acknowledged the difficulty in identifying the impact of unpaid work on the grade due to the insufficient precision in the wording of the terms of reference. Identifying the impact of doing or not doing such work is further hampered by the secrecy of pay. The interviewee presumes that there is a practice of salary increases in the company employing him/her to compensate for the performance of unpaid work. However, the increases are judged to be out of proportion to the amount of additional work performed. Possible consequences are rather implicit, conjectures about them coming from conversations between employees, e.g. conjectures about the possible consequences of not performing a certain task. The respondent whose observations are discussed drew attention to the ambiguous attitude of superiors in the context in question:

You have to do and not ask questions, and also I often have the impression that managers play such a game. I mean I have my doubts whether they are playing a game or whether it's really like that on the basis of 'I don't have any influence on it, I got it too. I'm not happy with it, but it's the right thing to do, we have no way out.' Well then theoretically the manager gains in the eyes of the employee and the employee feels such a sense of solidarity, of togetherness in the situation.

Another respondent felt that those unwilling to do unpaid work were perceived as uninvolved workers because they were only doing their job. This kind of assessment was sometimes suggested to the respondent and this was the interpretation he was to guess. "Doing the work was to ensure that the work would be done at all, and not doing it would be associated with being seen as someone who is not committed, does not care about the welfare of the company, shirks his responsibilities and does not bring value to the organisation". However, the participant in the study also experienced strong pressure, an explicit demand to perform unpaid work or an expectation to fulfil these demands also outside working hours.

The last respondent referred to here had encountered a situation of being threatened with dismissal for failing to meet the supervisor's expectations of unpaid work. This situation would be at the other end of the spectrum referred to above. His statement suggests that the situation described was a result of the personality traits of the supervisor rather than an organisational policy. The respondent talked about how his supervisor addressed him in this way: "(...) if not (in relation to doing unpaid work, author's note) then we can say goodbye. I can slowly collect myself from this company. Literally that kind of bullying, but that's the only situation I think, it lasted six months and it was quite hard".

The range of situations presented, in which an employee may find himself in relation to his attitude to unpaid work, testifies to the diversity of relations between employees and their superiors in the organisations surveyed. A relatively common situation is the creation of an ambiguous atmosphere, creating misunderstandings that would have employees willing to do unpaid work for fear of more or less real consequences. However diverse the supervisors' behaviour discussed was, it can be thought that this is not the kind of diversity that is desirable in modern organisations.

3. Conclusions

As already mentioned, the space of experiences of unpaid work starts with their absence and ends with a high frequency of occurrence. This observation confirms the validity of the thesis adopted and indicated in the introduction about the occurrence of this type of work in organisations. Several ways of understanding them can be discerned among the respondents:

1. Work where no remuneration is received at all for tasks performed, including:
 - a) work carried out on one's own initiative, without reference to formal terms of reference, with a view to:
 - to compensate for overly low (according to the person surveyed) productivity,
 - spontaneous, natural assistance to another person employed in the same position,
 - voluntarily helping a colleague at work,

b) work carried out in accordance with a supervisor's instructions but beyond the formal scope of duties.

2. Work for which remuneration is inadequate to the type of work and the competences used by the employee in the course of the work.

It is interesting to note that employees are willing to work without pay and do so spontaneously, even without suggestions from superiors. The original attribute of work perceived as unpaid should be considered to be the receipt of a salary inadequate to the competences used during the work, which is reminiscent of jobs described in the US as underpaid (Kauflin, 2017). The given ways of defining unpaid work expand the knowledge of employees' attitudes and expectations towards work in organisations.

The respondents' subjective perceptions of the nature of unpaid work are in line with views presented in the literature (Mayer, 2007; Shelby, 2002). The respondents' declared reason for describing work as unpaid in the form of going beyond the scope of duties may be indicative of a sense of being exploited workers, which is in line with the views of J. Snyder (2013) and M. Zwolinski (2007). Such a situation can be seen as a manifestation of injustice, which occurs when employees do not receive sufficient benefits from the excess and/or demeaning work they are obliged to do (Zwolinski, 2007). At the same time, managers benefit, even personally, from the same work of employees, as mentioned by one respondent.

As an aside, there is an interesting motive for some workers to undertake unpaid work by doing so spontaneously, spontaneously, driven to some extent by passion and a sense of mission, as described in the literature (Kim et al., 2020).

The work that was carried out as unpaid was characterised by varying properties that can be described using the following criteria:

- 1) place of performance: a) performed at the organisation's headquarters, b) performed at the employee's place of residence,
- 2) degree of dissimilarity to the tasks in the job description: a) identical work, b) similar work, c) work of greater complexity and sophistication,
- 3) frequency of unpaid work: a) work carried out systematically, b) work carried out periodically, c) work carried out occasionally,
- 4) execution time: a) during nominal working hours, b) outside nominal working hours,
- 5) the nature of the competences needed in the course of unpaid work: a) typical of the position held, b) more advanced than those required for the position held,
- 6) the hierarchical level to which the unpaid work belonged: a) the same level at which the employee was employed, b) different (higher, lower) than that at which the employee was employed.

Unpaid work, apart from being outside the scope of workers' duties, does not share common characteristics that distinguish it from work performed regularly in accordance with the said scope. The performance of unpaid work has the effect of broadening the spectrum of tasks carried out by the workers and, in many cases, this work may have formed the basis for the

extension of the workers' formal scope of duties. Only in some cases were these tasks performed as a substitute for other absent employees. The observed phenomenon may confirm one respondent's statement that formal terms of reference are developed primarily to comply with the law, while their impact on the actual tasks performed is very limited.

The functions attributed to unpaid work can be considered from different points of view. The first criterion is the nature of the benefits that this type of work brings to organisations. The next criteria are the type of entities that obtain profits through the type of work analysed and the time horizon of the profits resulting from this work.

1. Nature of the advantage:
 - a) material benefits:
 - reducing costs for the organisation,
 - retaining the organisation's clients,
 - b) intangible benefits:
 - greater organisational flexibility,
 - ensuring continuity of the organisation's management,
 - knowledge of the environment.
2. Entities profiting from unpaid work:
 - a) the entire organisation,
 - b) other organisational units,
 - c) others employed by the organisation,
 - from the same hierarchical level,
 - supervisors.
3. Time horizon:
 - a) immediate, short-term benefits,
 - b) long-term benefits.

Respondents' perceived benefits to the organisation from unpaid work vary. However, when considering these benefits, it is important to note the fact that employees performing excess tasks may have had a legitimate sense of unfair treatment (Zwolinski, 2007). The majority of respondents emphasised cost benefits, but it is important to recognise that these were achieved in different ways. Furthermore, it should be noted that respondents, although few, were aware that their unpaid work had a positive impact on the flexibility of the organisation. The insights indicated are in line in principle with the observations of Andrałojć (2024), who concluded that mature workers are more likely to use an 'external' narrative to describe the meaning and value of work (what their work gives to the world), while young workers use an 'internal' narrative (what work gives to themselves).

When considering the ways in which workers are motivated to perform unpaid work, several specific issues can be discerned: the way in which the message is conveyed about the existence of work that would be performed as unpaid, the use of manipulation of workers, the use of

coercion and the way in which the need for unpaid work is justified. Due to these criteria, the study identified different ways in which supervisors behaved.

1. Communication on unpaid work:
 - a) information on the existence of work to be done,
 - b) information about the existence of work to be done combined with a suggestion of the need to do it,
 - c) information on the need for unpaid work.
2. Manipulation:
 - a) downplaying the amount of unpaid work to be done,
 - b) Using the argument of learning opportunities and broadening competences.
3. Coercion:
 - a) formal employment in a lower position and assignment of tasks specific to a position at a higher hierarchical level,
 - b) an order to carry out unpaid work given by a supervisor,
 - c) The threat of dismissal if unpaid work is not carried out.
4. Method of justification:
 - a) use of rational arguments,
 - b) use of emotional arguments.

None of the respondents explicitly refused their superiors to do work that was identified as unpaid. This can be seen as an expression of a certain degree of loyalty to the organisation, as they supported the employers' interests with their activity, even though this required them to sacrifice certain aspects of their own interest. It is in line with J.M. Elegido's (2013) or B. Schrag (2001). This observation is relevant in view of the fact that M.L. Stanley, C.B. Neck and C.P. Neck (2023) found that loyal employees are selectively chosen by managers for exploitation in hypothetical situations, and that the choice of loyal employees is mediated by the expectation that loyal people are willing to make personal sacrifices for the objects of their loyalty. The ways of motivating essentially loyal employees to work unpaid, identified during the study, are indicative of a lack of partnership with subordinates, the use of coercive elements and a desire to demonstrate one's power. These are behaviours indicative of the persisting traces of a manor culture in contemporary Polish organisations (Hryniewicz, 2007).

When analysing the motivation of employees for unpaid work, it is important to note the omission by supervisors in their communication with respondents of the positive impact of such work on the flexibility of the organisation and the positive impact on their functioning. This can be interpreted as supervisors being unaware of this impact and/or underestimating employee awareness and loyalty.

The conclusions listed above clearly demonstrate that the objectives of the article have been met.

4. Summary

Although labour laws define what tasks employees should perform and for the performance of which they are remunerated, today's reality is more complex than the legislator would like. The functioning of organisations often deviates significantly from the intentions of legislators or the ideas of designers of management systems and organisational structures. For this reason, it seems very difficult to avoid employees performing certain tasks that go beyond those included in the employment contract and - in particular - in the terms of reference. There are arguments to justify such practices, which does not alter the fact that employees may perceive the performance of such tasks as unpaid work, i.e. work performed without adequate remuneration.

When examining the phenomenon of unpaid work, several phenomena can be discerned:

1. The use of a traditional tool to organise work in the form of terms of reference for a job occupied by an employee is sufficient in a stable and predictable environment. However, when the environment is volatile or even disturbed, as one interviewee mentioned, the terms of reference only serve to comply with the law and the tasks actually performed by employees are based on current needs and differ substantially from those recorded in organisational documentation.
2. A factor that contributes to the completion of tasks not included in the terms of reference are the values that guide employees, which are called core values. These can be thought to have been driven by respondents spontaneously performing tasks for their colleagues. Core values 'are conducive to (...) embedding the company firmly in reality' (Hopej-Kamińska, Hopej, Kamiński, 2007).
3. The behaviour of the supervisors of some of the respondents seems to more than exhaust the hallmarks of false leadership (Bieńkowska, Tworek, 2024) detrimental to both employees and the organisation. Moreover, in the case of one respondent, it can be believed that the supervisor used gaslighting.
4. It seems that, in addition to the key values mentioned in section 2, an important factor influencing the performance of unpaid tasks by respondents is the psychological contract (Ratajczak, 2007), which influences greater commitment to work and the achievement of organisational goals. However, it is important to be aware of what M.J. Abdalla, H. Said, L. Ali, F. Ali and X. Chen (2021) - violation of the psychological contract directly increases organisational distrust while indirectly it increases emotional exhaustion.
5. The desire to reduce costs as a motive for contracting out unpaid work indicated by respondents is not in doubt. However, it should be noted that in Poland as many as 82 per cent of companies are experiencing a shortage of workers, especially skilled workers (JD, 2024), and it can be thought that work, including unpaid work, already

employed will make up for the shortage of workers. In the context of savings, it is important to situate meaningless work (Graeber, 2020), which is the opposite of unpaid work: it is unnecessary, but its contractors are paid. Reducing such work will reduce the need for savings from unpaid work.

6. Work perceived by employees as unpaid has become a tool to ensure that companies increase flexibility - it can be thought that the need to ensure organisational flexibility leads to the outsourcing of work that employees perceive as unpaid because it is not part of their job description.
7. It seems reasonable to call for a change in the rules and/or the way in which the scope of work is determined in workplaces in such a way that the employee is not in doubt as to what he or she should or should not do. Perhaps a greater role in defining employee tasks should be given to core values and the psychological contract. Managers, on the other hand, should be made more aware of the fact that the condition for the successful performance of a leadership role in an organisation is to get rid of the folkish trappings accompanying the majority of managers pursuing a leader style of management (Hryniewicz, 2007).

The article is limited to capturing the phenomenon of unpaid work from a management perspective. However, it seems that such work deserves to be approached from the point of view of other disciplines, such as labour sociology or labour psychology. These disciplines will enable additional light to be shed on the performance of unpaid work.

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THE APPLICATION OF ARTIFICIAL INTELLIGENCE BASED TOOLS IN MARKETING ACTIVITIES

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Purpose: The aim of the article is to identify and verify whether and to what extent natural persons can use publicly available tools using artificial intelligence to conduct marketing activities for micro and small enterprises.

Design/methodology/approach: To develop the article, the methods of literature review, case study, "Chat GPT-4o", "Chat GPT 3.5" and the "Magic multimedia" function available in the "Canva" application were used.

Findings: Our own research has shown that AI functions in the versions available to all users are able to correctly predict market trends in a short period of time and support the design of graphics convincing people to purchase products based on fragmentary data.

Research limitations/implications: The use of artificial intelligence in predicting market trends, customer service and advertising personalization is available to individual users and micro and small entrepreneurs. However, publicly available basic tools may not be sufficient when competing with large enterprises on the market. They should be treated with limited trust and as an inspiration for action.

Practical implications: Identification and indication of tools and their effectiveness in forecasting market trends, customer service and advertising personalization.

Original/value: The article can help individual users and micro and small entrepreneurs in identifying tools using AI to support marketing activities.

Keywords: artificial intelligence, marketing communication, customer service, forecasting market trends, advertising personalization.

Category of the paper: Research paper.

1. Introduction

In recent years, a significant increase in the importance of modern technologies has been observed, especially in the field of Artificial Intelligence tools (in short AI). The European Parliament's definition of AI (European Parliament, 2023) is the ability of machines to demonstrate human skills such as understanding, learning, planning and creativity.

It has revolutionized many fields of science, including marketing. Artificial intelligence offers a wide range of possibilities thanks to which companies can precisely personalize content for customers, effectively manage customer relationships in real time and predict future market trends. The issue of using artificial intelligence in marketing activities has been dealt with by various researchers (Matz et al., 2024; Peruchini et al., 2024; Yang et al., 2021; Esch, Black, 2021; Davenport et al., 2020; Arsenijevic, Jovi, 2019) pointing in his works to, among other things, more precise identification of customer needs, matching the language and content of messages to the psychological profile of the recipient, converting the available customer base via social media, or creating highly personalized experiences for customers.

Currently, advertising personalization has become a key element of marketing activities because the most creative and best-tailored ads are able to attract their attention more effectively and more successfully encourage them to purchase the advertised product or service. All this is possible thanks to data analysis and machine learning algorithms that can be trained using enormous amounts of appropriately labeled data (WBT-IT, 2020).

In terms of forecasting market trends, AI is also able to effectively support the activities of entrepreneurs. AI systems can isolate patterns, relationships and trends that might not be possible for humans to notice or would take a much longer time. Based on the information and data entered, artificial intelligence can generate forecasts about what various sectors of the economy may look like in the future. Knowing what trends may prevail in given sectors in the future, companies have the opportunity and time to adapt their reactions and actions to the expected reality.

Artificial intelligence has also found its application in customer service, due to its ability to process, store and use enormous amounts of data. It has become particularly important in industries where maximum adjustment to the customer and personalization of content are crucial to achieving the expected sales results. Moreover, most processes can be performed automatically thanks to chatbots, recommendation systems or emotion and sentiment analysis tools (SeoHost, 2024).

The aim of this article is to check from the perspective of an ordinary user how he can use the potential of artificial intelligence to predict market trends, personalize advertising and customer service. This may become a milestone for micro-enterprises and entrepreneurs just starting their business who do not have huge share capital at their disposal and are forced to use publicly available and budget solutions.

2. AI in marketing activities

In the following parts of the article, each of the three aspects of using AI tools for marketing activities mentioned in the introduction will be discussed in more detail, i.e., the use of artificial intelligence in advertising personalization, forecasting market trends and customer service.

2.1. Advertising personalization

Mass media undeniably have a significant impact on how reality is perceived. A starting point and a humorous example may be the story presented by Peter Winterhoff-Spurk (2007, p. 128), where it was described how a man spent too much time watching television and tried to "switch" the villains who wanted to harm him to another program.

Ever since artificial intelligence appeared, its importance has been increasing significantly in creating advertising content, which was always intended to have the intended impact on the recipient by, among other things, persuading a favorable opinion about a product or service. The undoubted advantage of AI, according to Mariola Kolará ([https://nakatomi.pl/...](https://nakatomi.pl/), 2023), is the fact that it can store, analyze and use huge amounts of data on an ongoing basis, which can be used to create an advertisement perfectly tailored to what the recipient wants to see at a given moment. This is thanks to machine learning. Stuart Russell and Peter Norvig (2023, p. 9) distinguish three types, depending on the type of feedback between the elements of the input data: supervised learning, unsupervised learning, and reinforcement learning. Broadly speaking, these are developed algorithms and models that allow machines to "learn" from examples. As more examples are introduced, the efficiency and performance of machines increases and improves. We should also mention the so-called computer vision, which allows machines to understand graphical information (Mamczur, 2020). It deals with the automatic understanding and analysis of images and visual signals, with the aim of enabling machines to interpret visual data in a way like humans. Applications include object recognition, motion detection and tracking, and 3D reconstruction.

Machine learning continues to develop its capabilities, thanks to which user data can be constantly updated and used to create or display content that becomes increasingly tailored to the user with each attempt. This is crucial in today's reality in which the user is bombarded from all sides with various offers of products and services. However, thanks to the use of AI tools, there is an increased chance that an offer will be selected that is best suited to current needs. Companies understand very well how important it is to adapt to the user's preferences as closely as possible.

A particularly good example of the above-mentioned activities may be the streaming service "Netflix". At the end of March 2024, it served 269.6 million users (Zielińska, 2024), which makes it the largest website of this type in Poland and in the world (Persona, 2024). It has algorithms that, using information about what productions the user has recently watched and how he rated them, recommend what he should watch next. However, this is not the most advanced personalization activity. Since 2018, Netflix has been able to adjust the covers of the titles displayed to the recipient so that what he or she sees is as absorbing as possible (Borzechowski, 2018). This means that at the same time, the user can see a different movie cover on his/her device than on the device of a person who is not similar in terms of preferences. So Netflix seems to be cleverly and successfully using the message of Henry Ford, founder of Ford Motor Campaign: "If there is any secret to success, it lies in the ability to take the point of view of others and look at things from both the other person's perspective and your own".

2.2. Forecasting market trends

For a business to survive and be profitable, it is important to effectively gain and constantly increase an advantage over the competition. Following the words of Bill Gates, co-founder of Microsoft, "The business of every company begins and ends with an in-depth analysis of numbers. Regardless of what a company does, if it cannot draw conclusions from the facts about its own operations and makes decisions based on entrusted information or intuition, it will pay a high price". The need to predict what will happen in the future comes to mind. Not so long ago, this was possible only thanks to magic, but now, with the current level of development of artificial intelligence, it is becoming more possible to achieve. Following Szymon Machniewski (2023), this already allows companies to better plan marketing strategies, prepare future offers, but also to skillfully manage resources in a much faster and more effective way.

Artificial intelligence can automate the analysis of huge Big Data sets containing historical and current information from every area of an organization's operations. Predictive analysis, i.e., predicting future market trends, is possible thanks to machine learning, deep learning, and sentiment analysis. However, the analysis of the same amount of input data by a human could take an incomparably longer time than by a machine, and the result could not be as satisfactory. Therefore, the participation of AI in this area of organizational activity is important, because when trying to predict what may happen without appropriate resources and knowledge, the result may turn out to be worse than when intuition was the only determinant (Questionpro, 2024).

Walmart is a good example of a company's activities in the field of predictive analytics. It is an American supermarket chain founded in 1962 by Sam Walton. This giant uses AI tools to predict how demand will behave. This is helpful and allows the entrepreneur to prepare for situations that deviate from the norm (Torres, 2022). However, what is important, the capabilities that Walmart currently has are the result of many years of data collection, which may be unattainable for companies just starting their operations and entering the market.

2.3. Customer service

According to a 2017 study by Gartner, over two-thirds of marketers believe that their companies compete primarily in customer service (Pemberton, 2018). This means that this is an especially important scope of activity of every organization. The conclusions also explain the fact that systems and solutions designed to neutralize as much as possible the customer's unpleasant experiences in the process of using the company's services and to establish a relationship with the customer will make him willing to return to the company. This applies not only to the service sector, but also to all others.

Companies are aware of the importance of this aspect, and this is the reason newer technologies are being introduced into customer service, including those based on artificial intelligence. It allows you to significantly shorten customer service time, systematize the purchase process and filter potential long-term customers more efficiently. According to the

fourth edition of research conducted by Armatis (2022), customers expect fast (48%) and multi-channel (37%) service, as well as the possibility of contact around the clock (28%). Interestingly, as many as 27% of respondents showed a willingness to use more options to manage matters on their own. However, the same research shows that only 1% of respondents were most willing to use the services of bots. However, this indicates the direction of future research and the potential for the development of customer service bots, the operation of which could be as close as possible to what a human has to offer, and then customers will gradually change their preferences. These studies also indicate that the largest percentage of respondents prefer talking to a person by phone (30%), chatting with him (13%) or e-mail (11%). All these activities can be successfully replaced by machines in the future, but every fifth person showed the greatest willingness to talk to a person face to face, which may pose the biggest problem in effectively replacing this activity with a robot.

In customer service, AI can prove useful in many activities and forms. The first and most popular method are chatbots that respond to users' messages. Then, product recommendations should be indicated based on the user's previous activity, which are automatically processed and analyzed thanks to natural language processing (NLP) systems. This action translates into better problem solving and responding to customer inquiries, which is further linked to sentiment analysis, in which the machine can recognize human emotions and respond appropriately to them. Personalizing the customer's shopping experience is also becoming increasingly common, which may mean adapting the brand's website to the customer's individual preferences.

An example of a brand that has introduced artificial intelligence into customer service on a large scale is "Symplyhealth" (Maciejewski, 2024). It uses a Salesforce branded product called "Einstein GPT". Unlike common chatbots, which mostly generate simple, previously prepared answers, the "Einstein GPT" technology can understand what the customer has in mind, read emotions, and deliver messages in a satisfactory way, answering the buyer's inquiry, considering the context and the so-called "second bottom".

3. Methods: Chat GPT in predictive analysis

Private individuals, sole proprietorships or micro-enterprises often do not have access to such advanced technologies and solutions as larger competitors on the market with more capital. These units are forced to use tools available to all users. One such tool that is gaining undeniable popularity is "Chat GPT", which can generate answers to questions asked by the user in a truly brief time. The author's own research in this article consisted in verifying the answers obtained from Chat GPT to questions related to the situation in various markets. The project included a question about the current situation and forecasts for the next month.

Four Polish sectors were examined:

- banana market,
- hairdressing market,
- on-ear headphones market,
- cafe market.

The first part of the study took place on May 9, 2024, in which questions were asked about the trends that will prevail in the above-mentioned markets in a month.

The second stage of the research took place on June 10, 2024, where Chat GPT was also asked about the situation in a month and the current situation in selected sectors.

The third stage on July 4, 2024, included a question about the current situation.

The responses obtained are presented in tables 1 to 8. The summary of responses from Chat GPT includes predictions with the actual situation as of the expected date. The "x" means that Chat GPT did not cover this topic in one of its answers and did in the other one. Analyzing individual selected markets, the banana market (see table 1 and table 2) shows what trends, according to Chat GPT, were to prevail on the banana market in Poland a month after the survey was carried out and how, according to him, they looked like after that time.

Table 1.

Answers obtained from Chat GPT in the banana market - measurement 1

As of May 9 (question: What trends will prevail on the banana market in a month in Poland)	As of June 10 (question: What trends are currently prevailing on the banana market in a month in Poland)
the stability of supplies may depend on weather conditions in banana-producing countries	x
an increase in the costs of banana production may result in an increase in banana prices	increase in prices
increased interest in fair trade and ecological products	increased consumer interest in fair trade and organic products
stores may organize sales, which will lead to a short-term increase in demand	x
the availability of alternative seasonal fruits may reduce demand for bananas	x
x	increased supply of bananas

Source: Own development using <https://chatgpt.com/>

The same operation was repeated after a month, as shown in Table 2.

Table 2.*Answers obtained from Chat GPT in the banana market - measurement 2*

As of June 10 (question: What trends will prevail on the banana market in a month in Poland)	As of July 4 (question: What trends are currently prevailing on the banana market in a month in Poland)
price fluctuations due to seasonality	x
prices fall due to increased supply	x
increased consumer interest in fair trade and organic products	the growing popularity of fair trade and organic products
promotions and marketing activities in retail chains and supermarkets - short-term increase in sales	supermarkets organize promotions for bananas, which increases sales
price increases caused by unforeseen weather conditions in banana producing countries, changes in transport prices and inflation	price increases caused by climatic conditions and transport prices
stable demand in relation to consumer preferences	x
x	increased emphasis on maintaining the good condition of bananas during the transport process
x	increased consumer demand for different varieties of bananas
x	increased demand for ecological banana packaging or lack of packaging

Source: Own development using <https://chatgpt.com/>

The GPT chat was not asked about specific issues, but the ones it raised were consistent with each other in both cases.

The hairdressing market (see table 3 and table 4) shows what trends, according to Chat GPT, were to prevail on the hairdressing market in Poland a month after the experiment was performed and what, according to him, they looked like after that time.

Table 3.*Answers obtained from Chat GPT in the hairdressing market - measurement 1*

As of May 9 (question: What trends will prevail on the hairdressing market in a month in Poland)	As of June 10 (question: What trends are currently prevailing on the hairdressing market in a month in Poland)
the hairstyles will be inspired by social media	x
natural and simple hairstyles	x
increased popularity of coloring, especially with ecological dyes	increased interest in ecological products
increased popularity of care services	interest in care services is growing
introducing new solutions by hairdressers	modern solutions are increasingly introduced into hairdressing salons
high customer requirements regarding hygiene standards	x
popularity of online booking of services	increasing introduction of online booking options, mobile applications, and social media
x	increased demand for personalized services and consultations
x	they practice loose hair styling
x	increased demand for barber services
x	hairdressers are increasingly willing to invest in their development
x	more salons are getting involved in sustainable development

Source: Own development using <https://chatgpt.com/>

The same activity was repeated after a month, and the results obtained are presented in Table 4.

Table 4.

Answers obtained from Chat GPT in the hairdressing market - measurement 2

As of June 10 (question: What trends will prevail on the hairdressing market in a month in Poland)	As of July 4 (question: What trends are currently prevailing on the hairdressing market in a month in Poland)
choosing lighter and airy hairstyles due to the summer season	x
increased promotion of hair care services by hairdressers due to elevated temperatures	offering additional care services by hairdressing salons
increased popularity of ecological products among customers	choosing ecological products is becoming more common
increased customer expectations regarding solutions used by hairdressers (new technologies)	increased use of modern technologies
increased interest in barbering services for men	barbering services
customers are looking for natural and easy-to-maintain coloring solutions	customers are increasingly choosing natural and subtle coloring solutions
application of strict hygiene rules	increased hygiene and safety standards
hairdressers investing in development and training	the increasing importance of training and improving qualifications for hairdressers
increased marketing activities by hairdressers	the increasing role of marketing in hairdressing services
increased demand for personalized services	increased demand for personalized services
x	increased popularity of mobile services (in clients' homes) offered by hairdressers

Source: Own development using <https://chatgpt.com/>

Chat GPT was not asked about specific issues, but the ones it raised were consistent with each other in both cases. Moreover, in the case of this market, he pointed out more related topics in the first and second cases. This may suggest that, depending on the market, Chat GPT will be precise. Importantly, to obtain interesting and useful answers, you should ask questions as precisely as possible.

The over-ear headphones market (see Table 5 and Table 6) shows what trends, according to Chat GPT, were to prevail on the over-ear headphones market in Poland a month after the experiment and what, according to him, they looked like after that time.

Table 5.

Answers obtained from Chat GPT in the on-ear headphones market - measurement 1

As of May 9 (question: What trends will prevail on the on-ear headphones market in a month in Poland)	As of June 10 (question: What trends are currently prevailing on the on-ear headphones market in a month in Poland)
the increase in popularity of wireless on-ear headphones	the increase in popularity of wireless headphones
the increasing popularity of headphones with active noise reduction	headphones with active noise cancellation are more desirable
greater demand for headphones with built-in voice assistants (Siri, google assistant)	more models offer integration with voice assistants
concentration of producers not improving sound quality	consumers are increasingly paying attention to the high sound quality of devices

Cont. table 5.

paying more attention to design and comfort by customers	wearing comfort has become a key factor when choosing headphones, and style is also important when choosing
growing interest in gaming headphones	development of models intended for gamers
premium headphones with advanced features and high sound quality	premium brand headphones
increased interest among customers in multifunctional headphones	x
x	greater demand for headphones with long battery life
x	consumers' ecological awareness influencing purchasing decisions of headphones

Source: Own development using <https://chatgpt.com/>

The same operation was repeated after a month, as shown in table 6.

Table 6.

Answers obtained from Chat GPT in the on-ear headphones market - measurement 2

As of June 10 (question: What trends will prevail on the on-ear headphones market in a month in Poland)	As of July 4 (question: What trends are currently prevailing on the on-ear headphones market in a month in Poland)
seasonal promotions and sales in connection with the summer period	x
presentation of new models and technologies by brands	x
development of voice assistant technologies integrated with devices	increased interest in headphones with intelligent functions, including voice assistants
marketing campaigns related to preparing for the next school year	x
introducing more ecological solutions (ecological materials from which headphones are produced)	increasing user awareness and choosing models made of ecological materials
continuous increase in the popularity of gaming headphones among customers	x
you can expect that manufacturers will introduce headphones with a sound personalization function	x
further development of wireless headphone models	the importance of wireless headphones continues to grow
the growing importance of comfort and ergonomics among customers	the height and aesthetics of the headphones are crucial to customers
increased importance of reviews and user opinions, e.g., on YouTube	x
x	headphones with active noise cancellation are more desirable
x	increased interest in models with high sound quality
x	the increasing importance of multifunctionality of on-ear headphones

Source: Own development using <https://chatgpt.com/>

The GPT chat was not asked about specific issues, but the ones it raised were consistent with each other in both cases. Moreover, it can be said that in the discussed case Chat GPT performed worse due to the smaller number of overlapping topics. This may mean that he paid more attention to other aspects, assuming, that the aspects discussed were more important than others.

The coffee shop market (see Table 7 and Table 8) shows what trends Chat GPT believed would prevail on the coffee shop market in Poland a month after the experiment was performed and what, according to Chat GPT, they looked like after that time.

Table 7.

Answers obtained from Chat GPT in the cafe market - measurement 1

As of May 9 (question: What trends will prevail on the coffee shop market in a month in Poland)	As of June 10 (question: What trends are currently prevailing on the coffee shop market in a month in Poland)
cafes will introduce seasonal coffees, including iced coffees	x
the use of alternative methods of making coffee by cafes	x
introduction of various teas to the offer	consumers are increasingly willing to reach for alternative drinks such as tea
offering dairy alternatives (vegan and plant-based)	x
ecological activities introduced into the cafe's operations	actions for sustainable development are increasingly undertaken by cafes
continuation of the development of online cafes (offering e.g., home coffee delivery services)	the increasing importance of online coffee shops
cafes can offer coffee from small artisan plantations	increasing popularity of coffees from local small farms
increased interest in sensory experiences among customers (such as coffee tasting)	customers focus on the possibility of tasting or taking part in coffee-making workshops
promoting your business by cafes on social media	x
x	increased interest in various coffees from around the world
x	increasing the importance of the aesthetics of the cafe interior for customers
x	development of the concept of hybrid cafes that, for example, are also bookstores
x	cafes are increasingly introducing the latest technological solutions, such as mobile applications

Source: own development using <https://chatgpt.com/>

The same activity was repeated after a month, as can be seen in table 8.

Table 8.

Answers obtained from Chat GPT in the coffee shop market - measurement 2

As of June 10 (question: What trends will prevail on the coffee shop market in a month in Poland)	As of July 4 (question: What trends are currently prevailing on the coffee shop market in a month in Poland)
introduction of seasonal menus by cafes	customers are looking for diversity, including other flavors
increasing the takeaway offer and taking care of the garden for customers	x
cafes may introduce variable opening hours depending on the lifestyle of customers	x
introducing new technological solutions by cafes	introducing new solutions and technologies by cafes
paying great attention to hygiene and safety	x
cooperation with local suppliers	the increasing importance of local products
organization of interesting meetings and events in cafes	increased demand for educational meetings about coffee
supporting ecological activities	supporting ecological and sustainable development activities

Cont. table 8.

creative marketing strategies (competitions, cooperation with influencers)	x
growing your online business	x
x	demand for high-quality coffee
x	cafes try to provide the most comfortable conditions for meetings and work
x	emphasis on high-quality coffees

Source: Own development using <https://chatgpt.com/>

For the coffee shop, Chat GPT generated responses with similar efficiency to the over-ear headphones.

To sum up, in most cases the predictions came true or differed slightly from the actual situation. It is worth noting, however, that in many cases the topics discussed by Chat GPT did not overlap at all. This may mean that in the future, when using this tool to predict events in a real company, it may be better to ask questions more precisely, because in the case of the project in question they were asked in a general form. It is worth mentioning that GPT Chat's predictions should be read with a certain amount of limited confidence and not uncritically respect all of its answers and indications, because they may often be imprecise, which may result in poor or incorrect understanding. As you can see and read while using the tool: "Chat GPT may make errors." However, this is undoubtedly an interesting way to verify your own assumptions and provide additional support in the absence of other available solutions. Work on GPT Chat and improvements to subsequent versions are ongoing. In May 2024, its updated version premiered, available to all users. This may mean that an even more effective tool will be available in the future. It is also important that during our own research, it was carried out at a breakthrough moment, considering two versions of Chat GPT: "Chat GPT-4o" and "Chat GPT 3.5", which may be a certain limitation of the procedure.

4. Results: Personalization of graphics based on general data

The next stage of our own research included the process of personalizing graphics based on general data. The research was conducted based on graphics generated by artificial intelligence, considering the "Magic Multimedia" function available in the "Canva" application. The research included four groups of recipients:

- Men from the Baby boomer and X generations.
- Women from the Baby boomer and X generations.
- Men from generations Z and Y.
- Women from generations Z and Y.

The entered formulas were intended to generate graphics encouraging the purchase of a pen, a car, a house, and milk for each of the indicated recipient groups by artificial intelligence. Examples of generated suggestions for the milk category are presented in figure 1.



Figure 1. Examples of graphics generated by AI aimed at encouraging the purchase of milk.

Source: own study using the "Magic Multimedia" tool in the Canva application.

Based on information about the user's generation and gender, AI generated graphics that would potentially best encourage them to purchase the product. The way the question was constructed was determined by the fact that in a situation where the author is an ordinary user or a small entrepreneur, he often does not have tools to collect more data about product users. Questions for the graphics generating mechanism were created based on the question pattern: "Create a graphic for a woman/man from the generation.... which will encourage you to buy...." The graphics were generated based on fragmentary data about the potential customer.

The resulting graphics were presented to respondents who were asked to participate in the online survey. Sixty respondents took part in the study, including forty-four women and sixteen men. The study aimed to check whether, based on a small amount of information, it is possible to generate graphics supported by AI that are significantly effective in persuading specific groups of people to purchase various products.

The following tables 9, 10, 11 and 12 will present the answers obtained aggregated in specific groups of respondents, representatives of two characteristics: gender and age. "Option 1" in each case (house, pen, milk, car) was a graphic generated for women from Generation Z and Y, "Option 2" for women from Baby Boomers and X generations, "Option 3" for men from Generation Z and Y, and "Option 4" for Baby Boomer and Gen X men.

Table 9.

Research results for respondents from the group: Women, Generation Z and Y

Graphics subject	Option 1 – dedicated to group	Option 2	Option 3	Option 4
Milk	35%	32.5%	17.6%	15%
Car	12.5%	25%	47.5%	15%
Pen	17.5%	25%	37.5%	20%
House	27.5%	20%	12.5%	40%

Source: Own study based on survey research.

It should be stated that the most convincing graphic turned out to be the one generated for men from generations Z and Y. Therefore, in this case, we can confirm the effectiveness of the graphic in relation to the generation itself, but not to the gender.

Table 10.

Research results for respondents from the group: Women of the Baby boomers and X generations

Graphics subject	Option 1	Option 2 – dedicated to group	Option 3	Option 4
Milk	25%	25%	0%	50%
Car	0%	0%	75%	35%
Pen	0%	75%	0%	25%
House	0%	50%	0%	50%

Source: Own study based on survey research.

In the case of women from the Baby Boomer and X generations, the graphics aimed at this group and the group of men from the same generation gained the greatest recognition. This confirms the previously noted fact that there is a better fit in terms of generation than gender.

Table 11.*Research results for respondents from the group: Men, generation Z and Y*

Graphics subject	Option 1	Option 2	Option 3 – dedicated to group	Option 4
Milk	42.9%	35.7%	7.1%	14.3%
Car	21.4%	7.1%	50%	21.4%
Pen	28.6%	7.1%	42.9%	21.4%
House	35.7%	14.3%	21.4%	28.6%

Source: Own study based on survey research.

Men from generations Z and Y were most likely to choose graphics designed for them and women of the same generation. There is no significant advantage in any of these groups, which confirms the previously described relationship.

Table 12.*Research results for respondents from the group: Men of the Baby boomer and X generations*

Graphics subject	Option 1	Option 2	Option 3	Option 4 – dedicated to group
Milk	0%	50%	50%	0%
Car	0%	0%	50%	50%
Pen	50%	0%	0%	50%
House	0%	100%	0%	0%

Source: Own study based on survey research.

In the case of graphics for men from the Baby Boomer and X generations, it is not possible to state a significant advantage in each case, so this is the only case in which graphics from among the proposals for these generations were not chosen most willingly.

After selecting the graphic variant that was most encouraging in the respondent's opinion, he or she was additionally asked to justify his or her answer. The most common justifications were: "speaks to me", "is the most interesting to me", "is the prettiest".

It should be noted that the option dedicated to AI is never the least frequently chosen option, although other options are often also willingly chosen by respondents. This may mean that in the case of graphics personalization, for the process to be successful, you need to use a different tool or have more data about the recipient for whom the content is created.

5. Discussion: Moral threats and dilemmas

When using artificial intelligence in the above-mentioned situations, you should be aware that it involves great responsibility. The above-mentioned activities are also subject to a considerable risk of errors. For AI to successfully support marketing processes, it must have access to the most detailed user data possible. Often, this is information for the possession and use of which it is necessary to obtain the user's consent (GDPR, General Data Protection Regulation), which, due to oversight, may lead to privacy violations and conflicts with the law

(Żarska-Cynk, 2023). It is therefore important to strike a balance between content personalization and user privacy. An aspect that is also worth paying attention to is the fact that the use of AI may lead to even greater market inequality, because larger and more developed companies will have the best available solutions, while smaller ones will only be able to use basic tools. It may result in even greater differences in the preparation of diverse types of personalized content between competitors, and as a result, small businesses will disappear.

Moreover, there is a risk that advertising, even personalized advertising, may function as a manipulative tool that will successfully convince users to purchase products that may be harmful or may lead to excessive consumerism. However, it must also be added that creating advertisements and promotional campaigns has always been burdened with the above-mentioned responsibility. The only variable are the tools used for this purpose.

When predicting market trends using artificial intelligence, it should be noted that the forecast may not be accurate and using it is a choice that may lead to unexpected and negative consequences. As a result of excessive trust in technology, these actions may turn out to be unfavorable. This, in turn, with more companies repeating this practice, may lead to destabilization of financial markets and a crisis.

The use of artificial intelligence in customer service is also accompanied by numerous threats. It may lead to incorrect understanding of the client's intentions and to treating him in an inappropriate way. It is worth mentioning that many people are currently employed in customer service positions, and because of technological development, they may be increasingly replaced by machines. Therefore, an increase in unemployment and, consequently, other negative social effects are likely. In such a situation, it is pertinent to ask whether replacing humans with machines is appropriate, even if it reduces costs and streamlines numerous processes? Is AI able to successfully demonstrate the same empathy and understanding for humans and their problems as a real human?

6. Summary

This article examining the role of artificial intelligence in advertising personalization, predicting market trends and customer service highlights several key issues. According to the analysis of literature and the latest studies, AI in advertising personalization analyzes massive amounts of consumer data, which allows for the creation of personalized marketing activities. Thanks to advanced algorithms, accurate customer segmentation is possible, which in turn enables precise matching of the content created and displayed. However, if you only have publicly available tools, personalization is much more difficult, which is a big challenge for micro and small entrepreneurs. To predict market trends, AI uses predictive analysis based on the analysis of market and consumer data. Thanks to this, AI provides strategic

recommendations regarding the introduction of new products, price changes and marketing strategies. However, when it comes to common tools using AI technology, questions should be asked carefully and as precisely as possible, and the obtained data should be treated with a certain distance. In customer service, AI solutions are used in chatbots and virtual assistants that can serve customers 24 hours a day, quickly answering questions and solving problems. Sentiment analysis allows artificial intelligence to understand customer sentiment and needs, which enables quick responses to problems and improved satisfaction. Thanks to AI, customer service becomes more personalized, which increases user loyalty and satisfaction. According to the research conducted, artificial intelligence, even at its current stage of advancement, can significantly contribute to improving marketing activities carried out by entrepreneurs who do not have large resources. When it comes to forecasting market trends, the idea of using artificial intelligence seems to be supportive due to the consistency and accuracy of the answers. This result, however, was obtained after conducting research covering a short period of time, which may have a significant impact on the quality of the response. As for advertising personalization, tables 9, 10, 11 show a certain dependency in the effectiveness of matching for individual generations, while in relation to gender it means that the system, even such a common one, can help in matching marketing communication to the customer based on some data. However, this thesis was not confirmed by Table 12, which means that these conclusions should be treated with some caution, especially considering the limitation of the study, which is the non-representativeness of the obtained samples. Nevertheless, using AI tools to personalize content is helpful and justified. Importantly, development in the field of AI is continuous and it is possible that soon there will be new and more effective tools supporting marketing activities, which will also be dedicated to individual users.

Artificial intelligence is undoubtedly an important and frequently discussed topic by scientists and practitioners. The direction of future research may include checking the effectiveness of artificial intelligence in predicting market trends over a longer period. In the case of advertising personalization, it would be useful to also examine the effectiveness of other platforms helping in generating graphics.

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RISK INTELLIGENCE IN THE DECISION-MAKING PROCESS OF AN INNOVATIVE PROJECT

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Purpose: The purpose of the paper is to offer a fragmented proposal for a new interdisciplinary view of risk management and risk intelligence on the basis of selected and specified issues including the integration of scientific knowledge and the combination of research strategy methodologies. The content proposed in the publication related to risk analysis and management fulfils the sense of science through the developed indications for predicting and constructing an innovative future and mitigating the risk of knowledge transfer.

Design/methodology/approach: The methodological approach chosen by the author of the study is thinking guided by preconceived conclusive and explanatory sentences. The research methodology, on the risks occurring in the management process of an innovative project, is a description dedicated to the author's approach to the adopted solution to the research problem. In this way, based on methodological considerations, the organisation of the research subject has been structured.

Findings: Based on the professional experience and research carried out by the author of the publication, in the face of new economic challenges, risk analysis means the identification of features, characteristics, decomposed into its components (analysis in the intangible sense), its quantitative and qualitative components (analysis in the tangible sense) and taken into account in the implementation of an innovation project its overall, collective set.

Practical implications: In turn, the practical subject of the issues analysed in the study is the fragmented proposal of a new interdisciplinary combined view of the above problem during the implementation of high-risk projects.

Social implications: The issues related to the process of risk management during the implementation of innovation projects, which permeate economic and social areas today, become relevant for all.

Originality/value: The developmental nature of the work, is due to the importance of internal and external factors of cognitive activity and awareness conditions of the community organised into an organisation. The internal factors in the research carried out can include the variables empirically obtained in the studied organisations in terms of the causes of events. The external factors that the author considered in his work are: social, economic and cultural determinants of risk management.

Keywords: risk, risk management, risk intelligence, project, project management, decision-making process.

Category of the paper: Research paper.

1. Introduction

As experience has shown, the analysis presented in the publication should be a systems approach, in which the set of identified risks constitutes a system and its analysis, which enables an understanding of the risks that occur in the execution of innovative complex tasks in a rapidly changing environment. Such an exercise provides support to those responsible for decisions or a line of action in a specific situation characterised by uncertainty by identifying and considering the available options and comparing their anticipated consequences.

In addition, a pre-implementation and implementation analysis cannot be omitted, on the basis of which it becomes possible to establish the principles of cooperation, estimate the project budget, timetable or scope of design and implementation work. This, in turn, leads to a situational analysis, in which the company's place in a specific area will be profiled in connection with the innovative activity - in relation to the considered possibility of its development and the constraints occurring in this respect (market, demand, turnover, profits, consumer behaviour). This activity will also provide input to strategic analysis, strategic plan, benchmarking, environment analysis and competitive analysis, within the framework of objectives, brand and branches (competitor analysis, competitive intelligence).

This means that the problem in the research carried out is the presence of cognitive categories brought up from one's own culture, a realised environmental routine, linked to technological progress, environmental emotions and the presence of doctrinal biases – all of which cause possible limitations to development possibilities. Under these conditions, the social and scientific environment of expert knowledge in the sense of the influence of this environment on the formation of the contemporary boundaries of scientific rationality within it becomes essential.

In view of the editorial requirements, the content of the paper is a quantum (content capacity determined by the listed synthetic treatment of the problem) guide of the author's reflections around the holistically framed problem and a demonstration of how far this topic is new and hitherto insufficiently researched.

2. Literature Review

Today, following the opinion of A. Nieto-Rodriguez (2021) we can argue that the economies of many countries, especially the rapidly developing ones, are driven by projects. There is even talk of a process of transformation of economies towards a so-called project-economy.

Therefore, an important direction in management and quality sciences is the concept of Project Management, which was popularised worldwide as early as the 1960s. However, it was not until the 1990s that this new management concept, applied to unique projects, gained a significant number of supporters in Europe, including Poland. This happened both through contacts with developed companies applying project management in practice and as a result of the popularisation of this subject by global organisations.

The very notion of the word project comes from the Latin *proiectus*, meaning to advance/progress forward/forward (Toney, 2012). According to the authors, it can be translated as finding and presenting a way to solve a task/problem to be completed in the future.

In contrast, there is usually a consensus of interpretation of the concept in the literature, although the very popular and often cited opinion of the American authors can (and does) raise fundamental doubts. Table 1 compares the most important definitions of the term in conjunction with their main elements.

Table 1.
Overview of the definition of the term project

№	Distinctions	Definition
1.	<ul style="list-style-type: none"> • result 	A project is an activity undertaken to produce a result expected by the contracting party (Kisielnicki, 2018).
2.	<ul style="list-style-type: none"> • objectives and scope of the project 	According to the Project Management Institute, a project is an undertaking of a temporary nature, the aim of which is to create a unique product (manufacture of a product, provision of a service). Temporariness is understood here as a closed period of time in which a specific project sentence will be realised. Uniqueness is the uniqueness, the distinctive position of the designed product, belonging to a given class (group) of assortment ¹ .
3.	<ul style="list-style-type: none"> • objectives and scope of the project, • planning 	J.D. Frame (2012) argues that a project is goal-oriented in some way, involves the coordinated undertaking of related activities, has a finite duration (indicated beginning and end) and should be characterised by uniqueness.
4.	<ul style="list-style-type: none"> • objectives and scope of the project, • planning, • project efficiency, • control of the design process and implementation work 	In the German Project Management concept, project characteristics include goal orientation, one-offness, complexity, interdisciplinarity, organisational separation, significance (Witzel, 2013). R.K. Wysocki (2015) defines a project as a sequence of unique, complex and interrelated tasks with a common goal, intended to be completed within a specified period of time, without exceeding a set deadline, in accordance with set requirements.
5.	<ul style="list-style-type: none"> • project objectives and scope, • planning, • organisation of project teams, • project efficiency, • project implementation technique, • control of the design process and implementation work 	H. Kerzner (2015) defines the concept of a project as a project against which objectives, required resources, completion dates, costs, level of quality have been specified. Furthermore, he emphasises that projects in general should be distinguished by their uniqueness.

Source: compiled by the authors.

¹ [https://www.pmi.org/learning/library/#sort=relevancy&f:Topics=\[Leadership, 29.08.2024.](https://www.pmi.org/learning/library/#sort=relevancy&f:Topics=[Leadership, 29.08.2024.)

On the other hand, as far as the term project management is concerned, there are a number of interpretations of the concepts related to management techniques in the literature, also identified with such terms as management techniques, type of management or management method.

Based on the literature and for the purpose of this article, the authors assumed that management techniques are a set of rational and coordinated activities of people directed towards the goals of the organisation, implemented under specific conditions based on accepted procedures and rules of conduct (Malara, 2001).

Given the issue raised, it is, in the authors' view, necessary to point out that project management also involves taking into account other parameters that describe a project: time, cost and quality of results; and not just preparing action plans and writing this down in the form of a schedule. Thus, project management is an extremely complex issue in which three types of activities can be distinguished, falling under the scope of project management.

Table 2.
Tasks included in project management

Operational activities (primary)
These comprise the translation of existing inputs into the realisation of the project objective - the reference is to implement the project based on meeting a specific need and/or solving a specific problem. A distinction is made between operational activities, consisting in the preparation of a description of the project object (e.g.: project documentation, technical documentation) and executive activities, consisting in the material implementation of the project object.
Managerial activities
They focus on harmonising operational and support activities. They include: goal setting, planning, organising, motivating, coordinating and controlling.
Support activities (ancillary)
They consist of reinforcing operational and managerial activities by, among other things, creating the conditions for their efficient implementation. This group of activities can include: administrative support, accounting, legal, IT, etc.

Source: compiled by the authors.

If we are talking about innovation projects, these are usually high-risk projects, and their implementation in offshore critical infrastructure is an individual or team vision, which mainly leads to a breakthrough, characterised by identified uncertainties and variability. This state of affairs most often results from the application of the civilisational 'imagination paradigm', the essence of which boils down to the creative intellectual activity of man, postulating applicable results in the transformation of human cognitive capabilities. This transformation refers to the level of innovative reality and the subjective instrument of cognition with the implication of multi-paradigm. The realisation of such projects is most often characterised by the complexity of the problem, which is due to the lack of common or unambiguous tools to estimate objectively calculated and numerically translated quantifiability. Consequently, innovative creation under high-risk conditions becomes a way of anticipating the future based on knowledge, which is a component of our consciousness, and consciousness always precedes decision-making. Therefore, the integration of so-called project-based operational excellence within the framework of civilisational change in the maritime economy must be mainly based

on competences considered from two perspectives: people (knowledge, experience and capabilities) and organisations in an innovative high-risk project delivery system.

The management of any area of human activity has always necessitated the need to make decisions and bear the consequences of those decisions when confronted with a changing environment. The terms 'risk' and 'risk management' refer to these relationships. These terms are being used with increasing frequency, signalling the growing problem of the volatility of the external world. There are many definitions of risk in the literature. In some cases, a definition of the term 'risk' is given, while in others it is taken implicitly, as something to be taken for granted, and it is only possible to read how risk is understood from the context of the statement in which the word is used. Such an approach only exacerbates the conceptual confusion, all the more so as the concept of 'risk' is referred to both in the problem of describing people's behaviour, which is the subject of psychology, and in management theory or the problem of decision-making, i.e. in a normative sense (Gędek, 2018).

It is undoubtedly impossible to cite all the definitions of risk that appear in both domestic and foreign literature. Hence, the authors of the study, after analysing some of the available sources in Table 3, have made a brief definitional synthesis, tailored to the area of research undertaken.

Table 3.

Overview of definitions of the concept of risk

№	Author	Definition
1.	W. Ronka-Chmielowiec (2016)	<ul style="list-style-type: none"> – Risk is the chance of a loss occurring. – Risk is the possibility of loss occurring. – Risk is a state of affairs in which a possibility exists. – Risk is the probability of an outcome different from the expected outcome. – Risk is the dispersion of actual and expected outcomes. – Risk is the subject of insurance.
2.	T. Pszczołowski (1978)	Risk is the degree of likelihood of events beyond the control of the actor that cannot be accurately predicted and cannot be fully prevented.
3.	D.G. Uyemura, D.R. Deventer (1993)	Risk is the variability - measured by the standard deviation - of the net cash flow streams generated in an undertaking.
4.	M.J. Gardner, D.L. Mills (1988)	Risk is the deviation from the expected level of income.
5.	K Jajuga, T. Jajuga (1998)	Risk is the possibility of a performance outcome that is not expected, and a deviation from the expected outcome can be both negative and positive.
6.	C. Marshall (2001)	Risk is the possibility of events or adverse trends resulting in future losses or fluctuations in future income levels.
7.	M. Szemraj (2006)	Risk is the possibility of events (both negative and positive) that may affect the achievement of the intended objectives.

Source: compiled by the authors.

Adopting a neutral conception of risk, according to which risk represents both a potential opportunity and a threat, is too general. In order to identify the analysed phenomenon in relation to the business sector more precisely, a detailed risk classification is necessary. Risks are categorised on the basis of various criteria. The simplest of these is the cause of variation in the

company's financial result. Enterprise risks also include external risks, which affect the entire economic system, and internal risks, which affect the individual company. Because of this distinction, one can speak of inherent risks, i.e. risks that can be forecast on the basis of the law of large numbers; subjective risks - resulting from the incompetence of the human analyser and decision-maker; and objective risks, which result from the unpredictability of future events (Thlon, 2013). In Table 4, the authors have included a categorisation of risk according to the experience of the projects described later in this article, with the sources of risk assigned.

Table 4.

Category and sources of risk

№	Risk category	Examples of sources of risk
1.	Legal risk	licensing problems, protection of copyrights and patents, lawsuits from customers, lawsuits from employees, defaulted contracts, actions of market regulators
2.	Technical risks	technological changes, changes in quality requirements, capacity constraints, changes in demand, incorrect product implementation
3.	Non-technical internal risks	management changes, poor coordination of human resources, cash flow disruptions, employee errors, access restrictions, late deliveries
4.	External foreseeable risks	changes in financial markets, inflation, tax regulations, demand for raw materials, value of product or service
5.	External unpredictable risks	unexpected changes in regulation, fire, natural disasters, sabotage, vandalism, social unrest, unforeseen financial crisis

Source: compiled by the authors.

In summary, risk is a universal phenomenon and operating under conditions of risk is an inherent part of doing business, all the more so at a time of such a turbulent environment, which is hysterical with advancing globalisation, unstoppable technological progress or the increasing importance of scarce resources on the market (including, of course, human resources). Referring also to the definitions quoted, risk is a rather capacious term, not only in theory, but also in practice, which is particularly evident in the implementation of highly innovative, and therefore highly risky, international projects. It is therefore very important to have a detailed understanding of the nature and extent of potential risks in order to be able to select optimal solutions that, when implemented at the right time, should minimise their impact and effects.

3. Materials and methods

In measurement theory, measurement weighting is very important, because when carried out with a properly selected measurement method, it ensures high quality results by solving problems. In this case, we talk about risk taking into account its intelligence, related to the issues of: existence and unambiguity of representation, significance and scaling problems (Węziak-Białowolska, 2011).

In the case of the occurrence of risks in the implementation of innovative projects, we are talking about observable and initially unobservable (latent) phenomena, and therefore it is necessary to determine which phenomena that can be observed following a decision are symptoms or indicators of the occurrence of phenomena that constitute risks. In addition, it is necessary to determine the structure of the risk under investigation - whether it is a unidimensional or multidimensional phenomenon and whether it has latent characteristics. In other words, it is necessary to determine through which set of indicator variables, the initially unobservable phenomenon can be measured and what impact it has on forecasting negative market phenomena (Walasek-Jarosz, 2013).

In this situation, we can say that the phenomenon under study, hidden in risk, is a consequence of the occurrence of certain observable phenomena, and its indicator variables are formative indicators. We then say that the latent phenomenon under investigation is the source of the occurrence of specific observable phenomena or manifests itself through the occurrence of specific observable phenomena. The phenomena then constitute symptoms, which can be described using reflective indicators. In the situation of risk research, we can also deal with the so-called exploratory approach, in which, on the basis of a proposed set of statements treated as potential indicators of the measured phenomenon, the aim is to determine the number of its dimensions, their interpretation and their measurement (scaling). The approach used is therefore to detect the structure of the phenomenon under study and to interpret the results thus obtained. This structure can be complex (multidimensional) or simple (unidimensional).

Nowadays, in a new phase of development (informationalism), the functioning of the economy has changed, which is linked to the technological revolution, which is centred around information and the techniques of its production, storage and distribution. The development of technology also enables modelling and simulations, the analysis of which allows a better understanding of a given process, taking into account the assumed risks and their determinants. Digital social research methods have become an opportunity and a challenge. Based on them, e.g. the analysis of register data, it is possible to develop areas of data collection. But we must also bear in mind that the use of these methods carries the risk of the representativeness of the collected data. The sheer amount of data available does not increase the relevance and appropriateness of the conclusions drawn (Lincoln, 2019). Big Data as a method of social research, is a phenomenon that brings us to the civilisational breakthrough, which is defined as a system composed of data with specific properties, methods for storing and processing them, techniques for advanced data analysis and the necessary IT environment and equipment (digitalisation) (Żulicki, 2017).

However, in our research on risk and its intelligence during the implementation of innovative projects, we must take into account the fact that the applied techniques of advanced data analysis are based to a large extent on so-called found data, i.e. passively acquired data in correlation with actively acquired data (experience, research). This quantitative and qualitative

relationship will have an impact on the formulation of useful conclusions and the so-called risk of ‘discovering’ apparent correlations.

4. Results and discussion – assumptions for designing a security management model

The risk analysis presented below, in the form of a case study, concerns an innovative project subject feasibility at Blue Economy Consulting, based in Gdynia, which relates to, among other things:

1. Modular Microwave Plasma Burner - hybrid technology for the disposal of marine and hazardous waste.
2. Integrated management system for the maritime supply of strategic raw materials.
3. Power generation based on modular renewable energy source systems in small ports.
4. Innovative systems in the European Economic Area for the provision of electricity to ships in port, including electric and hybrid ships.

As a result of the risk analysis carried out using the rules of risk intelligence, with particular emphasis on understanding and learning about the factors that determine them, and on the basis of the diversity of professional experience and the diversity of sources of information, the occurrence of various types of most common risks was established. Particular emphasis should be placed on presenting the set of risks identified in the implementation of high-risk projects, the elements of which are:

1. Economic risks resulting from changes in the economic situation due to external factors (collapse of the maritime market, deterioration of the economic situation of countries in the Baltic Sea Region, economic crisis, financial problems of entities in the maritime economy).
2. Operational risks, resulting from inadequate and malfunctioning internal processes that take place in the environment of the people employed in the Project and the systems and events external to the process:
 - risks of conducting investments, which include market changes, possible increase in investment costs, shortages of maritime workers,
 - risk connected with legal procedures - legal procedures may result in the inability to complete the investment within the planned period,
 - withdrawal of the main contractor.

3. Economic (financial) risk, which may be caused by changes in economic conditions (competitive strategy):
 - debt risk - a bank granting a long-term loan to protect itself from credit risk will seek to use additional collateral opportunities,
 - investment financing risk.
4. Event risk, which can be caused by the occurrence of specific events or catastrophes.
5. Model risk, or the risk of theoretical error in the real world, which is the result of, among other things, structural risks arising from innovative assessment.
6. Risks related to the cognitive capture of the human factor, which include:
 - the deformation of the factual component and the cognitive dissonance that results from the acceptance of standards of one's own rationality on a normative and descriptive level ('theoretical blindness'),
 - the presence of mechanisms of understanding and interpretation of events that do not necessarily search for causes,
 - an interpretation that takes place solely on the basis of one's own recorded repetition of recorded events.

Under these conditions, multidimensional analytical information processing, which was carried out on the basis of having a set of individual and team skills that included analytical thinking, enabled in an informed decision-making process to solve complex problems in a set of low-risk elements that also included the following factors:

1. Cross-cultural aspects with legal, linguistic and semantic implications of legal interpretation (international consortium).
2. Distance between partners which limited the possibility of face-to-face meetings - communication barriers (another pandemic).
3. Regulatory changes - significant changes in standardisation parameters.

In contrast, the set of medium risk elements included the following:

1. Different priorities of the consortium partners - each company has its own markets and priorities and different experience in the IT sector, security standards for offshore critical infrastructure.
2. A change in the profitability of the project due to price changes (even more rising inflation).
3. Economic conditions due to overestimation of the costs of organising knowledge transfer and the associated breach of liquidity.

It should also be borne in mind that the emergence of competition in each of the projects analysed always represented a high risk.

Understanding the risks on the basis of the risks defined and identified, as well as the factors that condition them, made it possible to determine the structure of the risks identified in:

1. Corporate governance.
2. Management of risk limits.
3. Risk transfer.
4. Risk analysis through imprecise risk identification, measurement, control and monitoring.
5. Technological resources and data resources.
6. Entity communication in the company, which included the participation of all or a selected group of the company's employees, the motivation and reporting system and the participation of related parties (advisors, experts).

Furthermore, in view of the implementation of high-risk innovative projects, it is moribund to signal the main threats to the effectiveness of the use of risk intelligence in high-risk projects, which in these cases were:

1. So-called subjective 'groupthink', which resulted from an imbalance between individual and team thinking processes.
2. The occurrence of thinking errors and cognitive traps which are systematic errors in thinking and at their core represent oversimplification, overconfidence and so-called 'confirmation traps'.

The implementation of high-risk projects under conditions of uncertainty with subjective unquestionability gives rise to problems ranked outside its content, namely:

1. The objectives of the innovation activity, as points of reference, are defined on the basis of giving them their own results and their own interpretative framework adapted to them.
2. Instances of subjective sensibilisation that derive from ideas about the unquestionability of one's own or collective assumptions.
3. There is the adoption of one's theory alone, in which one accepts as valid once accepted arguments, which one also actively defends.
4. Falling into 'self-congratulation' over our own rhetoric.

However, using risk intelligence in high-risk projects, based on the extensive experience of the people involved in the projects, the presence of risk understanding factors was identified. Therefore, on the basis of risk analysis, it was possible to learn the probability distribution of all negative consequences. This made it possible to establish a tolerance band for situations of destruction of their objectives, i.e. a set of conclusions from which recommendations were made, implying the following actions:

1. Organisational:
 - the development of project management conditions which should take into account, among other things: the responsibilities of the functional persons, the complexity of the decision-making process with clearly defined decision-making tolerance bands for persons employed in the project,

- build a network of partners to manage all risks,
 - carrying out risk analyses,
 - developing the composition of project teams, including research teams,
 - building the competence sets of external needs for the necessary use of the potential of the human capital of the project participants to achieve the main objective and the project residual objectives,
 - development of terms and conditions of cooperation within the consortium and division of tasks for consortium members.
2. Analytical:
- development of the initial project management assumption,
 - development of the initial stage of administrative and legal activities as formal and legal instrumentation of the project,
 - identification of the primary objective and milestone objectives and their preliminary personal allocation to the project staff (job descriptions, scopes of duties) - on this basis development of personal tasks.
3. Financial:
- thorough analysis of the project budget, including: expenses, eligible costs,
 - analysis of the possibility of obtaining additional income on the basis of using the available financial instruments - analysis of additional sources of financing,
 - preliminary financial, formal and legal analyses, which were related to optimisation of the implementation of tasks resulting from the Project,
 - development of a plan for appropriate allocation of resources,
 - development of a time plan for each work stage based on harmonisation of activities and project costs and standardization,
 - ongoing analysis of economic and business indicators,
 - creation of a preliminary material and financial schedule based on the expectations of all project stakeholders.

To sum, the risk of the implementation of an innovative project, is the possibility of the occurrence of a certain type of risk with the implication of the incurred damage (loss), as well as the occurrence of a positively valued state (profit, benefit), understood as effectively achieving its objectives, which is associated with the decisions taken in relation to the future. Formally, decisions made under risk conditions in the implementation of a high-risk innovative project are referred to as a class of decision problems reflecting market challenge, customer, knowledge diffusion and market opportunity (Gędek, 2018). In this situation, the intended objectives of the activities, which are implemented in the decision-making process, should take into account the realised strategy for the situation of their destruction in a certain risk tolerance band.

Therefore, according to the learning experience, the basic issue in the so-called risk intelligence is to determine the difference between our degree of understanding of a given risk and the degree of understanding by others, which is mainly due to our awareness and our predisposition (Ficoń, 2007). Understanding risk requires two conditions. First, in order to fully comprehend risk, it is necessary to identify possible solutions to the problems created by the risks, as well as the factors that determine them. Secondly, understanding risk requires experience that allows us to recognise which of the solutions presented may be effective, which are flawed, and whether we need more information (Ciborowski, 2018).

When we talk about risk intelligence, we should have in mind this experience that we have already gained, are gaining or will gain in the future. This means that the concept of risk refers precisely to the second determinant of risk intelligence (Apgar, 2006). Accordingly, (non-risk) risk intelligence is, on the basis of decision-making, the ability to select the right type of risk by applying risk intelligence rules that identify and describe those risks that can be known and understood. additionally, it is the planning of the implementation of risky ventures that would enable optimal exploitation. The development of risk management skills must also include building a network of partners to manage all risks. Through subjective individual or collective experience (key skills), it will become possible to manage it effectively, Thus 'risk intelligence' refers to the ability to choose the right type of risk by applying the rules of risk intelligence, which we will be able to manage effectively through our experience. However, we must keep in mind the measure of uncertainty (value at risk) - this is the definition of the upper limit of expected losses.

When talking about risk intelligence, it is also important to bear in mind the presence of risk determinants. The determination of risk, which can be known as the rule of thumb for risk intelligence, is the degree to which we understand a given risk and select it for effective management, which we do in our decision-making process. In this situation, it is legitimate to explore areas of awareness of human innovative activity including, but not limited to: the subjective sensibility of the decision-making process vis-à-vis the praxeological significance of the proposed innovative solution, the unquestionability of the representability of the narrative or the present-day inconclusiveness and non-algorithmicity of human thinking (Walasek-Jarosz, 2013).

The rationale for this author's proposal stems from the fact that if the potential of our knowledge of risk, which comes from the power of science, is shaped by the methodological correctness of the research and analysis carried out, the application of which stems from a certain area of consciousness, then the reconciliation of the presented analytical results and their interpretation becomes a fundamental problem (Zulicki, 2018). In the area of awareness, the individual learning history of the subject (decision-maker) through consequences (experience) and its behaviour becomes essential. This behaviour should be understood as a deliberately directed reaction to benefit by achieving a goal on the basis of the actions performed. They are the result of the exploration of formed cognitive processes (cognitive

psychology) and task-oriented, achievement of specific goals on the basis of messages that remain in feedback (systemic psychology). This means a conscious action that justifies the expected reactions from a specific subject, on the basis of external information. All of this is aimed at stabilising events in accordance with planned predictions and always results from an elaborated structure of the decision-making process, which is based on either individual or collective cognitive architecture (Koch, 2008).

In this situation, it becomes essential, already mentioned, to have the necessary knowledge, understood as the ability to understand the relationship between cognition and reality, on the basis of which justified belief becomes possible (Wolenski, 2014). Therefore, from the point of view of the topic of the study, it is necessary to define the difference between the risk we expect in a given innovative endeavour and the actual risk we will be confronted with. The fundamental problem is whether we can understand the risk sufficiently to value the decision-making process positively in the data under conditions of innovative unpredictability (Apgar, 2006).

According to the literature, the occurrence of risk-related factors based on subjective assessment of the relevance of the information possessed for their understanding and which may affect the given risk, takes place under conditions of acceptance of standards of one's own rationality ('theoretical blindness') and the occurrence of innovation problems. These occur outside of its content, where the objectives of the innovation activity, as points of reference, are defined on the basis of giving them their own results and their own adapted interpretative framework (Bolton et al., 2005). In addition, the area of consideration must also include the occurrence of cognitive errors (ignoring predictability), the erroneous weighting of decisions and the occurrence of so-called emotional intelligence in which the subjective tendency to overestimate the understanding of reality manifests itself. Thus, either individually or collectively, the presence of a lack of awareness of bounded rationality, which gives priority to the understanding of one's professional representativeness vis-à-vis the innovative issue, results in the reality of conditions in which experience and intellectual conservatism may deprive us of the ability to choose the right type of risk, which we will be able to manage effectively.

Conclusions

In this situation, the intended objectives of innovative design and implementation activities should be realised in a decision-making process that should take into account the strategy for the situation of its destruction. In the process of analysing and assessing the probability of negative events in such a process, the vulnerability of the existing security system, understood as the weakness of the system, its lack of resilience and ability to counteract negative impacts, should also be taken into account. Risk analysis and estimation in knowledge transfer requires

systematic consideration of the potential for harm. The results of this estimation help to determine appropriate management actions and set priorities for risk management and the introduction of broadly defined safeguards and solutions to protect against the identified risks of implementing innovative projects.

It is important to include in the risk analysis, the design and execution of periodic reviews of the risks relating to security and the safeguards in place so that:

- Take into account changes in innovation activity requirements and priorities.
- Identify new threats to knowledge transfer and assess vulnerabilities.
- Confirm that the safeguards in place continue to be effective and appropriate.

The analysis of risks carried out in the publication takes into account the realisation that, today, the unscientificisation of risk is becoming a scientific problem in its own right. In this situation, it is necessary to reveal the contradictions and difficulties that exist in the interrelationships between practice and disciplines in interdisciplinary innovation, which should take into account that:

- In high-tech innovative modernity, the production of occurring risks and hazards shows a dependence on knowledge as its product, based on standards of its own rationality.
- The dynamics of civilisational progress means that we cannot speak of the predictability of hazards and risks either.
- In the space of threats to the implementation of innovative projects and the risks involved, there is the so-called intelligence of risk, which has a fundamental influence on the theoretical content of risk, its proliferation and its content (extent, intensity, causation, damage).

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THE SITUATION ON THE LABOUR MARKET OF REFUGEES FROM UKRAINE AND THEIR COMPETENCES

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Purpose: The aim of the article is to answer the questions about what proportion of refugees from Ukraine living in Poland would like to work, how many hours, for what remuneration and what general competences they have, as well as about their residence plans – whether they want to stay in Poland, return to Ukraine or perhaps go to another country.

Design/methodology/approach: The research presented in this article uses the analysis of literature on migration, especially war migration, and professional competences. It also includes results of the research which covered 292 refugees from Ukraine who arrived in the West Pomeranian and Greater Poland voivodeships after Russia's aggression against Ukraine.

Findings: The results of the research showed that most refugees would like to work, although usually part-time, for a relatively low salary, compared to the average salary in Poland, despite the fact that refugees have relatively high skills. About 1/3 of refugees plan to stay in Poland, about 1/3 to return to Ukraine and about 1/3 to wait with the decision until the end of hostilities.

Research limitations/implications: The additional study included in the analysis was conducted on a non-representative sample. The results are due to the reluctance of refugees to fill out surveys in general, and in particular in electronic form.

Practical implications: The obtained results facilitate decision-making both by managers in Polish companies and by the state administration. This is due to the better understanding of the competences of refugees and their expectations regarding the labour market.

Originality/value: Developing knowledge about the refugees' plans for the country they want to live in learning about their expectations regarding salaries and working hours.

Keywords: migration, labour market, competences, salary, employment.

Category of the paper: Research paper.

1. Introduction

In the last few years, with relatively high economic growth (GUS, 2024) and a low unemployment rate (approx. 5% registered, 3% according to BAEL), there have been dynamic changes in the business environment, the functioning of the economy and Polish society. In 2020-2021, Poland, like the whole world, faced the COVID-19 pandemic, and in February 2022, Russia attacked Ukraine. It caused large emigration, especially of women with children, and a significant part of these people came to Poland. Despite such social, political and economic turmoil, the Polish economy functioned relatively efficiently and opened up to help war immigrants (refugees). In a few months of 2022, about 2 million refugees came to Poland, who required support related to housing, food, health care, education, etc. In 2023, some refugees returned to Ukraine, especially those from the western part of the country, but over a million refugees remained in Poland. Of those who stayed, some work, some do not work but would like to, some do not work because they are pensioners or have children. The question arises as to what proportion of refugees would like to work, how many hours, for what salary and what general competences they have. It is also important to obtain information on future plans for their stay – whether they want to stay in Poland, return to Ukraine or perhaps go to another country. The answers to these questions are the purpose of this article. First, the concept of competences is analysed, then the situation on the refugee labour market in Poland is presented. The empirical part presents the results of surveys conducted directly among 292 refugees in the West Pomeranian and Greater Poland voivodeships. Finally, conclusions are drawn and recommendations are presented.

2. Competences – literature review

The concept of competence in Polish literature is relatively new, it appeared basically during the transformation from a planned economy to a market economy. In world literature, it can be assumed that it has existed since the mid-20th century (Kocór, 2019). It generally refers to the compliance of knowledge, education, experience, personality traits with the needs in the work performed and achieving results that are satisfactory to the employer (Mięczkowska, 2003). For H. Król, these are "predispositions in the scope of knowledge, skills and attitudes, ensuring the implementation of professional tasks at an effective and (or) distinctive level, in accordance with the standards set by the organization for a given position" (Król, 2006). A. Springer conducted an extensive analysis of the concept of competence (Springer, 2018), indicating, among others, the variety of definitions of this concept, many types and levels of competence. In turn, C. Bach and R. Sulikova (Bach, Sulikova, 2019) as well as U. Jeruszka (Jeruszka, 2016)

analyzed the diversity of interpretations of the concept of competence and pointed to its multidimensionality. On the other hand, V. Wickramasinghe and N. de Zoyza (Wickramasinghe, de Zoyza, 2009) indicated key competences in various areas of professional activity, the ability to manage time, cooperate and communicate. In the context of management, R.R. Wood and T. Payne considered communication skills and results orientation to be the most common competences (Wood, Payne, 2006). In turn, due to the variability of the political, economic and legal environment, which we have been encountering especially in recent years (Smolbik-Jęczmień, 2017), another element of competence is indicated, which is the efficiency of functioning in difficult and surprising situations (Heyse, Erpenbeck, Ortmann, 2015; Zhang, Yu, Marin, 2021). Career development and achieving professional success require the ability to self-direct, set goals, communicate, continuously acquire knowledge (Smolbik-Jęczmień, 2017), entrepreneurship (Chlebiej, 2022), knowledge of modern communication methods (Czekaj, Tyrańska, Ziębicki, 2022) as well as building social capital in the form of relationships with colleagues, co-workers, superiors, subordinates, clients. It can be assumed, to some extent, that competence development is the continuous updating of a given person's professional activities (Erpenbeck, Sauer, 2001).

Employers in Poland, but also refugees, are faced with an important issue of identification, which are the competences possessed by refugees, how to use them for effective work and how to develop them.

3. War migrants from Ukraine in Poland

The definition provided by, among others, the Central Statistical Office says that migrations are "movements of people related to a change of place of residence (permanent or temporary residence) combined with crossing the administrative border of the basic territorial unit" and international migrations are defined as "departures abroad and arrivals in the country for the purpose of settlement (permanent residence) or temporary stay" (CSO, 2023).

Migration theories indicate various types, causes, and purposes of migration. Research shows that the main cause of migration are economic factors, and migration is most often voluntary, being a means to achieve a specific income and wealth balance. The priority is the desire to find a new, better-paid job (Janicki, 2007; Docquier et al., 2014; Dustmann, Preston, 2012). When analyzing the issue of migration, not only economic, it is worth emphasizing the context of work and employment. In more developed economies, there is usually a shortage of workers for simple jobs that do not require high qualifications (Musiał-Paczkowska, 2003; Bite et al., 2020). If it is not possible to increase the supply of labor from within, then this gap is filled by immigrants, which can stabilize the economic situation of the country (Arango, 2000). As a rule, research related to migration concerns its impact on the functioning of society,

the economy, culture, and the labour market. The situation related to warfare and related migration was less frequently analyzed. The change in Europe, and especially in Poland, occurred as a result of Russian aggression against Ukraine, when Poland in particular became a country that quickly had to face the challenge of accepting a large number of war immigrants (refugees) (UNHCR, 2023). On the one hand, immigration is beneficial for the state, society, and companies, as the demand for goods and services increases, and the supply of labor increases, but it also creates many economic, social, and cultural problems (Harasimau, 2023; Gunel, Gedik, 2022). It causes an increase in budget expenditure, especially in the case of war immigration. War immigrants do not have time to prepare for departure, often do not have the means to meet basic needs of food, clothing, housing, health (Rowthorn, 2008; Speciale, 2012; Mavisakalyan, 2011). They therefore require support, at least in terms of accommodation, administrative and legal matters and income, including from work, in the search for which the state, private institutions and individuals support immigrants. It is also worth noting that immigrants come from a different language area, a different culture, which causes communication problems, but sometimes also misunderstandings and conflicts.

For the managers of the state and companies, questions also arise about the refugees' competences, needs, development and residence plans. This also applies to immigrants from Ukraine, who should be examined whether they want to return to their homeland, stay in Poland permanently or for a longer period, or perhaps continue to emigrate, to what extent do they make their stay in Poland dependent on the development of the situation in Ukraine? There is also a need to study and present answers to questions about the impact of immigrants on the economy in Poland, the labor market, the housing market, the demand for goods and services, and in the case of current immigration, especially services related to the education of children and youth from Ukraine. It is also worth mentioning the state's policy towards refugees from Ukraine. After Russia's invasion of Ukraine, Poland became the main destination for the escape of Ukrainians, primarily women with children and pensioners. By the end of 2022, about 8.5 million people from Ukraine had entered Poland and about 6.5 million had returned to Ukraine. After crossing the border with Poland, these refugees received immediate support in terms of food, residence, legal support, etc. (Isański et al., 2022). In the context of the labour market, in 2022, regulations came into force on helping Ukrainian citizens enter the labour market in Poland. A new possibility of legal work was introduced based on a free notification, which should be submitted electronically via website praca.gov.pl. This applies to Ukrainian citizens who entered Poland from 24 February 2022 and whose stay in the Republic of Poland was recognized as legal. Data for 2023 show that 1,080,000 Ukrainians took up work based on this possibility, of which 643,000 women (60%) and 437,000 men (40%) (MRPiPS, 2023).

4. Methodology and results of own research

Research on the situation of refugees from Ukraine on the labour market in Poland and their competences was conducted in the period November 2022 - December 2023. It covered a group of Ukrainians staying in north-western Poland (Wielkopolska and West Pomeranian Voivodeships) during the implementation of the project "Direction Integration - from crisis through support to integration of refugee families".

The surveys were completed directly by 292 people who came to Poland after Russia's aggression against Ukraine. A non-random selection of units for the study was used, mainly using the courtesy of institutions and organizations supporting people who came from Ukraine (Caritas, Refugee Aid Centers, Labour Offices, Greek Catholic Church etc.). This method of reaching respondents resulted from difficult access to the group of migrants, which is largely related to the dynamics of the war situation and the related unpredictability, among others, regarding the place of residence of refugees. For this reason, the results were not segmented based on the characteristics of the respondents. Some of the answers obtained were used in this article, in the context of the current and expected state policy towards refugees. The first part of these results will present a short description of the refugees studied, followed by the results of the research in the context of the competences of Ukrainians. First, the structure of the refugees surveyed is presented (Table 1).

Table 1.

Structure of the surveyed persons according to selected characteristics

Characteristic	Specification	Percentage
Current place of residence in Poland	Rural area	12,4
	Small town (less than 50 thous. inhabitants)	13,4
	Medium town (between 50 and 500 thous. inhabitants)	64,9
	Big town (at least 500 thous. inhabitants)	9,3
Age of the person being examined	under 18 years old	2,7
	18-29 years old	7,9
	30-39 years old	35,7
	40-49 years old	26,5
	50-59 years old	12,0
	60 years old or more	15,1
Sex of the person being examined	Women	89
	Men	11

Source: own research.

The data in Table 1. show that the surveyed people most often lived in towns with 50-500 thousand inhabitants (64.9%), were aged 30-39 (62.2%). The surveyed people were mainly women (89%).

The next questions concerned substantive aspects, referring to plans after the end of the war (Figure 1), the possibility of finding a job in the place of residence (Figure 2), they defined their current situation on the labor market (Figure 3), preferred number of working hours per week (Figure 4), received and satisfactory remuneration (Figure 5 and 6) and finally they defined and assessed their own competences: knowledge of languages (Figure 7), professions performed in Ukraine (Figure 8), and general competences (Figure 9).

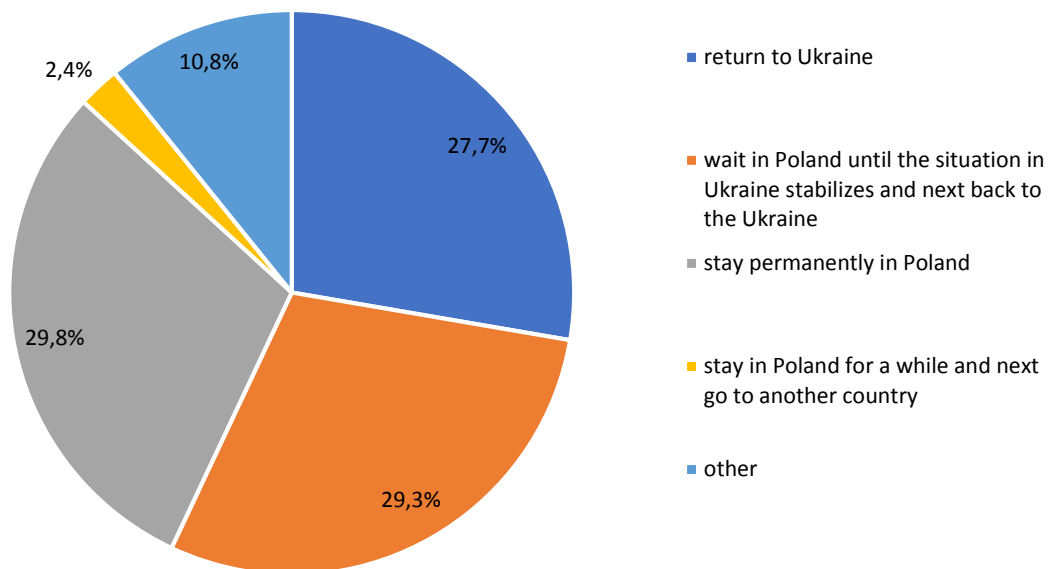


Figure 1. Plans of Ukrainians after the end of the war.

Source: own research.

The answers given by refugees indicate that almost 30% want to stay permanently in Poland and another 29% want to wait in Poland until the situation in Ukraine stabilizes. 28% of people want to return to Ukraine relatively quickly. Therefore, it can be assumed that about 1/3 of refugees will remain in Poland, with most of them being women with children.

Staying in Poland requires earning an income, and income from work is key in this respect. Figure 2 shows data on the possibility of finding a job as assessed by the respondents. This chart shows that refugees positively assess the possibility of finding a job in Poland. This was indicated by almost 71% of people, including almost 39% who assessed it definitely positively. Only slightly over 11% of the respondents assessed it negatively.

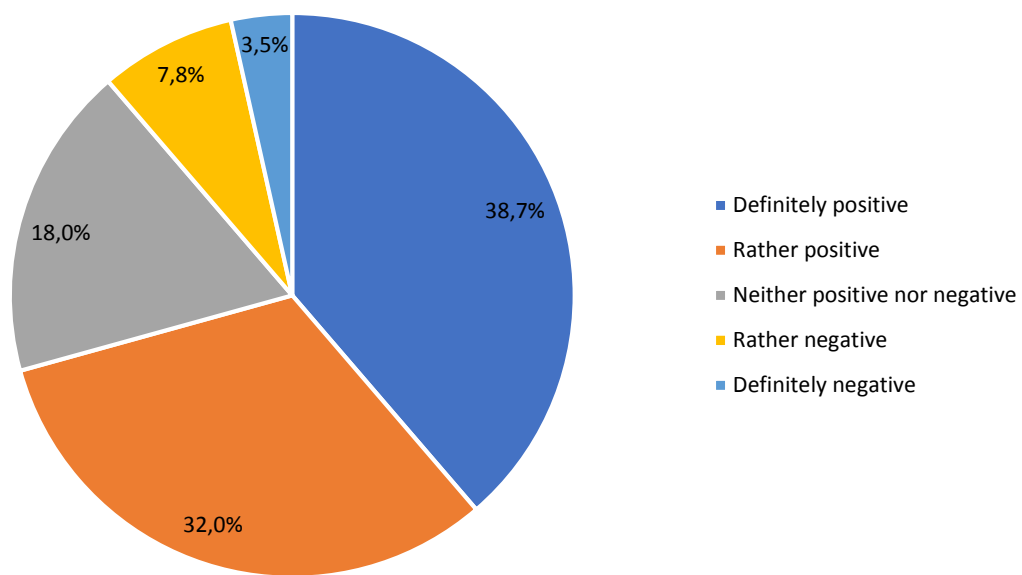


Figure 2. Possibility of finding a job in Poland.

Source: own research.

The next chart (Figure 3) presents data on the current professional situation of the respondents.

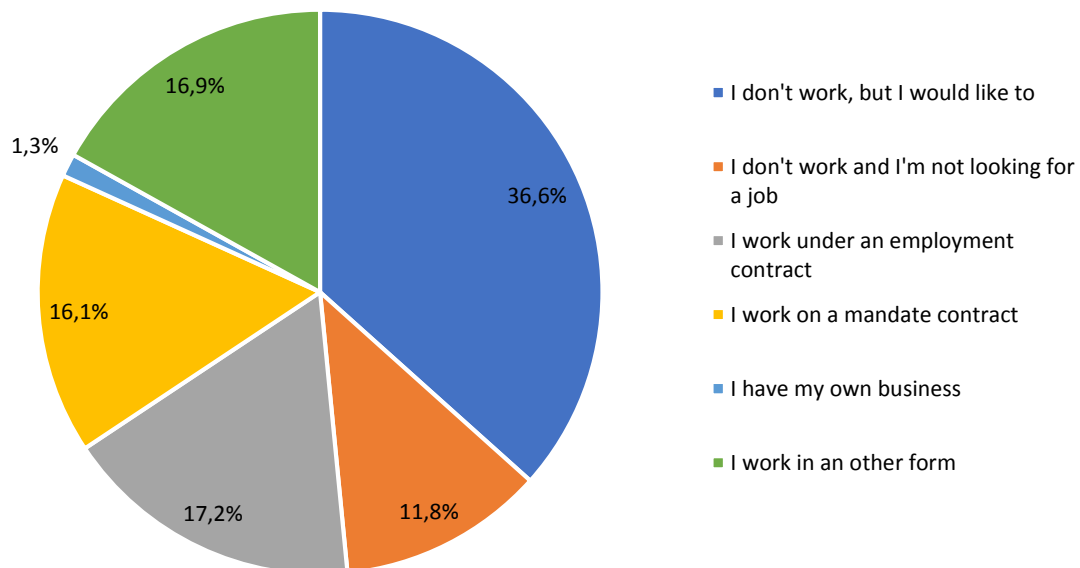


Figure 3. Current professional situation.

Source: own research.

The answers obtained show that over half (approx. 52%) work and almost half (approx. 48%) do not work, but 37% of these people would like to work. This data is supplemented by opinions on how many hours the refugees surveyed would like to work (Figure 4).

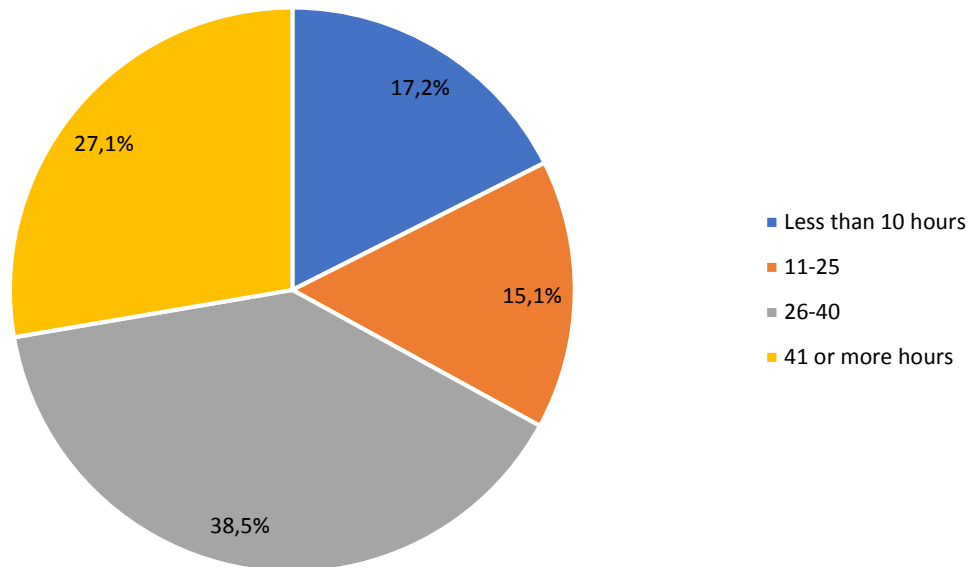


Figure 4. Preferred number of working hours.

Source: own research.

The data presented in Figure 4 show that people who work or do not work but want to work would most willingly work 26-40 hours (almost 39%) or 41 hours or more (27%). Some people (17%) would most willingly work up to 10 hours a week and 15% 11-25 hours. The preference for fewer hours probably results from the fact that it concerns mothers with small children.

The next two Figures (Figure 5 and 6) concern received and expected remuneration.

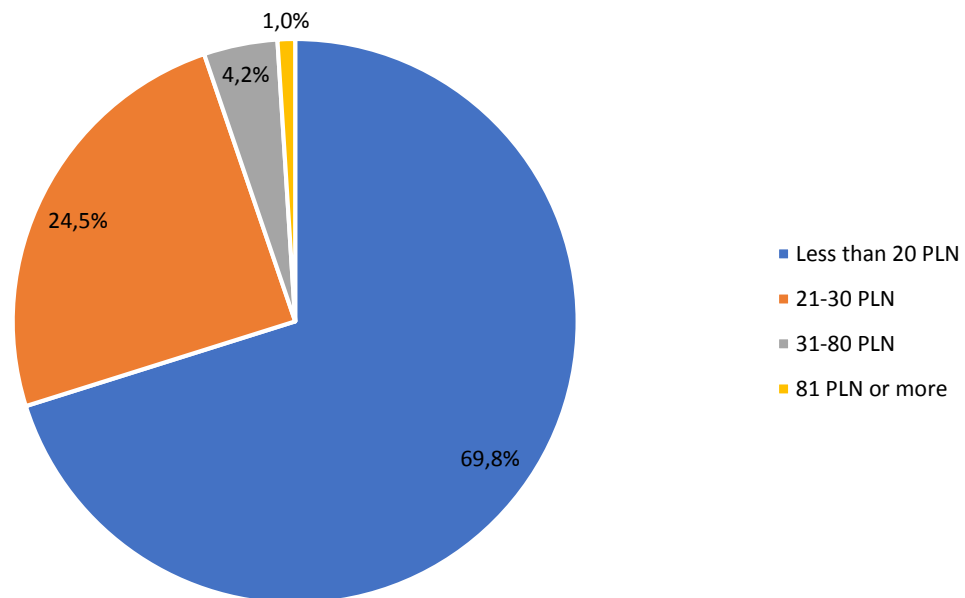


Figure 5. Remuneration received per hour of work (net, PLN).

Source: own research.

The refugees surveyed most often (70% of respondents) earned a salary of up to PLN 20 net, which is relatively low. Another 25% earned PLN 21-30 net and only 5% above this amount. It is worth comparing these data with the salaries expected (satisfactory) by refugees (Figure 6).

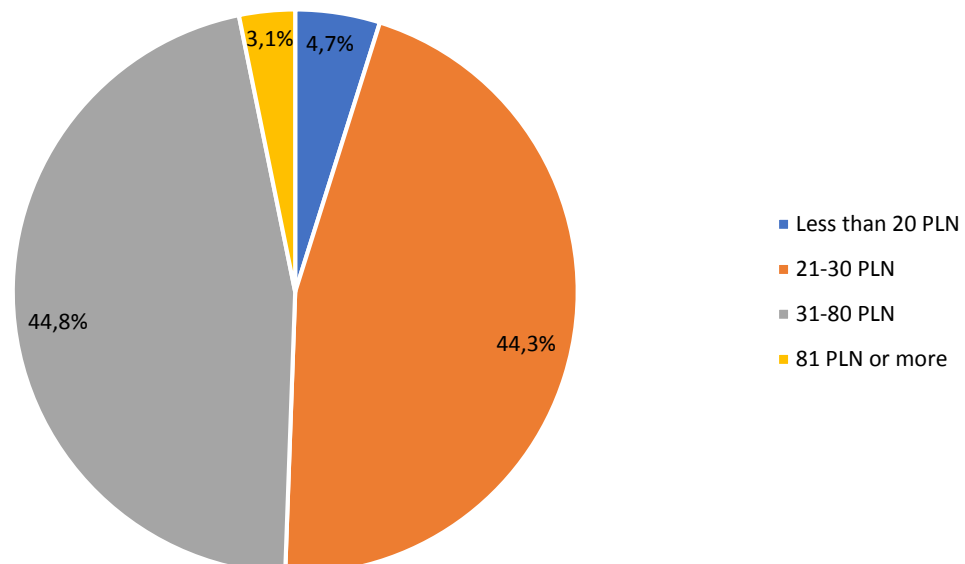


Figure 6. Satisfactory salaries.

Source: own research.

The salary satisfactory for refugees is higher than the one received and amounts to approximately PLN 30 net for half of the respondents (for most of them, because for 44% of all those working or wanting to work PLN 21-30) and for the other half over PLN 31 net (for 44% PLN 31-80). However, it can be assumed that the salary satisfactory is not high, taking into account the average salary in Poland.

Both in social life and at work, one needs to communicate with others. Therefore, one of the elements of competence is knowledge of languages. Figure 7 presents the answers in this area.

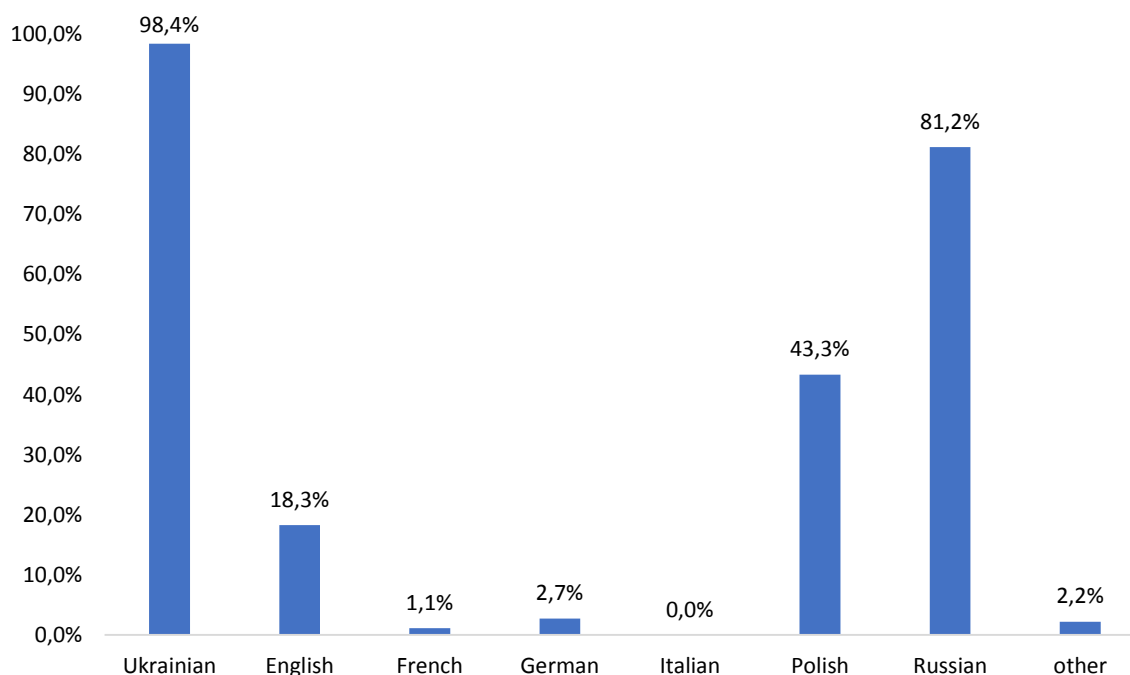


Figure 7. Knowledge of languages at a communicative level.

Source: own research.

The presented answers show that refugees mainly know two languages at a communicative level: Ukrainian and Russian. In addition, a relatively large number of people know Polish (43%). Of other languages, only English can be indicated, which is known by 18% of respondents.

One of the most important elements of competence, professional experience, has an impact on finding a satisfactory job. Refugees were asked in what professions they worked before emigrating from Ukraine. The answers are presented in Figure 8.

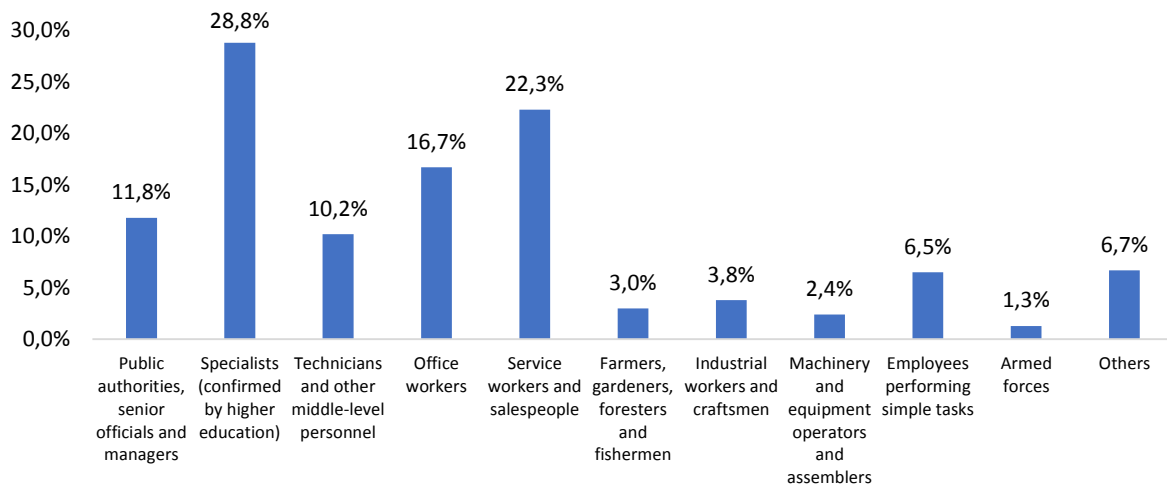


Figure 8. Most recent profession in Ukraine¹.

Source: own research.

The data obtained show that the largest percentage of people (almost 41%) worked in professions requiring high competences and, as a rule, higher education (29% as specialists, 12% as representatives of public authorities, senior officials, directors, etc.). In addition, almost half worked in positions requiring medium qualifications: 22% worked as salespeople, 17% as office workers and 10% as technicians and other medium-level personnel.

The last graph (Figure 9) presents self-assessments of various elements of competences.

¹ The percentage exceeds 100% because some respondents had two jobs and marked two answers.

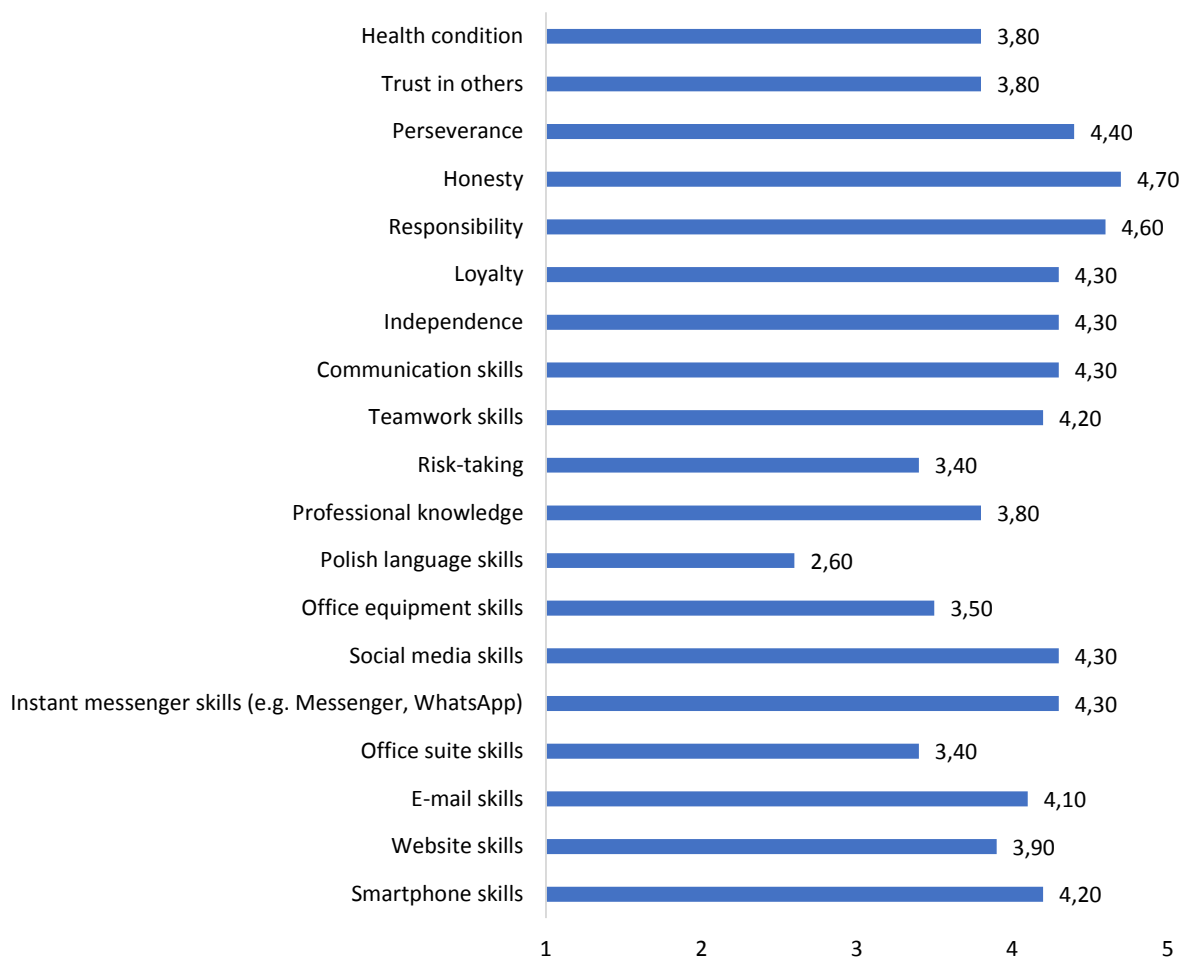


Figure 9. Assessment of own competences (on a scale of 1-5, where 1 – very poor, 5 – very good).

Source: own research.

The answers presented in Chart 9. show that in most cases refugees assess their competences well. The exceptions are the assessments close to very good: honesty (4.7), responsibility (4.6) and perseverance (4.4), or on the other hand: knowledge of Polish (2.6) and average assessments for: ability to use the Office package (3.4), risk-taking (3.4) and ability to use office equipment (3.5).

5. Conclusions and recommendations

The aim of the article was to determine the situation of refugees on the labour market and their general competences. Surveys conducted among refugees allow us to draw certain conclusions and present recommendations for further, in-depth research. It should be emphasized that the research concerned women in particular, as they constituted the vast majority of adult refugees.

Of the surveyed, approximately 1/3 want to stay in Poland, 1/3 want to wait for events to unfold and 1/3 want to return to Ukraine. Therefore, the end of Russia's aggression may cause a significant outflow of refugees, but on the other hand as many as 1/3 plan to remain in Poland.

Refugees are people who worked in Ukraine in professions that required relatively high skills. In Poland, about half of these people work, most often more than 25 hours a week, for low pay, below PLN 31 net. Their expected salary is also not high. For half of them, up to PLN 30 net per hour would be satisfactory.

A drawback is poor knowledge of foreign languages, including Polish. On the other hand, refugees rate other skills, especially soft ones: honesty, responsibility, perseverance, highly. There are basically no skills, apart from knowledge of Polish, that they would rate below average.

Based on the conducted research and presented conclusions, it can be stated that decision-makers in Poland at the state level, but also company managers and refugees, face certain challenges. In the case of refugees, these include in particular: investing in learning Polish, looking for opportunities to better use their professional skills, implementing flexible forms of time and work organization. The presented studies have several shortcomings: competences were assessed in general, too large a range of received salaries was taken into account (31-80 PLN), the studies were not conducted on a random sample. It is worth noting, however, that they overlap with other studies, e.g. those conducted by the National Bank of Poland.

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CURRENT ETHICAL CHALLENGES OF ARTIFICIAL INTELLIGENCE IN THE CONTEXT OF HUMAN WORK

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Purpose: The aim of the research is to determine the contemporary ethical challenges posed by Artificial Intelligence in the context of the labour market.

Design/methodology/approach: The article concerns the development of the labour market in the context of the growing possibilities of Artificial Intelligence. It presents threats and opportunities for development for employees, as well as important turning points in the development of technology through the use of analysis and synthesis.

Findings: The research indicated that Artificial Intelligence is an important and essential tool that can elevate human work to a higher level, while assuming human superiority. The issues of responsibility and the use of systems in a supportive manner indicate the direction in which the market can develop to the benefit of the ordinary employee and the entire structure of the company. Managing the organisation of work based on ethical values can make Artificial Intelligence optimise work for the benefit of everyone.

Originality/value: The proposed approach of comparing the ethical principles described over 40 years ago in the Papal Encyclical with the dynamically changing situation on the labour and technology market indicates the immutability of these principles and allows for verifying the direction of today's changes in the ethical system.

Keywords: ethics, artificial intelligence, labour market transformation, work organisation.

Category of the paper: Research paper.

1. Introduction

Artificial Intelligence is gradually changing our perception of the world and shaping our reality. It should be stated with all seriousness that it has a profound impact on the social and economic situation of many countries. The gradual implementation of specialised systems as well as the increasing access to them on the network mean that the labour market is gradually entering a time of changes that, according to some, will shape the reality related to human work and employment in a revolutionary way and according to others, in an evolutionary way (Kowalik, 2024). Artificial Intelligence, understood as a set of IT tools and systems, cannot be subject to ethical evaluation in itself. However, its production, training, implementation and

collection of Data into systems can and should be subject to such an evaluation. Each tool can be used in principle for the common good, or against it. We are dealing with a paradigm shift in which many aspects of specialised systems can improve human work, or even completely replace it on an unprecedented scale. In this article, through analysis and synthesis, we will attempt to look at the issues of ethics in the context of Artificial Intelligence in the world of human work. At the same time, it should be emphasised that the state of our knowledge, research and the situation on the labour markets are changing dynamically, so the thesis put forward in this article should be regularly reviewed and updated accordingly.

2. Human as a work subject

At the outset, it should be noted that a human aware of their freedom and dignity, regardless of their situation, is subject to unchanging and universal laws. In the context of the world of work, we can therefore certainly indicate that every participant in the labour market, recognizing their subjectivity and agency, is also aware of the fruits of their labour, that is, everything that in the world of work we call capital. Ignoring this relationship between labour and capital and pointing to the antinomy of both of these concepts led in the socialist system to the degradation of the quality of work and, consequently, to the degradation of man himself, who, underestimated, earning little, saw in the work performed the source of his oppression, and not a field of development and realization of his rational vocation. In the process of work, man is the creator of capital, including in particular a set of specialized technical means. This priority in the ethical sense must remain unchanged, but its proper understanding, especially in the face of emerging new issues related to the implementation of Artificial Intelligence, requires reflection today. This reflection is possible today based on new data from research on Artificial Intelligence and from research on the labour market, but its foundation, in the form of an ethical assessment of certain unchanging factors of human work, should be rooted in a broader reflection that has already been verified by the course of history. Such a source of our considerations will be, among others, the encyclical *Laborem exercens* of John Paul II. “All that we can say of everything in the production process which constitutes a whole collection of "things", the instruments, the capital, is that it conditions man's work; we cannot assert that it constitutes as it were an impersonal "subject" putting man and man's work into a position of dependence” (John Paul II, 1981).

The Pope's warning is becoming particularly relevant today. Specialized systems based on Artificial Intelligence are instruments supporting human work, as well as the increasingly rapidly growing technological capital of selected nations and enterprises. It must certainly be agreed that they condition human work in an increasingly broader area. However, the Pope does not agree with giving the status of an anonymous subject to these things. While in the 1980s,

despite the fact that work on Artificial Intelligence was already underway, the prospect of technology gaining some agency was distant, today looking at technology from the perspective of its subjectivity may already be more justified. Decision-making, data processing processes similar to those occurring in the human brain are features that, in the understanding of some, may entail the consequences of taking over this very subjectivity in some fields of work. Thus, man is increasingly losing some areas of his human activity to specialized systems. While Artificial Intelligence itself as a work tool, even with such broad capabilities, is not subject to ethical evaluation, its application itself can be assessed at least in general terms, taking into account some aspects of this phenomenon. According to Kai-Fu Lee, Artificial Intelligence with its current capabilities of operating in narrow, specialized areas, focused on problem optimization, can successfully replace white-collar professions involving an individual approach to the client and related to optimization. He cites the work of a telemarketer and an analyst granting loans as examples of the two most endangered professions. The revolution in these areas has already partially become a fact. So how does it affect the problem of employee subjectivity, around which our reflection is currently taking place? Let us return to *Laborem Exercens*, where the Pope notes that the sphere of human work is an integral sphere of human, rational and purposeful action. Human action allows the realization of the human vocation, proper to the person, to be realized (Gierycz, 2021).

So, does reproductive work consisting in optimization: finding a pattern and minimizing risk, who can be granted credit, or how to sell the most services, fit into the realization of human subjectivity in work described by the Pope? The answer to this question is not obvious and may depend on many factors. Reproductive, stressful work of a telemarketer is one of the most susceptible to depression and burnout (*Sztuczna inteligencja w obsłudze klienta...*, 2021). We can therefore put forward a hypothesis: the use of Artificial Intelligence in professions requiring repetition, limitation of invention, including those requiring contact with another person, which in a way limit the employee's subjectivity and condemn them to work in an automated environment that is not conducive to the fulfilment of the human vocation for rational action, can be very beneficial. Where mental work requires minimal intellectual investment and does not give the employee space for development or prospects for improving living conditions, creativity is killed and people are treated as cheap labour (Kroplewski, 2021). The same is true for physical work, e.g. in the profession of a production line controller. Such professions, also in the near future, will be eliminated in favour of specialized systems based on robotics. In the context of the problem described, the Pope in the encyclical *Laborem Exercens* also refers to the problems related to treating man on an equal footing with the means of production and all inanimate capital. He does this in reference to the threats of capitalist systems, because his encyclical has a universal dimension, which makes it very relevant in the face of current challenges: "But in the light of the analysis of the fundamental reality of the whole economic process—first and foremost of the production structure that work is—it should be recognized that the error of early capitalism can be repeated wherever man is in a way treated

on the same level as the whole complex of the material means of production, as an instrument and not in accordance with the true dignity of his work-that is to say, where he is not treated as subject and maker, and for this very reason as the true purpose of the whole process of production” (John Paul II, 1981).

It should be noted that the benefit associated with the liberation of man from the system of work that degrades his freedom of action, however, consists in the elimination of jobs, which translates into depriving employees of their previous occupation, which, given the lack of prospects for another job, is no longer beneficial. It should therefore be noted that the described perspective of changes, in addition to the economy, will also have a significant impact on the human psyche.

3. Loss of employment

At the beginning of his encyclical, the Pope notes and predicts that the development of automation in production will contribute to the loss of jobs and will require the rapid retraining of many workers. Today, we can extend this forecast to include the professions related to intellectual work. Leaving aside for now the economic issues and the impact of these changes on the labour market and social well-being, let us look at the impact of job loss on the person as a subject of work and on the perception of work ethic in such a situation.

Artificial Intelligence specialist Kai-Fu Lee describes the possible future situation of many workers losing their jobs to Artificial Intelligence as a personal and human crisis - a psychological loss of meaning in existence. The system of values rooted in culture, which he mentions in the context of work, can be linked to work ethic, a crisis that John Paul II wrote about in *Laborem Exercens*. "For centuries, people have filled their days with work - exchanging their time and effort for shelter and food. Around this exchange, we have built an entire system of values deeply rooted in our culture. Many of us derive meaning from our daily work. Advances in artificial intelligence will challenge these values and threaten to rob us of our sense of purpose in the rapidly approaching future” (Lee, 2018).

From the point of view of Christian values, we can reformulate this thesis and say that losing a job is losing the ability to carry out rational and purposeful action, which allows a person to achieve life goals. In addition, losing a job is associated with losing a source of income, which puts a person in a situation of uncertainty and fear.

Let's take a brief look at how the labour market currently looks in the context of employees changing their place of work. Already during the political transformation, new, flexible forms of employment began to appear, associated with a more individualistic and dynamic approach of employees to work. Contracts of mandate, self-employment in the form of business to business, civil law contracts, are just some of the forms of work that have been gaining great

popularity in recent years in favour of traditional forms of employment: employment contract, in one company for a long time. This dynamics, related to the search for new forms of self-fulfilment and the desire to make a career, in addition to increasing experience and the possibility of better earnings, may also be associated with a sense of uncertainty about the stability of employment, and as a result, introduces fear into a person's life. According to research, such a lack of stability and excess fear lead to numerous psychosomatic consequences, such as: hypertension, increased heart rate, cardiac arrhythmia, heart disease, obesity, increased cholesterol levels, sleep problems, chronic fatigue (Sęczkowska, 2019). In addition, there may be discouragement and lack of motivation to work, reduced productivity and, in the long term, burnout. Today, Artificial Intelligence is slowly entering all this dynamics of the labour market, which will be a significant factor influencing the fear of employees in some areas of the economy of losing their jobs. Losing a job, due to the entry of Artificial Intelligence into many areas of employment, will no longer be just a small disruption in a given area, which, for example, will force an employee to move to another company and continue working in their field, but will be a real revolution in which, in a certain time perspective, some professions will practically cease to have a *raison d'être*. The awareness of such a process by employees of threatened industries may be associated with an increase in fear and uncertainty about the future.

4. Transformations on the labour market

In the context of the development of techniques and technology, we observe increasingly advanced tools that have an impact on human work. In *Laborem Exercens*, John Paul II presents them as essential elements in fulfilling man's vocation to rule over the earth and its goods. The development of technology allows for the acceleration and multiplication of work, multiplying its effects. At the same time, the Pope notes: "However, it is also a fact that, in some instances, technology can cease to be man's ally and become almost his enemy, as when the mechanization of work "supplants" him, taking away all personal satisfaction and the incentive to creativity and responsibility, when it deprives many workers of their previous employment, or when, through exalting the machine, it reduces man to the status of its slave" (John Paul II, 1981).

These words are a great challenge and an invitation to reflect on the ethical perspective on the introduction of Artificial Intelligence.

For years, increasingly advanced machines have been replacing some employees in factories and enterprises, thus minimizing the need for a large staff. This phenomenon is not new and mechanisms for professional development, changing positions and scope of work

within a given employment sector have already been developed. However, it seems that this issue will look different in the case of the current technological revolution.

In order for a person to respond to the changes taking place, they must first try to understand the situation in the world of work and technology. Putting forward specific hypotheses regarding the prediction of trends and the possibilities of the development of Artificial Intelligence on the labour market is not an easy task. Its influence can certainly already be observed and is difficult to ignore. In economic forecasts, specialists talk about a breakthrough similar to the Internet breakthrough in 2000. Where after the initial enthusiasm of investors, emotions cooled down, and in the longer term, there was a slow increase in the reach and importance of the Internet in the world. Today, it is hard to imagine the labour market and everyday life without the Internet. Universal access to information, the speed of its transmission, and large data sets are elements that have become a permanent part of our everyday lives. These elements from the previous chapter of the technological revolution are now being combined with the next chapter. Artificial Intelligence, operating on large data sets, has somehow been incorporated into the world of the Internet, which will have a significant impact on the transformation of the global economy and, consequently, for individuals participating in the labour market. Systems based on Artificial Intelligence, depending on the training set, can be a more or less powerful tool that, due to the wide range of possibilities, can successfully replace even specialized employees. So we are no longer talking only about replacing low-specialized employees. We must therefore abandon such a simple distinction in favour of a more precise division.

5. Replacing a human – Possible scale of job losses

Just as mechanization contributed to replacing manual labour, so the later introduction of computers contributed to providing more and more computing power and the development of specialized systems supporting human work. Many systems operating on the basis of Artificial Intelligence provide more advanced functionalities, faster, providing greater possibilities, but functionally similar to those based on classic algorithms, differing in technical terms primarily in implementation. These are primarily expert systems based on pattern recognition, known for a long time. However, a new space for performing work that we define as requiring intellect is emerging. On the one hand, there will be an ongoing replacement of low-specialized employees, which we are already observing and which we have already referred to. On the other hand, experts predict numerous announcements of the elitization of highly specialized professions. They mention, among others, analysts, programmers, engineers, lawyers, as professions covered by this threat. It may turn out that there are too many specialists on the

market, and those who will develop in creative and conceptual work will count above all (Sroczyński, 2023).

Estimating the scale of changes in the labour market due to the increasingly widespread use of Artificial Intelligence has been a media topic that has aroused great interest since at least 2013, when Carl Benedikt Frey and Michael A. Osborne from the University of Oxford published an article presenting a forecast: 47% of jobs will be at risk in the next decade (Frey, Osborne, 2013). In response to such pessimistic results, scientists from the Organization for Economic Co-operation and Development (OECD) presented their report in 2016. Adopting a different method, consisting in dividing individual professions into specific tasks and assessing the possibility of taking over these tasks by systems, instead of estimating the probability of replacing a given profession in its entirety, researchers from the OECD indicated only 9% of jobs at risk in the coming years (The Risk of Automation..., 2016).

Today, after almost a decade, it is necessary to Comment on the latest news related to events on the labour market. First of all, it should be noticed that Artificial Intelligence has leapfrogged human cognitive and analytical abilities in many of its narrow needs. The latest research conducted by the OECD in 2023 showed that 27% of threatened jobs are vacant. This is the average value for European countries and the United States. Poland is in this ranking at the value from the last place with the highest result of 33.5%, while the United States (21.2%) or Great Britain (19%) are at the forefront of the rankings. This relationship may entail a higher time limit for work already automated in more developed countries.

Confronting the latest research results with those from a few years ago, we see a phenomenon of a certain underestimation of Artificial Intelligence at a given stage of history. The great technological growth to which we refer at various stages of this work has become fact and its scale in the coming years is currently difficult to estimate (Human-centred values..., 2019). According to Kai-Fu Lee, in connection with this enormous increase in the capabilities of Artificial Intelligence, the upper limits of scientists' estimates should be accepted. He gives 38% of positions at risk of automation in the USA by 2030 as his estimate (published in 2018). However, there are still other aspects that have a significant impact on how the number of jobs will change in the coming years. The number of 47% of jobs at risk presented at the beginning of this subsection was, as the authors of the report later said, only an estimate of what percentage of professions could be technically replaced, not what percentage will actually be replaced. Technical capabilities and the possibilities of implementing them in individual economies are two different areas, often with little overlap, especially in less developed economies.

6. Growing social stratification or equal opportunities

The high rate of threatened jobs in many dynamically developing countries may at the same time mean a chance for huge growth for companies - giants in the field of Artificial Intelligence and bringing some social groups in these countries to the edge of poverty. This is an economic opportunity of the winner-takes-all type. Observing the numerous manifestations of materialistic and economic thinking in today's world, which John Paul II warned against in the encyclical *Laborem Exercens*, it is very likely that local situations of this type are already taking place. An example of manifestations of such thinking can be the closing of factories in underdeveloped countries by giants of a given industry from the West. Until now, cheap labour performed the production process in the most economical way. With the emergence of technically advanced robots and quality control systems based on Artificial Intelligence, new opportunities have also appeared to relocate factories as close as possible to sales markets, i.e. away from countries that have previously participated in the production process. A cool calculation assuming the superiority of capital over the value of providing stable jobs where needed shows that eliminating the human factor and shortening the delivery routes of finished goods simply pays off. In addition, the rapid desire to take a position on the global market makes these changes happen at a revolutionary pace. The United States and China, having been leading the technological race for years, have taken the lead, significantly ahead of other countries and accumulating huge technological and human capital by attracting the best experts in the Artificial Intelligence industry (Straszyński, 2023). The specificity of this industry means that high-class specialists want to work where there is the greatest potential for technology development and capital to conduct further research. However, the specificity of Artificial Intelligence systems itself is largely based on optimizing the obtained results and thus supporting the strongest. The concept of sustainable development and equal opportunities does not fit into the specificity of the functioning of Artificial Intelligence heuristics. The new world order appears in the opinions of experts as the concentration of unimaginable wealth in the hands of a few Chinese and American companies. This image carries enormous consequences related to the tragedies of specific individuals, families and societies, which, deprived of their current stable employment, may sink into fear for the future and slow degradation. This is precisely what Pope Francis warns against in his message for the World Day of Peace: "In the ideological context of a technocratic paradigm inspired by a Promethean presumption of self-sufficiency, inequalities could grow out of proportion, knowledge and wealth accumulate in the hands of a few, and grave risks ensue for democratic societies and peaceful coexistence" (Francis, 2024).

Today, knowledge, understood in the context of technological advantage and more precisely: knowledge as data feeding heuristic algorithms of systems based on Artificial Intelligence, i.e., among others, collecting information about network users and profiling their

preferences and weaknesses, analysing market trends, and even the possibility of creating such trends and needs, i.e. exerting influence, are great wealth that can be used in an iniquitous way to build advantage and position on the market. The Pope also points to the risk not only of economic crisis or monopoly of selected companies on the market, but also, more broadly, of a threat to world peace. It is no longer an easy task to introduce, as it once was in the United States, antitrust laws to guard the provision of equal access to the market to all participants, and consequently opportunities for development. The specificity of technology is different. Systems based on Artificial Intelligence and data sets feeding these systems are by their nature global in scope and the possibilities of limiting their impact are very limited.

Pope Francis further emphasizes in his message: “Nor can we fail to consider, in this context, the impact of new technologies on the workplace. Jobs that were once the sole domain of human labour are rapidly being taken over by industrial applications of artificial intelligence. Here too, there is the substantial risk of disproportionate benefit for the few at the price of the impoverishment of many” (Francis, 2024).

We can certainly extend the scope of this thesis to other sectors of the economy. But in the next sentence the Pope also provides an outline of the recipe: “Respect for the dignity of labourers and the importance of employment for the economic well-being of individuals, families, and societies, for job security and just wages, ought to be a high priority for the international community as these forms of technology penetrate more deeply into our workplaces” (Francis, 2024).

It should therefore be noted that these basic postulates, which are always raised as an inalienable human right in every time of social unrest, must be reminded today. Such a direction, resulting from natural law, will always be based on the principles of the common good and social justice. The introduction of these principles and an attempt to take steps in accordance with them, even on a local scale, may bring the opposite effect to that described earlier and balance the opportunities. Undoubtedly, the development of technology can also bring great hopes to countries struggling with the economic crisis. However, the improvement of the quality of life and work can only occur there if the owners of this great technical capital, in accordance with the value of solidarity and the principle of the common good, promote technological exchange and introduce new jobs to those markets focused on cooperation with systems, thus balancing the jobs that have been lost and providing the opportunity to raise the local economy to a higher level of development. Pope Francis emphasizes the fact that Artificial Intelligence can and should serve human development: “Artificial intelligence will become increasingly important. The challenges it poses are technical, but also anthropological, educational, social and political. It promises, for instance, liberation from drudgery, more efficient manufacturing, easier transport and more ready markets, as well as a revolution in processes of accumulating, organizing and confirming data. We need to be aware of the rapid transformations now taking place and to manage them in ways that safeguard fundamental human rights and respect the institutions and laws that promote

integral human development. Artificial intelligence ought to serve our best human potential and our highest aspirations, not compete with them” (Francis, 2024).

Awareness of changes, their management at all levels of society, protection of human rights and promotion of its development are important factors that, taken into account, can ensure that the scenario of the future economic and social reality does not have to be catastrophic. An important aspect of this attempt to look at the future is to establish the place and role of Artificial Intelligence in relation to man, who is the subject of work.

7. The supporting role of Artificial Intelligence and the issue of responsibility

Artificial Intelligence, as an increasingly developed field of computer science, has enormous possibilities in its specific narrow areas of activity. It is therefore a specialized tool in the hands of a human, which does not define its own purposeful actions, but processes input signals provided by a human, often in a very complicated and difficult to explain way, returning the result either in the form of voice information, text or a specific movement. Therefore, we can talk about the auxiliary role of Artificial Intelligence and the superior role of a human in the work process.

Observing new realities and following numerous media reports, we are dealing with a picture of a reality increasingly saturated with technology and dependent on it. For years, we have been able to follow the development of new technologies such as the Internet and their increasingly widespread use. This creates a situation in which people increasingly often rely uncritically on information, results, and opinions that the Internet provides them with. Enriching the capabilities of the Internet with the Artificial Intelligence systems available in it can certainly deepen this process. The results that can be obtained by querying one of the natural language processing systems are even more tailored to the user's expectations and to a large extent free him from the need to think and create the result himself. Experts point out that we are increasingly giving up voluntarily making decisions in favour of systems. When making decisions, humans undertake a number of thought processes based on a broad cultural, social, and moral context. Systems, on the other hand, make decisions based on heuristics that ignore these issues, only generating a result and reducing it to the optimization of the problem. This creates a situation in which people, instead of deepening their intellect and implementing moral norms, slowly abandon them (Moser et al., 2022).

Today we can already talk about a new type of Artificial Intelligence agency, which we encounter at every turn. Professor Kowalkiewicz gives the example of “algorithmic managers” who award jobs to drivers providing ridesharing services and take them away based on poor grades. He also refers to the numerous errors and absurdities that Artificial Intelligence leads

to. One such case was a system error that caused candidates to be rejected for studies in Great Britain, which sparked protests and demonstrations against this type of use of Artificial Intelligence. Kowalkiewicz emphasizes that this new type of agency, which is becoming a real issue, requires human intelligence, control, agency, and only then will it be able to properly serve society (Kucharczyk, 2024).

We are therefore dealing, on the one hand, with a phenomenon of transferring decision-making from humans to systems, while at the same time being aware of the great opportunities created by the introduction of Artificial Intelligence. It should be emphasized that the lack of independent thinking and transferring intellectual effort from humans to machines may set the direction of changes in human morality and intellect, assuming an increasing dependence of humans on the decisions of systems and a lack of considering their own decisions in the light of moral principles. This would lead to the "optimization" of decisions made on the basis of greater profitability, bypassing human ethics and morality. Therefore, taking responsibility for the work of systems must simultaneously assume, in a way, two-track, human decisions and human control over the system. This control is always associated with the human taking responsibility for using a tool such as Artificial Intelligence, as Pope Francis writes in his message: "Intelligent machines may perform the tasks assigned to them with ever greater efficiency, but the purpose and the meaning of their operations will continue to be determined or enabled by human beings possessed of their own universe of values. There is a risk that the criteria behind certain decisions will become less clear, responsibility for those decisions concealed, and producers enabled to evade their obligation to act for the benefit of the community. In some sense, this is favoured by the technocratic system, which allies the economy with technology and privileges the criterion of efficiency, tending to ignore anything unrelated to its immediate interests" (Francis, 2024).

So, each time, it is the human who assigns the purpose of the system's operation who is responsible for using the generated result of these actions. The Pope points to the problem of hiding responsibility and blurring the criteria behind a given result of the system's operation. In its extreme form, we can define this problem as the black box problem. It consists in the impossibility of reproducing the way in which the system arrived at the returned results. Often, for very advanced systems and tasks, it is not possible to present all levels of processing in a way that is understandable to humans, and as a result, humans are unable to verify the correctness of these results. In such cases, there is no certainty that the results are correct, while at the same time they are not verifiable. This situation means that the result of a human decision remains random in a sense. If it is empirically verifiable without posing a threat to people and property, the problem ceases to exist, but otherwise, human responsibility for a potential failure becomes even greater.

Another important element that should be taken into account when discussing responsibility for results is the issue of data quality. This data, often coming from questionable, poor quality and unverified sources, can often be simply incorrect, distorted and incomplete, as the Pope

also mentions: "In addition, the vast amount of data analysed by artificial intelligences is in itself no guarantee of impartiality. When algorithms extrapolate information, they always run the risk of distortion, replicating the injustices and prejudices of the environments where they originate. The faster and more complex they become, the more difficult it proves to understand why they produced a particular result" (Francis, 2024).

Bias and discrimination can be a particularly acute problem when it comes to poor quality data from Internet exploration. The situation is different in narrow expert systems supplied, for example, with a large pool of clinical images. Such systems for analysing, for example, radiological images can be of great help in the work of radiologists. Reflecting on the issue of responsibility, this is an excellent example, showing the lack of full possibility of replacing the discussed profession by systems. While the technical possibility of analysing and describing the clinical image is available to specialized expert systems, the responsibility for the results will always rest with the doctor. This also applies to other specialties, in which AI creates a great opportunity to improve the condition of health care and relieve doctors. Monitoring health status and providing information about possible diseases at a very early stage is one of the great opportunities to improve the standard of social life.

It should be noted that the auxiliary role of Artificial Intelligence in the world of human work can only be considered positively if the human assumes full responsibility for implementing decisions made by the system through its intelligent use and thorough verification of the data received. The auxiliary role therefore indicates the possibility of raising human work to a higher level, through faster implementation of goals, the ability to focus on creative tasks, while transferring repetitive and tedious work to computer systems. These systems are also difficult to overestimate in processing huge amounts of data that would not be possible to process by humans while simultaneously analysing data and optimizing problems defined by humans. This is one of those aspects of implementing Artificial Intelligence that gives hope for the social and economic development of those countries that want to support their citizens in a controlled and thoughtful way, through legislative actions and promoting ethical Artificial Intelligence.

Considering the situation of threat to some jobs described above, it should be emphasized: "it is social harm and a disturbance of order to take away from smaller and lower communities those tasks that they can fulfil and to transfer them to larger and higher communities" (Kompendium..., 2005). Taking away certain developmental tasks from employees and transferring them to systems placed above employees, in some cases may contribute to the occurrence of damage in the very structure of the enterprise. In accordance with the principle of subsidiarity, however, one can put forward a hypothesis: Where possible, Artificial Intelligence, supporting human work, without taking away the initiative from employees, without eliminating well-functioning organizational units in enterprises on the basis of reducing positions, will be able to raise human work to a higher level. Employees will be relieved, they will have time to expand their competences, while the enterprise will have in its care the

growing human potential, which translates into market and financial results. Reducing the structure and relying exclusively on Artificial Intelligence can reduce the value of such an enterprise and weaken its market position.

8. Conclusions

When facing the upcoming revolution in the labour market, one must be aware of the inevitable changes that will come sooner (according to researchers who emphasize the great impact of Artificial Intelligence on the labour market) or later (according to researchers who emphasize the high costs of implementing such systems). In addition to the psychological impact for individual employees who will lose their employment, the deepening of social inequality are further affecting the status quo. The rich and affluent, with great technological capital, will be able to flood poorer markets, gaining a monopoly on them. Such a threat can only be neutralised by the joint efforts of nations and international organisations at the level of wise and fair social and economic policy. Activities directly related to Artificial Intelligence, consisting in promoting and implementing the principle of subsidiaries of systems in the context of human work, will also be of great importance.

It should be remembered that Artificial Intelligence opens up enormous opportunities for people, and new technologies in the labour market, properly implemented, can positively transform this market. Transferring part of human activity from repetitive and tedious activities to creative activities or those related to human contact in the area of broadly understood services can bring great benefits and raise human work to a higher level. Learning to cooperate with systems, where possible, without taking away from what people can do themselves in a creative and effective way, seems to be the right direction for the auxiliary implementation of Artificial Intelligence.

An important and valuable direction of the development of Artificial Intelligence is therefore its wise and honest use. Only knowledge of what Artificial Intelligence is, how it works, where it is used and what distinguishes our thinking and perception of the world from that which Artificial Intelligence can process from Data can lead to a stage in which participants in the labour market will use Artificial Intelligence with full responsibility and awareness. It is this sense of responsibility, seeing the long-term goal and being guided by conscience that gives humanity a higher position in which they can fulfil their calling in a creative and unrestrained way and use advanced tools, the fruit of their work, which is Artificial Intelligence, to build a more humane world.

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ORGANISATIONAL INEFFICIENCIES IN FINANCIAL CONSUMER PROTECTION. THE AFORTI HOLDING EXPERIENCE

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Purpose: The aim of the research is to determine whether it is possible to predict significant threats to financial consumers (such as financial pyramids, misselling, etc.) in advance, and if state institutions use this knowledge to take effective action. Additionally, the publication assesses the legal regulations and organizational structures in terms of their effectiveness in protecting consumer savings.

Design/methodology/approach: Basing on press and research papers, company announcements, financial reports, legal acts and state institutions statements, a case study was conducted on the Aforti Holding group regarding the company's activities, cash flows, changes in balance sheet structure, institutional actions, and the current situation of financial consumers.

Findings: It was possible to predict the risk of financial consumers losing their funds in advance, but despite the actions of several institutions, the phenomenon was not stopped. Affected consumers will probably lose most of invested funds.

Research limitations/implications: Further research is essential to enhance the organization and efficacy of consumer protection institutions within the financial market. Some data published by Aforti has not been audited, which could impact its reliability.

Practical implications: Institutions responsible for consumer protection can use this analysis to enhance the effectiveness of their actions, especially in terms of communication with consumers.

Social implications: Research conclusions can increase the focus of state institutions on the financial consumer and lead to more effective financial education for consumers.

Originality/value: Analysis of the effectiveness of financial consumer protection in light of newest events in the financial market. The conclusions from the research may serve as a basis for determining the direction of necessary changes in consumer protection.

Keywords: financial market, financial consumer protection, misselling, financial pyramid, Aforti Holding.

Category of the paper: research paper, case study.

1. Introduction

As the economy, including the financial market, continues to grow, the range of financial services offered to consumers is constantly expanding, along with the increasing complexity of financial products. Most consumers are interested in investing their savings, typically focusing on the safety of the offer and the interest rates being offered to them.

In a situation of low interest rates and high inflation, as observed in Poland in recent years, the potential returns have often become a priority for consumers. As a result, various offers appear on the market, some of which are contrary to the consumer's needs, typically characterized by above-average risk, and sometimes even bearing signs of crime.

Consumer safety in the financial services market should be guaranteed by the state, including a range of institutions established for this purpose. Unfortunately, a broad group of consumers periodically loses their life savings, often as a result of activities by lesser-known para-banking institutions, and sometimes even due to unethical banking offer. In recent years, some of the most well-known Polish examples include the Amber Gold scandal (financial pyramid) and the misselling of GetBack bonds (in banking sector).

The purpose of the following is to determinate the effectiveness of consumer protection against such phenomena, as well as highlighting any potentially failures in these mechanisms. The research was conducted basing on a case study of Aforti Holding S.A., and the tested research hypotheses pertain to the ability to predict undesirable phenomena, the reaction of state institutions to incoming information, and the effectiveness of the actions taken.

It should be emphasized that the Aforti scandal is the latest phenomenon in the e-consumer market and involves a significant number of consumers, which allows for a thorough assessment of the current condition of the consumer protection system.

2. Literature review

There is a significant imbalance of power and resources in the financial services market, and the consumer of these services is undoubtedly the weaker party. In particular, the consumer faces a knowledge deficit, both regarding the structure of financial products and the associated risks. For these reasons alone, institutional protection of consumers in the financial market is necessary. Moreover, such protection has a positive impact on the financial market and promotes economic growth (Frączek, Mitręga-Niestrój, 2015). It should also be emphasized that consumer protection, including for financial services, is a constitutional obligation of state authorities (Horosz, 2022).

Consumer safety in the financial services market in Poland is overseen by several institutions, including specialized ones such as the Financial Supervision Authority (KNF), the Office of Competition and Consumer Protection (UOKiK), and the Financial Ombudsman (RF). The Financial Supervision Authority exercises integrated oversight of the entire financial market, including granting licenses, conducting inspections and imposing penalties, issuing public warnings, and providing recommendations. The actions of this body are aimed at the entire financial market. The Office of Competition and Consumer Protection combats practices that violate the collective interests of consumers and unfair contracts through its decisions. The Financial Ombudsman, in turn, engages in both generalized pro-consumer activities and intervenes in individual cases (Kiciński, 2022). Additionally, one of the main institutions is the Bank Guarantee Fund (BFG), which focuses on the banking market, particularly bank deposits (Czechowska, 2017). Actions of the aforementioned institutions in the area of consumer protection for banking services are also described, indicating that some mechanisms are also applied to para-banking institutions (Pisarewicz, Kowalewska, 2017).

Financial consumers are exposed to many risks, including the most severe – loss of their funds, which can result from misselling or financial fraud. Misselling involves offering financial services to consumers that basing on the information available to the entrepreneur about the consumer's knowledge and requirements do not meet their needs. A well-known case is GetBack bonds offered by banks to consumers, often presented as a product even safer than a bank deposit. GetBack's stocks were suspended, the company is undergoing restructuring, and approximately 9000 consumers were harmed (Czaplicki, 2021).

One of the more distinctive methods of organized fund acquisition from consumers are the financial pyramid and Ponzi scheme. The main difference between these structures lies in how new investors are recruited: in a financial pyramid, the structure is multi-level (participants can create their own sales networks), whereas in a Ponzi scheme, the sales are entirely conducted by a single entity (Lesiak, 2023). In the literature, there is also an opinion that both terms can be used interchangeably, focusing only on the complexity of the sales structure. Such schemes offer investments promising high returns. However, in reality, the payouts of capital and interest are made using only funds obtained from new investors (Bojarski, 2020). For the purposes of this publication for simplicity the term “financial pyramid” will be used.

One of the most notorious financial frauds of this kind in recent years was Bernie Madoff's hedge fund, which raised about \$65 billion from investors, including institutional ones (Quisenberry, 2017). In Poland, the most famous case is the Amber Gold scandal, where the company offered consumers high-interest deposits, allegedly earned through trading precious metals. Despite actions taken by various state institutions (including KNF and UOKiK), the entity continued to sell its products until it lost liquidity and declared bankruptcy. The remaining assets of the company were insufficient to satisfy consumers, even at the nominal value of the funds entrusted (Antonowicz, Szarmach, 2013). In literature, it is also noted that an adequate level of financial education for consumers would have reduced the losses

incurred by consumers in the case of Amber Gold, as the offered interest rate was already suspicious (Kurowski, Laskowska, 2016).

3. Research methodology

The conducted research aims to determine how far in advance it is possible to foresee the risk of financial loss for a significant number of consumers, and if so, whether state institutions responded to the warning signals. Another objective is to assess whether these actions provided actual protection for consumers, and to evaluate whether the existing organizational and legal frameworks effectively safeguard consumers from losing their funds.

The research based on a case study of Aforti Holding S.A. (described in the press as a financial pyramid). Using publications, particularly press articles, announcements from state institutions, and statements issued by the company itself, a detailed history of actions taken by both the company and financial market institutions was established.

Based on the annual and quarterly consolidated financial statements of the company, the financial flows and changes in the balance sheet structure were analyzed. Furthermore, using the company's announcements, documents available from bankruptcy and restructuring proceedings and legal acts possibility of consumers recovering the funds entrusted to the company was assessed.

The following research hypotheses were presented:

- it was possible to predict in advance payment issues affecting financial (hypothesis 1),
- state institutions obtained such information and took actions aimed at protecting consumers (hypothesis 2),
- actions taken by state institutions protected financial consumers from losing their savings (hypothesis 3).

4. Results – case study

4.1. Timeline of events

Aforti Holding S.A. debuted on the Warsaw Stock Exchange (WSE) in 2011 (as Montu), initially offering business intelligence services and then transforming into a group of companies providing various financial services. The company engaged in active marketing, including sponsoring sports clubs, and offered a variety of investment products to financial consumers (Misiura, 2024b). In 2018 Aforti Holding S.A. was the subject of scientific research, but only

in terms of the impact of management methods on the financial efficiency of the enterprise (Rostek, Młodzianowski, 2018).

Aforti's actions in offering investments products to financial consumers persisted at least since 2019 (Provincial Prosecutor's Office, 2024). Aforti presented its products, particularly promissory notes, as risk-free and with guaranteed returns (Decision nr RWR 6/2023, 2023). These investment products were marketed in a way that misrepresented their true nature to consumers (Rutkowska-Tomaszewska, Zwaliński, 2023). The products were sold by former bankers, leading consumers to perceive them as bank offers. Following the commencement of proceedings by the Office of Competition and Consumer Protection, promissory notes were withdrawn from the offer and replaced by other products, including debt conversion based on promissory notes. The company also offered consumers shares in its subsidiaries (Misiura, 2024b).

Aforti's various products were offered to around 3,000 consumers, initially promising returns of 6% annually, later increasing to 14-17% (Czuchnowski, 2023). The total funds acquired by Aforti and its subsidiaries from consumers range from approximately 280 million PLN (Misiura, 2024b) to even half a billion PLN (Czuchnowski, 2023), depending on the source and methodology used. Issues with fulfilling the company's obligations to consumers began in mid-2022, and payments ceased at the beginning of 2023. It should be noted that during this period, new investment products were still actively offered to consumers (Misiura, 2024b).

The Polish Audit Oversight Agency (PANA) filed a notice at the beginning of 2022 regarding a potential crime by Aforti, indicating possible signs of a financial pyramid (Kucharczyk, 2023). In addition, the auditor raised reservations in case of consolidated annual report for 2021, particularly regarding the valuation of short-term and long-term investments (Report, 2022). A year later, the company was unable to find an entity to approve the consolidated annual report for 2022, so the report was not submitted (Misiura, 2024b). Due to the failure to submit the consolidated annual report for 2022, the Warsaw Stock Exchange Management Board suspended trading of Aforti Holding S.A. shares on June 1, 2023 (Resolution WSE, 2023), and maintained the suspension for the same reasons on June 3, 2024 (Resolution WSE, 2024).

Aforti Finance, a subsidiary of Aforti Holding, was added to the Financial Supervision Authority warning list in July 2023 (RB ESPI 12/2023, 2023). The President of the Office of Competition and Consumer Protection initiated proceedings on December 10, 2020, regarding the offering of promissory notes to consumers in a manner inconsistent with their function and providing false information about the safety of invested funds and guaranteed returns. On August 4, 2023, a fine of 790,234 PLN was imposed on Aforti Holding S.A. (Decision nr RWR 6/2023, 2023). The Provincial Prosecutor's Office in Warsaw initiated an investigation in 2023 into fraud related to valuable property concerning Aforti's investment products. The Financial Supervision Authority imposed financial penalties on a member of Aforti

Holding's management in 2023 and 2024 for failing to report the sale of his shares despite the obligation to do so (KNFa, KNFb).

On December 13, 2023, a bankruptcy petition for Aforti Holding S.A. was registered, and proceedings began on May 16, 2024 (KRZa). On June 14, 2024, Aforti Holding S.A. submitted a restructuring plan (KRZb). On September 14, the proposed arrangement was approved by 67% of creditors, meeting the required 2/3 majority (ESPI 17/2024, 2024). The voting process was surrounded by controversies, particularly due to the invalidation of 81 votes (11.4%), which could have influenced the outcome. According to the plan, repayments will be quarterly, with the first payment in two years amounting to 1% of the claims, and subsequent payments increasing to 2% and so on, up to 24% (Misiura, 2024a).

4.2. Analysis of financial statements for the years 2018-2023

A range of information about Aforti Holding's activities can also be obtained basing on the analysis of consolidated financial statements. The company published annual financial statements (approved by the auditor) only up to 2021. Therefore, data for 2022 and 2023 were obtained from quarterly reports, whereas the 2021 report had reservations (thus, its reliability may be also limited). Selected data, particularly relevant to the research subject, are presented in Table 1.

Table 1.

Selected financial data of Aforti Holdings S.A. capital group in years 2018-2023 (in million PLN)

year	net revenues from sales	profit (loss) on sales	total assets	own shares (stocks)	assets without own shares	total liabilities	long-term liabilities	net profit (loss)
2018	572,01	- 4,58	155,05	0	155,05	148,02	57,53	0,32
2019	1036,53	- 27,4	210,07	20,58	189,49	164,85	93,48	0,24
2020	1010,42	- 21,27	283,31	36,36	246,95	239,7	131,02	3,67
2021	2219,68	- 21,6	194,88	66,42	128,46	249,22	119,57	- 64,74
2022	2794,49	- 16,03	181,26	66,42	114,84	275,65	189,72	- 33,57
2023	1759,19	- 10,38	154,88	66,42	88,46	300,04	219,49	- 21,97

Total liabilities: Liabilities and provisions for liabilities.

Source: own work basing on consolidated annual reports of the Aforti Capital Group for the years 2018-2021 and quarterly reports of the Aforti Capital Group for Q4 2022 and Q4 2023.

The group's exceptionally high sales revenue is certainly striking, amounting to over half a billion PLN in 2018, and nearly 3 billion PLN at its peak in 2022. Media reports suggest that such high revenue was a result of the accounting practices of Aforti's online currency exchange operations, with the total value of sold currencies being fully considered as revenue. Although this practice complies with legal regulations, it could have misled consumers (Misiura, 2024b). This thesis is supported by the group's sales profit, which appears to be only marginally influenced by the volume of sales. The change of this values is presented in Figure 1.

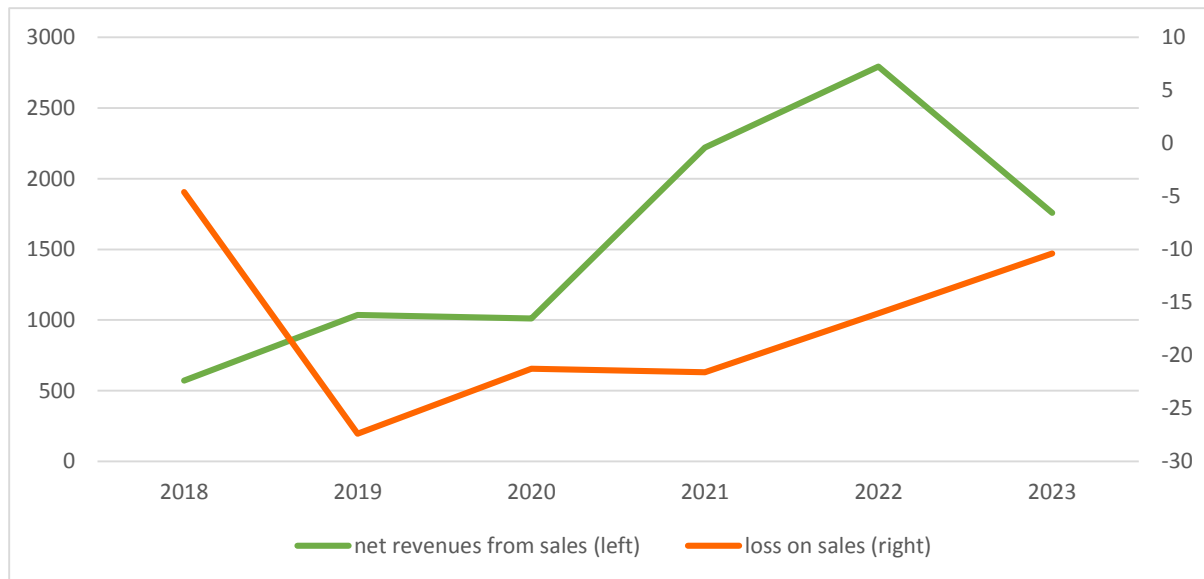


Figure 1. Aforti Holding S.A. capital group net revenues from sales and loss on sales in years 2018-2023 (in million PLN).

Source: own work basing on consolidated annual reports of the Aforti Capital Group for the years 2018-2021 and quarterly reports of the Aforti Capital Group for Q4 2022 and Q4 2023.

Equally striking is the increase in Aforti Group's total debt and the rise in long-term debt, particularly based on promissory notes and loans (to which most of the promissory note debt was converted). It should be emphasized that during the observed period, the share of long-term debt (mostly arising from the sale of the aforementioned financial instruments) systematically increased from just under 39% in 2018 to over 73% in 2023. The ratio of these values is shown in Figure 2.

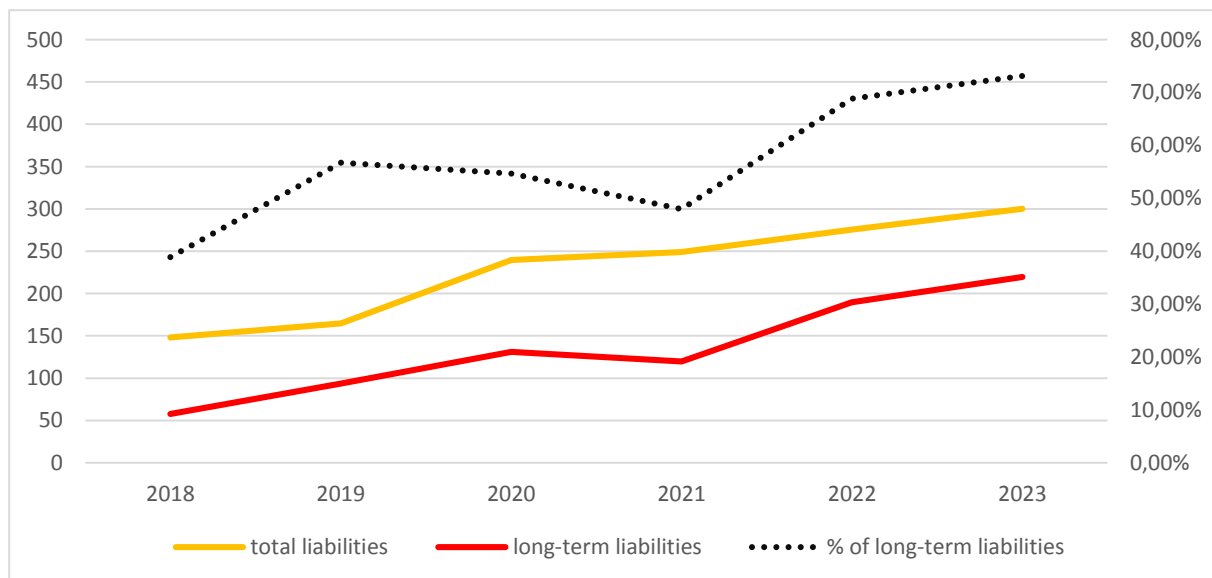


Figure 2. Aforti Holding S.A. capital group structure of liabilities in years 2018-2023 (in million PLN).

Source: own work basing on consolidated annual reports of the Aforti Capital Group for the years 2018-2021 and quarterly reports of the Aforti Capital Group for Q4 2022 and Q4 2023.

Until 2020, the total value of Aforti Holding S.A.'s assets was also increasing, with a notable and successive rise in the value of own shares in the assets (reaching nearly 43% in 2023). Considering the current situation of the company (bankruptcy filing, restructuring approval request, suspension of stocks trading), it can be assumed that this position does not reflect the reported value. Therefore, the value of assets excluding own shares has been calculated. The comparison of these values is presented in Figure 3.

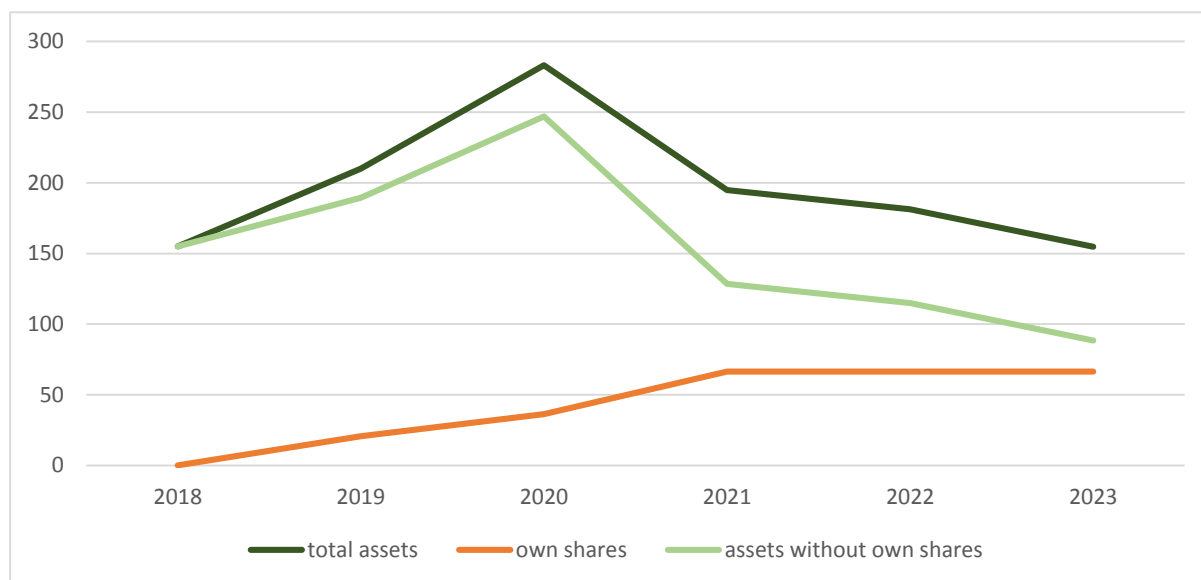


Figure 3. Aforti Holding S.A. total assets and own shares in years 2018-2023 (in million PLN).

Source: own work basing on consolidated annual reports of the Aforti Capital Group for the years 2018-2021 and quarterly reports of the Aforti Capital Group for Q4 2022 and Q4 2023.

As indicated above, the company's debt steadily increased throughout the analyzed period, with asset values rising until 2020 and then falling back to 2018 levels. The difference between assets excluding own shares and total debt from 2018-2020 was slightly above zero (7.03 million PLN, 24.64 million PLN, and 7.25 million PLN, respectively), but in later years, these values significantly dropped below zero (minus 120.76 million PLN, minus 160.81 million PLN and minus 211.58 million PLN). These values are shown in Figure 4.

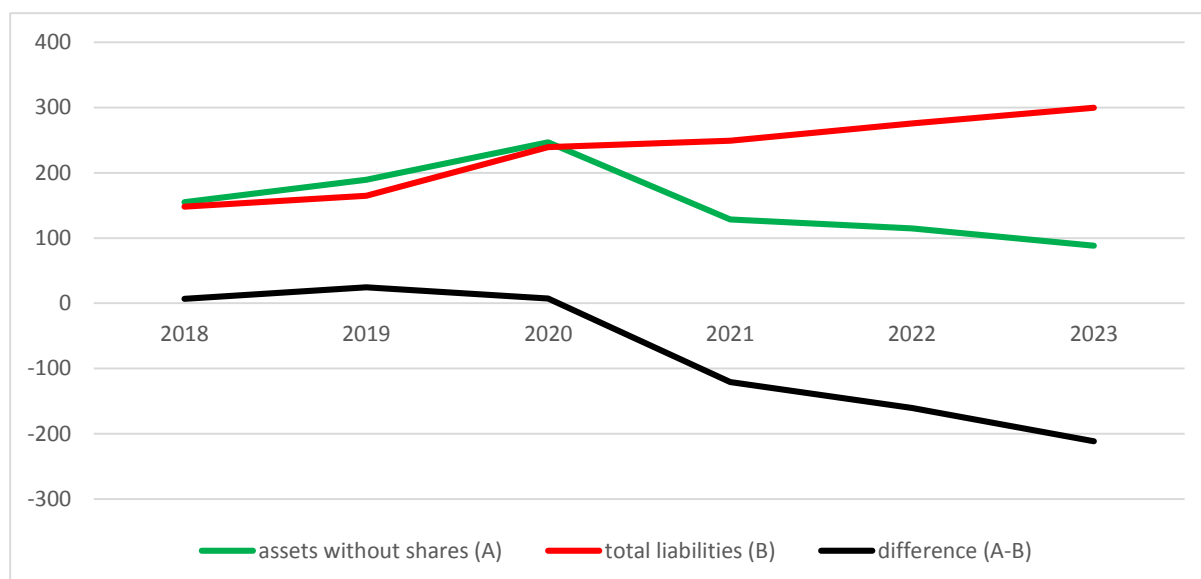


Figure 4. Aforti Holding S.A. assets without shares versus total liabilities in years 2018-2023 (in million PLN)

Source: own work basing on consolidated annual reports of the Aforti Capital Group for the years 2018-2021 and quarterly reports of the Aforti Capital Group for Q4 2022 and Q4 2023.

It's worth noting that during the analyzed period, the company initially achieved very modest profits (the highest being 3.67 million PLN), but from 2021 onwards began recording losses reaching tens of millions. At least since 2021, the company has not been able to meet all of its obligations (the value of which continued to increase), and by 2023, the total liabilities exceeded the value of its reported assets, which theoretically could have been used to satisfy creditors, more than threefold.

4.3. The situation of consumers in context of restructuring and bankruptcy

As indicated above, a bankruptcy petition was filed against Aforti, and then a restructuring petition was filed. When there are pending bankruptcy and restructuring requests, the restructuring request takes precedence. Therefore, if a restructuring request is submitted (even if it is after the bankruptcy filing), the restructuring request will be addressed first, and the bankruptcy request will be put on hold during that time (Machowska, 2017). This regulation makes the company's intent to initiate restructuring proceedings clear.

The conclusion of a restructuring arrangement is effective against all debts covered by it, even if they are not listed in the debt register. The only exception to this rule are debts not disclosed by the debtor, provided that creditors were unaware of the restructuring proceedings. Acceptance of the arrangement prevents the enforcement of existing debts (Groele, 2020). Consequently, the potential approval of the restructuring arrangement would significantly limit the ability of consumers who purchased Aforti products to recover even part of their funds. Even hypothetically, executing the arrangement would expose consumers to losses, as they would receive only the nominal amount of their funds over many years.

It is also possible that Aforti's restructuring will not be approved by the court. In such a situation, the declaration of bankruptcy is expected. The declaration of bankruptcy suspends legal proceedings against the bankrupt, and the court can only hear the case after the bankruptcy procedure is exhausted. It is also not possible to initiate new legal proceedings for claims subject to bankruptcy proceedings (Chrapoński, 2021). After the sale of the bankrupt's assets, the proceeds are distributed according to a specified order, with contractual claims (including those from Aforti's financial instruments) being satisfied only after, for example, employee wages (Janda, 2023). Therefore, in the case of bankruptcy consumers can expect to recover only a small portion of their invested funds.

Even if hypothetically neither the restructuring is approved nor the bankruptcy declared, it is highly unlikely that consumers of Aforti's investment products will recover their funds, at least in their nominal value. Given the company's current financial situation, it is far more probable that they will receive only a very small portion of the entrusted capital.

5. Discussion

The analysis of the financial statements of Aforti Holding S.A. highlights the use of accounting methods that allowed the company to report significant sales revenues. However, the systematic increase in these revenues did not correlate with the profit from sales or the overall profit of the group. These discrepancies were observable from the beginning of Aforti's involvement in offering investment products to consumers. It was also noted by professionals but was not apparent to the average consumer. It can be assumed that this was the first warning signal.

The company has been systematically increasing the position of its own shares since 2019, and the assets minus own shares only slightly exceeded liabilities until 2020, but starting from 2021, they achieved significantly lower values (the difference already exceeded 100 million PLN gap in 2021). From 2021, not only did the value of assets minus own shares decrease, but the value of total assets also declined. The company's debt structure was also systematically changing, with the share of long-term liabilities (especially from loans and promissory notes – products offered to consumers) increasing from less than 40% to over 70% during the studied period. Changes in the asset structure can be considered a second warning signal.

The perturbations associated with the publication of subsequent financial statements are also significant. The annual financial statement for 2021 was published with reservations from the auditor, while the annual financial statements for 2022 and 2023 were never published by the company. Notably, at the beginning of 2022, the PANA notified the prosecutor's office of a potential financial pyramid scheme. Notifications were also sent to institutions such as the Office of Competition and Consumer Protection (UOKiK). The issues related to the financial

statements were a strong enough warning for state institutions to take their initial actions basing on them.

The conducted case study indicates that it was possible to observe warning signals and foresee, with noticeable advance, the problems related to the activities of Aforti Holding S.A., specifically the risk of the company's inability to meet its obligations towards financial consumers. Hence, Hypothesis 1 should be considered positively verified. It should be emphasized that identifying this phenomenon was possible for professional entities, but not for average consumers.

The notification of a potential crime resulted in the initiation of an investigation by the Provincial Prosecutor's Office in Warsaw. At the end of 2020, the President of the Office of Competition and Consumer Protection initiated proceedings (which led to an apparent change in Aforti's offer in 2021), and in August 2023, imposed a fine on Aforti Holding S.A. due to identified defectiveness. In 2023, the Financial Supervision Authority included a subsidiary of Aforti Holding S.A. on the public warning list and imposed fines on a member of Aforti Holding's management in 2023 and 2024 for irregularities in the sale of his shares in 2021. In June 2023, the WSE Management Board decided to suspend trading of Aforti shares. Clearly, information about the irregularities reached state institutions, and appropriate proceedings were initiated. Therefore, Hypothesis 2 should also be considered positively verified.

Unfortunately, despite the fact that the first warning signs at Aforti could be noticed a few years ago, the company continued to intensively acquire funds from consumers. Moreover, the initiated proceedings at best resulted in an apparent remediation of the situation (e.g. withdrawing promissory notes from the offer and replacing them with other instruments). Even with the involvement of all institutions and the suspension of Aforti's stocks trading, the company continued to offer its products to consumers. It is therefore reasonable to ask why, despite the available information and actions taken, significant amounts of funds were still being acquired from consumers, and why clear information about the actual risk did not reach consumers.

The legal consequences of current situation are poor for consumers who have purchased Aforti's investment products. Even if restructuring is adopted, in the best case, it will result in the return of funds at their nominal value over many years. In the worst-case scenario, it will merely delay the declaration of bankruptcy. The company's bankruptcy will also be a lengthy process, during which consumers will recover at most a small portion of the entrusted funds.

The facts described above indicate that the existing legal and organizational solutions neither protected a significant number of consumers from purchasing Aforti's investment products nor provide them with a real possibility of recovering their invested funds. Therefore, Hypothesis 3 should be considered negatively verified.

However it should be noted that there are some limitations of conducted research, particularly due to the nature of the research material. Firstly, the financial statements of Aforti for the period 2021-2023 are either subject to auditor's reservations or have not been audited at all, thus the data provided by the company may be unreliable. Secondly, due to the freshness of the topic, a significant part of the events concerning Aforti has been established based on non-peer-reviewed press publications. Finally, the preparatory criminal proceedings concerning irregularities are still ongoing and their final conclusions are unknown.

6. Conclusions

The Aforti case represents the latest event in the consumer financial market, enabling the analysis of the current level of consumer protection against the risk of losing their savings (invested funds), as well as the current nature of such offers addressed to consumers.

Due to the economic situation, particularly high inflation and low interest rates on banking products, Aforti's offer attracted considerable interest from consumers seeking investment opportunities with more favorable terms than those offered by bank deposits. Without delving into whether Aforti's activities constitute a crime (a relevant investigation is underway), there were at least a few clear signals indicating significant risks associated with these products, including suspicions of a financial pyramid scheme.

Despite the fact that state institutions took action in response to these signals, subsequent consumers were not protected from losing their funds. Moreover, it seems likely that in the event of Aforti Holding S.A.'s restructuring or bankruptcy, the affected consumers will recover at most a small portion of their savings, and this in an uncertain future. Thus, despite the activation of mechanisms developed in the wake of previous scandals, effective protection for consumers was not ensured.

It is evident that a range of changes is needed in consumer protection within the financial market, both in terms of legal regulations that form the basis for state institutions' actions and the way these institutions operate. The actions they take should result in providing consumers a real protection. The research results and their conclusions will be particularly useful for consumer protection institutions in the financial market, benefiting both supervisory entities and consumer-focused organizations. The results could be also valuable for further studies in field of financial consumer education.

Further research is also essential to better understand the mechanisms of operation of para-banking institutions, which would allow for quicker identification of such entities in the future, as well as understand the decision-making processes of consumers. This could enable the implementation of effective preventive measures, including consumer education that empowers them to independently assess such entities.

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POSSIBILITIES OF APPLICATION OF LM METHODS AND TOOLS IN THE CONSTRUCTION INDUSTRY – LEAN CONSTRUCTION – THEORETICAL CONSIDERATION

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Purpose: The study aims to present the possibilities of using the methods and tools of the LM concept in the construction industry. The potential impact of the LM solutions used on the implementation of the construction process was determined in terms of improving the organization and safety of work, workflow (employees, materials, information), timeliness of work performed, and employee involvement. Attention was paid to the possibility of eliminating or limiting activities that do not add value to the construction process, which is the main goal of both Lean Manufacturing and the Lean Construction approach.

Design/methodology/approach: Based on the analysis of literature related to the researched topic, LM methods and tools were identified, the implementation and use of which in construction may translate into improved implementation of the construction process in its various aspects.

Findings: Based on the analysis, it was found that the methods and tools of the LM concept can be used in the construction industry. The eight LM solutions most frequently mentioned in the literature, which can improve the functioning of the construction process and eliminate losses, were analyzed. The selection and use of a given tool will depend on the problems occurring in the construction project, as well as on the awareness of the work organizers/managers about the possible benefits that these solutions can bring to construction workers and all project stakeholders. Attention should also be paid to barriers that may hinder the use of lean practices in construction processes, including resistance to change, non-compliance with applicable standards, lack of awareness, lack of commitment of employees and people supervising the process, and lack of communication.

Originality/value: The article attempts to determine the potential impact of LM methods and tools on improving the construction process. The use of LM solutions in construction may indicate the direction of improvement activities for supervisors and organizers of work on the construction site.

Keywords: Lean Manufacturing tools, Lean Construction, construction industry.

Category of the paper: literature review.

1. Introduction

The Lean Manufacturing concept (LM) was based on the Toyota Production System, developed by T. Ohno and S. Shingo in the 1950s (Pavanskar et al., 2003; Ohno, 1998). The system has developed methods, tools and techniques that improve production processes by eliminating activities that do not add value, known as losses (jap. muda). The LM concept has gained traction worldwide with principles focusing on loss reduction, continuous improvement, and increased efficiency (Olu-Lawal et al., 2024). It has been used by companies in various industries for many years (Utami et al., 2023), bringing many benefits, including eliminating errors, reducing inventories and costs, reducing Lead Time, improving productivity, quality and work safety, and changing the work culture (Melton, 2005; Gupta, Jain, 2013; Al-Qayoudhi, 2022; Oleksiak et al., 2023).

LM solutions are also used in the construction industry. Based on the model used in the automotive industry, in 1992 L. Koskela introduced the Lean Construction approach to the construction industry (Koskela, 1992). He stated that the construction industry should adopt a new production philosophy that will improve competitiveness by identifying and eliminating activities that do not add value to the process. Lean Construction (LC) involves designing a production system to minimize losses of materials, time and effort to generate maximum value for the final product (Koskela, 1992). As the construction industry struggles with low productivity rates, inefficient work practices, high costs, on-time performance, and low safety levels (Demirkesen, 2022; Bajjou, Chafi et al., 2020; Bajjou et al., 2017a) the use of LM solutions may reduce existing losses and improve flow.

The study aims to present the possibilities of using the methods and tools of the LM concept in the construction industry. The impact of the most frequently used LM solutions on the implementation of the construction process was determined in terms of improving work organization and safety, workflow (employees, materials, information), timeliness of work, and employee involvement. At the same time, attention was paid to the possibility of eliminating or limiting activities that do not add value to the construction process, which is the main goal of both Lean Manufacturing and the Lean Construction approach.

2. Lean Manufacturing concept

The concept of "lean" was first used in 1988 by J. Krafcik in the article "Triumph of the Lean Production System" (Krafcik, 1988). In 1990, scientists from the Massachusetts Institute of Technology (J. Womack, D. Jones, D. Roos) published the book "The Machine That Changed the World", giving the concept of "lean" a special meaning. The book was the first to

present Japanese production methods compared to traditional mass production systems and highlighted the excellent results of Toyota Motor Corporation with the implemented management system - TPS. After years of observations, the authors concluded that TPS was the first working lean production system, called Lean Manufacturing (Womack et al., 1990). Production in this system is called lean because it uses fewer resources compared to mass production in half the time. Its main goal is to eliminate activities that do not add value to processes, defined as losses, which include (Ohno, 1998; Melton, 2005; Bicheno, Holweg, 2016; Furman, Małysa, 2021; Al Bashar, Taher, 2024): overproduction, excessive inventory, over-processing, waiting, unnecessary motion, unnecessary transportation, defects, and unused employee creativity. By continuously identifying and eliminating losses and focusing on activities that create value, one strives to obtain an excellent value stream (Thangarajoo, Smith, 2015), which has been defined as the principles of Lean Thinking (Figure 1) (Womack, Jones, 1996).

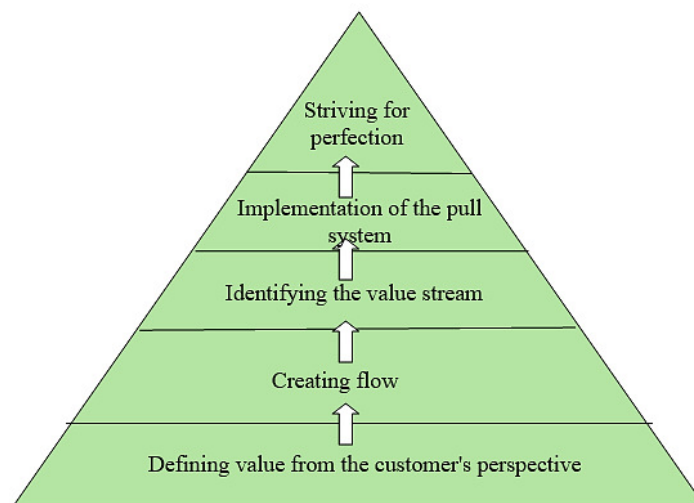


Figure 1. Lean Thinking principles.

Source: Own elaboration based on (Womack, Jones, 1996).

The practice of LM is considered to be one of the most effective methods used by manufacturers worldwide to improve their competitiveness. By emphasizing continuous improvement and eliminating waste, one seeks to maximize performance in terms of productivity, quality, turnaround time, cost, and customer satisfaction (Al-Qayoudhi, 2022). Enterprises can achieve this by using LM methods and tools tailored to their needs. The most frequently used solutions include (Al-Qayoudhi, 2022; Furman, Małysa, 2023; Al Bashar, Taher, 2024; Pawlak, 2024; Wolniak, 2024): the 5S method, Visual Management (VM), Standardization, Value Stream Mapping (VSM), Just in Time (JiT), Poka-Yoke, SMED, TPM, Kaizen, and quality management tools for solving problems (e.g. Ishikawa diagram, 5Why analysis, PDCA).

3. Lean Construction approach

Since the mid-1990s, Lean Construction has emerged as a new concept in the discipline of construction management and the practical sphere of construction. There are two interpretations of LC: one talks about the application of lean production methods in construction, and the other - sees lean production as a theoretical inspiration for the formulation of a new theory, based on construction methodology, called Lean Construction (Koskela et al., 2002).

L. Koskela began implementing the Lean approach in the construction sector, which resulted in his work "Application of a new production philosophy in construction" (Koskela, 1992). In this work, he argued that production should be improved by eliminating material flows and that conversion activities would improve its efficiency. The theoretical foundations of Lean Construction proposed by Koskela assume the perception of production in construction as a process of transformation, flow and value generator (the T-F-V theory), therefore the goal of LC is to create production systems that allow for the optimization and elimination/reduction of flows to improve delivery times. In this sense, LC is a new way of thinking in construction project management, aiming to reduce sources of loss and generate maximum value for the client using the least amount of resources (Bajjou et al., 2017; Ahmed et al., 2021; Garces, Pena, 2022).

In 1997, G. Ballard and G. Howell created the Lean Construction Institute to develop and disseminate new knowledge in the field of construction project management, and TPS principles began to be applied in the industry, adapting them to construction (Demirkesen, 2021). There are eight categories of losses in LC, presented in Table 1. It is believed that ignoring these losses is the main cause of problems related to cost overruns and delays in the construction industry (Bajjou et al., 2017), and may also negatively impact on safety and work organization.

The theory of Lean Construction is based on five main principles (Howel, 1999; Bajjou, Chafi, 2020):

1. Identification of value from the client's perspective.
2. Mapping the value stream - determining how value is created, when it is delivered, and where improvements need to be made; process mapping is a key tool because it allows for a better understanding of the process and the detection of waste, enabling decisions on improvements to be made.
3. Ensuring the uninterrupted flow of value - the main goal is to achieve continuous flow by reducing unnecessary movement, defects, queues, and waiting.
4. Applying the pull system in the process - necessary materials or information must be delivered to the next customer (the next stage in the supply chain) as quickly as needed.
5. Striving for perfection - continuously improving the process by eliminating losses and increasing transparency on construction sites.

Table 1.
Categories of losses in construction

Type of losses	Loss characteristics
Overproduction	Overproduction requires more materials, employees, and equipment than necessary to meet customer requirements, resulting in an increased amount of production.
Unnecessary transportation	The inefficient workflow includes work-in-progress, finished products, or parts being moved over significant distances between workstations.
Unnecessary motion	Any unnecessary movement performed by employees during their daily work (e.g., walking, searching, arranging tools, parts).
Excessive inventory	Excess at any stage of the workflow (work-in-progress, raw materials, finished products) results in excessive storage and transportation costs.
Waiting	The result of waiting is the inability to immediately perform a task due to shortages (of labor, materials, information, equipment) or due to downtime, delays, and bottlenecks.
Defects	Inspection, production, repair, replacement, or disposal of defective products or parts means a loss of time and costs and directly impacts the efficiency of the construction process.
Over-processing	Inefficient processing leads to shortages while over-processing leads to unnecessarily high quality; both are considered losses.
Unused employee creativity	Underutilization of employees' potential, loss of skills, ideas, and improvement opportunities constitute a major source of losses for construction companies.

Source: Bajjou et al., 2020; Demirkesen, 2021.

The most frequently used tools within Lean Construction include: Last Planner System (Ballard, 2000), Building Information Modeling (Garces, Pena, 2022) and Prefabrication (Bajjou et al., 2017), as well as solutions taken from the Toyota Production System, i.e.: 5S method, Visual Management (VM), Value Stream Mapping (VSM), Poka-Yoke, Just in Time (JiT), Gemba Walk, Daily Meetings, Root Cause Analysis (5Why analysis, Ishikawa diagram) (Bajjou et al., 2017, 2017a, 2017b; Abdelkhalek et al., 2019; Ahmed et al., 2021; Demirkesen, 2021; Yazan, 2022; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024)

It is believed (Unnikrishnan, Sudhakumar, 2024) that Lean tools and methods should be used already at the design stage of construction works, taking into account various factors, e.g. requirements, geographical conditions of the system location, types of waste generated, size of the workplace, labor productivity and safety procedures.

4. The use of LM methods and tools in the construction industry

Based on the analysis of literature on the topic discussed, Table 2 summarizes the LM methods, tools and techniques most frequently used in the construction industry.

Table 2.*LM methods, tools and techniques used in the construction industry*

Authors	LM tools and methods	Characteristics
Bajjou et al., 2017 Bajjou et al., 2017a Ahmed et al., 2021 Demirkesen, 2021 Yazan et al., 2022 Musa et al., 2023 Unnikrishnan, Sudhakumar, 2024	5S/6S	A method aimed at creating a well-organized, orderly and safe workplace, e.g. through designated tool storage zones and material storage at the construction site. 5S/6S simplifies the production flow on the construction site, improves ergonomics and work safety, and limits excessive movement of workers.
Bajjou et al., 2017 Bajjou et al., 2017a Abdelkhalek et al., 2019 Ahmed et al., 2021 Demirkesen, 2021 Yazan et al., 2022 Musa et al., 2023 Unnikrishnan, Sudhakumar, 2024	VM	Tools facilitating communication on the construction site and providing employees with key information regarding quality, safety and work organization, e.g. light and sound signals, boards, pictograms, color coding. VM improves the organization, transparency and safety of construction works.
Bajjou et al., 2017 Bajjou et al., 2017a Bajjou, Chafi, 2020 Ahmed et al., 2021 Unnikrishnan, Sudhakumar, 2024	Poka-Yoke	Technical solutions that prevent the possibility of an employee making a mistake and, as a result, prevent quality errors or accidents at work.
Bajjou et al., 2017 Bajjou, Chafi, 2020 Ahmed et al., 2021 Demirkesen, 2021 Musa et al., 2023 Unnikrishnan, Sudhakumar, 2024	VSM	A graphical tool used to present the flow of materials and information in the construction process. VSM aims to simplify the process and its sequence by identifying losses, and thus creates opportunities for process improvement.
Ahmed et al., 2021 Yazan et al., 2022 Musa et al., 2023 Unnikrishnan, Sudhakumar, 2024	JiT	JiT monitors inventories and ensures the delivery of the necessary materials and equipment in the required quantity and precisely on time for a given stage of construction works. JiT reduces flow time and improves safety (eliminating congestion at the construction site).
Bajjou et al., 2017a Demirkesen, 2021	Gemba Walk	Gemba walks help highlight problems on a construction site and provide opportunities for improvement by identifying the root cause of the problem. They also enable the identification of problems related to work safety.
Ahmed et al., 2021 Szkolnicki et al., 2017 Demirkesen, 2021 Musa et al., 2023 Unnikrishnan, Sudhakumar, 2024	Daily Meetings/ Daily Huddle Meeting	Short, daily team meetings to discuss the results of the previous day's work, the current work plan, and emerging problems (including those related to health and safety). It is a tool that allows to monitor the progress of construction works and improves communication within the team, engaging employees in solving problems before they affect the progress of the project.
Ahmed et al., 2021 Demirkesen, 2021 Unnikrishnan, Sudhakumar, 2024	Root Cause Analysis (5Why, Ishikawa diagram)	Tools for determining potential causes of problems in construction work (Ishikawa diagram) and for identifying the root cause (5Why).

Source: Own elaboration.

The 5S/6S method is considered one of the first steps to be taken when implementing LC. By implementing five or six stages (selection, systematics, cleaning, standardization, self-discipline, and safety), the method allows for a well-organized, transparent and safe workplace on the construction site. This can be achieved by removing unnecessary items from the construction site, designating and describing storage areas for materials and tools, and introducing cleanliness standards, which ensures better accessibility, improves organization and work safety, and reduces losses related to excessive movement of workers and the possibility of accidents (falls, trips). It is believed that implementing and maintaining 5S/6S conditions can promote a health and safety culture and workforce productivity (Bajjou et al., 2017, 2017a; Ahmed et al., 2021; Demirkesen, 2021; Yazan et al., 2022; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024).

Visual Management (VM) is a communication tool that informs how work should be done and whether the way it is done deviates from the established standard. It involves presenting key information for employees and all stakeholders in a simple, clear and understandable way, which makes the construction process transparent, simple and safe. As part of VM, the following solutions can be used on the construction site: color coding, labels of material storage zones, hazardous areas, transport paths, paths for employees, safety boards and signs, digital billboards (with key information about the process), light and sound signals. The use of various forms of VM improves the efficiency of production planning and control (information display), and helps increase employee involvement in the improvement process by visualizing current and target performance indicators. It also allows for the identification of the arrangement of workstations, materials and tools, which limits excessive and risky movement of employees around the construction site. Light and sound signals, safety signs inform about threats (work in progress, unfinished work, falling objects) (Bajjou et al., 2017, 2017a; Abdelkhalek et al., 2019; Ahmed et al., 2021; Demirkesen, 2021; Yazan et al., 2022; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024).

The use of Poka-Yoke solutions allows to prevent errors made by employees that may affect the quality of production, productivity and work safety (these errors may result, for example, from the monotony of work, lack of attention or lack of experience). In construction works, systems are used to identify errors, where the process is automatically interrupted and/or a light and sound signal appears informing the employee about an error or danger, e.g. entering the area of falling objects from a height, concrete drying zone (Bajjou et al., 2017, 2017a; Bajjou, Chafi, 2020; Ahmed et al., 2021; Unnikrishnan, Sudhakumar, 2024).

Another tool is VSM, which allows for graphical presentation and analysis of the flow of materials and key information in the construction process. VSM helps identify activities that add value for the customer and identify losses, which is the basis for taking improvement actions. When used skillfully, VSM can simplify the flow of the construction process (Bajjou et al., 2017; Bajjou, Chafi, 2020; Ahmed et al., 2021; Demirkesen, 2021; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024).

The use of Just in Time in the construction process is intended to monitor inventories and ensure the delivery of materials and other necessary resources exactly on time and in quantities necessary for a given stage of the process. This organization of production ensures uninterrupted flow and also affects the work safety on the construction site - timely deliveries of materials eliminate the formation of excessive inventories that create congestion that may cause accidents at work (Ahmed et al., 2021; Yazan et al., 2022; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024).

The use of Gemba Walk in the construction industry is important due to the possibility of continuous, regular observation of the process by superiors. Gemba Walk makes it possible to identify losses and problems (including those related to work safety) and collect data that is necessary to determine the root causes and take improvement actions. The literature also mentions Safety Walks, during which the work and behavior of employees are monitored in terms of compliance with occupational health and safety rules and 5S/6S (Bajjou et al., 2017a; Demirkesen, 2021). Daily Huddle Meetings also have a similar importance as regular team meetings play a key role in planning and discussing ongoing work/tasks to be performed, monitoring construction work progress, discussing problems, and paying attention to hazards. This tool improves communication and influences employee involvement in improvement processes (Ahmed et al., 2021; Szkolnicki et al., 2017; Demirkesen, 2021; Musa et al., 2023; Unnikrishnan, Sudhakumar, 2024).

It is worth emphasizing the importance of using Problem-Solving tools to determine the potential causes of losses/problems in the project and determine the root cause. The most frequently mentioned in the literature on the subject are the Ishikawa diagram and the 5Why analysis. Using them in everyday work can improve the construction process in terms of quality, timeliness and safety (Ahmed et al., 2021; Demirkesen, 2021; Unnikrishnan, Sudhakumar, 2024). Problem-solving is an integral part of the continuous improvement process and the basis of TPS.

5. Possibility of influencing selected LM methods and tools on the construction process

The analysis conducted on the use of LM methods and tools in the construction industry allowed to determine the potential impact of these solutions on improving various aspects of the construction process, as presented in Table 3. Eight LM methods and tools most frequently mentioned in the literature were selected.

In terms of improving work safety/safe working conditions on the construction site, it is possible to use seven LM methods and tools (Table 3). 5S/6S and VM are solutions that can significantly improve work safety. The use of visual markings, labels and signals informs

and warns all employees about the threat. Similarly, Poka-Yoke, through technical and visual solutions, prevents errors leading to accidents. The application of JiT principles also improves work safety, because the delivery of materials in the right quantity and time prevents the formation of congestion that can cause accidents at work (falls, trips) and impede the movement of employees. Regular Gemba Walks allow to identify and respond to threats occurring on the construction site on an ongoing basis, and discussing and solving safety problems during Daily Huddle Meetings can reduce the possibility of accidents at work (using Problem-Solving tools).

Table 3.

Possibility of influencing LM methods and tools on the construction process

Area of improvement	5S/6S	VM	Poka-Yoke	JiT	VSM	Gemba Walk	Daily Huddle Meetings	Root Cause Analysis
Work safety/safe working conditions	+	+	+	+		+	+	+
Safe behaviors	+	+	+			+	+	+
Organization of work/workplace	+	+				+	+	
Workflow (employees, materials, information)				+	+			
Timeliness of work				+	+		+	
Increased employee involvement	+	+					+	+
Elimination/limitation of losses	+	+	+	+	+	+	+	+

Source: Own elaboration.

In terms of improving safe behavior, it is possible to use six LM methods and tools. Applying and respecting the 5S/6S and VM rules and using Poka-Yoke solutions in construction works shape the safe behavior of employees, build awareness, and promote a safety culture among employees. A key role in this respect is played by supervisors, who observe employee behavior and react to deviations from health and safety regulations (as part of Gemba Walk) and discuss problems related to work safety and possible hazards during Daily Huddle Meetings. Safe behaviors can also be shaped by involving employees in solving health and safety problems and analyzing the causes of their occurrence (5Why analysis, Ishikawa diagram).

In terms of improving the organization of work/workplace in the construction process, it is possible to use four LM methods and tools: 5S/6S, VM, Gemba Walk, and Daily Huddle Meetings. Maintaining order on the construction site, designating places to store materials and tools, and using visual markings have a positive impact on the organization of tasks and make work easier. Observation of the process by superiors and paying attention to any deviations during Gemba Walk may affect the organization of work and maintaining the 5S rules. Moreover, discussing the current work plan and existing problems related to work organization

during Daily Huddle Meetings also affects the discussed aspect (drawing attention to the problem before it disorganizes the process).

In terms of improving the workflow and timeliness of construction work, it is possible to use JiT and VSM. Organizing the delivery of materials to the construction site in the right quantity and time (JiT) allows to improve the efficiency of work by shortening the flow time in the process and the response time of suppliers. The assessment of the current state of the process, based on mapping (VSM), allows to identify areas of loss and take action to improve the flow of materials and information. VSM and JiT can therefore be an effective tools to achieve uninterrupted workflow. In terms of improving the timeliness of work, it is also possible to use Daily Huddle Meetings, to discuss current tasks to be performed, monitor work progress, and solve problems that may make it difficult.

The use of four LM solutions (5S/6S, VM, Gemba Walk, Daily Meetings) can increase the involvement of all construction workers. Compliance with the 5S/6S principles, compliance with the introduced VM tools, compliance with work and safety standards, identifying irregularities related to quality and health and safety, and solving problems during meetings - all this may translate into an increase in commitment to continuous improvement.

All LM methods and tools listed in Table 3 can eliminate or reduce losses occurring in construction works:

- excessive movement of workers on the construction site (5S/6S, VM, Gemba Walk),
- unnecessary movement during searching for tools/materials and during avoiding congestion on the construction site (5S/6S, VM, JiT, Gemba Walk),
- excessive transport of materials (JiT, VSM, Gemba Walk),
- creation of excessive inventories (JiT, VSM, Gemba Walk),
- waiting for materials or the next process stage (JiT, VSM, Gemba Walk),
- defects caused by workers' errors (Poka-Yoke, VM).

Each loss should be discussed during Daily Huddle Meetings and analyzed to determine the root cause.

6. Summary

Based on the analysis, it was found that the methods and tools of the LM concept can be used in the construction industry. The eight LM solutions most frequently mentioned in the literature were analyzed and presented in Table 3. It was found that they can improve the functioning of the construction process in various aspects:

- in terms of improving work safety/working conditions – the impact of 5S/6S, VM, Poka-Yoke, JiT, Gemba Walk, Daily Huddle Meeting, Root Cause Analysis,
- in terms of shaping safe behaviors – the influence of 5S/6S, VM, Poka-Yoke, Gemba Walk, Daily Huddle Meeting, Root Cause Analysis,
- in terms of improving the organization of work/workplace – the impact of 5S/6S, VM, Gemba Walk, Daily Huddle Meeting,
- in terms of workflow – impact of JiT, VSM,
- in terms of timeliness of work – the impact of JiT, VSM, Daily Huddle Meetings,
- in terms of employee involvement – the impact of 5S/6S, VM, Gemba Walk, Daily Huddle Meeting.

Attention was also paid to the possibility of eliminating or reducing losses in the construction process - in this aspect, all LM methods and tools listed in Table 3 can be used and support management in taking improvement actions.

The choice and use of a given tool will depend on the problems occurring on construction sites, as well as on the awareness of the work organizers/managers about the possible benefits that these solutions can bring to construction workers and all project stakeholders. Attention should also be paid to barriers that may hinder the use of lean practices in construction processes, including: resistance to change, non-compliance with applicable standards (including occupational health and safety), lack of awareness, lack of commitment of employees and supervisors, and lack of communication.

The conclusions from the analysis may guide construction companies that take actions aimed at eliminating losses and increasing the efficiency of the process.

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IDENTIFYING AND MAPPING KEY GREEN RESEARCH AREAS: TOWARDS THE GREENING OF SOCIAL ENTERPRISES

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Purpose: Identification of key green research areas explored in scientific publications that address social enterprises while also examining sustainability and/or various green research threads.

Design/methodology/approach: The study was planned and conducted between July 2024 and November 2024. Two methods focusing on the review of scientific publications were employed in the research process: a systematic literature review and a classic literature review. The analysis included 642 scientific publications retrieved using bibliometric query Q1 from the Scopus database and 602 scientific publications extracted using bibliometric query Q2 from the Web of Science database. The full text of these publications was analysed to identify and extract green research areas.

Findings: Thirty-one key green research areas were identified in scientific publications that explore social enterprises while also examining sustainability and/or various green research threads. The findings indicate that the concept of green social enterprises is already explicitly addressed in existing research. Additionally, an important research thread is the topic of green jobs, which is represented by two different terms: 'green jobs' and 'green collar jobs'.

Research limitations/implications: The study was constrained by two key factors. The first was the selection of databases (Scopus and Web of Science). The second factor was the design of the original bibliometric queries (Q1 and Q2). It should also be emphasized that these limitations contributed to ensuring the quality of the study and facilitate the possibility of reproducing it in the future for comparative purposes.

Originality/value: This study differentiates itself from other bibliometric studies on social enterprises through the design of the bibliometric queries. Additionally, it identified key green research areas by analysing the full content of the selected articles, rather than relying on author or indexed keywords as in traditional reviews. Consequently, the bibliometric maps generated contain a significantly larger number of green research areas. The discussion highlighted, among other aspects, the creation of green jobs and the development of green competencies within green social enterprises. In this context, it was emphasized that future research should explore whether green jobs in green social enterprises can be distinguished from golden-green jobs. This article is intended for those interested in the green transition of social enterprises.

Keywords: golden-green jobs, green economy, green jobs, green labour market, green social enterprise, sustainable development.

Category of the paper: Literature review.

1. Introduction

Various research issues related, both directly and indirectly, to the transition to more sustainable models of socio-economic development are increasingly being explored in academic discourse. Consequently, the green economy is becoming the subject of various types of analysis by researchers (e.g. Alsmadi, Alzoubi, 2022; Manisha, Singh, 2024; Mo et al., 2024). The transition to a green economy can occur through an ongoing process of green transformation or green transition. In the case of green transformation, it should be emphasized that profound, systemic changes are necessary in the functioning of economies, societies, and institutions to achieve sustainability. Therefore, green transformation involves radical change. In contrast, green transition should refer to gradual, pro-ecological shifts in socio-economic life. This approach implies an evolutionary and incremental adaptation of socio-economic systems to the challenges posed by sustainable development, rather than the radical change associated with green transformation. For the purposes of this article, subsequent references will focus on green transition.

Scientific research addressing the issue of green transition also highlights the role and importance of implementing various sustainable development practices in socio-economic life (e.g. Pesor et al., 2024; Regmi et al., 2024). Some of these practices are explicitly referred to as green practices in academic discourse (e.g. Bagri et al., 2021; Masyhur et al., 2024; Wang et al., 2023). In the author's view, considering the significance of sustainable and green practices, it could be argued that they facilitate the gradual transition from a brown economy to a green economy.

Green transition, as previous research indicates, can be examined both through the lens of specific economic sectors (e.g. Afzal et al., 2024; Gea-Bermúdez et al., 2021; Sulich, Zema, 2023) and specific economic actors, particularly enterprises (e.g. Chi, Yang, 2023; Leng, Hu, 2024). One particularly distinctive market actor is social enterprises, which prioritize social goals (e.g., social and professional inclusion) over profit maximization in their operations. This unique focus on social objectives has led research to explore the further development of social entrepreneurship in the context of various social and economic challenges (e.g. Podgórnjak-Krzykacz et al., 2024; Podgórnjak-Krzykacz, Przywojska, 2018). Social enterprises may be undergoing a process of greening, and as a result, an increasing number of green issues are being addressed in academic discussions concerning the operation of social enterprises (e.g. Kozar, 2023b; Osti, 2012). Some researchers even argue that it is possible to define a new model of social enterprise - green social enterprise (e.g. Barna et al., 2023; Descubes et al., 2018; Kozar, 2023a). Therefore, the greening of social enterprises is, in the author's view, gradually becoming an increasingly popular subject of academic research.

The aim of the research was the identification of key green research areas explored in scientific publications that address social enterprises while also examining sustainability and/or various green research threads. To achieve this aim, it was assumed that green research areas are defined as words or phrases used in scientific publications that include the term 'green'. By referencing 'green' in this way, researchers highlight the pro-environmental values of their work, differentiate their research from non-green approaches, and establish a direct link to sustainability issues. This research objective was accomplished through the scientific exploration of two bibliometric databases, namely Scopus and Web of Science. The study employed two methods for literature review: the systematic literature review (SLR) and the classic literature review (CLR). The VOSviewer software (version 1.6.20) was used to map the key green research areas.

This article is divided into four sections, each interrelated and collectively leading to the presentation of the research conducted and the resulting conclusions. The introduction provides an overview of the analysed topic, states the research objective, and highlights the research methods employed. The methodological aspects outlined in the introduction are discussed in greater detail in the second section of the article. The research methodology is described step-by-step, based on the detailed timeline adopted, to ensure the study can be replicated in the future and compared with other analyses that have utilized bibliometric reviews in the context of social enterprise issues. The third section presents the results and includes a discussion, with attention given to potential future research directions. In particular, it emphasizes the need for further exploration of green competence development and the creation of green and gold-green jobs within green social enterprises. The brief conclusion at the end of the article highlights how the ongoing green transition is gradually contributing to the development of a new model of social enterprise: the green social enterprise.

2. Research methodology

The research study, the results of which are presented in this article, was conducted between June and November 2024. As outlined in the research schedule presented in Figure 1, the study was divided into four distinct stages, each with its own timeline and designation. All stages, along with the research activities conducted during them, formed an essential procedure aimed at ensuring the highest possible quality of the bibliometric analyses and enabling their replication for future comparative purposes. Therefore, it is not possible to single out any stage as being more important than the others. The same applies to the individual research steps carried out sequentially, as shown in Figure 1.

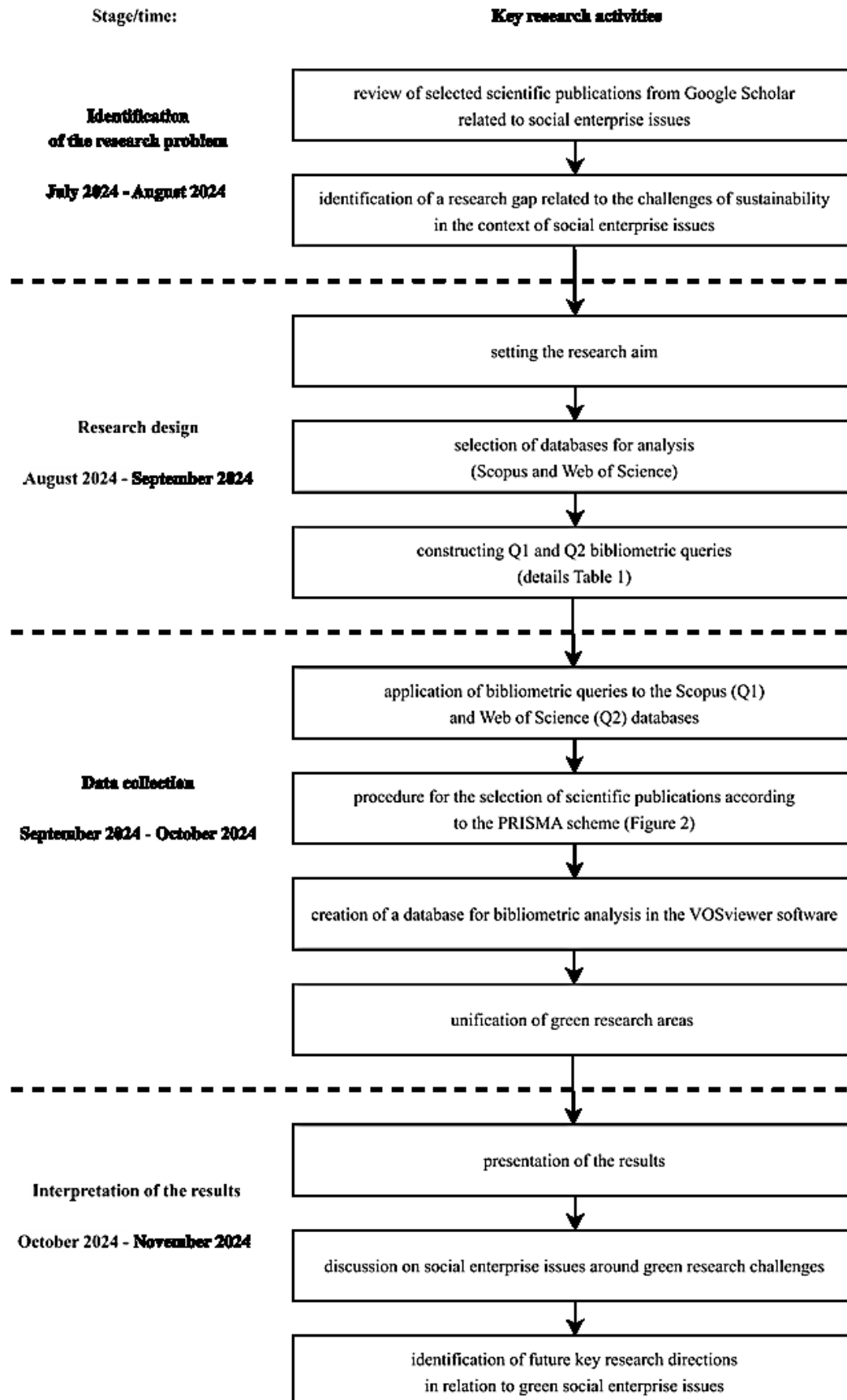


Figure 1. Research procedure stages and timeline.

Source: Authors' elaboration.

The identification of the research problem was carried out in the first stage of the study. To achieve this, a review was conducted using the freely accessible web search engine Google Scholar to examine existing scientific publications related to social enterprises and social entrepreneurship in a broad sense. No specific criteria were applied to exclude publications from the analysis. As a result, numerous research reports, various types of articles (including those employing bibliometric analysis), book chapters, and entire books were reviewed to identify research gaps in the field of social enterprises. The observations made during this process revealed that the issue of sustainable development is increasingly being addressed in scientific discussions related to social enterprises, often in the context of research that can be linked to the ongoing green transition of social and economic life. Additionally, it was found that the growing interest among researchers in green issues requires structuring through the identification of key green research areas.

The observations made during the first stage of the research, particularly the recognition of the need to structure the discussion around green issues related to social enterprises, formed the basis for the second stage, which focused on study design. First, the research aim was defined: identification of key green research areas explored in scientific publications that address social enterprises while also examining sustainability and/or various green research threads. This aim necessitated conducting bibliometric analyses using two methods: SLR and CLR. It was assumed that green research areas would be identified through content analysis of entire scientific publications. This type of analysis is broader than traditional bibliometric analyses, which focus only on author or indexed keywords, and contributes to more comprehensive observations. The analysis of complete scientific publications enables the identification of new phenomena and research trends that may not yet be represented by keywords or that are only sporadically explored, making them difficult to capture in bibliometric maps.

Phase two of the research also included the selection of databases for identifying scientific publications relevant to the study. Two bibliometric databases were chosen: Scopus and Web of Science. This selection was based on several important factors highlighting the quality of these databases. Firstly, both databases have rigorous and transparent procedures for indexing individual scientific journals. Due to these procedures and their recognition within the scientific community, Scopus and Web of Science are widely regarded and frequently utilized by researchers who often prioritize indexing in these databases when choosing journals to which they submit their research for review. An additional factor in the selection of these databases was their use in other studies that conducted literature reviews in the fields of sustainable development (e.g. Sulich et al., 2023; Wodnicka, 2024b; Wodnicka, Królikiewicz, 2024), green transition or green transformation (e.g. De Felice, Petrillo, 2021; Persson Thunqvist et al., 2023), and social enterprise issues (e.g. Gupta, Srivastava, 2024; Littlewood, Khan, 2018; Quillooy et al., 2024). Furthermore, both databases allow for the use of bibliometric queries to consistently select the range of publications for further analysis.

Considering the advantages of selecting these databases and the need to ensure that the study can be repeated for comparative purposes in the future, two original bibliometric queries were constructed (Table 1). Query Q1 was designed for the Scopus database, while Query Q2 was created for the Web of Science database. It should be noted that, due to the structural differences between these databases, the queries vary in syntax (notation), although they search for the same topics in terms of content and research quality. It is important to mention that the analysis does not include scientific publications from 2024, the year in which the research was conducted, as the publication cycle in many journals indexed in these databases was still ongoing at that time. Therefore, it is possible that new scientific publications related to social enterprises will emerge. This approach is considered a good practice adopted by an increasing number of researchers (e.g. Sulich, Sołoducho-Pelc, 2024; Wodnicka, 2024a), aimed at enhancing the potential for future comparative research by others conducting the same or similar bibliometric queries.

Table 1.
Details of search query syntax for Scopus databases

Database	Symbol	Query syntax	No. results
Scopus	Q1	TITLE-ABS-KEY ("social enterprise*" AND (sustainability OR "sustainable development" OR green)) AND PUBYEAR > 1999 AND PUBYEAR < 2024 AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re")) AND (LIMIT-TO (LANGUAGE, "English"))	642
Web of Science	Q2	((((TS=("social enterprise*" AND (sustainability OR "sustainable development" OR green))) AND LA=(English)) AND DT=(Article OR Review)) NOT PY=(2024)) NOT DT=(Book Chapter OR Book OR Book Review))	602

Source: Authors' elaboration 27.10.2024.

At the third stage of the research, the constructed bibliometric queries were applied to the selected databases. As a result, 642 scientific publications were identified in the Scopus database, and 602 scientific publications were found in the Web of Science database. It was recognized at this stage that some publications appeared in both bibliometric databases. Therefore, the PRISMA procedure (Figure 2) was conducted to create a single database for the analysis, including only those scientific publications that met specific criteria: they were accessible (which was crucial, as the full content of the publications was analysed), written in English (to ensure the meaningful interpretation of green research areas), and contained references to both social enterprises and relevant green research topics. The final database included 210 scientific publications, each associated with its identified green research areas. This database was structured to enable the use of VOSviewer software for mapping, similar to bibliometric analyses based on author's or indexed keywords.

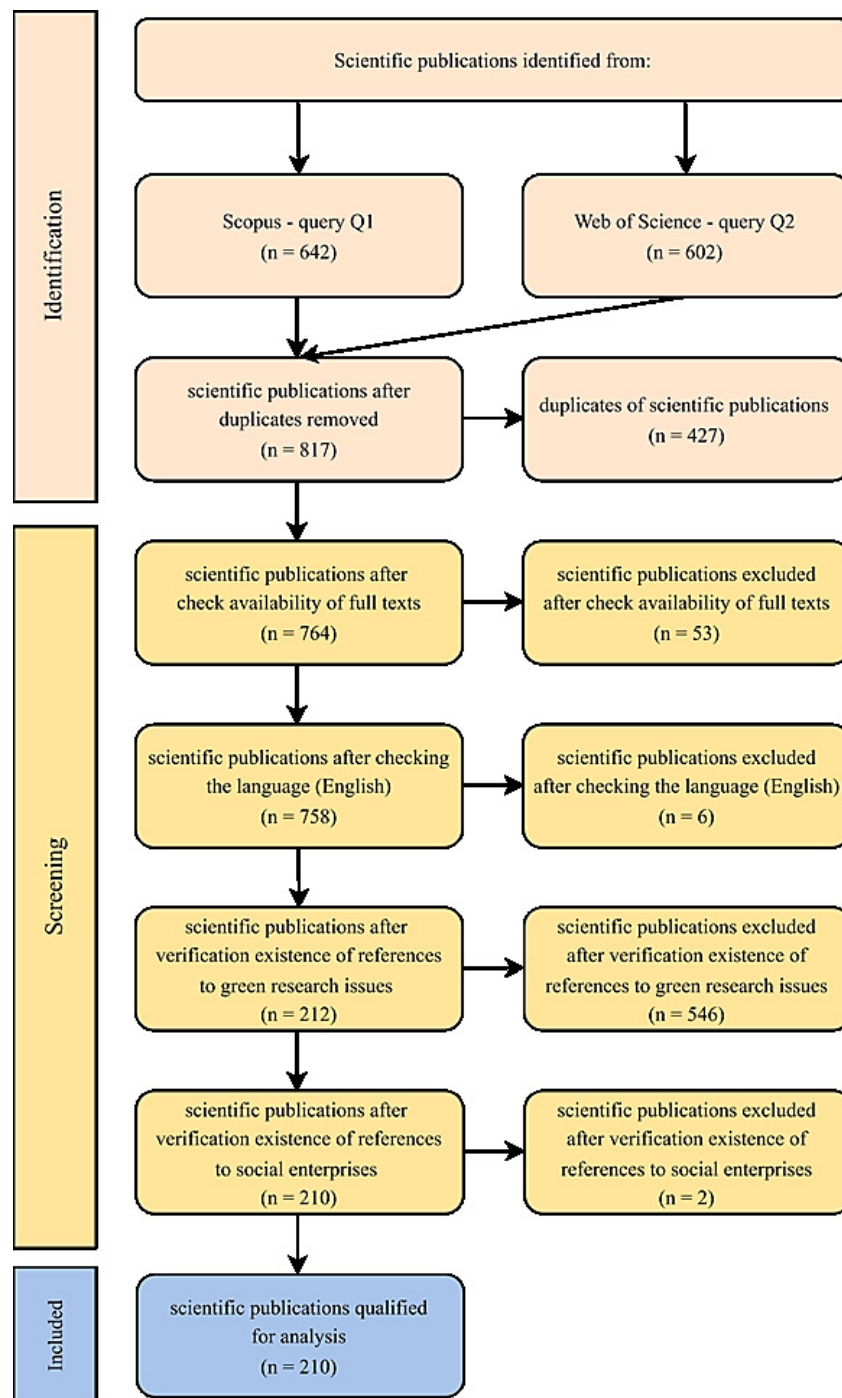


Figure 2. PRISMA scheme for the selection of scientific publications for analysis.

Source: Authors' elaboration.

The final research activity conducted in the third stage of the study was a review of the identified green research areas, which highlighted the need for standardization. This procedure is commonly performed in bibliometric analyses where data are visualized using VOSviewer software to enhance the transparency of the resulting bibliometric maps. As a result of this standardization, standardized green research areas were identified in the dataset. Examples of these standardized green research areas, which are also represented in the bibliometric map shown in Figure 3, are provided in Table 2.

Table 2.
Selected standardised green research areas

Identified green research issues:	Unification into a green research area:
green collar jobs	green collar army; green-collar jobs
green company	green (sustainable) company; green companies
green consumers	green consumer
green economy	cultural green economy; green economies; green economy government; green economy strategies; sustainable green economy
green enterprises	green enterprise
green entrepreneurs	green entrepreneur; green or environmental entrepreneur
green initiatives	green and sustainable initiatives; green initiative
green innovation	green and/or social innovation; green innovation consciousness; green-innovation
green jobs	green job; green job creation; green-job training programme; green/sustainable job
green products	green products category
green products and/or services	green products and services; green products or services; green products/services; marketing of green products or services
green projects	green-innovative projects; green/sustainable projects
green revolution	green revolution-based technologies; green revolutions
green services	green services category
green social enterprises	green social enterprise
green spaces	green space; local green spaces; public green spaces
greenwashing	corporate greenwashing; green washing; green-washing; greenwash monitoring

Source: Authors' elaboration.

The final stage of the research, illustrated in Figure 1, focused on presenting the results and engaging in scientific discussion around them. A detailed description of this stage is provided in the next section of the article. However, it is important to emphasize that the shape of the data obtained was influenced by two key considerations. First, the study was limited to two bibliometric databases: Scopus and Web of Science. As a result, any publications related to the research issues that were not indexed in these databases were excluded. On the other hand, this approach ensured a clear selection of journals for the study. It should also be noted that it is currently impossible to access all scientific publications on a given research topic, so applying such restrictions is scientifically justified. The researcher must make the decision to select appropriate publications for analysis. Additionally, only publications identified through the bibliometric queries were included in the analysis. This approach ensures that the study can be replicated in the future and compared with other bibliometric studies focused on social enterprises. Deviations from this strict research procedure could result in different outcomes (e.g., by including other bibliometric databases or altering the design of the bibliometric queries).

3. Results and discussion

The procedures carried out during the data collection stage resulted in the creation of a bibliometric database comprising 210 scientific publications, each assigned one or more of 300 different green research areas (following a standardisation process). This database was subsequently analysed using the VOSviewer software, which enabled the identification of key green research areas by extracting those mentioned most frequently in the content of the analysed scientific papers through a co-occurrence analysis using the full counting method. The VOSviewer software set a minimum threshold of 5 occurrences for a keyword to be considered significant. This criterion led to the identification of 32 green research areas out of the initial 300 analysed. However, for data visualization purposes, 31 of these areas were used, as they were deemed key green research areas. The term 'green issues' was excluded from the analysis due to its overly general nature (all the green areas analysed are subsets of green issues).

Between each of the visualized key green research areas, as shown in Figure 3, there are links represented by lines. For further analytical purposes, both the number of links and occurrences are presented numerically in Table 3. These are two fundamental measures for describing bibliometric data. Links (L) represent the number of key green research areas shown in the bibliometric map with which a specific isolated key green research area co-occurred at least once in the analysed scientific publications. Given that 31 key green research areas were identified in the bibliometric map as a result of the analyses, the maximum number of links possible is 30. Regarding the bibliometric measure of occurrences (O), it is important to note that this measure determined whether a green research area was classified as a key area. This measure indicates the number of scientific publications among the analysed set in which a specific green research area was mentioned, either explicitly (in the original notation of the area) or after standardization (when a different verbal notation referred to the same area). In the research conducted, the maximum number of occurrences could have been 210, corresponding to the total number of scientific publications analysed that contained references to various green research areas.

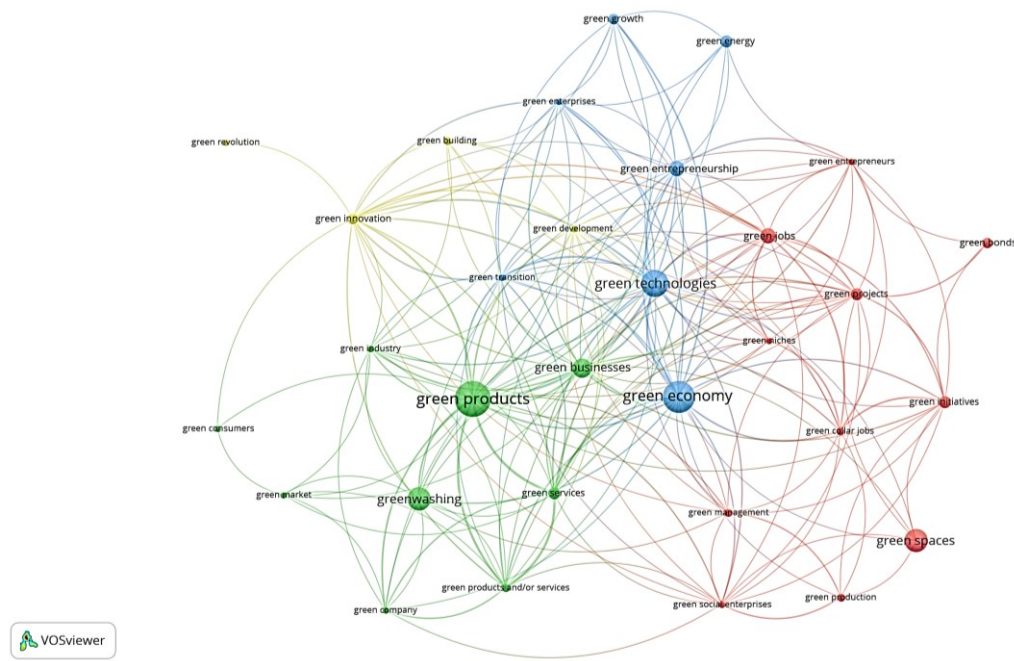


Figure 3. Bibliometric map of co-occurrence of key green research areas identified in the study within the context of social enterprise issues - network visualisation.

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

Table 3.

Keyword co-occurrence clusters presented in Figure 3

Cluster	Keywords
red	green bonds (L = 3, O = 8); green collar jobs (L = 12, O = 6); green entrepreneurs (L = 14, O = 5); green initiatives (L = 13, O = 9); green jobs (L = 17, O = 11); green management (L = 12, O = 6); green niches (L = 11, O = 5); green production (L = 6, O = 6); green projects (L = 20, O = 9); green social enterprises (L = 16, O = 5); green spaces (L = 7, O = 17);
green	green businesses (L = 23, O = 14); green company (L = 10, O = 5); green consumers (L = 3, O = 5); green industry (L = 14, O = 5); green market (L = 8, O = 5); green products (L = 24, O = 26); green products and/or services (L = 16, O = 6); green services (L = 18, O = 9); greenwashing (L = 10, O = 17);
blue	green economy (L = 23, O = 23); green energy (L = 7, O = 9); green enterprises (L = 14, O = 5); green entrepreneurship (L = 14, O = 11); green growth (L = 8, O = 8); green technologies (L = 24, O = 20); green transition (L = 18, O = 5);
yellow	green building (L = 8, O = 6); green development (L = 17, O = 5); green innovation (L = 19, O = 8); green revolution (L = 1, O = 5);

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

None of the identified key green research areas was the subject of scientific consideration in all the analysed publications (Table 3). The highest number of occurrences were recorded for green products (green cluster), green economy (blue cluster), and green technologies (blue cluster). These research areas thus represented the most significant key green research areas among those identified. In contrast, green technologies (blue cluster), green products (green cluster), green economy (blue cluster), green businesses (green cluster), and green projects (red cluster) collectively had the highest number of different green research areas.

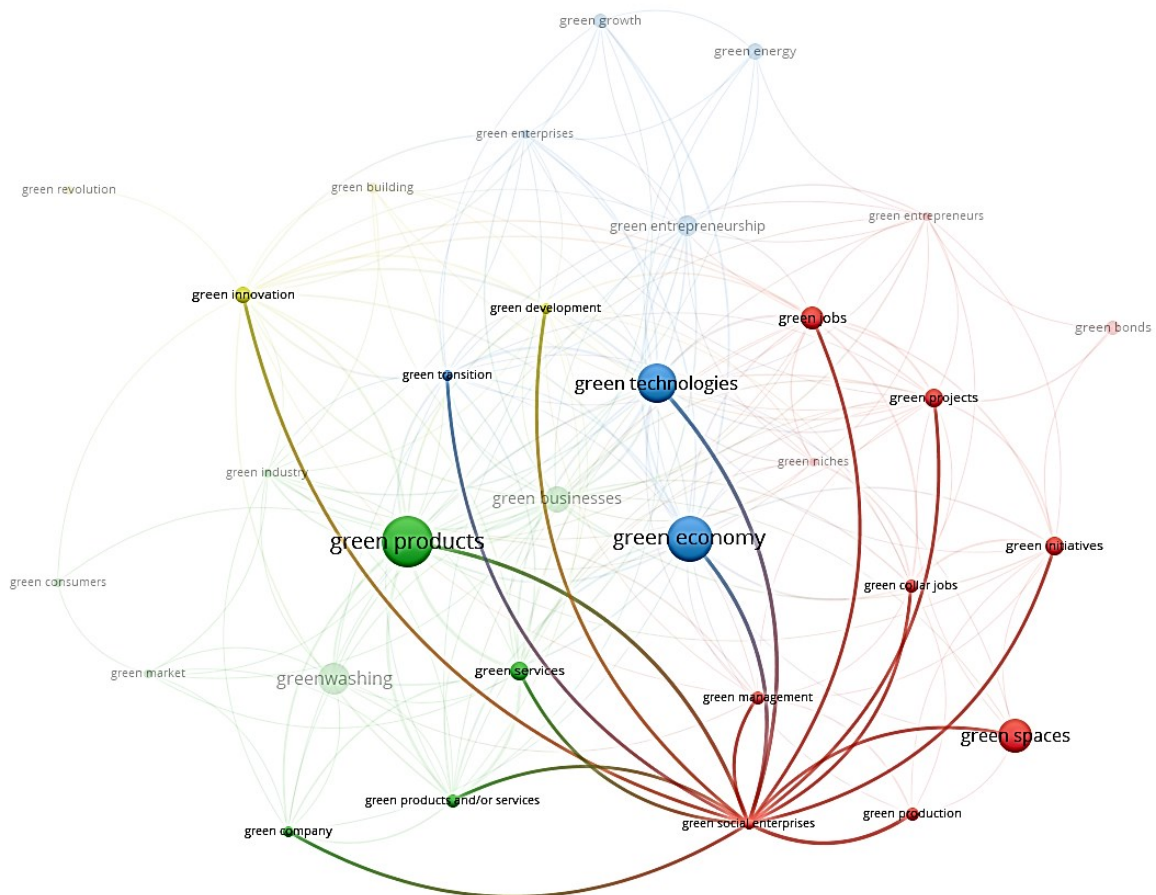


Figure 4. Visualisation of green social enterprises on a bibliometric map.

Source: Authors' elaboration in VOSviewer software (version 1.6.20).

It is worth noting that among the key green research areas visualized in the bibliometric map shown in Figure 3, there is a reference to a new model of social enterprise that is gaining increasing recognition in academic discussions: green social enterprise (red cluster). As illustrated in Figure 4, this research area co-occurred with 16 different identified key green research areas in the analysed scientific publications. The three most frequent green research areas were green products (Barna et al., 2023; van Gils, Horton, 2019), green economy (Barna et al., 2023; Descubes et al., 2018), and green technologies (Barna et al., 2023; van Gils, Horton, 2019). Additionally, significant references to the creation of a new type of job, namely green jobs, were observed. This issue was represented both by direct references to green jobs (Barna et al., 2023) and green collar jobs (Descubes et al., 2018). During the standardization stage, these green research terms were intentionally left unstandardized to illustrate the complexity of green issues surrounding the functioning of social enterprises and to emphasize that the same research problem can be referred to differently by various authors studying social enterprises and addressing different green themes. In this context, as discussions in various economic sectors indicate, the term green jobs is commonly used (e.g. Araújo et al., 2018; Kozar, Sulich, 2023; Mathieu, 2024). Therefore, this term will be used in the subsequent discussion.

This study distinguishes itself from previous research by the scope of its bibliometric inquiry. While issues related to social enterprises have been bibliometrically explored in the context of sustainability and its challenges (e.g. Ghosh et al., 2024; Harsanto et al., 2022), this study adopts a broader approach by referencing green issues in general, making it a novel and original bibliometric query. Over time, selected green-specific research questions, such as green enterprises, have started to emerge in academic reviews (e.g. Jayawardhana et al., 2022). However, these studies do not encompass the full range of green research issues related to the green transition of social enterprises, as they tend to focus on specific green topics. This study stands out due to its comprehensive bibliometric inquiry, which contrasts with research that limits itself to social enterprise issues alone, without incorporating additional themes for exploration in individual bibliometric databases (e.g. Hisyam, Lin, 2023). Furthermore, the analyses conducted help address a research gap by identifying key green research areas discussed in scientific publications that address social enterprises while also considering sustainability issues and/or various green research threads.

Among the key green research areas identified in academic studies addressing social enterprises are green products (e.g. Bandyopadhyay, Ray, 2019; Lin, Chen, 2016; Wu et al., 2022), green services (e.g. Abdullah et al., 2022; Sacchetti, 2023), or a combination of both (e.g. Bansal et al., 2023; Rahdari et al., 2016; Stecker, 2016). It can be inferred that one of the pathways for the green transition of social enterprises should involve incorporating green services and/or products into their offerings or replacing existing non-green services and/or products with ones that meet environmental sustainability criteria. Consequently, it can be concluded that the green transition can occur through modifications to the range of services and/or products provided by social enterprises. However, such changes are unlikely to be achieved without the introduction of green innovations (e.g. Rahdari et al., 2016) or the implementation of suitable green technologies (e.g. Ayoungman et al., 2023; Enciso-Santocildes, Caro-González, 2023; Hagedoorn et al., 2023). This presents a challenge for managers of social enterprises: how to effectively implement green changes while meeting the social objectives of the organisation. Therefore, the issue of balancing the realisation of social objectives with the financing of a green transition should become a crucial focus for future research on social enterprise operations. Such research could potentially lead to the development of practical recommendations not only for social enterprise managers but also for external support organisations, facilitating the smooth implementation of green transitions. It is certain that many social enterprises will face the need for such transitions, as public pro-environmental awareness continues to rise. For instance, the emergence of a new consumer category, the green consumer, is already being recognised in scientific research. This trend was also evident in the identification of key green research areas in this study (e.g. Bandyopadhyay, Ray, 2019).

Another important area for future research in the context of the green transition is the issue of greenwashing. This phenomenon is increasingly being addressed in various studies (e.g. Gallo Aguila et al., 2024; K. Gupta, Singh, 2024; Santos et al., 2024). The pressure to adapt to green transformations, combined with inadequate funding, can contribute to the emergence of greenwashing. This undesirable practice misleads consumers seeking green products and/or services into believing they are eco-friendly, even when they lack genuine green credentials. Currently, there is no research focusing on greenwashing in relation to green products and services offered by social enterprises. However, as the analyses in this study have shown, the issue has already been identified in academic literature addressing social enterprises (Bonomi et al., 2017; Dąbrowska, 2022).

As previously mentioned, the analyses conducted observed references to green jobs and their direct connection, on the bibliometric map, to the new social enterprise model of green social enterprises (Figure 4). In the opinion of the author, green social enterprises that aim to achieve social and professional inclusion can create green competencies and green jobs for individuals who are socially and professionally excluded. However, there is a lack of targeted research to determine the scale of green job creation in green social enterprises. The author believes that future research should include an assessment of the quality of these green jobs and the extent to which they are genuinely green. Such research would enable a comparative analysis with other market actors and help answer whether social enterprises can effectively contribute to the inclusion of green jobs and the development of employees' green competencies, preparing them for a gradually greening labour market. Additionally, research on green social enterprises should seek to distinguish so-called 'golden-green jobs' from the other green jobs they create. The concept of golden-green jobs is beginning to emerge in academic discourse (e.g. Kozar, 2024; Kozar, Padaszyńska, 2024).

In the context of future research on the green transition of social enterprises, it is also worth addressing an issue that was not identified as a key green research area during the analysis: the green competence gap. This issue is already prominent in academic discourse (e.g. Nikoloski et al., 2024; Pavlova, 2018; Renfors, 2023). Future research should focus on the extent to which the green competence gap influences the ongoing green transition process in social enterprises. In this context, it would be beneficial to survey not only those responsible for managing social enterprises but also representatives from external support organisations that assist these enterprises.

4. Summary

The survey identified 31 key green research areas in scientific publications that addressed both social enterprises and sustainability, as well as various other green research threads. Only one area explicitly referred to the concept of social enterprise: green social enterprise. In this context, numerous other key green research areas with which it is linked (e.g. green jobs) were also recognised.

The development of research focused on the ongoing green transition of social enterprises and its effects is inevitable. It has already been demonstrated that green social enterprise is an emerging model of social enterprise. In the author's view, this opens up possibilities for further scientific discussion and the potential segmentation of the green social enterprise model into sub-models. These sub-models could focus on aspects such as green products and/or services, the development of green competencies (in the context of social and professional inclusion), and the creation of green jobs within these enterprises.

At the same time, it should be noted that the pace and extent of the green transition in social enterprises (in this direction) will be fundamentally influenced by various changes already underway in socio-economic life, which are gradually fostering green awareness among participants in this sphere. A key question is whether it will be possible to develop solutions that can effectively meet the social objectives of social enterprises while implementing often costly green changes. Additionally, the quality of the green transition process must be considered. This will be influenced by the green credentials of both those responsible for managing social enterprises and the external actors supporting them. Thus, as highlighted by the analyses undertaken, the green transition of social enterprises, from a scientific perspective, presents new research challenges.

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DRIVERS AND BARRIERS OF PROJECT MANAGEMENT MATURITY IN IT START-UPS

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Purpose: The main aim of study was the identification of the significant factors that are perceived as positively and negatively influencing the maturation processes of project management in nascent and young innovative firms termed as start-ups.

Design/methodology/approach: The study base on mixed-method approach. The research on factors driving and limiting project maturity in start-ups was performed using qualitative data collection methods. Additionally, quantitative approach and quantify the elements indicated by respondents were used to support study conclusion.

Findings: In the studies it was confirmed that among the factors influencing the maturity of project management in start-ups very frequently the same factors were indicated as drivers and as barriers. Based on the research findings it was identified that start-ups can be divided into three groups with different characteristics which relates to proposed new division of barriers and drivers of project management development. Within the analyses identified factors were distinguished as directly and indirectly influencing project management processes.

Research limitations/implications: Limitations of research relates to the number of interviews and the fact that the sample comprised the organizations located in the same region. The extension of the sample, inclusion of start-ups from diverse locations can add value to the results and confirm or extend some of discoveries.

Practical implications: Identification of barriers (negative influence) and drivers (positive influence) of project management processes in start-ups. Division of the factors into those that have direct and those that have indirect influence of the advancements.

Originality/value: The paper presents exploration of the peculiarities of advancing project management in young, new product-oriented organizations termed "start-ups". Results of interviews with IT start-up founders and stakeholders from start-up ecosystems (VCs, university incubators) used for studies and discussions enhanced understanding of factors affecting project management maturity.

Keywords: Project Management, Project Management Maturity, Start-ups.

Category of the paper: research paper.

1. Introduction

Project management maturity has been a topic of interest for project management theorists and practitioners for years (Crawford, 2006; Backlund et al., 2014; Brookes, 2014). It results primarily from the main assumption of maturity research, i.e., the belief that project maturity affects the effectiveness of the organization and achieving repeatable successes in project activities. Therefore, striving for project management maturity is regarded as a direct orientation towards development, effectiveness, or efficiency of the organization being managed (Cooke-Davies, Arzymanow, 2003).

Organisational project management maturity can be understood as a measure of the ability to initiate and execute projects for different but correct purposes (Anderson, Jessen, 2003). In this context, project management maturity models are the instruments designed to assess progress toward maturity via providing a systematic means to perform benchmarking and are considered to add value to organizations trying to achieve continue improvement (Pennypacker, Grant, 2003; Pasian 2014). One interesting stream of research concerns the contingency of project maturation (Jiang et al., 2004; Pasian, 2014). Our exploration is a part of this trend. What we want to underline here is that although there is an important stream of research on project management maturity that underlines the role of the repeatability of processes that lead to definability and predictability of process and long-term perspective (Backlund et al., 2014), our research was focused on project maturation in nascent and young organizations termed start-ups. Our research on factors driving and limiting project maturity in such type of organization was based on the assumptions conveyed by Pasian (2014) that project management maturity could be also related to undefined projects preformed in dynamic environment and a culture of adaptability. Moreover, our fits into the research stream on the topic oriented towards specific types of projects and peculiar conditions of their realization (Cooke-Davies, Arzymanow, 2003; Pasian, 2014).

We are interested in exploring the peculiarity of advancing project management in young, new product oriented organizations, characterized by innovative technologies or business models termed as “start-ups” (Berg et al., 2020; Steininger, 2019; Ghezzi, 2018; Unterkalmsteiner et al., 2016). What seems to be interesting in this context are the similarities and differences between a project and a start-up, as both are temporary endeavors with a defined beginning. Start-ups at their early stages can be viewed as a project with specific goals and timelines, mile-stone orientation, and limited resources.

This unclear demarcation between a start-up and a project make the exploration more complex as well as based on interpretations and managerial viewpoints. In our research we are interested in how start-up founders frame the relationship between start-up and project maturation processes. Therefore, our research is based on qualitative methods of data collection. The interviews with IT start-up founders and with people engaged in activities of start-up

ecosystems (such as venture capital, university incubators) are used for our studies and discussions. Within our research we will look at the following questions: What factors are the drivers and the barriers in project management maturation in start-ups? What are the similarities and differences among the factors influencing the development of start-ups and those influencing the maturation of project management? Are there any differences in the perception of the factors by the start-ups proprietors and other external stakeholders?

The structure of our paper is as follows. After short demonstration of the prior research on the factors influencing the development of start-ups and projects, we will continue with delineation of research methods and research process, next we will present research results and discuss them briefly. Finally, the conclusions, limitations and avenues of further research will be provided.

2. Barriers to the development of start-ups versus barriers to project maturity

The concept of “maturity” is being used increasingly to describe the state of an organization’s effectiveness (Crawford, 2006). Project management maturity, in broad terms, pertains to the degree of advancement exhibited by an organization's project management processes, methods, and competencies (Backlund et al., 2014). It reflects the organization's ability to manage and execute projects efficiently and consistently over time.

Over the past three decades, the evaluation frameworks known as project management maturity models have garnered considerable attention in both research and practical applications (Backlund et al., 2014; Crawford, 2006; Grant, Pennypacker, 2006; Brookes et al., 2014). This attention has led to the emergence of numerous project management maturity models, including but not limited to the Capability Maturity Model (CMM), Capability Maturity Model Integration (CMMI), Portfolio, Programme, and Project Management Maturity Model (P3M3), Organizational Project Management Maturity Model (OPM3), and PRINCE2 Maturity Model (Young et al., 2014; Brookes et al., 2014).

Maturity is commonly measured in discrete stages and across a number of dimensions. Measurement is based on subjective assessments of what people are doing operationally, with each being scored (or allocated) a level of maturity, usually from a graded step model. Most models are based on five stages to maturity: initial level, repeatable level, defined level, managed level and optimizing level. These five levels define an ordinal scale for measuring the maturity of an organization’s process and for evaluating its process capability. Project management maturity can be used to measure current capability and define improvement targets for organizations wishing to improve the effectiveness of their project management. The importance of maturity models lies in the general assumption that

organizations with higher maturity levels are expected to be successful in terms of project effectiveness or efficiency and thus have a competitive advantage in the marketplace (Cooke-Davies, Arzymanow, 2003).

Previous research on project management maturity has addressed numerous questions concerning aspects such as performance enhancement (Brookes et al., 2014; Nieto-Rodriguez, Evrard, 2004; Jiang et al., 2004), project success (Milosevic, Patanakul, 2005), the maturity of projects across diverse environments (Cooke-Davies, Arzymanow, 2003; Pasian, 2014), and the contingent views of project, process and context as influencing maturity assessment (Mullaly, 2014).

When analysing the results of prior research on the conditions of project maturation, a few perspectives can be identified. First, there are investigations comparing project maturity in various sectors, demonstrating the influence of the *type of project activities* (Cooke-Davies, Arzymanow, 2003; Pasian, 2014). Next, an important stream of research underlines the role of the *repeatability of processes* that lead to definability and predictability of process, and similarly, the significance of a long term perspective in developing project management competence and skills (Backlund et al., 2014). There are numerous studies focused on the role of *internal organizational* factors, such as organizational culture (Andersen, Jessen 2003; Dinson, 2003; Riollano, 2012), leadership (Ahmed, 2018), knowledge management (Nelson, 2007; Easterby-Smith, Lyles, 2012), or introduction of particular structures, such as PMO (Khalema, Waveren, Chan, 2015). Finally, there are studies underlying the importance of including *individual competences* of people involved (Skulmoski, 2001).

What has to be underlined, according to Pasian (2014), project management maturity, although frequently seen as a feature of repeatable processes under constant and clear improvements, could be also related to undefined projects performed in dynamic environment and a culture of adaptability. One good example of organization performing undefined projects in the conditions of constant adaptability are start-ups. The term "start-up" denotes a nascent business entity characterized by innovative technologies or business models that distinguish them from prevailing solutions, coupled with scalability potential enabling swift and significant expansion with the aim of enhancing their market presence (Berg et al., 2020; Steininger, 2019; Ghezzi, 2018; Unterkalmsteiner et al., 2016; Crowne, 2002). Start-ups often engage in rapid iterations of their product or service based on user feedback, market changes, and other factors, they are known for fast-paced development, with ability to react to changes in product and business development, and introduce flexibility in the process (Berg et al., 2020).

The research on the factors influencing the development of start-ups offers a long list of potential drivers as well as barriers in start-up growth. The systematic literature review of IT start-up success factors (Santisteban et al., 2017) demonstrates that the most important role played *individual* factors related to founding team competences: their previous experience, academic formation, technological capabilities, leadership competences. Next, this research pointed at *organizational* factors such as size, age, location, and finally at the *external* factors,

such as governmental and VC support, R&D policy, the development of ecosystems and clusters, and environment dynamism.

Start-ups and projects share several commonalities, particularly in their organizational and operational aspects. First, both start-ups and projects are temporary endeavours with a defined beginning, start-ups may evolve into established businesses, but their early stages can be viewed as a project with specific goals and timelines. Next, they have usually clear and defined objectives, use milestone-based approaches to track progress, operate with limited resources, involve a degree of risk and uncertainty, and both require effective collaboration among team members. Although similarities exist, it is essential to emphasize the distinct characteristics inherent to start-ups and projects. Start-ups represent comprehensive business entities with long-term visions, whereas projects are transient undertakings devised to accomplish specific objectives. The resemblance between the initial phases of a start-up and project endeavours underscore the applicability of project management principles and methodologies in providing guidance and structure to their development trajectories. The similarity has given rise to the enquiry regarding the similarities and differences in barriers and drivers of start-ups and project maturation.

3. Research method

This research has been designed as a cross-sectional exploratory study based on qualitative semi-structured interviews (Flick et al. 2004, Brinkmann, 2013). However, we have to note, that for the introductory exploration, we conducted three selected case studies based on observations and in-depth interviews with start-up founders and team members.

Our semi-structured interviews were conducted with two distinct groups of respondents: firstly, IT start-up founders or co-founders, and secondly, representatives of entities within the start-up ecosystem, such as business incubators, academic accelerators, or venture capital institutions. This methodological approach enabled a comprehensive exploration of perspectives from both the entrepreneurial forefront and the support infrastructure surrounding start-up ventures.

The process of our research comprised two distinct phases: first, we contacted 4 organizations supporting local start-ups ecosystems asking for transferring our message about this study. In this way we managed to gain the acceptance from 18 IT start-ups proprietors and were able to conduct three case studies based on interviews and observations, and then qualitative interviews based on the protocols designed iteratively after analysing the cases. In our research process these 18 firms were interviewed in three time series. As we were aware of the fact that when tackling complex phenomena in their real-world context, it is very common for both the interviewers and the interviewees to unconsciously miss or neglect some

points, we decided also to conduct additional six interviews with some experts, i.e., venture capitalists, consultants, employees of organizations supporting local start-ups to discuss our research questions and confirm our findings.

The protocol of the interviews was consistent with the study's research question. First, the informants were asked to generally describe start-up development (size, products, business models, financing, etc.), and comment on the processes undertaken in their start-up during the early stages of its development. In addition, the informants were invited to discuss the experience of the owners (founders and co-founders), and project management activities (daily activities, methods, software used, etc.). Finally, we asked questions regarding the factors (both: barriers and drivers) influencing the development of the start-ups and project management processes.

During the data analysing process all interviews were transcribed then coded in MAXQDA by one of the researcher to identify dominant themes related to our inquiry. We not only concentrated on the themes that constituted the influencing factors (positively and negatively) but we decided to introduce some elements of quantitative approach and quantify the elements indicated by respondents during our talks. Consequently, we introduced mixed-method approach, i.e., the exploration that combines qualitative and quantitative data analysis within a single study (Azorín, Cameron, 2010; Harrison et al., 2020).

4. Research results

The start-ups involved in the study differed from one another, allowing us to classify them into three groups: A, B and C. Start-ups A were companies in the pre-seed and seed phase, employed from 1 to 5 employees, and did not formalize team work into structure with a legal form. In Group B, start-ups most often operated as limited liability companies and employed from 5 to 10 employees. Younger organizations of this segment in the early growth phase were an exception, engaging fewer human resources, but often supported themselves with outsourcing, minimizing the current staff maintenance costs. Enterprises in the expansion phase (Group C), most often limited liability companies dependent on financing entities, employed up to 20 people. What was noteworthy was the relationship between the age of the organization and the development phase. In Group A of start-ups there were the youngest organizations, none older than 5 years, similarly in segment C there were no very young start-ups, operating for less than one year, while in each group there were organizations 2-3 years old. When it comes to financing, the dominant share of private funds and funds from the accelerator was typical for segment A. In the A category, the most characteristic was the involvement of proprietors' own time, converted into financial values, and small capital resources. Group B was also dominated by organizations using equity capital (6 out of 9 enterprises),

but their volume reflected larger private investments of owners and was related to the need to employ the first employees. This group intensively sought grants to finance the construction of the product. Segment C enterprises were distinguished by the share of financial resources coming from outside and self-financing from the sale of products.

The analysis of the statements of respondents representing Groups A, B and C and the surveyed Experts (E) enabled the identification of factors positively and negatively influencing the development of project management in start-ups. Additionally, the factors that, in the respondents' opinion, determine the development of start-ups were identified. These conditions were termed as factors with an indirect impact on the development of the project management. As mentioned, for the purposes of presenting the research results, the statements of individual respondents were given a quantitative dimension by calculating the number of indications of individual factors in the respondents' statements. The summary of results are presented in Table 1.

Table 1.

Assessment of the positive and negative impact of selected factors on the development of project management in start-ups

		Negative							Positive				
Indirect factors (start-up development)		A	B	C	E	Indirect factors (start-up development)		A	B	C	E		
	Market	1	5	5	4		Market	1	7	5	2		
	Organizational culture	1	0	0	0		Ecosystem	4	3	3	11		
	Financing	1	5	3	5		Financing	0	3	3	2		
	Procedures, policies	1	3	0	1		Sales/Customers	0	1	2	4		
	Prioritizing	0	2	0	1		Prioritizing	0	1	1	0		
	Owner(s)	0	0	1	5		Owner(s)	3	3	2	5		
	Availability (no time)	3	5	1	0		Product characteristics	3	4	0	2		
	Human resources	1	2	5	3		Human resources	0	1	0	3		
			Negative							Positive			
Direct (project management)		A	B	C	E	Direct (project management)		A	B	C	E		
	Availability (no time)	2	4	1	3		Start-up development	0	2	2	2		
	Financing	0	1	3	0		Financing	0	3	1	1		
	Procedures, policies	0	0	0	1		Procedures, policies	1	1	2	3		
	Human resources	1	2	3	0		Human resources	0	1	2	0		
	Prioritizing	3	4	4	2		Prioritizing	1	6	1	0		
	Ecosystem	1	0	0	0		Ecosystem	0	0	1	2		
	Owner(s):	1	1	2	1		Owner(s)	0	2	9	0		

Source: Own study.

4.1. Analysis of indirect factors

The list of negative indirect determinants allowed us to notice that companies in the initial stages (A) are struggling with lack of availability (time) resulting from full-time employment and working for other organizations, which, in fact, was underlined frequently when answering various questions during the interview. Not without significance for early growth start-ups was the negative impact of adapting to externally imposed procedures, policies and formalization required by grant processes: ... *theoretically we had been granted the grant, but changes in national policy resulted in a change in the attitude of the financing institution, and as a result*

we did not sign the contract... (Respondent 11/A). This group, however, indicated the importance of the start-up ecosystem as supporting their development as positive factors: *...yes, the Krakow ecosystem, acceleration programs, a lot of knowledge for free, semi-free, favourable start-up environment...* (Respondent 4/A). Similarly, the importance of the role played by the owner and his involvement was noticed.

Entrepreneurs in segments B and C, in addition to the frequently mentioned limitations in availability and constant lack of time, indicated limitations related to obtaining financing for the development. What has to be noted, they pointed at the difficulties related to market factors, including the labour market and the shortage of properly competent employees: *...problems with finding people, much better financing from the competition, we have insufficient money...* (Respondent 2/B), or deficiency in consumers responsiveness: *...lack of qualified staff, lack of trust in the industry, lack of consumer awareness and that we need to educate our customers...* (Respondent 3/C).

An element that was not identified by the respondents representing all groups, but highlighted by Experts asked within our research, is the negative impact of the owners' competences, e.g.: *... on the other hand, the lack of abilities in selling what they have invented, it will not sell itself...* (Expert 3).

It is worth noting that among the positively influencing factors, the role of external factors, such as market conditions and ecosystem support were indicated most frequently. Entrepreneurs from Group B rated very highly - again - the importance of the market and the possibility of active operations on the market, selling products and acquiring customers: *...hacker attacks - interest in cyber-security, the current war in Ukraine has made people aware ...we have a geographically unlimited market...* (Respondent 7/B).

According to experts, apart from the influence of the supporting start-up ecosystem, again the involvement and competences of the owners were key factor of the firm development, e.g.: *... definitely the first thing: one technical, substantive co-founder (at least one), the second is the complementarity of co-founders... someone who understands and loves product.... ...it should be someone from the founding group....* (Expert 2).

To sum up, the information resulting from the analysis of indirect factors allowed to indicate the important role of the external factors such as market and ecosystem, as well as the owner(s) engagement, which was perceived both in a positive (having proper competences) and negative (lack of time or abilities) context. Factors such as the influence of organizational culture and lack of proper prioritization of tasks were mentioned rarely.

4.2. Direct factors

Among the significant factors directly influencing the development of project management in start-ups the proper prioritization of tasks was indicated more frequently. This view resulted from recognizing the role of efficiently implemented projects in start-up future growth. This way of interpreting the conditions was visible in the statements of respondents belonging

to all groups: ... *everyone is involved, ... and the founders have experience from similar projects implemented before...* (Respondent 13/B). Prioritization of task was mentioned by respondents during the discussions regarding negative as well as positive factors of project management maturation processes.

Among positive factors, the respondents from Group C, i.e. the segment with the highest level of organizational maturity, noticed the importance of their own attitudes and commitment, e.g.: ...*my cooperation with the university and the use of many resources that would be more difficult to access...* (Respondent 12/A).

It was not surprising, however, that among factors of negative influence, the respondents of Group B indicated the importance of resources, such as financing and time: ...*time, I work in two companies...* (Respondent 7/B) or ...*time and the fact that we do not have a person familiar with the techniques and aspects of project management* (Respondent 13/B). During the interviews, entrepreneurs also mentioned the impact of remote work on the development of common, understandable design practices and interaction related to performing activities together and simultaneously: ...*time zones, communication, especially with technical people, the problem of not being able to admit failure and errors, also lack of language skills, we work in English, and for Poles it is a second language* (Respondent 2/B). Remote cooperation has been classified as a group of factors generally referred to as availability.

When comparing the perspectives of start-up owners and ecosystem experts there are no significant differences. Representatives of supporting organizations also noticed that the development of a start-up and the resulting increase in the number of tasks performed affect the project management both positively and negatively. The information obtained during our discussions with experts indicates the importance of time and availability as well as factors related to management and prioritization of project management activities: ... *as a rule, yes, there is project awareness...* (Expert 4). The experts also pointed out procedural factors related to grant and investment procedures. This determinant was perceived and presented as external pressure (external requirements) that shaped project management processes in organizations: ... *mainly control in enterprises where projects related to grants are carried out....* (Expert 4).

5. Discussion

The main aim of our study was the identification of the significant factors that are perceived as positively and negatively influencing the maturation processes of project management in nascent and young innovative firms termed as start-ups. In our research, on the base of mixed method approach, we indicated the drivers and the barriers in project management as seen by two groups of respondents: the proprietors (start-ups' founders and co-founders) and experts in start-ups growth coming from start-ups ecosystems, i.e., business accelerators and venture

capital. As we see the similarities between projects and start-ups, first of all related to time and resource constraints, we explored prior research looking at the similarities and differences among the factors influencing the development of start-ups and those influencing the maturation of project management. Next, within our studies we surveyed start-up development factors as indirectly influencing project management processes. Finally, we analysed the similarities and differences in the proprietors and experts assessments, considering the assumption that they represent internal and external stands in their analyses and interpretation of reality.

When comparing the results of our research we can consider prior studies on the conditions of project management maturation. There are numerous studies focused on the role of internal organizational factors influencing project management maturity, such as organizational culture (Andersen, Jessen, 2003; Dinson, 2003; Riollano, 2012), role of leadership (Ahmed, 2018), the significance of knowledge management (Nelson, 2007; Smith, 2012) as well as underlying the importance of individual competences of people involved (Skulmoski, 2001). In this context, our study is not confirming the internal factors mentioned above. We can assume that our respondents, mostly founders of start-ups, have not consider such factors as their own leadership style or organizational culture they create. These components are perceived as being a part and result of their personal involvement, and they try to do their best engaging their time and personal funds. They have the tendency to perceive external factors or lack of time as responsible for the low advancement of project management processes.

In our studies we confirmed that among the factors influencing the maturity of project management in start-ups very frequently the same factors were indicated as drivers and as barriers. The most important factor are competences and attitudes of founders and co-founders. They experience but also lack of time, part-time involvement in start-up activities due to the work for other employers, the priorities put on product development rather than the advancements of internal management processes are indicated are discussed by our respondents. In our research, the dynamic and adaptive culture as well as knowledge acquisitions (workshops organized by accelerators functioning in ecosystem) were rather related to the start-up development seen as indirectly influencing approach towards project management.

When looking at the factors influencing start-up development we revealed not only the importance of external factors such as the role of ecosystems supporting obtaining funds and knowledge, but also the market and existing demand allowing gaining revenue required for the development. Again, the role of founding team, lack of time or competences were indicated as main barrier for expansion.

We can relate directly to the results of previous research on start-ups success factors (Santisteban et al., 2017) and the most important role played by founding team competences: their previous experience, academic formation, technological capabilities, leadership

competences. Next, we confirmed the importance of the *external* factors, such as the development of ecosystems and clusters, and environment (market) dynamism.

Our contribution we see as threefold. First, in our research we distinguished segments of start-ups and consequently we managed to indicate and analyse the difference in factors influencing project management processes in nascent (A), young (B) and expanding (C) start-ups (see Table 1). According to our research, there are differences in the drivers and barriers of the development perceived by the respondents from each group. For instance, in Group B the most important positive factor are proper priorities and proper assessment of the role of project management as the driver of start-up growth. Among Group C respondents the role of the founder is frequently assessed as influential. And as to start-up development, Group B is frequently discussing the role of market for their products, while respondent from Group C indicate the role of absence of employees' competencies as influencing (negatively) the development of their start-ups.

Next, in our study we suggest a new division of barriers and drivers of project management development. Within our analyses we have distinguished factors of direct influence on project management processes as well as the factors influencing start-up development and, in consequence, indirectly influencing the approach towards projects.

Finally, we emphasised the fact that similar factors are perceived by the start-up founders as barriers or as drivers of the development of their firm (e.g., market) or the management processes (e.g., prioritizing tasks). The assessment of the effects of these factors can attributed to the particular experience of the start-up founder.

We believe that even if there are no clear borders between start-ups and projects, it is important to understand how the primary stakeholders of start-ups perceive project management development and understand its significance for the future successes of their firms (Pasian, 2014).

6. Concluding remarks

The aim of our research was to explore the factors influencing the development of project management processes in peculiar type of organizations, i.e. nascent and young IT start-ups. On the basis of semi-structured interviews we indicated the main themes of discussions raised by respondents when talking about the barriers of the development of their organizations and the advancement of the processes. Next, applying mixed method approach and quantifying the importance of indicated factors we demonstrated and discussed the most frequently pointed factors.

Our contribution relates to the identification of barriers (negative influence) and drivers (positive influence) of project management processes in start-ups. We managed to divide the factors into those that have direct and those that have indirect influence of the advancements. Moreover, we also analysed these factors separately for three groups of star-ups depending on the stage of their development and compare the perspectives of founders and representatives of ecosystems.

Limitations of our research relates to the number of interviews and the fact that the sample comprised the organizations located in the same region. The extension of the sample, inclusion of start-ups from diverse locations can add value to the results and confirm or extend some of our discoveries. Apart from the extension of our sample we see some other avenues for further research, e.g., quantitative research based on a questionnaire constructed on the basis of semi-structured interviews conducted within qualitative studies.

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POLITICAL WILL AND POLITICAL SKILL: EXAMINING THE ROLE OF INDIVIDUAL FACTORS

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Purpose: This study aims to fill the gap in the existing literature on organizational behavior by examining the combined effects of individual factors (e.g., gender, age, job tenure) on political will (PW) and political skill (PS).

Design/methodology/approach: This study employs a quantitative approach. Data were collected via questionnaires filled out by senior and middle managers employed in large and medium-sized enterprises operating in Poland. To establish the relationship between the variables, we used Spearman's rho correlation coefficient and to compare the mean values of PW and PS between the analyzed groups we implemented the Student's t-test for independent samples.

Findings: The study revealed significant insights into PW and PS in organizational settings. Women demonstrated higher interpersonal influence and apparent sincerity compared to men. Negative correlations were found between age and all dimensions of PW and most dimensions of PS, indicating lower levels of these attributes in older employees. Similarly, negative correlations were observed with job tenure, as longer-tenured employees exhibited lower levels of PW and PS. These findings underscore the need for targeted developmental programs to enhance political skills across different demographic groups within organizations.

Research limitations/implications: The study underscores the necessity for integrated studies that simultaneously examine PW and PS for a holistic understanding of these constructs within organizational settings. Future research should involve larger or more diverse samples to validate the findings and conduct longitudinal studies to observe how PW and PS evolve over time and with organizational changes.

Practical implications: This research offers practical implications for leaders and managers seeking to foster effective political behaviors and enhance organizational outcomes. Ultimately, it aims to provide a nuanced understanding of the complex interplay between individual factors in shaping PW and PS as they are vital for navigating the complex political landscapes of modern organizations.

Originality/value: This paper offers new insights into demographic influences on PW and PS within organizational settings, challenging conventional assumptions. By highlighting that older employees and those with longer tenure may have lower levels of PW and PS, the research calls for a reevaluation of developmental practices within organizations. This paper is particularly valuable to organizational leaders, HR professionals, and scholars interested in

enhancing leadership effectiveness and promoting equitable development opportunities across diverse employee groups.

Keywords: political will, political skill, organizational politics, political behaviors, organizational outcomes.

Category of the paper: research paper.

1. Introduction

The work environment is inherently political. Consequently, to be effective, one must develop the ability to persuade, influence, and control others, often referred to as political skill (PS) (Mintzberg, 1983, 1985). According to Ferris et al. (2005, p. 127), PS is “the ability to effectively understand others at work and to use such knowledge to influence others to act in ways that enhance one's personal and/or organizational objectives.” PS is a concept often discussed in the context of organizational behavior and leadership; it is a vital attribute for effective leadership and organizational success, encompassing the ability to understand and influence others to achieve desired outcomes (Ferris et al., 2005).

PS is a multidimensional construct, comprising: social astuteness, interpersonal influence, networking ability, and apparent sincerity (Ferris et al., 2000, 2005). Social astuteness relates to individuals who are perceptive of others and are very good at sensing even the most subtle social situations and can adjust their behaviors accordingly (Blass, Ferris, 2007). Interpersonal influence is best described as the ability to induce intended changes in other people (Bing et al., 2011). Networking is the ability to both: establish and take advantage of a range of alliances, coalitions, and friendship networks (Pfeffer, 1993). Finally, apparent sincerity is the ability of those with this competency to conceal the motives for their actions and present themselves as sincere and trustworthy (Blass, Ferris, 2007). It is now widely accepted that performance, effectiveness, and career success depend less on intelligence and hard work and more on social astuteness, position in the organization, and political savvy. According to Ferris et al. (2006), PS may be one of the most important competencies that individuals, especially leaders, must possess in today's work environment.

For individuals to survive in the political arena, they must possess both PS and political will (PW) (Mintzberg, 1983). PW refers to the willingness to use one's energy to achieve political goals and is seen as an essential condition for engaging in political behavior (Mintzberg, 1983). According to Treadway (2012, p. 533), the individual-level PW is “the motivation to engage in strategic, goal-directed behavior that advances the personal agenda and objectives of the actor that inherently involves the risk of relational or reputational capital”. Treadway also argued that PW includes self-serving and altruistic motives. The self-serving motives are related to the individual need for achievement, power, and Machiavellianism, while altruistic motives relate to the need for affiliation, organizational citizenship behavior, and voice behavior. The desire

to engage in political behavior is inherent in many aspects of our professional lives (Kapoutsis et al., 2017). Although theory exists explaining the importance of PW in influencing others and managing politics (e.g., Doldor et al., 2013; Treadway, 2012), empirical research addressing this construct is scarce in the management science literature (Treadway, 2012). One of them is (Kapoutsis et al., 2017), who asserted that PW is one of the main motivators that spark personal and organizational resources to achieve political goals. In another research Semadar et al. (2006) indicate interpersonal competencies can be vital predictors of managerial job performance.

The two concepts discussed above are related to the term “organizational politics”, which is used to describe behavior to create, maintain, modify, and abandon shared meanings (Sederberg, 1984). They are also critical to understanding organizational behavior. Despite their importance, there is limited research on how individual factors (e.g., gender, age, job tenure) and organizational factors (e.g., level of position in the organization, number of employees in the organization, type of industry) jointly influence PW and PS. Thus the study addresses this gap by exploring the relationship between PW, PS, and the individual factors mentioned above.

1.1. Gender, PW and PS

Studies have shown that men often display higher levels of PW compared to women, driven by societal expectations and organizational cultures that historically favor male-dominated leadership styles (Eagly, Carli, 2007). Men are generally more likely to pursue and assert political objectives within organizations, reflecting traditional power dynamics. Conversely, women may exhibit PW differently, often focusing on collaborative and consensus-building approaches rather than direct confrontation or assertiveness. This difference in approach can influence how PW is perceived and enacted within organizational settings (Eagly, Johannesen-Schmidt, 2001).

Gender also affects the development and application of PS. Women, for instance, are often found to excel in the dimensions of social astuteness and apparent sincerity due to their typically higher emotional intelligence and interpersonal sensitivity (Rosener, 1990). Also Goleman (2020) highlights that women generally score higher on measures of emotional intelligence, which includes skills such as empathy, social astuteness, and interpersonal influence. This allows us to formulate the following hypotheses:

H1a: Men exhibit higher PW compared to women due to traditional power dynamics within organizations.

H1b: Women exhibit higher levels of social astuteness, interpersonal influence and apparent sincerity as components of PS compared to men.

1.2. Age, PW and PS

Younger employees often exhibit lower levels of PW compared to their older counterparts, primarily due to limited experience and job tenure (Kacmar, Ferris, 1991). As individuals age and gain more experience, they develop a clearer understanding of organizational dynamics and become more confident in pursuing political objectives. Older employees, with their accumulated experience and established networks, typically display higher PW. They are more likely to engage in political behavior to influence organizational outcomes, driven by a sense of responsibility and commitment to their roles (Lawrence, 1988).

Also, as younger employees are concerned, while they are potentially adept at certain dimensions of PS, such as networking ability, they may simultaneously lack the social astuteness and interpersonal influence that come with experience (Avolio et al., 1999; Ng, Feldman, 2010).

As individuals age, they refine these skills through continuous learning and adaptation to organizational politics. Older employees, with their extensive experience, often demonstrate high levels of PS. They can navigate complex social interactions and influence organizational decisions effectively, leveraging their deep understanding of organizational culture and politics (Ng, Feldman, 2008). Thus, we formulate the below hypotheses:

H2a: Older employees exhibit higher PW compared to younger employees due to greater experience and job tenure.

H2b: PS increases with age, as older employees develop more refined interpersonal and networking abilities.

1.3. Job tenure, PW and PS

Longer tenure is associated with increased PW, as long-serving employees often have a deeper commitment to the organization and its objectives (Lawrence, 1988). This commitment is driven by their investment in the organization's success and their desire to see their contributions recognized and sustained (Luthans et al., 2007). PS improves with experience, as employees learn from their interactions and observations within the organization. Experienced employees are more adept at understanding the nuances of organizational politics and are better equipped to influence others effectively (Ng, Feldman, 2010). They develop a keen sense of social astuteness and networking ability, which are critical for navigating complex organizational landscapes (Ferris et al., 2008).

H3a: Employees with longer tenure display higher PW, driven by their commitment to the organization.

H3b: PS is positively correlated with job tenure, as longer-tenured employees have more opportunities to refine these skills.

2. Research method

For this study, a Polish version of the measurement tool was developed to assess the constructs mentioned above. This tool is based on established measurement scales whose validity and reliability have been rigorously tested. The following scales were used to construct the questionnaire:

- **PW:** Political Will Scale (PWS), developed by Kapoutsis et al. (2017), with a Cronbach's α of 0.88; PWS consists of 8 items, sample questions are “I would engage in politics to serve the common good” and “I would use political tactics to improve my working conditions”;
- **PS:** Political Skill Inventory (PSI), developed by Ferris et al. (2005), with a Cronbach's α of 0.80; PSI consists of 18 items, sample questions are “I am good at building relationships with influential people at work” and “I am particularly good at sensing the motivations and hidden agendas of others”.

The groups of control variables were also included:

- **Employee Demographics:** Gender (1 = male; 2 = female), age (in years), and job tenure with the organization (in months).

For the Polish version we used a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The empirical research was conducted among senior and middle managers employed in large and medium-sized enterprises (employing at least 50 people) operating in Poland. The companies' contact information was obtained from the Central Statistical Office, and the sample selection was both random and purposeful.

The research comprised two stages. The first stage, a pilot study, was conducted from October to December 2021, yielding 113 completed questionnaires. The second stage, conducted from January to December 2022, involved the main study and collected an additional 365 completed questionnaires. Out of these, 108 questionnaires were excluded for formal reasons. The results were analyzed and interpreted using SPSS for Windows 10.0.

3. Results

Firstly, the examined sample was characterized in terms of demographic variables. Subsequently, descriptive statistics values for the analyzed interval variables were calculated. The shape of the distributions of the analyzed variables was assessed based on the values of skewness and kurtosis measures. Additionally, an analysis of differences in the intensity of the analyzed variables between the group of women and the group of men, the group of individuals of different ages (8 age intervals), and the group of individuals with different job tenures

(5 intervals) was conducted. The statistical significance of differences between the compared groups was verified using the Student's t-test for independent samples. The relationship between the age of the respondents and their job tenure in the organization with the analyzed variables were examined based on the values of Spearman's correlation coefficient.

The study involved 370 participants, comprising 189 women and 181 men. Table 1 presents the age distribution of the respondents.

Table 1.
Age of respondents

Age	n	%
up to 25 years	58	15,7
26-30 years old	27	7,3
31-35 years	21	5,7
36-40 years old	47	12,7
41-45 years old	58	15,7
46-50 years old	66	17,8
51-55 years old	37	10,0
56 years and over	56	15,1
Total	370	100

Note. n – number of people; % – percentage of the sample.

Source: own study.

The largest group of respondents were those aged 46-50 years. A total of 153 respondents (41.4%) were under 40 years of age, while 217 respondents (58.6%) were over 40 years of age. Table 2 presents the distribution of the respondents' job tenure.

Table 2.
Job tenure of respondents in the organization

Job tenure	n	%
less than 1 year	28	7,6
at least 1 year but less than 2 years	36	9,7
at least 2 years but less than 5 years	82	22,2
at least 5 years but less than 10 years	55	14,9
10 years and older	169	45,7
Total	370	100

n – number of people; % – percentage of the sample.

Source: own study.

Most of the respondents are people with at least 10 years of work experience, 146 people (39.5%) are people with up to 5 years of work experience and 224 people (60.5%) are people with at least 5 years of work experience.

Table 3 presents the descriptive statistics for the analyzed interval variables, i.e., mean values, standard deviations, minimum and maximum values, and the values of skewness and kurtosis measures. The summary is supplemented with the values of Cronbach's alpha reliability coefficients.

Table 3.
Descriptive statistics for interval variables analyzed

Variables	M	SD	min	max	S	K	α
Political will							
Benevolent	12,37	3,46	4	20	-0,36	-0,51	0,81
Self-serving	8,92	3,42	4	18	0,35	-0,60	0,87
Political skill							
Social astuteness	17,86	2,72	9	25	-0,04	0,25	0,76
Interpersonal influence	15,31	2,17	8	20	-0,24	0,26	0,76
Network ability	20,12	3,42	9	30	-0,25	0,05	0,75
Apparent sincerity	12,29	1,38	7	15	-0,04	0,88	0,57

Note. M – average value; SD – standard deviation; min – minimum value; max – maximum value; S – measure of skewness; K – measure of kurtosis; α - value of the Cronbach measurement reliability coefficient α .

Source: own study.

The values of the skewness measures fell within the range characteristic of a normal distribution, i.e., from -1 to 1. This indicates that the distribution of the analyzed variables is approximately normal, which is important because it validates the use of parametric statistical tests and supports the generalizability of the study's findings.

Table 4 presents a comparison of the mean values of the analyzed variables between the group of women and the group of men. The summary is supplemented with the values of the Student's t-test for independent samples.

Table 4.
Mean values of the analyzed variables in the group of women and in the group of men

Variables	Women		Men		t	df	p
	M	SD	M	SD			
Political will							
Benevolent	12,21	3,29	12,54	3,63	-0,90	368	0,368
Self-serving	9,00	3,49	8,83	3,34	0,48	368	0,630
Political skill							
Social astuteness	18,02	2,76	17,69	2,68	1,17	368	0,244
Interpersonal influence	15,54	2,04	15,07	2,27	2,11	368	0,036
Network ability	20,01	3,37	20,23	3,49	-0,62	368	0,535
Apparent sincerity	12,45	1,35	12,12	1,39	2,35	368	0,020

Note. M – average value; SD – standard deviation; t – value of the Student's test t for independent samples; df – number of degrees of freedom; P – bilateral statistical significance.

Source: own study.

It was found that the scores on the interpersonal influence scale and the apparent sincerity scale were statistically significantly higher in the group of women than in the group of men (Figure 1).

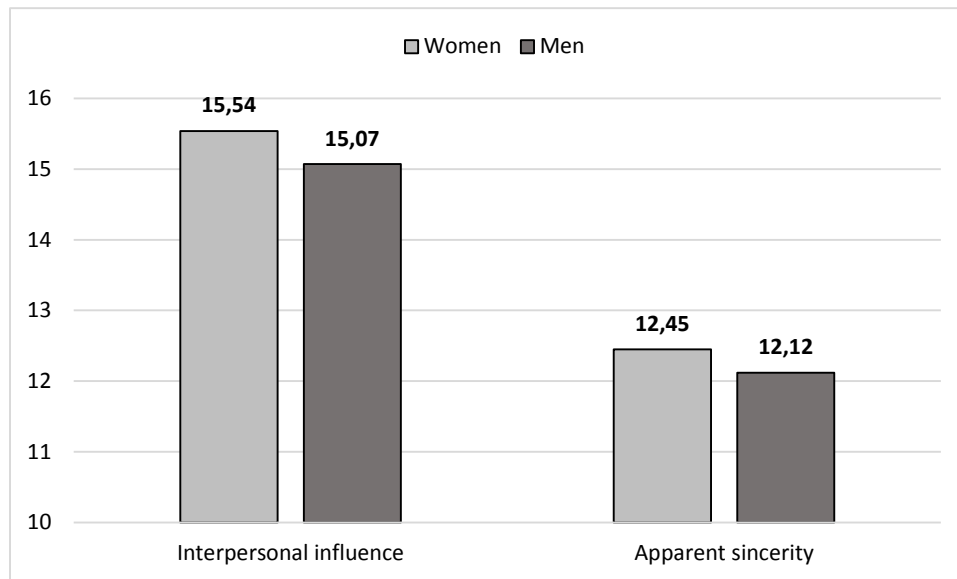


Figure 1. Average scores on the Interpersonal influence scale and on the Apparent sincerity scale in the female and male groups.

Source: own study

Table 5 presents the values ρ of Spearman's correlation coefficients between the age of the subjects and the variables analyzed. A two-tailed test of statistical significance was used.

Table 5.

Correlation coefficients between the age of respondents and the analyzed variables

Variables	Age	
	ρ	P
Political will		
Benevolent	-0,174	0,001
Self-serving	-0,233	0,001
Political skill		
Social astuteness	-0,267	0,001
Interpersonal influence	-0,194	0,001
Network ability	-0,218	0,001
Apparent sincerity	-0,071	0,172

Note. ρ – the value of ρ the Spearman correlation coefficient; P – bilateral statistical significance.

Source: own study.

Statistically significant negative correlations were obtained between the age of the respondents and all dimensions of PW and most indicators of PS, except for the scores on the apparent sincerity scale. The older the respondents, the lower their scores on all dimensions of PW and most indicators of PS.

Table 6 presents the values of Spearman's correlation coefficients between the job tenure of the respondents in the organization and the analyzed variables. A two-tailed test of statistical significance was applied.

Table 6.

Correlation coefficients between the job tenure of the respondents in the organization and the analyzed variables

Variables	Job tenure	
	ρ	P
Political will		
Benevolent	-0,109	0,036
Self-serving	-0,114	0,029
Political skill		
Social astuteness	-0,118	0,023
Interpersonal influence	-0,186	0,001
Network ability	-0,084	0,108
Apparent sincerity	-0,031	0,554

Note. ρ – the value of ρ the Spearman correlation coefficient; P – bilateral statistical significance.

Source: own study.

Statistically significant negative correlations were obtained between the job tenure of the respondents in the organization and all dimensions of PW, as well as the scores on the social astuteness and interpersonal influence scales. The longer the respondents' job tenure in the organization, the lower their scores on all dimensions of PW, social astuteness, and interpersonal influence scales.

Summarizing the results of the conducted empirical research, the study aimed to investigate the relationship between PW and PS across different demographic variables, including gender, age, and job tenure. To achieve this, several hypotheses were formulated to test specific aspects of these relationships. The next section presents the verification of hypotheses, which explore the influence of gender, age, and job tenure on PW and PS among the respondents.

Significant findings included higher scores for women on the interpersonal influence and apparent sincerity scales compared to men. Statistically significant negative correlations were found between age and all dimensions of PW, and most indicators of PS, except for apparent sincerity. Similarly, significant negative correlations were observed between the job tenure and all dimensions of PW, as well as social astuteness and interpersonal influence, indicating that older respondents and those with longer job tenure scored lower on these dimensions.

4. Discussion

The results of this study contribute to the growing body of literature on PW and PS within organizational settings, highlighting the nuanced influences of demographic variables such as gender, age, and job tenure. By examining these relationships, this research provides a deeper understanding of the complex dynamics that underpin political behaviors in organizations. Existing literature has underscored the importance of PS in navigating organizational environments, which are inherently political in nature (Mintzberg, 1983, 1985; Pfeffer, 1981).

PW, on the other hand, defined as the motivation and determination to engage in political behaviors within organizations, is crucial for achieving both personal and organizational goals. The study examined several hypotheses to understand the role of demographic factors in shaping PW.

Hypothesis H1a posited that men would exhibit higher PW compared to women due to societal expectations and traditional power dynamics within organizations. This hypothesis was not confirmed; the findings did not support the notion that men have higher PW compared to women. Hypothesis H1b suggested that women would exhibit higher levels of social astuteness, interpersonal influence, and apparent sincerity as components of PS compared to men. This hypothesis was partially confirmed, as women scored significantly higher than men on the interpersonal influence and apparent sincerity scales, but the results did not indicate higher levels of social astuteness for women compared to men.

Hypothesis H2a posited that older employees would exhibit higher PW compared to younger employees due to greater experience and job tenure. This hypothesis was not confirmed. The findings indicated a significant negative correlation between age and PW, showing that older employees had lower PW. Hypothesis H2b suggested that PS increases with age, as older employees develop more refined interpersonal and networking abilities. This hypothesis was also not confirmed. The results showed significant negative correlations between age and most indicators of PS, indicating that older employees had lower PS in terms of social astuteness, interpersonal influence, and network ability.

Hypothesis H3a posited that employees with longer job tenure would display higher political will, driven by their commitment to the organization. This hypothesis was not confirmed. The findings indicated a significant negative correlation between job tenure and PW, showing that employees with longer tenure had lower PW. Hypothesis H3b suggested that PS was positively correlated with job tenure, as longer-tenured employees had more opportunities to refine these skills. This hypothesis was also not confirmed. The results showed significant negative correlations between job tenure and social astuteness, as well as interpersonal influence, indicating that longer-tenured employees had lower PS in these areas.

Empirical findings from this study present a nuanced understanding of the relationship between PW and PS across different demographic variables, including gender, age, and job tenure. This research builds on previous studies, particularly those of Ferris et al. (2005) and Doldor et al. (2013), to enhance our understanding of the complex dynamics of organizational politics.

Firstly, our results indicated higher scores for women on the interpersonal influence and apparent sincerity scales compared to men. This contradicts Ferris et al. (2005) findings, that there are no systematic relationships between political skill and gender but aligns with Doldor et al. (2013) findings, which emphasize the importance of gender in the development of PS, particularly in how women navigate organizational politics differently from men. This suggests that women may employ certain aspects of PS more effectively, likely due to

societal expectations and gender norms that encourage women to develop strong interpersonal skills and sincerity in their professional interactions.

Secondly, the study found statistically significant negative correlations between age and all dimensions of PW, and most indicators of PS, except for apparent sincerity. This contradicts the commonly held belief that PS and PW increase with age and experience, as suggested by mainstream theories in organizational behavior (Pfeffer, 1981). Instead, our findings highlight a potential decline in these attributes with age, which could be attributed to factors such as burnout, resistance to organizational change, or diminishing motivation to engage in political behaviors (Dent, Goldberg, 1999; Maslach, Leiter, 2016).

Similarly, significant negative correlations were observed between the job tenure and all dimensions of PW, as well as social astuteness and interpersonal influence. These findings challenge traditional assumptions that longer tenure within an organization leads to greater political acumen. It raises important questions about the nature of PS development over time and suggests that prolonged exposure to the same organizational environment may limit the growth of political competencies due to factors like entrenched routines (Tushman, Romanelli, 1985) or decreased exposure to diverse perspectives and new challenges (Leonard-Barton, 1992).

5. Conclusion

This study provides valuable insights into the relationships between gender, age, job tenure, and the dimensions of PW and PS. While some hypotheses were not confirmed, the findings highlight important demographic differences that can inform organizational development practices. Understanding and addressing these differences is crucial for fostering effective leadership and enhancing organizational performance (Yukl, 2013). The literature review highlights the critical roles of gender and age in shaping PW and PS within organizational settings (Eagly, Carli, 2007). Understanding these influences can provide significant value for both theory and practice, helping organizations foster effective political behaviors across diverse employee groups. Future research should continue to explore these relationships to develop a more comprehensive understanding of political dynamics within organizations (Ferris et al., 2005).

The study underscores the importance of examining demographic variables in understanding political behaviors within organizations. The unexpected findings regarding age and tenure suggest that further research is needed to explore the underlying mechanisms that influence the development of PW and skill over time. Future research should explore the underlying causes of the observed negative correlations and examine potential interventions. Longitudinal studies could provide insights into how PS evolves over time and in response to

organizational changes. Additionally, qualitative research could uncover the personal and contextual factors that influence the development and maintenance of PS (Mintzberg, 1983).

Based on our findings, we recommend that organizations implement targeted training programs to enhance political skills across all employee demographics, ensuring that both younger and older employees, as well as those with varying job tenures, can develop the necessary competencies to navigate organizational politics effectively. Specifically, we suggest the need for targeted developmental programs that address the specific needs of different demographic groups. For instance, older employees and those with longer tenure might benefit from training that refreshes their social skills and adapts their strategies to current organizational contexts (Ferris et al., 2005). Additionally, organizations could implement mentorship programs to help less experienced employees develop their PS (Ahearn et al., 2004).

There is also a need for future research that would delve deeper into the organizational level factors that influence PW and PS. Key variables such as organizational culture (Chatman, O'Reilly, 2016), leadership style, changes in professional roles (Ibarra, 2003), and human resource practices play significant roles in shaping these political competencies. Investigating these factors can provide valuable insights into how different organizational environments foster or inhibit political behaviors, contributing to a more comprehensive understanding of organizational dynamics (Pfeffer, 1993).

Additionally, examining the impact of organizational size and industry context on PW and PS can enhance our understanding of the complex nature of organizational politics. Larger organizations, with their increased complexity and formalization, may necessitate different political strategies compared to smaller, more agile firms (Bolman, Deal, 2003). Similarly, industry-specific factors can shape the development and application of PSs, highlighting the need for tailored strategies to manage political behaviors effectively across diverse organizational settings (Mintzberg, 1983).

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INTERNATIONALIZATION ACCELERATORS IN AUTOMOTIVE SECTOR COMPANIES

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Purpose: The main aim of the article is to identify and describe the accelerators of internationalization of automotive companies, i.e. the factors that create the conditions for this process to occur and significantly strengthen it. An additional goal is to group these factors according to specific criteria and try to determine their importance using specific examples.

Design/methodology/approach: The study used mixed research methods. The research began with literature studies. They allowed for determining the current state of knowledge in the studied area and formulating the research problem. The actual research was conducted using the qualitative approach. Case studies supported by data from secondary sources are an important element of the research.

Findings: All factors enabling and accelerating the internationalization process can be classified into one of four groups: politics, market, costs and competition. Each of these groups is characterized by features common within this group and significantly different from those of the other groups. With the passage of time and with evolution of the global economy, the importance of the described factors and the strength of their impact on the overall shape of enterprise internationalization are changing.

Research limitations/implications: The research expands scientific knowledge of factors that determine the background of the internationalization process and strengthen this process. They show the context that makes it easier to understand why car companies undertake expansion to foreign markets and what benefits and threats result from it. The main limitation is the relative scarcity of objective and highly reliable data presented in a way allowing for quantitative comparative research. The acquired data is dispersed and discontinuous. Therefore, it can be assumed with high probability that not all relationships and dependencies have been noted.

Practical/social implications: This article is recommended for researchers dealing with its subject matter and for management practitioners, especially executives responsible for management and development strategy. The characteristics, recommendations and conclusions contained herein enable a better understanding of the complex, complicated and multi-faceted system of conditions for the international expansion of enterprises.

Originality and value: The originality of the research consists in an attempt to comprehensively describe the most important factors setting the background for internationalization of enterprises and strengthening this process. The article's conclusions and recommendations allow for a better understanding of the mechanisms of conducting business and competing in the global environment.

Keywords: internationalization, strategy, management, internationalization accelerators.

Category of the paper: research paper.

1. Introduction

Internationalization of enterprise operations intensified on an unprecedented scale in the 1980s. This process then became the subject of increased interest of both management practitioners and theorists. Attempts were made to learn about motives for internationalization, determinants of this process, its model course, and, above all, benefits of these processes and risks associated with them. The first studies showed that the main motives for adopting an internationalization strategy was the desire to use cheap raw materials and labor, and, first of all, the opportunity of taking over shares in new markets for production carried out in the home country. However, over time, the motives for taking action outside the home country were becoming increasingly complex. The determinants of internationalization, in particular the scope and strength of their impact, are constantly changing.

With the changes taking place in the global economy, the scope of benefits and the scale of risks related to the internationalization process are also changing. An example is the withdrawal from Far Eastern countries by an increasing number of manufacturers. The relative benefits of low labor costs, taking into account high transport costs, are decreasing. Such solutions are becoming less and less profitable. Threats resulting from the learning effect are also increasing. Western European and North American countries that invested in Asia (except Japan) simultaneously transferred technologies, know-how and other strategic resources to the latter. These assets now allow enterprises in this region to obtain competences and skills similar to, and sometimes higher than, those of Western companies.

In addition to these changes, which were definitely evolutionary, there were also changes of a sudden, even revolutionary nature: the outbreak of the Covid-19 pandemic and the Russian aggression against Ukraine. These events brought the economy to a turning point. These examples demonstrate clearly that the topic of internationalization remains relevant. It certainly will, and should, be an area of further research on which recommendations for management practitioners could be based.

The scope of impact of the processes of internationalization and globalization is very wide. They affect people, all types of business, social organizations and legal regulations. This translates into changes in the operation of the economic, social and legal systems of individual countries and, consequently, the entire world economy. Undoubtedly, in each of these areas it would be possible to find critical elements with a very strong impact on the discussed processes. However, there is no doubt that enterprises constitute a group of entities whose activities greatly influence changes in the life of individual local, regional and national economies. These trends are then aggregated and transformed at the highest level, which is the global economy.

2. Research methodology

The approach used in the work was mixed and required the use of two methods. The first part of the work included studies of the literature on the subject in order to determine the current state of knowledge in this area. The second stage included qualitative research. A research approach consisting of a qualitative case assessment was used. The study included the following stages.

- Review of the literature: A thorough review of monographs and scientific articles was conducted. The literature was obtained from renowned databases, including Scopus, Web of Science and ScienceDirect. The literature covered the issues of development of the world economy and international expansion and internationalization of enterprises.
- Formulation of the research problem: The literature analysis enabled the identification of a research gap. It was found that there is a lack of research that addresses the issues of identification and description, as well as changes in the strength, of the impact of factors that create a set of conditions for internationalization of a specific sector throughout its life. This allowed for the formulation of the main goal and a secondary goal. The main aim of the article is to identify and describe the accelerators of internationalization of automotive companies, i.e. the factors that create the conditions for this process to occur and significantly strengthen it. The additional goal is to group these factors according to specific criteria and try to determine their importance based on specific examples.
- Data and information collection: Data was obtained from various sources:
 - international institutions,
 - industry organizations,
 - market reports,
 - enterprise reports,
 - press articles,
 - websites.
- Data analysis: The information and data obtained were subjected to careful selection and rigorous analysis, subordinated to the purpose of the research. Then, the classic assumptions of the qualitative research approach were applied.
- Results and recommendations: The article ends with conclusions and recommendations for the scientific community and for executives in charge of strategic management.
- Limitations: The source data was dispersed and discontinuous. This circumstance significantly complicates any comparative research and makes it impossible to study the development of phenomena over time using quantitative methods. This leads to the obvious conclusion that many cause-and-effect interdependencies have not been noticed or properly assessed.

3. The essence of internationalization of enterprises

Internationalization, in the simplest terms, means that an enterprise expands its activities beyond the borders of its home country in order to find better development opportunities. The essence and causes of internationalization are very complex, as they are shaped by a number of closely interconnected and largely interdependent factors. An important feature of this process is its multidimensionality, which involves an interfusion of several spheres: economy, business and society. The dialectical nature of internationalization should also be emphasized. This process is influenced by interrelated and conditioned sub-processes that seem contradictory, for example homogenization and differentiation or globalization and regionalization.

Johanson and Wiedersheim-Paul (1975) and Johanson and Vahlne (1990) concluded that internationalization is a slow, gradual and evolutionary process. The authors noted that the typical course of an instance of internationalization begins with exports and the next phase is various forms of cooperation, which precede direct investments characterized by the highest degree of control among all forms of foreign involvement. Currently, this method of internationalization is known in the literature on the subject as the “Uppsala model”. This approach was also used. The evolutionary model has many supporters among researchers. Critics, however, argue that this theory was applicable in the 1970s, when the advance of internationalization and globalization was slow, but now the theory has become outdated. Simple evolutionary theories often insufficiently explain strategic behaviors and the choice of forms of enterprise development on foreign markets. At the end of the 1980s, Johanson and Mattson (1988) and Root (1987) promoted the view that the internationalization process is largely dependent on the conditions in which the company operates. However, the company chooses a specific level of internationalization and its forms depending on the potential benefits that can be obtained.

Internationalization of a company's operations is a complex and multidimensional phenomenon, and therefore difficult to describe within a uniform model. Regardless, it is identified with growing involvement in international activities (Welch, Luostarinen, 1988) or even with any type of activity undertaken outside the borders of the home country (Rymarczyk, 2004). The fact of expanding from the domestic market into an increasing number of foreign markets is often emphasized (Misala, 2005). Internationalization is also treated as a synonym for geographical dispersion of a company's economic operations outside its home country (Przybylska, 2010).

Internationalization is pursued through various organizational forms, depending on the level of the company's involvement in foreign operations. Globalization is considered its highest stage (Fischer, 1998; Zorska, 1998; Gwiazda, 2000; Gierszewska, Wawrzyniak, 2001; Flejterski, Wahl, 2003). According to Mittelman (1996), a manifestation of globalization is the

spatial reorganization of production and the penetration of industries across borders, the expansion of financial markets, and the diffusion of similar consumer goods to distant countries. Globalization is also considered as a process (Bairoch, Kozul-Wright, 1996) in which the production and financial structures of countries become interconnected by an increase in the number of cross-border transactions and leads to the emergence of a new international division of labor in which the creation of national wealth depends increasingly on business organizations from other countries. Early theories by Levitt (1991) and Rugman and Hodgetts (1995) viewed corporate globalization as the production and distribution of goods and services on a worldwide scale. According to McGrew (1992), globalization consists in the multiplicity of links and mutual interactions of states and societies that form the current world system. Globalization is characterized by two dimensions: scope and intensity. It is driven by phenomena involving activities on a global scale. Globalization also involves intensification of cooperation between states and societies that make the global community. Various types of relationships and connections are simultaneously expanding and deepening in the global economy. To sum up, globalization of the world economy is often considered as a consequence of the process of internationalization of enterprises.

4. Enterprise internationalization accelerators

The causes of globalization of the world economy, like its essence, are very complex. Although globalization is considered a relatively new phenomenon, in fact its roots lie in the 18th and 19th centuries. The industrial revolution of the late 18th century changed the face of factories and initiated mass production of goods. That laid foundations for the phenomenon of globalization of sectors and concentration of activities in specific areas. The development of markets resulted in lower prices and, thus, an increase in attractiveness of products.

It is important to distinguish globalization of markets from globalization of sectors, as each form of globalization has different implications for different aspects of strategy and operations. It is also important to understand links between global sectors and markets, as the characteristics of the sector and market influence the specificity of the global strategy. The following distinction between “sectors” and “markets” was adopted in the research: sectors generate supply while markets create demand. This distinction was adopted by, among others, Stonehouse et al. (2001).

The course of the internationalization process is shaped by a number of factors that are strongly interconnected and largely interdependent. They are a kind of accelerators, i.e. factors that speed up this process. According to the concept of Yip (1996), they can be divided into external factors related to the international environment and internal factors related to the development of the enterprise and its strategic decisions. The group of external factors includes

political and market-driven factors, while the group of internal factors includes cost- and competition-driven factors. This division was used by Rymarczyk and by the authors from the Strategor Group, among others. Zorska (1998) distinguished three groups of factors while expanding Dicken's approach: scientific and technical progress, changes in international competition and economic policies of the state. The article distinguishes four groups of factors:

- politics-driven,
- market-driven,
- cost-driven,
- competition-driven.

4.1. Politics-driven factors

Politics-driven factors are related to the broadly understood economic policy of the state, as well as economic processes initiated or modified by the policy. The factors that contributed most to internationalization of production sectors, including the automotive sector, which is the subject of research, are characterized below.

The **policy of the host country** is a very important determinant of the process of enterprise internationalization. There may be discrepancies between expectations of potential investors and expectations of host country governments. Terms of trade imposed on foreign companies may be inconsistent with their global strategies and, therefore, cause a conflict between their own needs and political pressures. According to Dunning (1992), economic policies of host countries influence the course of the globalization process by removing obstacles and distortions in the operation of markets and by stimulating their activity.

Removing barriers to the flow of resources is a necessary condition for conducting geographically dispersed and functionally integrated business activities. **Liberalization of trade** occurs as a result of gradual exhaustion of development opportunities based on national resources and markets (Romanowska, 1997; Szymański, 2001; Stonehouse et al., 2001; Cygler, 2002). Benefits of international exchange result from mutual access to sales markets. In this way, agreements liberalizing international exchange were concluded and several organizations were established, the most important of which are:

- International Monetary Fund (IMF),
- World Bank,
- Organization for Economic Cooperation and Development (OECD),
- World Trade Organization (WTO),
- various UN agencies:
 - International Labor Organization (ILO),
 - United Nations Development Program (UNDP),
 - United Nations Industrial Development Organization (UNIDO),
 - Food and Agriculture Organization of the United Nations (FAO),
 - United Nations Conference on Trade and Development (UNCTAD).

The task of the IMF and the World Bank is to maintain financial stability and liquidity in international financial turnover. The OECD is an organization associating 38 of the most developed countries in the world, participation in which offers opportunities to reduce costs of international transactions and bank guarantees and loans. The WTO works for liberalization of international trade, while specialized agencies of the UN facilitate the exchange of experience and information and offer assistance to less developed countries.

Deregulation of domestic financial markets is an important accelerator of internationalization. Moving away from fixed exchange rates contributed to a strong increase in turnover and increased speed and security of financial operations. Capital became more easily available.

Legal regulations regarding stronger intellectual property protection are another important determinant. Better protection of products and brands and unification of similar standards around the world drove the emergence of global products.

Easement of state interventionism is another very important factor in internationalization of enterprises. The lowering of political barriers was possible thanks to the increasing dominance of market forces over government regulations.

Economic integration is also an important factor of globalization. It involves cooperation of the member states of a given group and leads to the establishment of huge markets with unified economic, technical, legal, social and financial background. Economic integration eliminates exchange barriers within a given region, while maintaining common trade restrictions outside the group. The groups with the greatest importance in the world economy are the European Union (EU) and the North American Free Trade Agreement (NAFTA). At the end of the 1990s, they accounted for approximately 50% of the world trade and approximately 70% of foreign investments. Other regional groupings important for the world economy include:

- Asia-Pacific Economic Cooperation (APEC),
- Association of Southeast Asian Nations (ASEAN),
- ASEAN Free Trade Area,
- MERCOSUR (Mercado Común del Sur).

The described factors drive internationalization of manufacturing enterprises, regardless of their sectors. In the case of the automotive sector, the most important politics-driven factors include the following:

- economic and economic integration,
- trade liberalization,
- state interventionism reflected in:
 - tax policy,
 - import policy,
 - policy towards foreign investments.

The processes of **economic integration** of large areas and regional **economic integration** are of great importance for internationalization of the automotive sector. They enable the building of markets free from customs barriers. They thus create greater freedom in the international exchange of goods, services and means of production within a specific group of countries. Integration leads to unification of legal, technical and fiscal terms of conducting business in associated countries, while maintaining common restrictions for outsiders. The most important cooperation agreements are the EU and the NAFTA. They concentrate the vast majority of trade and resources of automotive companies. To this China should be added, which has become a major player in the sector.

The ASEAN countries have set for themselves a goal of promoting economic development, securing political and economic stability and solving problems in the region. Their cooperation was intended to strengthen the economies of the individual members so that they could resist the expansion of companies from the USA, Japan and Europe (Oziewicz, 2001). This unfavorable climate for imports and direct investments resulted in the almost complete absence of European and American manufacturers. They expected trade liberalization in the entire region. Japanese companies, on the other hand, used a multi-local approach, i.e. each country in the group was treated as a separate market. This strategy allowed Japanese manufacturers to gain a 90% share in the ASEAN's market. The use of integrated measures as part of a global strategy is very difficult in the ASEAN due to the group's strongly protectionist policy. In an attempt to protect their own markets, the ASEAN countries forced manufacturers to source from local suppliers. Japanese manufacturers were therefore forced to completely reorganize their supply system for their factories in Thailand, Indonesia, Malaysia and Philippines (The Economist, 2000, p. 82).

The internationalization process is driven by economic policies of individual countries, the essential component of which must be removal of barriers to the flow of resources. **Liberalization of trade** results from gradual exhaustion of opportunities for enterprises to develop based on their national resources and markets. Therefore, enterprises are looking for new markets and strive to reduce production costs. Despite clear global trends to eliminate barriers to the flow of resources, individual countries or entire groups in some regions continue to protect their markets. This strategy was adopted by the EU towards the USA and, above all, towards Japan and South Korea. Korean manufacturers therefore decided that the best way to enter the EU market was to set up their operations in countries aspiring to this group. They located their plants in Slovakia and Czechia. When these countries joined the EU, they became part of this market. The motive for investing in these countries was primarily the desire to bypass tariff barriers. In order to protect their own market, European and North American companies began to press the South Korean government to facilitate their access to this market, threatening to impose economic sanctions in case of refusal. Behaviors aimed at protecting their own market are also typical of Japanese governments.

The internationalization process may be shaped by **state interventionism** including the tax system, among others. The Japanese tax system favored for a long time vehicles with very small engine sizes. This is how they defended access to their market. Only long-term protests by Western manufacturers contributed to liberalization of the state's protectionist policy in the form of high customs barriers. As a result, these barriers were completely abolished in 1978. However, exports to Japan were still effectively limited by very strict environmental pollution standards in force in that country, usually unattainable for Western manufacturers at that time.

An important factor in shaping markets and competition is the **state's import policy**. Strong state interference in market control mechanisms marked the development of the automotive sector in South Korea. A total ban was introduced on the import of cars from Japan. This was an expression of huge concerns about technologically advanced and highly competitive Japanese products. The ban allowed Korea to avoid direct competition on its own market and contributed to the strengthening of the domestic industry. In contrast, Thailand's liberal economic policy meant that the country has never become an independent car producer. It is only a host for activity of Japanese and American companies.

In response to the growing competitive advantage of Japanese manufacturers, the USA also used adequate import policy tools. When imports from Japan increased almost sixfold in just a decade, the US introduced import limits. Almost all EU countries also took steps to protect their markets. An exception was Germany which had an extremely competitive domestic industry.

An important determinant of internationalization is the **host country's investment policy**. There are often discrepancies between expectations of potential investors and interests of host countries. An example is the Japanese government's regulations on car imports from the mid-1950s. Despite huge demand that the domestic production could not meet, the Japanese government decided to maintain high customs duties, effectively defending access to this market. The aim was to establish a foundation for development of the domestic industry. In return, favorable conditions were offered for concluding license agreements. The imports of components were gradually limited and, at the end of the 1950s, the domestic automotive industry was almost entirely supplied from local sources. As a result, high customs duties and legal regulations unfavorable to foreign investors blocked the expansion of American and European companies in Japan for many years.

State interventionism is the most important factor that has structured the current layout of competitive forces in China. The main motive for the initial investments in China in the 1980s was the desire to achieve a high starting competitive position on this market. After a decade, the best position there was won by German Volkswagen whose production in 1994 exceeded 100,000 vehicles, or one third of all vehicles assembled in China at that time. Low labor costs were of secondary importance because low production efficiency and negligible demand on the internal market made operating there unprofitable. Therefore, most manufacturers tried to enter the Chinese market only when the country's economy offered the promise of a rapid and steady growth. However, under influence of a strong lobby of early investors who wanted to negotiate

the most favorable terms of trade, in 1994 the Chinese government introduced a two-year ban on establishing new joint ventures in the automotive sector. This is how the government rewarded the early investors.

The US government's interventionism was of a completely different nature. In order to improve competitiveness of the domestic sector, a unique car development plan was implemented in 1993: the Partnership for a New Generation of Vehicles (PNGV). That was supposed to encourage the development of a new standard for American cars, which would enable them to effectively compete worldwide with European and Japanese vehicles. It was a collaborative research program between the US government and the three largest domestic car companies. The goal was to introduce extremely fuel-efficient vehicles (2.9 l/100 km) to the market by 2003. The project involved eight federal agencies, national laboratories, universities and a technology company, the United States Council for Automotive Research (USCAR), which included DaimlerChrysler, Ford Motor Company and General Motors Corporation. On request of the car manufacturers, the program was canceled in 2001 by the administration of G.W. Bush, and some of its tasks were transferred to another program: the FreedomCAR.

Table 1 summarizes information on the content and statuses of the most important car trade agreements between the EU and other countries/regions of the world.

Table 1.

Statuses of car trade agreements between the EU and other countries/regions of the world

Region/country	Agreement content	Negotiation status	Duties on passenger vehicles
UK	Comprehensive free trade agreement	3 of 5 negotiation completed.	–
China	Investment treaties, investment protection and market access	Mandate for negotiations since 2013.	25%
USA	Agreement on conformity assessment and customs relief for industrial products	Mandate for negotiations since 2019, further steps planned.	2.5% on passenger cars, 25% on commercial vehicles
India	Comprehensive free trade agreement	Mandate for negotiations since 2007, break after 12 rounds of negotiations (since 2013). Talks on continuation are ongoing.	Up to 100%
Mexico	Renewal of the existing agreement	Agreement on the commercial part – 2018. Internal final consultations underway in the EU.	0%
MERCOSUR	Negotiating directives of 1999	After almost 20 years, agreement on the commercial part – 2019, Internal final consultations are underway in the EU.	35%
ASEAN	Comprehensive agreement with the ASEAN as a region	Negotiations started in 2007. Bilateral since 2009. Discussions about starting regional negotiations ongoing since 2018.	Up to 80%
Malaysia	Free trade agreement	Negotiations since 2010, currently discontinued.	30%
Indonesia	Free trade agreement	Negotiations since 2016.	50%
Philippines	Free trade agreement	Negotiations since 2016.	30%
Thailand	Free trade agreement	Negotiations since 2013. Frozen since the 2014 military coup.	80%

Source: VDA, 2020, p. 75.

International trade and cross-border supply chains are important success factors for the global automotive industry. Isolation and barriers to entry lead to high prices, costs and trade conflicts. Free trade agreements play a crucial role in lifting these barriers. European manufacturers use solutions negotiated within the EU. Currently, priority is given to agreements with the MERCOSUR countries. The Brazilian and Argentinean markets are seen as the markets of the future, but they impose high tariffs: up to 35% on passenger cars and 18% on car parts. The next priorities for the European car industry are agreements with China, the ASEAN countries and India.

However, in addition to customs barriers, there are also non-tariff trade barriers. The most important of them, according to VDA (2020), include:

- corruption and/or lengthy customs procedures,
- complex regulatory environment,
- unreasonable packaging, labeling and technical standards,
- state subsidies,
- fixed minimum import prices,
- additional fees and commissions, such as for recycling”,
- “buy domestic” policies,
- currency market control,
- import licenses,
- general and/or specific quotas for certain products,
- import bans,
- additional commercial documents.

4.2. Market-driven factors

The second group of external factors are market-driven factors. These include **development of transport**, among others. The increased accessibility to transport facilitated the movement of goods. The result was the opening of individual markets to international products on an unprecedented scale. This development enabled consumers to learn about products and services that were previously unavailable to them (Stonehouse et al., 2001; Szymański, 2001).

A factor that has a huge impact on the dynamics of the globalization process is the **information revolution**. Communication provided by telephone, fax and now, above all, the Internet, enables enterprises to coordinate their activities around the world. The appearance of satellite and online TV contributed to increasing mass awareness of the existence of specific products and brands (Romanowska, 1997, p. 110; Zorska, 1998, p. 22).

An important market factor is **unification of international demand**. This leads to unification of the assortment on a global scale. The universal nature of consumer tastes and product unification result in the need to have global distribution channels. Unification of consumer tastes enables the use of global strategy instruments, such as global market

participation, manufacture of global brands, use of global competitive policies and global marketing.

Unification of technology and means of production is another accelerator of internationalization. The best technological solutions are spreading rapidly, setting new quality, functional and aesthetic standards (Kozmiński, 1999). The use of modern computerized production systems covering design, supply, production and logistics is prerequisite to being competitive. This means world-class manufacturing. However, full product unification for all world markets is not possible, as demand for many goods still varies in different countries. This is due to their traditional cultural differences and established consumption habits. The phenomenon of demand unification itself does not explain globalization of enterprises but is a factor that favors it (Cygler, 2002; Stonehouse et al., 2001). Unification facilitates development of globally unified supply systems. The general trend is that components are purchased from fewer but larger suppliers. Concentration of supply sources ensures cost reduction without compromising on quality. Unification also applies to marketing standards. This makes it possible to design advertising campaigns that may be used all over the world. However, it should be emphasized that some markets, for various reasons, retain their regional distinctiveness. For example, Ford Mondeo was available in the USA under the name Ford Contour and under a completely different brand: Mercury Mystique. Opel Vectra on the British market was called Vauxhall Vectra.

Three factors have the greatest impact on the internationalization process in the automotive sector, as in most manufacturing sectors:

- unification of consumer tastes,
- new information and communication technologies,
- transport development.

Unification of consumer tastes leads directly to unification of global demand. In the automotive sector, this process gained particular dynamics in the 1980s. Product features that are increasingly desired by customers around the world include greater cost effectiveness, reliability, durability and high performance. Due to increasing problems with road traffic and parking space, the ability to combine small external dimensions of the vehicle with a large interior space is valued. Cars that used to be strongly differentiated today display many common features.

The tendency for consumer tastes to become similar makes it easier to participate in major markets because one product, after introducing only minor modifications (or even without them), can serve many foreign markets. This enables the use of a strategy of focusing on similarity. It takes advantage of the fact that a standard product is accepted in most countries. This allows highly standardized products to enter new markets. For example, Toyota, Nissan and Honda focused their activities primarily on basic needs common to all markets they serve, i.e.: quality, reliability and cost effectiveness, and only then on the need for differentiation.

Today, the ability to compete in the automotive sector depends more than ever on technological advancement and the ability to quickly implement **new information and communication techniques and technologies**. They make it possible to replace traditional forms of design work with computerized processes based on advanced mathematical models. An example is the integrated computer-aided design/computer-aided manufacturing (CAD/CAM) system. It enables coordination of design work, starting from the initial phase, i.e. concept, through production simulations to accident simulations (crash tests). This significantly shortened the time of creating designs.

The result of the more extensive use of the ICT is greater flexibility of enterprises and their production systems, more effective logistics, shorter car development time and higher productivity. The Internet has revolutionized the way information is exchanged. The use of modern sales and distribution systems based on e-commerce technology is increasing. The pioneers in this area were German component suppliers who started to conclude B2B (business-to-business) transactions on line. Currently, applications supporting B2C (business-to-customers) transactions with end clients are also increasingly used. Modern methods of data transfer protection enable safe online cooperation both with suppliers and between various R&D and production centers of globally operating enterprises. The Internet is increasingly used for internal communication and training. It may become a car sales channel no. 1 in the future.

Technological developments have led to improvements in **transport** and generated new production and organizational methods. Favorable technical conditions emerged to increase mobility of means of production. Unification and improvement of means of transport offers time and cost savings. Lower transport costs facilitate the regrouping of production centers without fear of reducing the product range. An efficient network of people and information flow has become a key element of the infrastructure of globalization processes. Road transport has won the competition with railroads in freight transport. The former is more cost-efficient, faster and more flexible. Cars play an even greater role in transporting people than in transporting goods. Almost 97% of all trips in Germany are made by cars. Overall, the percentage of people traveling by this means of transport is approximately 83%. Including public transport, this share increases to over 90%. Statistically, 80% of residents in Germany have a car.

Each of the factors discussed affects the automotive sector with different strength. The sensitivity of individual markets to these factors also varies. For example, the pressure to standardize products is weaker in the USA than in Europe. European cars must be exceptionally versatile. In the USA, mainly due to the higher level of motorization in this country, the custom of buying a car for specific purposes persists.

4.3. Cost-driven factors

Sectors requiring high expenditure on R&D and incurring high fixed costs are often more globalized than others. The motive pushing a company to expand abroad is the ability to spread these costs over a larger number of products and thus improve economic performance. The **cost-driven factors** in the background of internationalization of enterprises include:

- economies of scale,
- shortening of product life cycles,
- rapidly changing technologies,
- learning and experience curve,
- logistic improvements,
- cost differences between countries,
- high product development costs.

Global economies of scale occur when national markets are not large enough in relation to the production capacity. However, increasing the scale of operations in one place is accompanied by the risk of rigidity and by susceptibility to crises (Yip, 1996). For this reason, in order to increase production efficiency, the same links in the value chain are often located in different countries. The factors determining the choice of country are primarily cheap labor, access to cheap raw materials and favorable conditions in the host country. Economies of scale result from the participation of a larger number of products in fixed costs. This is due to the spread of fixed costs (e.g. R&D, management, advertising) over a larger number of cars, which leads to a reduction in capital expenditure per product unit. Large-scale production also provides other benefits. For example, the enterprise's negotiating potential in relations with suppliers and governments of host countries increases (Strategor, 1997). Production significantly increased during the period of dynamic development of the global automotive sector without the need to cut the shares of rivals. In a period of stagnation or low growth, each time when one of the market players wins, competitors have to reduce their outputs.

The market forces an increasingly faster pace of development and implementation of new products. As a result, the **product life cycle shortens**. The need to compensate for high R&D expenditure often contributes to the decision to internationalize. Back in the 1980s, a given car model was produced for about a decade. Then, the face-lifting of the model was done at most twice, usually by introducing some minor stylistic changes, without significant technical innovations. Today, models are replaced every five years, on average, and the sector offers more and more of them.

Rapidly changing technologies are another accelerator of internationalization of automotive companies. The time between making a discovery and implementing an innovation has shortened from about 14 years in the 1950s to about 3 years today. However, this result of the shortening of the product life cycle implies larger expenditure on R&D. These factors have a dual impact on the internationalization process. On the one hand, the company internationalizes its activities to minimize the costs of R&D. On the other hand, the effects gained as a result of these expenditures stimulate technological progress, therefore the costs of R&D activities increase (Wysokińska, 2001; Romanowska, 1997). Technological changes are stimulated by changes in the area of communication. For example, the Internet makes it possible to deliver information to suppliers in real time. This makes it easier and faster to process orders. In the automotive sector there have long been visible trends for cars to be assembled to custom orders. Manufacturers such as GM and Toyota began working on the Five-Day-Car project in the late 1990s. This project assumed that the time from the moment the customer placed the order to the moment the car was delivered to them, which used to be approximately two weeks, would be reduced to a maximum of five days. The prerequisite for success of such projects is precise coordination of activities between the manufacturer and component suppliers, and information about each order must reach many places at the same time.

The result of shortening product life cycles and rapidly changing technologies is an increase in the slope of the **knowledge and experience curve**. Greater dynamics and accumulation of effects resulting from learning may, in turn, be an important motive for making the decision to expand abroad.

Cost differentiation between countries is also an important accelerator of internationalization. It enables concentration of production functions in regions with favorable cost levels, diversifying sources of competitive advantage.

High **development costs** place a huge burden on even the largest enterprises. Investments in the R&D sphere are accompanied by a high degree of risk. In order to minimize it, it is necessary to quickly implement results of R&D on as many foreign markets as possible. Another way is to undertake joint R&D, even by directly competing companies. If the partner is an existing foreign competitor, this is another contribution to internationalization of the business.

Increasing efficiency of supply sources and **logistic improvements** are another accelerators of internationalization in the sector. Integrated supply chains are currently becoming an important factor of competitive advantage. This term refers to groups of cooperating enterprises that create chains, networks or spider webs. Their goal is to optimize value added throughout the entire chain through effective management of the entire network of enterprises (Laskowska, 2002). In the times of rapidly changing technologies, the sequential transfer of information between individual entities is ineffective. Modern methods of managing supply chains of automotive companies aim to coordinate functions of a specific group of cooperating companies connected by a logistics network, including suppliers, manufacturers, distributors and customers. Dynamic information transfer within this network is intended to achieve jointly set strategic goals. An example of an integrated system supporting supply chain management is mySAP SCM (mySAP Supply Chain Management) and its module intended for automotive companies: mySAP Automotive. They support the management of modern networked supply chains – from the selection of supply sources, through planning demand for finished products, to controlling their physical distribution. This system enables partners to quickly identify changes on the demand side and use this information throughout the entire logistics chain. It also provides a basis for creating a fully cooperative supply chain that allows for a much more effective response to changes in the company's environment. This translates directly into reduced costs, increased operating efficiency and profits. Other benefits obtained from integrated supply chains include:

- shorter delivery times,
- less disruptions in production,
- lower inventory level,
- higher quality.

In addition to striving to improve efficiency of supply sources and implementing logistical improvements, companies are constantly looking for optimal production systems. A classic example is the Toyota Production System (TPS) that initiated a real revolution of “lean production” in the automotive sector (Monden, 2011). It is based on just-in-time deliveries, Total Quality Management (TQM) and continuous improvement. For many years it was a determinant of efficiency in the sector. Today, strong competition from rivals who copied Toyota's production system has reduced national productivity gaps.

Cost differences between countries are one of the most important factors in choosing the location for a business. It largely explains the inflow of foreign direct investment to in Asia, South America and Central and Eastern Europe. Labor costs were one of the most important reasons for moving production activities abroad in the 1990s. Figure 1 shows differences in hourly wages in the countries that were then the main area of activity of car companies.

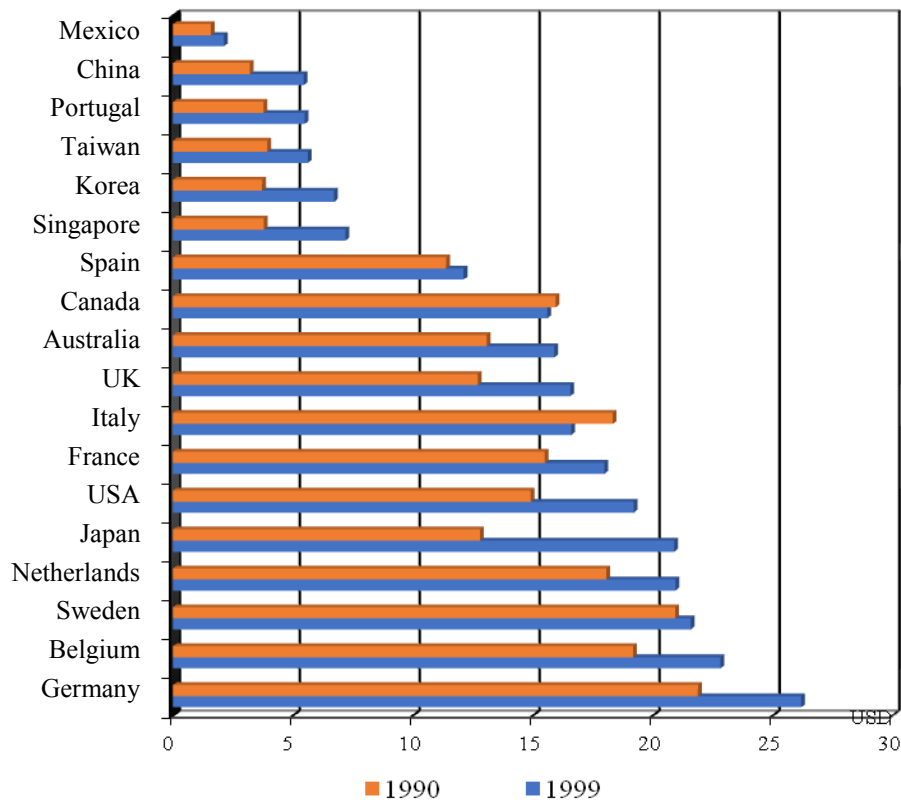


Figure 1. Comparison of hourly labor costs in selected countries in 1990 and 1999.

Source: International Labor Organization 2002, pp. 610-615.

The countries with the highest labor costs are the highly developed countries of Western Europe, Japan and the USA. These are the countries of origin of the largest car manufacturers. High production costs on home markets encouraged companies to move their operations to countries with lower labor costs and cheap raw materials. The dynamics of the internationalization process was influenced by the rates of increase in labor costs in the home countries of these manufacturers. Japan recorded a particularly strong increase in labor costs. This is the main reason for the high dynamics of internationalization of Japanese enterprises. A strong increase in labor costs also occurred in developing Asian countries. They have almost doubled within 10 years in South Korea and Singapore.

In order to assess the impact of labor costs on the choice of location for manufacturing activities, production volumes during the same period were analyzed.

Table 2.*Car production volume in selected countries in the world in 1990 and 2000¹*

Country	Production (000's)		Production dynamics (w %) ²	Country's position by production dynamics
	1990	2000		
Triad:				
EU:				
Belgium	1184,7	1156,4	97,6	(20)
France	3295,0	2879,6	87,4	(22)
Spain	1971,7	2366,4	120,0	(16)
Netherlands	121,3	215,1	177,3	(12)
Germany	4626,2	5144,2	111,2	(18)
Portugal	60,2	190,9	317,1	(5)
Sweden	342,2	406,2	118,7	(17)
UK	1334,5	1620,5	121,4	(15)
Italy	1874,7	1422,5	75,9	(25)
North America:				
USA	6077,4	5542,7	91,2	(21)
Canada	1226,0	1551,2	126,5	(14)
Japan	9948,0	8363,5	84,1	(24)
Latin America:				
Argentina	81,1	238,9	294,6	(6)
Brazil	663,4	1347,9	203,2	(10)
Mexico	318,6	1132,7	355,5	(2)
Asia:				
China	86,6	604,7	698,3	(1)
India	189,0	632,1	334,4	(4)
South Korea	932,7	2602,0	279,0	(7)
Malaysia	85,6	295,0	344,6	(3)
Taiwan	107,7	263,0	244,2	(8)
Türkiye	149,0	297,5	199,7	(11)
CE Europe:				
Czechia	190,9	428,2	224,3	(9)
Poland	292,0	487,1	166,8	(13)
Russia	951,0	1022,0	107,5	(19)
Australia	376,8	323,6	85,9	(23)

¹ The list refers to passenger cars and station wagons.² The reference point for calculating production dynamics is the state figures from 1990.

Source: VDA, 2002.

European countries with high labor costs (Germany, Belgium, Sweden, France, Italy and the UK) recorded a relatively small increase in production in the analyzed period. It even decreased in Italy, France and Belgium. The competition structure in these countries did not change significantly. There was no foreign manufacturers on the Swedish and Italian markets, and only Ford in Germany. Fiat assembled small numbers of its cars in France. European and American companies have located their plants in Belgium which does not have its own automotive industry. On the UK market, previously dominated by GM and Ford, Japanese manufacturers began to play an increasingly important role (every third car manufactured there). In the 1990s, strong growth dynamics was observed in the countries of Central and Eastern Europe: in Poland by 66.8%, and in Czechia more than twice.

A higher rate of production growth than on the European continent was then observed in South American countries: Brazil, Argentina and Mexico. Within a decade, car production in Brazil doubled, in Argentina tripled, and in Mexico increased by more than 2.5 times. These countries had very low labor costs at that time. The analysis of the relationship between production volume and labor costs supports the thesis that low labor costs are a factor that strongly attracts foreign investments in the production sphere, and the relationship is as follows: the lower labor costs, the higher the production growth rate.

Cost-driven motives also determined the placement of production in South Asian countries. For example, production in Taiwan and Malaysia increased during the analyzed period by 2.5 and 3.5 times, respectively. However, it was the development of the Chinese market that had the greatest consequences for changes in the competitive structure of the global automotive sector, as is known from today's perspective.

The presented analysis shows that the highest growth is recorded in countries with the lowest labor costs. This means that cost-driven factors, especially labor costs, are one of the most important accelerators of the internationalization of automotive companies. The top 10 countries that recorded the highest production growth rates during the last decade of the last century were China, Mexico, Malaysia, India, Portugal, Argentina, South Korea, Taiwan, Czechia and Brazil. Apart from Czechia and Portugal, all the other countries are situated in South Asia and Latin America. Czechia and Portugal also had some of the lowest labor costs in their region. Therefore, there is a clear relationship between the level of costs and the dynamics of production growth.

High labor costs were one of the reasons why Japanese auto companies lost their cost advantage in the 1990s. This was mainly due to overemployment and low productivity of managerial staff. Japan's share in global employment had been steadily increasing since the early 1980s. To counteract this, Toyota's management decided in 1994 to introduce revolutionary changes in their employment system. They decided to break with the tradition of "lifetime employment", especially observed in the automotive sector, and hire specialists just for the time needed to complete a specific project. Labor costs are the subject of constant analysis also in European and American companies. In their constant fight to reduce costs, companies are often forced to significantly reduce employment and renegotiate remuneration policies.

4.4. Competition-driven factors

Competition-driven factors are related to broadly understood changes in the area of competition. As the protection of domestic markets decreases, the flow of resources between subsidiaries is becoming increasingly easier. Therefore, large areas of integrated economy emerge, in which competitive fight is becoming ever fiercer. Attempts to cope with global competition are made by expanding commercial activities to new foreign markets and by creating new production and distribution networks there (Cygler, 2002). These factors have

a significant impact on all instruments of the global strategy. However, it should be noted that different sectors have different levels of globalization (Yip, 1996). Individual companies, sectors, markets and even countries are affected by these trends to varying degrees and with varying intensity. However, the general global trend supports the thesis about the ongoing process and its strong dynamics.

The competition-driven factors most important in the automotive sector include:

- changes in demand and supply,
- price competition,
- innovative potential,
- strategies towards competitors:
 - market capture,
 - accepting initial losses,
- technical innovations,
- cooperation agreements.

Internationalization in this sector is driven largely by changes in international competition. The most important changes include those on the **demand and supply** sides. The ascending process of concentration of ownership and capital is reflected in the increasing production potential of automotive enterprises. Other premises for internationalization include the acceleration of demand growth on emerging markets and the equalization of mean levels of gross domestic product and consumer income. These trends are accompanied by a tendency for unification of tastes and needs of customers around the world, enabling the marketing of universal models intended for large groups of buyers in many countries. Strong competition in the sector and increasing end user requirements contribute to improvements in terms of quality, durability, style, functionality, reliability and cost effectiveness of cars.

Price competition was one of the most important tools of competitive struggle two or three decades ago. This strategy was particularly often used on developing markets because achieving a production scale enabling competition with leaders is very difficult in mature sectors. Enterprises entering the sector or trying to increase their market shares often engage in price competition.

Strategies towards competitors are also important for the overall course of internationalization. In the 1980s, Renault increased its share in the truck segment using a market capture strategy. For this purpose, they decided to sell cars at prices lower than their competitors, and even dumping prices. The company suffered huge losses but significantly improved its competitive position. The strategy of accepting initial losses in order to introduce a substitute product serves the same purpose. This strategy was used by Japanese companies in the 1960s and 1970s and by Korean companies (Hyundai, Daewoo, Kia) in the 1980s and early 1990s. When introducing a new product to the market, Korean companies imitated Japanese and Western European manufacturers in terms of vehicle style and additional equipment standards. They used cheap, but often outdated, technologies. The market success of such

a product is very strongly correlated with its price. Therefore, it is initially low and competitive vs. other products. Initial losses are accepted in the hope that low costs will gradually lead to production profitability. This strategy carries a serious threat, as low profitability may result in loss of liquidity, then the ability to service debt, and ultimately even bankruptcy of the company. An example is Daewoo Motor which was closed down in 1999 for this reason. Their strategy failed because of the optimistic assumption that the cost decline would be much faster than would result from the principle of accumulating experience. This manufacturer assumed, when entering the automotive sector, that it would not need to accumulate experience from the very beginning, as it could already take advantage of most of the hitherto technical developments of the global automotive industry. Moreover, Daewoo assumed that having more modern machinery than their competitors would enable them to manufacture cars at lower costs. However, it turns out that full use of volume and cost strategies may only occur with high standardization of the product and manufacturing processes. Striving to maximize economies of scale may lead to the so-called “stiffness” of the organization, which means a reduction in adaptability to changes taking place in the company’s environment.

In the current conditions, **technical innovations** have become more important than prices. An example of this phenomenon is Volkswagen which achieved an unquestionable market success (it is the largest manufacturer in Europe) despite prices set at levels clearly higher than those of their competitors (approximately by 10-15%). However, the company’s cars are widely appreciated for their durability and quality of workmanship, which compensate for their high price.

The increasingly weaker market protection and more efficient capital flow promote various **forms of cooperation**. In some cases even between companies directly competing with each other. Cooperation agreements in the automotive sector are concluded in all basic business functions (R&D, manufacture and sales) and adopt various structural configurations.

5. Conclusions and recommendations

Internationalization of a company’s operations may be driven by a number of factors that are strongly interconnected and largely interdependent. They contribute to this process to varying degrees and with varying strength. Those that significantly advance internationalization may be called accelerators. They were divided into the following groups: politics, market, costs and competition. Among the politics-driven factors in the automotive sector, the most important are economic integration, trade liberalization, state interventionism reflected in tax policies, import policies and foreign investment host countries’ policies. Among the market-driven factors with the greatest impact on the internationalization of automotive companies are unification of consumer tastes, new information and communication technologies (IT) and

development of transport. Among the cost-driven factors, the most important are economies of scale, shortening of the product life cycle, rapidly changing technologies, the effect of learning and experience, logistical improvements, cost differentiation between countries and high product development costs. The most important competition-driven factors in the automotive sector include changes in demand and supply, price competition, innovation potential, competitive strategies, technical innovations and cooperation agreements.

This study is a report on qualitative research, the aim of which was to analyze factors influencing the adoption and development of internationalization strategies by automotive enterprises from the birth of the sector to the present day. The research results make a contribution to the knowledge about internationalization and provide a context that makes it easier to understand the current balance of power and competition structure in this sector.

The limitations of the study include its lack of comprehensiveness. This is because of the inability to obtain sufficient data. The data on the subject is dispersed, discontinuous and offered in various layouts. This makes it impossible to precisely track the development of specific phenomena over time and to conduct comprehensive comparative analyses. The research must be fragmentary, which seems obvious in the light of the above comments. However, despite these limitations, it expands knowledge in the researched area.

Further research in this area is justified for the reasons mentioned above. It is highly probable that not all relationships have been discovered and described. An additional premise is that the world economy is in the process of constant transformation. The importance of the described factors and the strength of their impact on the overall shape of enterprise internationalization are changing.

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THE PRO-ECOLOGICAL BEHAVIORS OF ENTERPRISES IN THEIR BUSINESS MODELS – CASE STUDY A.P. MOLLER-MAERSK

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Purpose: The aim of the presented article is to present the pro-ecological behaviour of the A.P. Moller-Maersk company in the context of an increasingly widely implemented business model, which is the ESG strategy.

Design/methodology/approach: The basic research method used in this article is a case study and the description and analysis of enterprise business models.

Findings: As a result of the research, the characteristics of the business model of the A.P. Moller-Maersk company were presented, focusing on its pro-ecological behaviour.

Originality/value: The described company, being a one of the largest sea carriers and container operators, successfully implementing ESG assumptions may become an entity whose behaviour will be imitated.

Keywords: business models, decarbonization, pro-ecological behaviour of enterprises, ESG.

Category of the paper: Research paper.

1. Introduction

Enterprises, as entities focused on achieving business goals, are always looking for effective ways of processing resources and behaviours acceptable on the market. Due to several conditions, both internal and external to the entity, enterprises operate in a diverse manner, however, by observing the market activity of entities, certain regularities can be identified in the business models they implement. Nowadays, issues related to sustainable development appear in the first place in terms of importance and universal acceptance, taking the form of a CSR strategy, or in a more advanced form - ESG. Environmental aspects are a priority that is increasingly being included in the strategies of economic entities, thus becoming a leading element of the business model. The concept of sustainable development connects, on equal terms, environmental, social and economic issues, however, considering the growing environmental awareness of individual people, various types of institutions, and mainly states,

environmental aspects have initiated and dominated the discussion on the search for balance in human activity in its environment – natural, social and business.

The idea of translating the concept of sustainable development into a practical business dimension, which is quite widespread in the world, leads to changes in the strategies implemented by enterprises. Business models based on Corporate Social Responsibility (CSR) and ESG strategies, i.e. balanced environmental, social and governance aspects, are becoming more and more common, and are encouraging individual companies to change their market behaviour. In building their image as a responsible company, entities often change their environmental behaviour. Pro-ecological behaviour is becoming an important dimension according to which modern enterprises want to be and are assessed.

One of the companies that successfully implements a business model based on the ESG strategy, and at the same time having a significant impact on the market, especially the transport one, is A.P. Moller-Maersk, whose main areas of activity are maritime transport and container trade. In addition, there are many other companies that make up the conglomerate (including energy companies and, until recently, also mining companies involved in the extraction and processing of crude oil). Due to the nature of its business and the size of the company, which currently employs 100,000 people of 181 nationalities (Annual Report, 2023), its impact on the natural environment is undeniably significant. Therefore, the pro-ecological behaviour of this entity is worthy of attention, as it becomes a kind of behavioural model for other companies.

2. Enterprise business models

Every enterprise that is established and operates according to market principles has two basic assumptions. Firstly, it should bring benefits to the owners, which is identified by the goal of increasing the value of the economic entity in the long term. Second, as part of the socio-economic system, a company takes into account the goals of the social system in the management process, breaking down its main goal into subgoals, including social goals. Such action cannot be random or ad hoc. It must be included in long-term, stabilising activities and exemplified in a formalised strategy, and should in fact be based on the corporate philosophy and its model.

Business philosophy is an ambiguous concept, but one thing is undeniable. Business philosophy refers to the social nature of man and the fact that his actions are of a moral nature (Kmiecik, 2013). Therefore, since man is the basic driving force that brings an entity to life and implements the management process, moral aspects should be transferred to the operating principles of enterprises. In this context, business philosophy should include the values shared by the members of a given organisation, define the business profile, set long-term goals, including those located in the socio-economic system, and lead to the creation of a strategy by

defining the mission. In the management dimension, therefore, the business philosophy should lead to targeted and repeatable decision-making focused on achieving the main objective - multiplying the value of the entity and based on knowledge of the mechanisms for creating this value. From this perspective, it is therefore necessary to build a conceptual abstract of the value creation process in the form of a business model.

There are many definitions of the concept of a business model (a selected set of definitions is presented in Table 1, together with the data on authorship), but it is clear that their core can be indicated, relating to the logic of using resources and performing activities that guarantee the ability to exist, achieve the assumed goals of the enterprise and development. Therefore, for each company, the resources identified as important within the areas of business activity are different (Janulek, 2022), as are the processes and values, and therefore the business models begin to diversify in their structure.

Table 1.

A selected set of business model definitions with the author(s)

Autor (year)	Definition
B.W. Wirtz (2000)	A business model shows in a very simplified and aggregated form how the process of creating goods and services transforms these resources into marketable information, products and/or services. The business model reveals the combination of production factors that should be used to implement the strategy.
K. Obłój (2002)	A combination of the company's strategic concept and the technology of its practical implementation, understood as the construction of a value chain allowing for the effective exploitation and renewal of resources and skills.
C.L. Afuah, P. Tucci (2003)	A business model is a method of using and expanding resources through an offer worth more than the competition, while maintaining the company's profitability.
P.B. Seddon, G.P. Lewis, P. Freeman, G. Shanks (2004)	A business model is an abstraction of strategy that captures aspects of an individual company's strategy and applies them across multiple companies.
T. Falencikowski (2013)	A multi-component conceptual object describing the logic of creating value for customers and capturing value by the enterprise.
M. Jabłoński (2013)	A specific, original shape of the relationship between various resources and activities engaged in the enterprise, in which the logic of generating income is based on lasting pillars thanks to a value proposition for customers adequate to the needs of the market.
B. Woźniak- Sobczak (2014)	An ideal, conceptual model of flexible combination of the necessary capital resources in terms of quantity and quality, creation of relationships between partners that, in conditions of continuous learning, determine the logic of creating value for its main stakeholders.
O. Gassmann, K. Frankenberger, M. Csik (2014)	A comprehensive picture of a company, describing how it creates value.
T. Doligalski (2014)	A simplified image of the company showing its most important elements and the relationships between them; a construct used to improve the functioning of the enterprise as such.
A. Daunorienė et al. (2015)	The business model creates a heuristic logic for organizing capabilities with the realization of economic value.
B. Nogalski, A.A. Szpitter, M. Jabłoński (2016)	A business model is a set of related and interacting elements that interact in various ways to enable the creation of the expected value only with a favourable configuration.
M. Ziółkowska (2018)	It is a way to achieve long-term goals. It is an element of the strategy and expands the number of elements needed to achieve strategic goals. A business model is the plan that an enterprise creates to generate revenue and maximize operating profit.

Source: Janulek, 2022, pp. 48-49.

The diversity of business models in the practical dimension results from the interdisciplinarity of business management and the individual approach of the economic unit. The adoption of specific perspectives can be a way of organising the activities of economic entities related to the creation of an individualised business model concept. These perspectives are (Kaczyński, 2021):

- choices perspective – a set of actions related to market service policy, selection of assets, method of value creation,
- activity perspective – focus on activities and processes that create value and determine competitive advantage,
- normative perspective – descriptive and graphic characterisation of business models, verbal characterisation of values.

Referring to the above-mentioned perspectives, economic entities clearly identify two areas of the business model - the internal dimension (choice of assets, method of value creation, operational activities and processes) and the external dimension (suppliers, distribution channels, segments and market service policy, as well as market behaviour). Together, these dimensions contribute to the long-term creation of the company's value, on the one hand by creating areas and principles of cost generation, and on the other hand, areas and principles of revenue generation. As a result, these areas and principles contribute to the creation of surplus - financial accumulation, which allows making investment or disinvestment decisions (withdrawal of capital from specific areas of economic activity), in accordance with the adopted business model. The boundary conditions for these decisions are the conditions created by the socio-economic system, including the values and goals defined by this system, as well as the level of acceptance of the market behaviour of economic entities by their broadly understood environment.

At present, one of the basic values of developed socio-economic systems is the minimisation of negative environmental externalities, which comes down to the decarbonisation of the economy. “The potential of decarbonization is recognised by global powers, including the United States and the European Union, which are investing in the green technology market” (Zieliński, 2021, p. 128), and for economic entities it is manifested in the sustainable development paradigm. Sustainable development is the sine qua non of social and economic development, defined as development that meets the needs of the present without limiting future generations' ability to meet their needs. This means the need to integrate political, economic and social objectives while maintaining an environmental balance. Sustainable development should have the characteristics of durability and stability - the concept of sustainable development is often used interchangeably with sustainable or stable development, as well as self-sustaining development. This is a type of socio-economic development stimulated in the technosphere, which is part of the natural environment (Miszczuk, Miszczuk, 2022, p. 8). In Europe, in the regulatory sphere, the expression of this process is the European Green Deal,

which is a package of policy initiatives aimed at ecological transformation, leading to climate neutrality by 2050.

The decarbonisation transformation of the economy, especially the European one, in the regulatory dimension requires economic entities to adapt their activities and behaviours to the defined framework and goals of the Green Deal. Due to the long-time horizon, it is necessary to include the goals and principles of decarbonisation of the economy resulting from the European Green Deal into the business models of enterprises, taking into account the environmental goals related to this process, with a view to their long-term implementation. One of the levels of management according to the development of the socio-economic system understood in this way is the construction by economic entities of sustainable business models that take into account pro-ecological solutions as part of internal processes - elements of the value chain and in the form of products or services (with ecological features) offered on the market. It is also related to the processes of investing or withdrawing capital from specific activities.

As a consequence, this allows entities to achieve economic and environmental benefits in the form of minimizing emissions, saving production resources with functionality and usability similar to other products/services. Benefits also result from regeneration and recycling of waste - thanks to them, the demand for resources is reduced and material cycles are closed. Energy efficiency including systems based on renewable energy sources is also improving, which is justified by high fuel prices and climate change. It is also possible to optimise efficiency through the use of solutions involving the transmission, collection and processing of data in electronic form (Information and Communication Technologies - ICT), which serves to control the consumption of resources, including energy, and allows for monitoring the consumption or redistribution of resources (Leszczyńska, 2017). All these activities lead to sustainable business models being part of the trend of changes in socio-economic systems and sometimes visible only within the organization, but at the same time becoming a tool for building a competitive advantage aimed at achieving a better strategic position by externalizing them, i.e. communicating them to other entities of the system in the form of generated by this organization of behaviour.

3. Pro-ecological behaviour of enterprises in their sustainable development - implementation of CSR and ESG strategies

The issue of corporate behaviour is a broad and multidimensional one. Virtually every activity of an economic entity is perceived by its environment as behaviour (Majecka, 2013). Knowledge about behaviour, which can be obtained by observing the market situation, can be used to develop effective business strategies that are accepted by the environment. Strategic

thinking, supported by knowledge about the desired directions of activity of economic entities in the environment, leads to the choice of many different behaviours. In the modern world, pro-ecological behaviour, which fits into the concept of sustainable business activity, is becoming increasingly important.

CSR is a type of business model that, loosely translated, refers to corporate social responsibility. This model assumes that running a business based on the principles of sustainable development and respecting the local business context, both environmental and human, is a trend that in today's developed economies is a permanent part of the market environment. Moreover, the cause-and-effect relationship between the implementation of the CSR model and the economic efficiency of enterprises was confirmed (Flammer, 2015). The correlation between satisfied employees who are more efficient and reputation, which translates into greater customer trust, and the CSR model adopted by the company, is also important.

A relatively new strategy, but already widespread around the world, is ESG, an acronym that comes from the English words Environmental (E), Social (S), Governance (related to Corporate Governance – G) (Why does UN environmental program matter?). ESG involves taking into account environmental, social and management aspects in conducting business in the face of increasing awareness of market entities about the impact on these areas of their business activities in the face of climate change and the impact of these changes on the planet as a whole.

The environmental aspect of the ESG strategy focuses on three key areas in which business entities should introduce improvements that reduce the negative impact on the natural environment while conducting their operational activities. The first area is broadly understood climate change, which is becoming more and more visible. Businesses can attempt to decarbonize their operations to achieve zero CO₂ emissions as quickly as possible. Business entities can also support their contractors in reducing greenhouse gas emissions by establishing close cooperation in this area. The second area is the environment and ecosystems. Within this area, corporations can financially support entities involved in ecological activities, as well as initiate ecological projects in the field of renewing ocean biodiversity, soil resistance and animal habitats in places where the entities' operational activities are carried out. Another area is ensuring the recovery of the maximum amount of production factors through recycling, which has a positive impact on the natural environment and can also reduce the costs associated with the purchase of new materials in the long term. Detailed areas of the environmental aspect of the ESG business model can be described through a number of indicators used to report the company's involvement in this area (Wytyczne do raportowania ESG, 2023).

The social aspect of ESG strategies focuses on human resources priorities. The first area is supporting talents and developing employee' skills by offering training and further education opportunities thanks to the support of the organisation. The next area is human rights, which

may be at risk as companies expand into new countries and communities where human rights awareness is low. In these countries, companies that have implemented an ESG strategy take responsibility for respecting the human rights - both of their own employees and subcontractors. The third area in the social aspect of the ESG strategy is diversity, equality and integration, where business entities provide a work environment that respects the principles of tolerance, where every employee feels treated equally and appreciated adequately to their work contribution. The fourth area is integrated trade, where companies take responsibility for the openness and transparency of trade in supply chains. The fifth area is safety (including safe and hygienic working conditions) and protection - companies also operate in this area to ensure the above for employees and their customers. A number of measures have been developed for each area allowing for systemic reporting of enterprises' involvement in the social area (Wytyczne do raportowania ESG, 2023).

The management aspect of the ESG strategy includes the area of business ethics - stigmatizing and eliminating unethical behaviour in the company, including corruption, maintaining inequality of opportunities and reducing opportunities in striving for the development of poorer communities and unequal treatment. The second area is civic attitude, which promotes business responsibility for supporting communities and communities where the entity's operational activities are conducted. Another area is sustainable purchasing, which supports fair business practices for both the entity and its contractors to maintain transparency and honesty in the supply chain. The fourth area is tax responsibility, which involves conducting business in accordance with tax regulations in the countries of various jurisdictions where the company operates. The last area at the management level is ethics regarding access to data - the entity takes full responsibility for storing and processing the data of its employees and contractors in a transparent and technologically secure manner, respecting data security principles. Also, in terms of management aspects, there are a number of measures using which the company can inform the environment about its involvement in building the ESG model (Wytyczne do raportowania ESG, 2023).

The precursor of activities at the management level is the United Nations, which on its website promotes investing in businesses that have adopted the ESG strategy as ethical, socially and globally responsible in the face of climate change. As early as 2012, the UN issued recommendations for states and enterprises in the field of ethical business and respect for human rights (Guiding Principles on Business and Human Rights, 2012). Many global companies are voluntarily implementing an ESG strategy and committing themselves to long-term, specific goals because their reputation depends on it.

It should also be borne in mind that the implementation of an ESG strategy in a company's business model has not only reputational but also financial consequences - both in terms of costs and revenues. In the short term, the implementation of an ESG strategy may be associated with increased operating costs due to analytical and training activities and the need to implement new production technologies or changes in the supply chain, as well as termination

of cooperation with unethical suppliers or subcontractors and establishment of such cooperation with ethical entities, but often at higher prices. Moreover, avoiding tax optimization - which is treated as ethical behaviour - may increase tax expenses. However, in the face of environmental changes and the increasing awareness of the global community and consumers, it seems that these costs are highest at the stage of implementing ESG strategies, but in the long run they may benefit companies in the form of increased revenues contrary at the expense of competitors who have not implemented ESG (Friede, Busch, Bassen, 2015).

In addition, the implementation of ESG has a significant impact on the increase in the capital value of companies. This is related to ESG reporting (Nelson, 2018), which global companies voluntarily publish on their websites, but also include in consolidated financial reports, which are mainly addressed to stock market investors. The scale of informing the market environment about the implementation of the ESG strategy is so visible that indexes of ESG companies have been created on global stock exchanges and in issue prospectuses, as well as on international websites for investors (Kilroy, 2022), economic entities are indexed taking into account the ESG rating (analogously as in the case of credit or financial rating). This has a significant impact on investors' assessment of the potential of a given company's shares, and thus on the assessment of the increase in the capital value of a business entity. Therefore, the ESG strategy is not just a declarative response to the need to take into account, among other things, the impact of climate change in business, and the real actions of economic entities, which in previous decades were mainly recipients of environmental resources, towards changing the way they do business (What are the Principles for Responsible Investment, 2023).

4. Pro-ecological behaviour as a result of implementing the A.P. business model. Moller-Maersk

The company A.P. Moller - Maersk, known under the Maersk brand, was established in 1904 in the middle of the second industrial revolution on the small Danish Island of Funen. The entity began as a steam shipping company, when ships sailed without fixed schedules specifying the time of port call. Owner of A.P. Moller, wanting to expand his business, encountered resistance from the management and decided to act on his own by establishing Steamship Company 1912. This ensured his operational independence, which paved the way for development in the following years. The company built its own ships (Ostrowski, 2023), which made it independent from external suppliers. It was a risky, but also strategic business moves due to the geopolitical situation (outbreak of World War I). The next step was to build its own shipyard, thanks to which Maersk could serve very busy routes in Asia and the USA. Such a wide range of operational activities allowed the company not only to expand its existing activities in the area of freight transport, but also to enter the market of tankers and specialized

forwarding solutions. By 1939, Maersk had a fleet of 46 ships and was in second place in Denmark. During World War II, Maersk decided to have the company's leading office in New York, not Copenhagen - so the management was formally carried out from the USA. By such action, on the one hand, Maersk avoided the seizure of its assets by Nazi Germany, but on the other hand, Maersk's activities were blocked by the US government, as Maersk ships were under a foreign flag to the Americans and were taken over by the US Navy. During the war, half of the company's assets (46 ships in total) were lost - the ships sailed as transports for the army. After the war, Maersk focused on rebuilding the fleet, commissioning the construction of ships in several countries and purchasing several German and American cargo ships. The quick reconstruction of the fleet allowed the company to build another shipyard, thanks to which it could build even larger units. In the 1960s, Maersk obtained a license to extract crude oil from the Danish part of the North Sea, which was crucial for the development of the company's operations and revenue growth. Maersk's strategy also changed - the decision was made to sell the shipyard and the company focused on outsourcing the production of tankers and container ships, which allowed it to service transatlantic connections. Throughout the 1990s, Maersk continued and expanded its dominant container shipping business. In addition, he ran a diversified business including oil and gas extraction (acquiring as clients such fuel giants as Shell and BP and having drilling platforms around the globe), container logistics and energy.

In its 2022 annual financial report, Maersk outlines its goals and vision as follows: "In A.P. Moller-Maersk we strive to go above and beyond, every day, to ensure a more integrated, flexible and sustainable future for global logistics. We strive to provide truly integrated logistics. Across oceans, ports, on land and in the air, we connect our supply chains with the power of our infrastructure and the power of our human resources and technology to drive end-to-end innovation that accelerates our customers' success. A more integrated world improves quality of life and well-being at all levels. It is our responsibility to ensure a more sustainable tomorrow for future generations. We believe in an integrated world. One planet. Connected along the entire length. By integrating, we improve the flow of food, goods and data that support people, businesses and economies around the world. This enables the exchange of values, culture and ideas. Improving the lives of all is also about ensuring a sustainable future for our planet. Global trade is a major contributor to the climate crisis, and this is a decade of action. We strive to lead the decarbonization of end-to-end supply chains and enable significant positive environmental impact this decade. With a dedicated team of over 110,000 employees in over 130 countries, we explore new frontiers and implement new technologies because we see change as an opportunity. No matter the challenges, we remain confident and resilient because our values remain constant. By living our values, we inspire confidence in our efforts to integrate the world to improve the lives of all" (Annual Report, 2022). The values have not changed, but in the report for 2023 it can be read that employment in the described entity has

dropped to 100,000 people (Annual Report, 2023), which is still a huge number of employees. drilling all over the world), container logistics and energy.

The values that guide Maersk were taken from the family home of Anna and Peter Maersk-Moller, who raised ten children, one of whom was a son, A.P. Moller founded the company Maersk (Maersk core values). The values cultivated at Maersk were values passed down from generation to generation in the Maersk-Moller family, to such an extent that the last president, who was a member of the Maersk-Moller family, who resigned in 2003, had five values written down as invariable for the entity's activities on future generations. Generational heritage and timeless values passed down for decades form the basis of Maersk's business, so that the brand can continue to operate not only today, but also in the future. On the Maersk website you can read that the company has always used new technologies because it sees changes as an opportunity for development. While today's challenges facing Maersk, and the industry, is much more complex than ever before, they also present great opportunities, supported by values that have been shared for generations. Maersk's first value is to constantly care for the future. Today, when solving contemporary problems or checking the possibilities of shaping the future, innovations are introduced and everything is improved, every operational process is improved as much as possible. The second value actively practiced at Maersk is humility. The company constantly listens to its customers, employees and the market environment, and therefore constantly learns and shares this knowledge, assuming that only together - as part of the global system of communicating vessels - can it achieve success. Another value at Maersk are employees, who should be provided with the right environment for development, which is why we collectively benefit from a culturally diverse global workplace where people feel safe and appreciated. Maersk's fourth value is integrity. Maersk believes in the principle that words spoken oblige us to act. The only way to gain the trust of customers and partners is when they know that promises will be kept, even when it is difficult to fulfil. Maersk always acts openly and honestly. The fifth value of Maersk is the brand, i.e. what is the basis of the company's existence. As Maersk understands, a brand is a promise and commitment to trust and strive for excellence. Everyone working at Maersk is an ambassador representing the brand's values, striving for a more sustainable and integrated world.

Nowadays, Maersk mainly deals with global sea transport of containers, thus being a leader in supply chains around the world for decades. Conducting transport activities on such a large scale has an undoubted impact on the natural environment through the use of fossil fuels to power ships carrying containers. In addition, the A.P. capital group Moller-Maersk had its own separate company, Maersk Drilling A/S, which extracted crude oil and natural gas for Maersk, but also for entities such as Shell and BP. First (in 2019), the oil extraction company was separated from the structures of Maersk, and in 2022, the merger with Noble Corporation was carried out (Noble and Maersk Drilling..., 2022).

In 2019, the European Commission adopted the European Green Deal (Europejski Zielony Ład, 2019), which assumes, among other things, climate neutrality of the economies of European Union countries by 2050. Maersk has set itself the goal of achieving climate neutrality by 2040. In 2021, Maersk decided to restructure itself and adapt to EU expectations, but also to the changing rules on the global market, where global corporations are increasingly implementing ESG strategies.

In 2022, Maersk started implementing ESG. The first step was the sale of the profitable oil and gas production company Maersk Drilling A/S, as zero emission in this industry would never be possible due to the very nature of fossil fuels. Already on the first pages of the financial statements, investors and clients can read about the implementation of the ESG strategy, which shows how seriously the entity approaches the implementation of its values and adopted environmental protection goals in conducting business. The company's next step in entering the green path was the purchase of thirteen large ocean ships powered by bioethanol in 2021 and six in 2022, as the first in the industry, thus giving a signal to the market environment that there is a demand from the ocean transport industry for ships powered by ecological fuels. In 2023, the first cruise from South Korea to Denmark took place on the Laura Maersk container ship, which operates exclusively on green methanol (Annual Report, 2023). Since 2020, Maersk has reduced the use of fossil fuels to power its ships by 7%, however emissions intensity in maritime transport will persist due to disruptions to global supply chains, port congestion and capacity constraints in maritime logistics. Maersk has ordered the largest electric trucks on the market for the years 2023-2025, which will be used in warehousing and distribution. In addition, nine strategic partnerships in the field of ecological fuel have been established and confirmed in 2022, contributing to an increase in the portfolio of approximately 5 million tons of bio and e-methanol by 2030. Such partnerships are key to scaling up the use of new fuel and increasing production capacity and technology in an innovative business model.

In terms of social activities, Maersk increases the share of women in management structures (currently 26%). In addition, the company's code of ethics has been updated to align with the ESG strategy. This Code is the main management document and constitutes the basis for advising employees in decision-making processes in accordance with the company's values and goals and implementing the commitments to adapt to international standards.

As a global leader in transportation and logistics, A.P. Moller-Maersk takes responsibility to take customers, society and the environment very seriously. ESG is the basis of the Group's purpose, an integral part of its business strategy and a condition for success as a Global Integrator. To demonstrate leadership, A.P. Moller-Maersk is committed to ambitious goals in all dimensions: environmental, social and governance. Maersk's commitment to achieving net zero carbon emissions across the enterprise by 2040 can be considered industry leading. Significant progress has been made towards decarbonization, and a roadmap has been established to achieve the 2030 decarbonization targets (including technical aspects, required capital expenditure and impact on commercial strategy for all products, and the rapidly growing

demand for ECO Delivery (Annual Report, 2022). Maersk reports its activities in great detail every year - specifying which management recommendations it undertakes to fulfil and which it partially fulfils, while explaining why (Recommendations for Corporate Governance in Denmark; Corporate governance statement, 2023).

In the context of implementing the ESG strategy, it is worth mentioning the ratings obtained by the examined entity from independent organizations. For activities related to climate change, in 2023 Maersk received an A rating from CDP¹ (<https://www.cdp.net/en>, 2023) (in 2022 it was an A-rating, and in 2020-2021 a B-rating) and a gold medal in 2022 for commitment to sustainable development from EcoVadis² (<https://twitter.com/Maersk/status/1552549445576826881>). This rating is reserved for the top 2% of companies in the industry based on their ESG score and is a testament to the Group's commitment to sustainability in all areas covered by its ESG strategy.

5. Summary

As the presented business models show, there is no single path to market success. Each company must find the best solution for itself in order to appear positively in the minds of environmental entities, especially customers and shareholders. One of the areas that are nowadays perceived as particularly important to be active in this area is the sphere of ecological behaviour. A very interesting example of companies that take their environmental obligations seriously is A.P. Moller – Maersk, which has been successfully implementing the ESG strategy for several years. Due to the fact that this company is extremely important for the maritime transport market, logistics and container transport as such, it is worth analysing its behaviour. They can become a set of model actions for other entities to follow.

¹ CDP is a not-for-profit charitable organization that operates a global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts. Over the last 20 years, a system has been created that has resulted in commitment to environmental issues around the world.

² Ecovadis is an organization that evaluates business activities in the field of sustainable development (since 2007). It prepares company ratings by creating a network of 130,000. rated entities from around the world.

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Footnotes

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THE USE AND APPLICATION OF ARTIFICIAL INTELLIGENCE (AI) IN DECISION-MAKING PROCESSES

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Purpose: The aim of the study was to analyze and characterize the available tools in decision-making processes using artificial intelligence.

Design/methodology/approach: The article uses the method of text analysis together with the technique of content analysis. It was also supported by empirical research on the use of AI tools in decision-making processes. The article focuses on the areas of application of AI in decision-making processes; AI tools used in decision-making processes and use in business are characterized. The benefits and disadvantages of these tools and the ethical implications of using AI by managers are indicated.

Findings: Although the use of AI tools cannot work on their own, initiate thought processes or define threats and benefits, trends in this field are evolving along with technological progress. AI already plays a key role in decision-making processes and its scope will increase.

Research limitations/implications: The development of AI should be constantly monitored. The identified threat is the use of NLP techniques in the tools used, which can lead to manipulation both by decision-makers and by decision-makers.

Practical implications: Growing trust in AI tools in business gives opportunities for faster decision-making without human error. It is advisable to use them in practice to reduce the time of decision-making and reduce the risk of human error in this process.

Social implications: AI is the future happening today. It is impossible to avoid the use of artificial intelligence by humans. The benefits of AI are greater than the risks at this point. As a result, many industries need to use AI tools in their practice to stay on the market, and customers and contractors put pressure on such activities by trusting these tools.

Originality/value: The article is dedicated to managers who want to use AI in their professional practice, who are not yet convinced.

Keywords: artificial intelligence, tools supporting the decision-making process, AI ethics.

Category of the paper: General review.

1. Introduction

Artificial intelligence (AI) is the result of the joint efforts of many scientists, engineers, and researchers from various fields. Its development is continued by thousands of people around the world. The term "artificial intelligence" (AI) was first used in 1956 at a conference at Dartmouth College (Pańczyszyn, 2023). The key stages in the development of AI are the years 1940-1956 when computers appeared. Then Alan Turing, a British mathematician, proposed in 1950 the concept of the "Turing test" as a criterion for machine intelligence. This was the foundation for the development of reflection on thinking machines. In 1956, a conference was held at Dartmouth College, at which research on artificial intelligence was formally initiated. At the turn of the 70s and 80s, there was a decline in interest in AI due to the reduction in research funding, which did not bring the expected progress (Tiuryn, 2024). The AI renaissance occurred in the 1990s and 2000s as AI began to develop again thanks to advances in machine learning, deep neural networks, and generally available computing power (Historia sztucznej inteligencji/Deep Technology, 2024). Currently, the era of AI is a time of dynamic development in which technologies based on this field are used in many areas of life (Wykorzystanie sztucznej inteligencji w zarządzaniu/NexTech, 2024).

Today, businesses around the world are using a variety of AI-based tools, including: ChatGPT (an all-in-one AI writing assistant that can help you create content like emails, blog posts, and marketing copy. ChatGPT analyzes your starting words and generates phrases or paragraphs based on your topic and tone of voice (McFarlanda, 2024)); Pictory (is an AI video generator that lets you create and edit high-quality videos. Pictory can turn a blog post into an engaging video for use on social media or a website (Perry, 2024)); Jasper (an AI writing assistant that can help you create compelling emails, articles, and other content. It can write a 1500-word article in less than 15 minutes (McFarlanda, 2024)); Fireflies.ai (is an AI platform for real-time meeting summarization. Fireflies.ai can help you create highlights from talks, webinars, and other events (Perry, 2024). These tools have a variety of uses and can help companies effectively manage content, communications and other aspects of their business (Dierolf, 2024; Stawicka, 2023).

2. Areas of application of AI in decision-making processes

Today, artificial intelligence (AI) is playing an increasingly important role in strategic decision-making in companies. AI can influence decision-making processes. The use of AI in strategic decision-making will be one of the key factors for future competitiveness. Human-AI interaction and the ability to choose which decisions to entrust to AI will become some of the

most important skills for decision-makers. Today, AI already plays a key role in the decision-making processes of many companies. It is increasingly used to inform public sector policies and decisions around the world, for example, supervised learning is already being used by some governments to detect potential criminals and terrorists. Despite the potential of AI, only 7% of companies use it in large strategic decisions, such as strategy development or financial planning. However, the importance of this technology for the future is enormous. As many as 75% of business leaders believe that what will set companies apart from competitors in the future will depend on who has the most advanced generative AI (Meissner, Narita, 2023). However, the introduction of AI into decision-making processes can help companies increase efficiency, improve performance and make better use of resources (Atsmon, 2023; Meissner, Narita, 2023; Tewari, 2024).

The disruptive impact (AI) and benefits of its use are numerous. The areas in which artificial intelligence can support management are:

1. **Data Analytics:** With the ability to analyze massive data sets in a short period of time, AI enables business leaders to make more informed and precise choices (Wykorzystanie sztucznej inteligencji w zarządzaniu/NexTech, 2024). Automating the data analysis process allows you to identify patterns and tendencies that may escape the human eye. This, in turn, leads to better prediction of market performance and trends.
2. **Optimize business operations:** Companies use advanced AI algorithms to optimize their operational processes. Examples of applications include:
 - Automatic product recommendation systems that match the offer to the preferences of a specific customer.
 - Algorithms to optimize supply chains, minimize costs and delivery times.
 - Decision-making support systems in human resource management, e.g. in recruitment or employee performance evaluation.
3. **Project management:** AI tools enable you to achieve your project goals more efficiently and quickly. Advanced algorithms can predict potential problems and suggest the best solutions, which significantly reduces the time and costs associated with the implementation of projects.
4. **Automate decision-making processes:**
 - AI enables the automation of routine tasks and processes, which speeds up decision-making.
 - AI algorithms analyze data, identify patterns, and recommend actions, which is invaluable in a dynamic business environment.
5. **Personalization of the offer and customer service:**
 - AI allows you to personalize the offer and communication with customers.
 - Algorithms analyze data on customer behavior, which allows you to tailor the offer to individual needs.

6. Predicting trends and risks:

- AI analyzes historical data and predicts the probability of certain phenomena occurring.
- This helps you make better business decisions and minimize risk.

The introduction of AI into decision-making processes is inevitable and can bring many benefits if properly implemented and managed (Automatyzacja procesów decyzyjnych w zarządzaniu projektami/Mindbox, 2024; Trąd, 2022). It can become the key to success in managing a modern enterprise. Its ability to analyze data, automate, and predict outcomes can significantly improve operational efficiency and increase customer satisfaction (Wykorzystanie sztucznej inteligencji w zarządzaniu/NexTech, 2024; Dąbrowski, 2024). AI is used in project management, recruitment, financial analysis, marketing, logistics, and many other areas.

3. AI tools used in decision-making processes

The IT market already has tools that perform tasks in decision-making processes. The most commonly used are:

1. ClickUp Brain - is an all-in-one project management platform that combines the power of documents, chats, AI, and goals in a centralized digital space. ClickUp Brain, the platform's built-in AI feature, is one of the most powerful AI tools for work I've tested so far. It allows you to create custom workflows, automate repetitive tasks, and streamline processes. By setting triggers and rules, you can automate actions such as sending notifications, assigning tasks, updating statuses, and more (Parker, 2024).
2. Microsoft Power BI - is a popular data analysis tool that allows business analysts to visualize, explore, and share information. Power BI allows you to combine different data sources, create interactive reports and charts, and make decisions based on data analysis.
3. Tableau: Another data visualization tool that is often used by business analysts. Tableau allows you to create advanced visualizations, analyze trends, and uncover hidden patterns in your data.
4. ChatGPT: This is a ubiquitous large language model (LLM)-based chatbot that is trained to provide detailed answers to questions in natural, human language. The ChatGPT website saw around 1.6 billion visits in January 2024 and dominates the traffic that generates AI tools. Currently, ChatGPT has over two million developers and is used by at least 92% of Fortune 500 companies — not bad for an LLM that is less than two years old (Willing, 2024).

5. Claude AI: Claude is becoming more and more popular in 2024. It's a language model powered by Anthropic that works on both word tasks and returns fantastic results in coding, creating infographics, charts, and more. Anthropic is committed to human values and ethical considerations, with an emphasis on safety and reliability. The latest version, Claude 3.5 Sonnet, is currently delighting users on Twitter (Willing, 2024).
6. Synthesia: This is a browser-based AI software that creates engaging videos based on plain text. With over 140 AI avatars and 120 languages to choose from, it's a popular AI video tool among marketers, sales, and product teams. You can use ready-made, fully customizable templates for your AI video. Additionally, the software offers basic video editing features in its panel—you can edit colors, backgrounds, and text styles to match your brand (Singh, 2024).

The choice of tools depends on the specifics of the business and specific needs. It's worth considering what features are most important to you and what goals you would like to achieve with AI decision-making tools (Ali, 2024; Daley, 2024; Loktionova, 2024).

4. The use of AI in business

Artificial intelligence (AI) has a huge impact on various fields of business. For example, Airbnb uses AI to optimize the prices of its listings. Advanced algorithms analyze many factors, such as previous prices, bookings, seasonality, and location. Based on this, the AI system calculates the optimal price for each apartment for each night, adjusting it in real time to the current demand and supply (Mróz, 2024). Starbucks uses AI to optimize work schedules. This allows them to manage employee availability and working time more effectively (10 przykładów zastosowania AI w biznesie, 2024). ZestFinance analyzes alternative data, and Allstate uses image recognition technologies to assess repair costs and speed up the claims process (10 przykładów zastosowania AI w biznesie, 2024). Additionally, many companies are using AI to personalize marketing campaigns based on customer behavior analysis. Companies can tailor their offers to individual needs, which translates into better sales results (10 przykładów zastosowania AI w biznesie, 2024). AI also helps in credit risk assessment and fraud detection. AI automates routine tasks such as document processing, customer service, and employee schedule management (Adamska, 2023). By analyzing customer behavior data, companies can tailor their products and services to individual preferences (Adamska, 2023). AI can analyze historical data and predict the probability of certain phenomena occurring, which helps you make better business decisions (Strzałkowski, 2023). It can optimize delivery routes, manage warehouses, and speed up logistics processes (Strzałkowski, 2023). Virtual assistants, chatbots, and automatic voice recognition systems help you serve customers by answering questions and solving problems (Adamska, 2023). Thus, AI can process vast

amounts of data, identify patterns, and provide valuable insights for businesses (Adamska, 2023). Therefore, artificial intelligence has great potential in business and can contribute to increasing efficiency, improving customer service and increasing profits (Kania, 2024).

5. The popularity of AI in companies around the world and in Poland

According to the PwC Global AI Jobs Barometer 2024 report, nearly one-third of companies worldwide use artificial intelligence (AI) in their businesses (Raport Global AI Jobs Barometer/PwC, 2024). Notably, AI adoption in companies is on the rise, and the technology is impacting jobs, wages, employee skills, and productivity. Examples of the benefits of using AI include increased productivity, higher innovation, and improved quality of services (Raport Global AI Jobs Barometer/PwC, 2024). While the challenges of AI implementation are still present, more and more companies are investing in this technology to achieve full business results (Siedem na dziesięć..., 2024; Bokszczanin, 2024; Ipsos zbadał..., 2020).

According to a report prepared by the Polish Economic Institute, only a small percentage of Polish companies use artificial intelligence (AI) in their businesses. We are talking about only 6.6% of domestic companies that use solutions such as chatbots, content generators or image recognition technology (Pasałowski, 2023). This result places us at the bottom of the ranking of countries in terms of AI adoption in companies. Compared to other countries, Poland is still lagging behind. For example, in China, 58% of companies have implemented artificial intelligence, and in India, 57%. In Europe, Italy (42%), Germany (34%), France (31%) and Spain (31%) have the highest levels of adaptation (Supernak, 2023; Sawicki, 2024). It is worth noting that investments in AI can contribute to increasing efficiency and improving financial results in companies, which is why education and technological support are key to increasing the percentage of companies using this technology in Poland (Sawicki, 2024; Sztuczna inteligencja w firmach w Polsce/KPMG Poland, 2023).

6. Benefits, risks and challenges of using AI in management

Artificial intelligence (AI) in decision-making processes brings both benefits and certain risks. Using AI systems requires a lot of data to be shared. There is therefore a risk of confidential information leakage or unauthorised access to data (Zagrożenia związane..., 2024). Artificial intelligence (AI) in decision-making processes brings both benefits and certain risks. Using AI systems requires a lot of data to be shared. There is therefore a risk of confidential information leakage or unauthorised access to data (Walarus, 2023). AI działa na

podstawie algorytmów, ale nie ma świadomości ani celów (Złoch, 2024). Introducing AI into decision-making processes can lead to a loss of control over the system (Wzorcowe zasady.../Portal Gov.pl, 2022). Unfortunately, more and more users share sensitive information with artificial intelligence. There is concern about the privacy and security of this data. It is worth paying attention to these risks and using appropriate safeguards to make the use of AI safe and effective (Odpowiednie wdrożenie AI minimalizuje ryzyko/KPMG Poland, 2024).

The implementation of artificial intelligence (AI) brings with it many challenges, both technical and social. Advanced AI models, such as neural networks, are often black boxes. Their decisions are difficult for people to understand. Introducing AI into decision-making processes can lead to situations where we are unable to explain why a given model made a certain decision. AI models learn from the data we provide them. If the data is biased or contains hidden bias, the models may also show the same bias. This can lead to unfair decisions, e.g. in recruitment or granting loans. Introducing AI into decision-making processes can create new attack vectors. If we poorly secure AI systems, they can become vulnerable to manipulation or hacking attacks. Decisions made by AI can have an impact on people's lives. Therefore, it is important to implement AI in an ethical manner. Questions about privacy, accountability, and fairness must be addressed. The introduction of AI may raise concerns in society. People may be afraid of losing their jobs, excessive supervision or loss of control over decision-making processes. In many countries, there are no uniform regulations on AI. Companies have to adapt to different regulations, which can be challenging. It is worth noting that despite these challenges, artificial intelligence has great potential and can bring many benefits if properly implemented and managed.

7. Ethical implications of AI use by managers

Another important issue to discuss is exploring the ethical implications and challenges of implementing AI systems is crucial. AI must be used in a way that is fair and in line with society's values (Kubera, 2024). Companies are increasingly paying attention to the ethical aspects of using AI in decision-making processes. It is important that algorithms are fair, transparent and do not lead to discrimination.

In view of the above requirements, ethical standards for the use of artificial intelligence (AI) have been created. The most important documents regulating these issues include:

1. UNESCO Recommendation on AI Ethics: UNESCO adopted a Recommendation on AI Ethics in November 2021. It is the first and so far the only legally binding instrument with a global scope dedicated to this issue. This recommendation guides the exchange of experience, cooperation and international dialogue in the context of AI (Dokumenty: Publikacje Polskiego Komitetu ds. UNESCO/Polski Komitet ds. UNESCO, 2023).

2. Standards for the ethical use of generative artificial intelligence in the Warsaw m.st Office: The project implemented by the SWPS University in cooperation with EGO and the Center for Technology Ethics of the Humanites Institute aims to develop standards for the ethical use of generative artificial intelligence in the Warsaw m.st Office. The developed standards will be regularly updated and adapted to the changing world and technological developments (Jakubik, Kuszewski, 2024).
3. European Commission's ethical framework for AI: The European Commission recommends that AI systems be developed, deployed and used in accordance with ethical principles such as respect for human autonomy, harm prevention, fairness and explainability (Skrzek, 2024).
4. Ethics in AI: The integration of ethical principles in projects, education and training, and international collaboration on standards are crucial for trust in AI. Transparency, accountability, and privacy also play an important role in AI ethics (Wytyczne w zakresie.../Publications Office of the EU, 2018).

The introduction of ethical standards is essential for artificial intelligence to serve the good of humanity and operate in accordance with social values (Łukawski, 2024).

Introducing ethical principles when creating artificial intelligence (AI) systems is crucial to ensure that AI serves the good of humanity and operates in accordance with societal values. It is therefore proposed that the following principles should be applied to companies wishing to ensure ethical actions in the process of using AI: 1) transparency: companies should strive for transparency in the operation of their AI systems. This means that users and stakeholders should have access to information about how the algorithms work, the data they collect and the decisions they make (Websensa, 2023); 2) Accountability: AI developers should be accountable for the effects of their systems. This means that they should make informed decisions, taking into account the potential consequences for people and the environment (Websensa, 2023); 3) Protect privacy: Companies should ensure user privacy and have appropriate safeguards in place to avoid privacy breaches as a result of data being used by AI systems (Websensa, 2023). 4) Security: AI systems should be secure and resilient to attacks. Companies should follow IT security best practices to minimize the risk of threats (Łukawski, 2024); 5) diversity and non-discrimination: AI developers should ensure diversity in project teams to avoid bias and discrimination in the operation of systems (Łukawski, 2024); 6) Education and awareness: Companies should educate their employees about ethics in AI and awareness of potential issues. This will help you understand what challenges may arise and how to counteract them (Łukawski, 2024).

Introducing guidelines, fairness metrics, and ensuring team diversity can help AI developers build safe and responsible AI (Florkina, 2024). The dynamic development of ethics in AI requires constant attention, innovation and cooperation (Skrzek, 2024; Etyka sztucznej..., 2024).

8. Trust in artificial intelligence (AI)

Therefore, the key is trust in artificial intelligence (AI) among managers, which affects the implementation of this technology in companies. Poland ranks one of the last in the European Union in terms of artificial intelligence adaptation. Only 3.7% of companies in Poland use AI-related technologies, mainly in large enterprises employing more than 250 people. Senior executives in companies are a major factor inhibiting the adoption of AI-based technologies. Many companies are older family businesses, where the approach to technology is conservative. However, smaller companies that want to compete with larger ones see technology as a key tool to improve efficiency and provide better services (Kasperski, 2024). The structure of companies, restrictive internal policies and high complexity of the implementation process are a challenge in the implementation of new technologies. However, it is worth noting that smaller companies that invest in AI and modern tools have a chance to succeed (Kasperski, 2024). In addition, Poland is facing a serious problem of a shortage of workers, which will affect the quality of services. With an aging population and shrinking workforce, investments in AI can help address this issue (Kasperski, 2024). Introducing AI into decision-making processes requires education, openness to new technologies and a change in organizational culture. It is crucial to understand that AI can be a tool that supports, not replaces, humans. Therefore, building trust in this technology is essential for its successful implementation (Tana, 2024; Olak, 2024; Brewer, 2023; EY Polska, 2021).

9. Conclusion

Artificial intelligence (AI) does not have human consciousness. This means that they are unable to act independently, initiate thought processes or define risks and benefits from the tasks they perform (Lewicki, 2024). Today's AI works on the basis of complex algorithms and processes that allow it to learn and adapt to new situations. Although AI systems make decisions "on their own", they have no awareness or goals (Sztuczna inteligencja (AI).../Web Poradnik, 2024). They only execute commands according to what they are programmed to do (Sztuczna inteligencja (AI).../Web Poradnik, 2024). In practice, this means that AI is a powerful tool that can be used for both good and bad purposes, depending on how people use it (Lewicki, 2024; Gościny, 2024). As in any field, it is worth keeping up with trends. Trends in decision-making tools evolve with technological advancements. And as you can already see, AI already plays a key role in decision-making processes. Companies are increasingly using AI-based tools such as virtual assistants, data analytics, and generative language models. The value of AI lies in its ability to process vast amounts of data and generate insights from it (Meissner, Narita, 2023;

Purdy, Williams, 2023). Tools that enable the automation of decision-making processes are becoming more and more popular. Examples include automating data management, automating business processes, and automatically generating question responses (Purdy, Williams, 2023). Collaboration between decision-making tools and analytical tools such as Power BI or Tableau allows for better use of data and faster and faster decision-making. NLP tools allow you to analyze and understand text in natural language. This is useful in the process of gathering information and evaluating different options (Gartner Identifies the Top Trends in Data and Analytics for 2024, 2024). And virtual and augmented realities can help visualize data and scenarios, making it easier to make decisions in difficult situations (Sriram, 2024). Therefore, it is worth following new trends and adapting to changing conditions.

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THE IMPACT OF ECONOMIC FACTORS ON THE MANAGEMENT OF THE STRUCTURE OF AN ENERGY-SELF-SUFFICIENT MINE WATER PUMPING STATION

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Purpose: The pumping stations owned by Spółka Restrukturyzacji Kopalń S.A. (SRK S.A.) pump approximately 100 million cubic metres of mine water per year. The pumping of this volume of water is associated with high electricity purchase costs. The process of pumping mine water must continue even after the mine has been closed. These pumping stations protect neighbouring mines and lower-lying areas from flooding and underground aquifers from contamination. Reducing pumping costs would reduce the company's need for budget subsidies. The aim of the research was to prepare a concept for the modernization of a mining groundwater pumping station, which could be implemented by operators of similar pumping stations scattered across post-mining areas.

Design/methodology/approach: The innovative energy self-sufficiency scenarios proposed in the article not only meet SRK S.A.'s needs, but also fit with Just Transition processes. Likely directions of change in design preferences with further potential changes in the economic situation have been indicated. The article draws the attention of designers to the need to forecast the market situation when designing new renewable energy installations.

Findings: Survey research and analysis of changes in selected market factors allowed us to learn about the susceptibility of preferences for choosing the designed renewable energy installations. The article analyses the impact of changes in the euro/zloty exchange rate, the unit cost of building a photovoltaic farm and the selling price of hydrogen on the preferences for choosing a variant of new self-sufficient energy installations.

Research limitations/implications: The study analyzed the influence of selected factors on design preferences of innovative technical and organizational systems that could be used in such capital-intensive activities as the protection of post-mining areas from flooding by constant drainage of water flowing from the rock mass to the workings of liquidated mines. It seems necessary to know the influence of other environmental factors on the possibility of modernizing existing mine water pumping stations.

Practical implications: The change in the preferences for selecting variants for individual evaluation criteria resulted in an increase or decrease in the absolute value of the analyzed factors, most often exceeding 15 percentage points.

Social implications: Mine water pumping stations protect the rock mass and the ground surface from flooding. Innovative development of post-industrial areas will allow for the creation of new jobs for retrained miners, and at the same time will be a source of drinking water and energy for the post-mining agglomeration.

Originality/value: The combination of the Just Transition problem and the need to dewater closed mines has not been the subject of comprehensive scientific research. The article proposes an innovative use of mine water pumping stations and adjacent post-industrial areas, which leads to improved economic efficiency of both issues.

Keywords: drainage of liquidated mines, multi-criteria analysis, renewable sources of energy, hydrogen extraction, revitalization of post-mining installations.

Category of the paper: Research paper.

1. Introduction

Just Transition in Silesia is similar to that in other regions that formerly based their local economy on the mining industry. Decision-makers preparing societies to achieve climate neutrality pose the challenge of post-mining regions to go through a difficult transformation process (Badakhshan et al., 2023; Barszczowska, 2023; Bondaruk et al., 2015; Chmielewska et al., 2020, Gupta, 2023b; Kaczmarek et al., 2022; Kaczmarek, 2022; Mostafa et al., 2024; Shavarskyi et al., 2022; Shnorhokian, Mitri, 2022; Talhofer, Hošková-Mayerová, 2019). Just Transition is also an opportunity for development for post-mining regions, the opportunity to invest in renewable energy sources and create new markets related to green energy and sustainable transport (Amoah, Stemm, 2021; Biały et al., 2020; Chmiela, 2023; Chmiela et al., 2023; Gajdzik et al., 2023; Gupta 2023a; Prusek, Turek, 2018; Riesgo Fernández et al., 2020). Just Transition in the Upper Silesian Coal Basin is also the opportunity to restructure and revitalize post-industrial areas remaining after previous intensive mining (Weijian et al., 2024; Wojtacha-Rychter et al., 2024a, 2024b; Sehedá et al., 2024; Gasior et al., 2023; Smolinski, Howaniec, 2023; Siudyga et al., 2023; Pylypenko et al., 2023). The described variant of self-sufficiency energy project of the underground pump station is one of many elements that may affect the economic and social structure of one of the cities of the Silesian agglomeration and the entire region (Chmiela et al., 2023; Mhlongo, Amponsah-Dacosta, 2016; Mhlongo, 2023; Salom, Kivinen, 2020; Smoliło et al., 2023; Yousuf et al., 2023). Drainage of goafs from liquidated mines by SRK S.A. protects active coal mines against potential flooding. The company pumps out approximately 100 million m³ of water annually using deep-well or stationary drainage methods (data for 2022). The purchase of electricity is one of the largest cost components (Łabaj et al., 2020; Janicka, Sajnóg, 2022; Mucha et al., 2016; Shavarskyi et al., 2022; Shnorhokian, Mitri, 2022; Wysocka et al., 2019). The main research goal was to learn the impact of changing economic conditions on design preferences when choosing a variant of the energy self-sufficiency project of an example of the underground pump station

belonging to the Branch of SRK S.A. called Central Mine Drainage Plant in Czeladź (CZOK). In addition to cover the energy needs of the underground pump station, the project aims to revitalize its facilities, maintain the existing ones and create new jobs (Bondaruk et al., 2015; Gawęda, 2024; Panahi Borujeni, Gitinavard, 2021; Prakash Pandey, Prasad Mishra, 2022; Smoliło et al., 2023; Taha, Abdel-Wahab, 2024).

The analyzed underground pump station is located in one of the districts of a large city in the Silesian Agglomeration. Water is pumped into the nearby river in accordance with the water law permit. The surface facilities of the underground pump station are accompanied by a reclaimed area of 8.7 ha. In 2022, it pumped out 1.1 million m³ of water. It is estimated that the underground pump station requires approximately 6.25 GWh of electricity to perform its activities.

2. Materials and methods

The calculations and design assumed the implementation of an installation producing energy for own needs. One way to reduce the demand for purchasing electricity from the grid is to build photovoltaic farms. When the system will provide electricity at night or on non-sunny days, it is necessary to use a system for storing the energy generated during sunny days (battery) (Chand, Paladino, 2023; Changqing, Jong-Beom, 2021; Doorga et al., 2022; Jae-Chan et al., 2021; Manowska, Nowrot, 2022). The project assumes the construction of a farm with a generating capacity of approximately 7.4 MWp, which will be able to produce approximately 10 GWh of “green”, “clean” electricity annually. The peak of pump station requires approximately 2.3 MW of electricity. On sunny days, the demand will be completely satisfied by photovoltaic farm and then there will also be an overproduction of energy, which can be used during non-sunny periods after being “stored” (Słupik et al., 2021; Smoliński, Howaniec, 2020; Tokarski et al., 2021).

Insolation on sunny days meets more than the energy needs of the underground pump station. However, there is a need to store energy for non-sunny days. Storing energy in the produced hydrogen allows for very effective long-term storage of the generated energy surpluses and their use during greater demand for electricity (Gado et al., 2024; Howaniec et al., 2023; Wojtacha-Rychter et al., 2021; Zadrąg, Kniaziewicz, 2019). For these reasons, in two variants of the energy self-sufficiency project of the underground pump station, excess energy was assumed to be stored in hydrogen obtained in the electrolysis process, and battery storage was assumed only to power some devices operating also at night, to buffer the generated energy or for the possible needs of stabilizing the operation of electrolyzers.

2.1. Analyzed variants of the self-sufficiency energy model of the underground pump stations. Adopted variants of modernization of the underground pump station

Assuming maximum use of the electricity that is generated, two groups of variants for the modernization of the underground pump station were designed. Each group comes in two types of variants, which gives four decision-making variants that differ in the amount of necessary expenditures and different degree of meeting the energy needs of the underground pump station. The first group of variants (variants 1 and 2) assumed only the construction of the so-called photovoltaic panel installation with the necessary equipment and infrastructure. In these variants, it will be necessary to obtain a license for electricity generation.

In the second group of variants (variants 3 and 4), obtaining a license for the production of electricity was abandoned in favor of storing energy in hydrogen obtained from electrolysis. This group of variants, apart from the installation of photovoltaic panels, includes additional equipment necessary for water electrolysis, storage, sale or combustion of the produced hydrogen.

2.1.1. Equipment and principle of functioning of variant 1 “Virtual prosumer”

Variant 1 assumes the implementation of an installation that produces energy for own needs on the basis of the so-called “Virtual prosumer”. It is planned to build the installation of photovoltaic panels with the capacity of 6.89 MWp along with the necessary equipment and infrastructure. On non-sunny days, the underground pump station operates during periods of the day with the lowest electricity purchase price. It was assumed that the pumping time and operation of the most energy-intensive equipment would be changed to sunny periods with the farm's production. This change ensures the use of approximately 40% of the produced electricity in the underground pump station. The remaining surplus, i.e. approximately 60% of generated energy, will be transferred to the local supplier's network and at the same time collected to another underground pump station belonging to SRK S.A. This model requires payment of energy transmission costs to the local supplier.

2.1.2. Equipment and principle of functioning of variant 2 “Energy turnover”

Variant 2 assumes the implementation of an installation producing energy partially used for own needs. The surplus of energy produced will be sold to the network of the local “green” energy recipient. On non-sunny days, the underground pump station will operate during periods of the day with the lowest electricity purchase price. Income from the sale of surplus energy produced to another customer's network, and the income obtained will be used to purchase energy for the operation of the underground pump station during non-sunny periods. To simplify the settlement model, it was assumed that energy would be purchased from a local supplier in accordance with the currently negotiated price, and the excess production of “green” energy would be sold to a local customer for 80% of the negotiated purchase price of “black” energy.

2.1.3. *Equipment and principle of functioning of variant 3 “Sale of hydrogen”*

Variant 3 assumes storing of the excess generated by electricity in the form of hydrogen. In the period with excess production of electricity, the surplus will be stored in the form of hydrogen through electrolysis. The produced hydrogen, after being compressed to the rated value, will be transferred to the tank from where it will be sold on an ongoing basis at the refueling station at prices close to retail prices. The income obtained in this way could be used to purchase energy and work during sunny periods. Variant 3 requires additional equipment related to water electrolysis, hydrogen storage and distribution. Additionally, the sale of the produced oxygen will cover part of the costs of purchasing “black” energy for the submersible pumping station during non-sunny periods. Due to the fact that distribution costs are difficult to determine at this stage of design, it was assumed that the profit from hydrogen sales will be 60% of the current retail price.

2.1.4. *Equipment and principle of functioning of variant 4 “Hydrogen combustion”*

Variant 4 envisages storing of the excess generated by electricity produced by the photovoltaic farm in the form of hydrogen and then combusting it into cogeneration engines to obtain energy again. The cogeneration engines will produce electricity for the needs of the underground pump station, and the heat energy will be consumed for its own needs and transferred for a fee to the heating network of neighboring residential buildings. Any excess of hydrogen will be transported to another underground pump station to generate electricity and heat there. Variant 4, apart from the construction of the basic installation with photovoltaic panels with a capacity of 6.89 MWp along with the necessary equipment and infrastructure and a battery energy storage facility requires additional equipment related to water electrolysis, hydrogen storage and combustion.

3. Results and discussion

The conducted expert opinion research (Chmiela et al., 2023) showed that the criteria presented in Table 1 should be used to assess the liquidation model variant. The experts were scientific employees of scientific and research institutions and engineering and technical employees of the company's power machinery departments.

Table 1.
Criteria for assessing the underground pump station modernization options

Assesment criterion			Weight
1.	Reduction of expenses for electricity purchase	[financial units]	0.265
2.	Investment expenditures	[financial units]	0.269
3.	Energy independence of the company	[%]	0.354
4.	CO ₂ emission	[Mg CO ₂ /rok]	0.052
5.	Workplaces	[items]	0.060

Source: Chmiela et al., 2023.

The variant was selected in two stages (Anton et al., 2019; Gossen et al., 2016; Gupta 2023a; Hudymáčová et al., 2010; Koziel, Pietrenko-Dabrowska, 2023; Stankevich, 2017; Wolnowska, Konicki, 2019). In the first stage of the evaluation, a single-criteria assessment was used for individual criteria and if more than one variant was selected, the variant with the smallest duration of time was finally selected. In the second stage, a multi-criteria analysis was carried out, taking into account all the criteria for assessing the analyzed four variants of the modernization of the underground pump station.

During previous research (Chmiela et al., 2023), it was found that the value of the currently negotiated purchase price of electricity has the greatest influence on the choice of variant in single- and multi-criteria assessment. To enable comparison of the impact of changes in the euro/zloty exchange rate, the unit cost of building a photovoltaic farm and the sales price of hydrogen on individual evaluation criteria and multi-criteria evaluation were analyzed for a constant value of the electricity price negotiated by the company in the third quarter of 2023.

In the analysis, the value of the analyzed factors (euro/zloty exchange rate, unit price of building a photovoltaic farm or hydrogen price) was changed in steps of 1 percentage point, looking for limit values that would cause a change in the classification of variants in a single- and multi-criteria assessment. The values estimated during the price research conducted in June 2023 were adopted as the base values of the analyzed factors. All information regarding costs (criterion “Reduction of expenses for electricity purchase” and “Investment expenditures”) is provided in the adopted [financial units] expressed as a fraction of the base value, which is the amount of expenditures determined during the price research conducted in June 2023 for implementation of the first variant, called “Virtual prosumer”. The simulated change in the euro exchange rate resulted in the change of three assessment criteria: “Reduction of expenses for electricity purchase”, “Investment expenditures” and “Energy independence of the company”. The change in the unit costs of building a photovoltaic farm was reflected only in the level of criterion 2 “Investment expenditures”. Due to the expected storage of surplus electricity in hydrogen obtained in the electrolysis process, the last factor analyzed was the price of hydrogen. The change in the price of hydrogen had an impact on the values of two evaluation criteria: “Reduction of expenses for electricity purchase” and “Energy independence of the company”.

3.1. Changes in the value of criterion 1 “Reduction of expenses for electricity purchase”

To facilitate the analysis, a simplified method of calculating the value of criterion 1 “Reduction of expenses for electricity purchase” was adopted. It was assumed that the value of this criterion would consist of savings resulting from the actual current consumption of “green” electricity produced by the farm and from the use of stored surplus energy. This value should be increased by the income from the possible sale of “green” energy, sales of thermal energy, hydrogen or oxygen, and the costs related to their turnover should be reduced. The model

assumes that any income obtained will be directed to the purchase of the missing “black” electricity from a local supplier at the currently negotiated rate.

Table 2.

Changes in the value of criterion 1 “Reduction of expenses for electricity purchase” caused by the change in the euro/zloty exchange rate

Euro/zloty exchange rate		-18%	±0.00	+17%
Variants		[financial units]		
1	„Virtual prosumer”	0.27	0.27	0.27
2	„Energy turnover”	0.28	0.28	0.28
3	„Hydrogen sale”	0.23	0.25	0.27
4	„Hydrogen combustion”	0.23	0.23	0.23
Score:		The best	The second	The third

Source: Author’s own study.

The modeled change in the euro/zloty exchange rate resulted in the change of the value of reducing expenses for the purchase of electricity only for variant 3, which provides for the sale of obtained hydrogen (Table 2). The change in the euro/zloty exchange rate of 17 percentage points up and 18 percentage points down corresponded to the change in the criterion value of 8 percentage points up and down. Smaller changes in the euro exchange rate resulted in the change in the value of expenditures reduction without changing the order of classification of variants. Only the above-mentioned large changes in the euro exchange rate led to the correction of the classification of variants in the second and third positions. Regardless of the euro/zloty exchange rate, the best variant in this criterion for the negotiated purchase price of electricity in the third quarter of 2023 was variant 2 “Energy turnover”.

Table 3.

Changes in the value of criterion 1 “Reduction of expenses for electricity purchase” caused by the change in the price of hydrogen

Hydrogen price		-15%	±0.00	+17%
Variants		[financial units]		
1	„Virtual prosumer”	0.27	0.27	0.27
2	„Energy turnover”	0.28	0.28	0.28
3	„Hydrogen sale”	0.23	0.25	0.27
4	„Hydrogen combustion”	0.23	0.23	0.23
Score:		The best	The second	The third

Source: Author’s own study.

The analyzed change in the price of hydrogen, similarly to the change in the euro/zloty exchange rate, resulted in the change of the value of reducing expenses for the purchase of electricity only for the variant providing for the sale of obtained hydrogen (Table 3) and produced identical results. The only difference was the scope of changes introduced. The change in the price of hydrogen resulted in the change in the value of the reduction of expenses without changing the order of classification of variants, and only large increases in the price of hydrogen led to the correction of the classification of variants in the second and third positions, leaving variant 2 “Energy turnover” as the best. The reduction in the price of

hydrogen by 15 percentage points and an increase in the price by 17 percentage points corresponded to the change in the criterion value of 8 percentage points up and down. For the conditions of the third quarter of 2023, in the criterion “Reduction of expenses for electricity purchase”, the most favorable option was option 2 “Energy turnover”, the next option was option 1 “Virtual prosumer”, and the third option was option 3 “Hydrogen sale”.

3.2. Changes in the value of criterion 2 “Investment expenditures”.

When estimating the value of criterion 2 “Investment expenditures”, fixed outlays for all variants were taken into account, such as outlays for the construction of a photovoltaic farm with full equipment (e.g. fencing, monitoring system, etc.) and operating costs (e.g. insurance, service costs, taxes, etc.) and costs related to additional equipment of the variants (e.g. direct power supply line for the local recipient, electrolyzers, cogeneration engines, gas tanks, compressors and energy storage) along with their operating costs.

Table 4.

Changes in the value of criterion 2 “Investment expenditures” caused by changes in the euro/zloty exchange rate

Euro/zloty exchange rate		-10%	±0.00	+10%
Variants		[financial units]		
1	„Virtual prosumer”	1.00	1.00	1.00
2	„Energy turnover”	1.03	1.03	1.03
3	„Hydrogen sale”	2.63	2.74	2.86
4	„Hydrogen combustion”	2.95	3.06	3.18
Score:		The best	The second	The third

Source: Author’s own study.

The change in the euro/zloty exchange rate resulted in the change of the value of reducing expenses for the purchase of electricity only for variants 3 and 4, which provide for storing energy in the form of hydrogen (Table 4). For these variants, the change in the euro/zloty exchange rate by 10 percentage points up and down corresponded to the change in investment expenditures by 4 percentage points. Despite the change in the value of expense reduction, the order in which the variants were classified did not change.

Table 5.

Changes in the value of criterion 2 “Investment expenditures” caused by the change in the unit cost of building a photovoltaic farm

Unit cost of building a farm		-10%	±0.00	+10%
Variants		[financial units]		
1	„Virtual prosumer”	0.90	1.00	1.10
2	„Energy turnover”	0.93	1.03	1.13
3	„Hydrogen sale”	2.64	2.74	2.84
4	„Hydrogen combustion”	2.97	3.06	3.16
Score:		The best	The second	The third

Source: Author’s own study.

Table 5 shows the impact of changes in the unit cost of building a photovoltaic farm on investment expenditures. For variants 1 and 2, which do not provide for the storage of surplus electricity, such a change had a direct impact on modernization expenditures. Due to the additional components of variants of storing excess electricity in hydrogen, an example of a 10 percentage point change in the value of outlays down and up resulted in a change in capital outlays of 3 to 4 percentage points. For the conditions of the third quarter of 2023, the most favorable options were variants 1 “Virtual prosumer” and 2 “Energy turnover”. Variant 3 “Hydrogen sale” was slightly worse.

3.3. Changes in the value of criterion 3 “Energy independence of the company”

In the adopted simplified method of calculating the value of criterion 3 “Energy independence of the company”, the annual amount of electricity obtained by the photovoltaic installation of the underground pump station was divided by the annual energy demand of the company and expressed as a percentage.

An independently conducted analysis of changes in the euro/zloty exchange rate and changes in the price of hydrogen on the company's energy independence gave exactly the same results.

In both cases, the result was the change in the amount of energy obtained only for variant 3 “Hydrogen sale”, which provides for the sale of obtained hydrogen (Table 6). The change in the euro/zloty exchange rate, as well as the downward price of hydrogen, by 15 percentage points corresponded to the reduction of meeting the company's demand by 7 percentage points and the promotion of variant 4 “Hydrogen combustion” to third place. Further reduction of the euro/zloty exchange rate and the price of hydrogen, despite the reduction of the company's energy independence, no longer resulted in changes in the classification of variants. When increasing the euro exchange rate and the price of hydrogen independently of each other, the limit was an increase in both factors by 31% percentage points. The result was an increase in the energy independence of the company for variant 3 “Hydrogen sale” by 14 percentage points and this variant moved to the second position from the third. Another limit value causing the change in the classification of variants was the increase in the euro/zloty exchange rate or the price of hydrogen by another 16 percentage points. With this value, for any of these factors, variant 3 “Hydrogen sale” turned out to be the best, ensuring the production of electricity providing 3.13% of the company's energy demand.

Table 6.

Changes in the value of criterion 3 “Energy independence of the company” caused by changes in the euro/zloty exchange rate or the price of hydrogen [%]

Euro/zloty exchange rate or hydrogen price		-15%	±0.00	+31%	+47%
1	„Virtual prosumer”	3.12%	3.12%	3.12%	3.12%
2	„Energy turnover”	2.93%	2.93%	2.93%	2.93%
3	„Hydrogen sale”	2.40%	2.57%	2.94%	3.13%
4	„Hydrogen combustion”	2.40%	2.40%	2.40%	2.40%
Score:		The best	The second	The third	

Source: Author's own study.

In the case of the conditions of the third quarter of 2023, in criterion 3 “Energy independence of the company”, the most favorable was variant 1 “Virtual prosumer”, the next variant 2 “Energy turnover”, and the third variant 3 “Hydrogen sale”.

3.4. Changes in the value of criterion 4 “CO₂ emission”

The value of criterion 4 “CO₂ emission” adopted for the analysis depends only on the actual consumption of “green” electricity produced by the underground pump station's photovoltaic farm. Possible changes in the emission factor will not affect the order of selection of the underground pump station modernization variants adopted for analysis. The greatest emission reduction is characterized by variant 1 “Virtual prosumer”, followed by variant 4 “Hydrogen combustion”. The remaining variants are equivalent in this evaluation criterion and therefore, due to the lower duration of time, variant 2 “Energy turnover” was chosen.

3.5. Changes in the value of criterion 5 “Workplaces” resulting from changes in market conditions.

The estimated value of criterion 5 “Workplaces” is not dependent on changes in the analyzed market conditions. In this criterion, the best option is variant 4 “Hydrogen combustion”, the next option is variant 3 “Hydrogen sale”, and the third option is variant 1 “Virtual prosumer” due to the lower duration of time.

3.6. Multi-criteria evaluation of variants.

The multi-criteria evaluation of the adopted modernization variants of the underground pump station consists of obtaining a comprehensive assessment of the examined phenomenon, taking into account all the criteria for assessing the modernization variants (Chmiela, 2023; Chmiela et al., 2023; Smoliło et al., 2023). A standardized “OU” rating is assigned to criteria whose increase in absolute value is perceived positively in accordance with formula 1, while criteria whose increase in absolute value is perceived negatively is assigned a standardized assessment in accordance with formula 2. Each of the assessment criteria is assigned a weight affecting the result. The multi-criteria “OW” assessment was carried out according to formula 3.

$$OU_{ij} = \frac{h_{ij}}{h_{i \max}} \quad (1)$$

$$OU_{ij} = \frac{h_{i \min}}{h_{ij}} \quad (2)$$

$$OW_j = \sum_1^i w_i \cdot OU_{ij} \quad (3)$$

where:

OU_i - value of the normed assessment for the criterion „i” for variant „j”,

OW_j - value of the multi-criteria assessment for the variant „j”,

i - number of the criterion for assessing the pump station modernization options,

j - number of the underground pump station modernization variant,

w_i - weight for criterion number „i”,

$h_{i \min}$ - the smallest value in criterion number „i”,

$h_{i \max}$ - the highest value in criterion number „i”,

h_{ij} - value in criterion “i” for variant number “j”.

The ratio transformation method used in the multi-criteria assessment eliminates the problem of possible differences in the units of analyzed parameters and the difference in the absolute size of the numbers describing individual parameters by placing the obtained values of individual parameters as a dimensionless number in the range from 0 to 1 (Amoah, Stemn, 2021; Anton et al., 2019; Chmiela, 2023).

Table 7.

Changes in the value of multi-criteria assessment of the underground pump station modernization variants caused by changes in the euro/zloty exchange rate [dimensionless]

Euro/zloty exchange rate		-9%	±0.00	+10%
1	„Virtual prosumer”	0.9476	0.9476	0.9476
2	„Energy turnover”	0.8936	0.8936	0.8936
3	„Hydrogen sale”	0.6629	0.6807	0.7009
4	„Hydrogen combustion”	0.6636	0.6606	0.6574
Score:		The best	The second	The third

Source: Author’s own study.

The modeled change in the euro/zloty exchange rate resulted in the change of the value of the multi-criteria assessment only for variants 3 and 4 with the storage of the obtained hydrogen (Table 7). The downward change in the euro/zloty exchange rate by 9 percentage points resulted in the change in positions 3 and 4 of variants 3 and 4. Regardless of the euro/zloty exchange rate, the best variant in the multi-criteria assessment for the realities of the third quarter of 2023 was variant 1 “Virtual prosumer”, and the next variant was variant 2 “Energy turnover”.

Table 8.

Changes in the value of multi-criteria assessment of the underground pump station modernization variants caused by changes in the price of hydrogen [dimensionless]

Hydrogen prices		-9%	±0.00	+10%
1	„Virtual prosumer”	0.9476	0.9476	0.9476
2	„Energy turnover”	0.8936	0.8936	0.8936
3	„Hydrogen sale”	0.6591	0.6807	0.7048
4	„Hydrogen combustion”	0.6606	0.6606	0.6606
Score:		The best	The second	The third

Source: Author’s own study.

The change in the price of hydrogen resulted in the change in the value of the multi-criteria assessment only for variant 3 “Hydrogen sale” (Table 8). As in the case of the euro/zloty exchange rate, the downward change in the price of hydrogen by 9 percentage points resulted in the change in positions 3 and 4 of variants 3 and 4. For variant 3, the value of the multi-criteria assessment decreased by 3.2 percentage points, and the value of the multi-criteria

assessment for the remaining variants were unchanged. Regardless of the hydrogen price, the best variant in the multi-criteria assessment for the realities of the third quarter of 2023 was variant 1 “Virtual prosumer”, and the next variant was variant 2 “Energy turnover”.

Table 9.

Changes in the value of multi-criteria assessment of the underground pump station modernization variants caused by changes in the unit cost of building a photovoltaic farm [dimensionless]

Unit cost of building a farm		-10%	±0.00	+10%
1	„Virtual prosumer”	0.9476	0.9476	0.9476
2	„Energy turnover”	0.8927	0.8936	0.8944
3	„Hydrogen sale”	0.6743	0.6807	0.6867
4	„Hydrogen combustion”	0.6545	0.6606	0.6662
Score:		The best	The second	The third

Source: Author’s own study.

The analyzed change in the unit cost of building a photovoltaic farm resulted in the change of the value of the multi-criteria assessment for variants 2, 3 and 4 (Table 9), and the value of the multi-criteria assessment of variant 1 “Virtual prosumer” was constant. Regardless of the amount of the unit cost of building a photovoltaic farm, the best variant in the multi-criteria assessment for the realities of the third quarter of 2023 was variant 1 “Virtual prosumer”, the next variant 2 “Energy turnover” and the third variant 3 “Hydrogen sale”.

The next step was to analyze the possible synergy in changes in these factors. Three hypothetical decision-making situations were modeled, including a joint change of all analyzed factors (tables 11, 12 and 13), which were compared with an unchanged decision-making situation (table 10), with a constant assumed purchase price of electricity negotiated by the company in the third quarter of 2023.

The first decision-making situation, called “Downgrading” (Table 11), is a situation in which all analyzed factors had their values reduced to a limit that changed the classification of variants. The euro/zloty exchange rate was reduced by 18 percentage points, the unit price of building a photovoltaic farm was reduced by 10 percentage points, and the price of hydrogen by 15 percentage points compared to the value from the third quarter of 2023. In this decision-making situation, the change in the multi-criteria assessment occurred only in variants 2 and 3. The modeled situation reduced the multi-criteria assessment of variant 2 “Energy turnover” by 0.1 percentage points and of variant 3 “Hydrogen sale” by 10.5 percentage points. As expected, there was the change in the classification of variants in position 3 and variant 4 changed places with variant 3.

In the second decision-making situation, called “Increase 1” (Table 12), all analyzed factors had their values increased to the first limit changing the classification of variants. The euro/zloty exchange rate was increased by 31 percentage points, the unit price of building a photovoltaic farm was increased by 10 percentage points, and the price of hydrogen by 31 percentage points compared to the value from the third quarter of 2023. Increasing the parameter values resulted

in the change in the multi-criteria assessment of all variants without causing the expected change in their order. The modeled situation reduced the multi-criteria assessment of variants 1, 2 and 4. In variant 1 “Virtual prosumer” the assessment dropped by 7 percentage points, in variant 2 “Energy turnover” by 10.5 percentage points, and in variant 4 “Hydrogen combustion” by 8.9 percentage points. The multi-criteria assessment increased by 13 percentage points in variant 3 “Hydrogen sale”. What is significant is the very quick reduction of the difference between the value of the multi-criteria assessment of variant 1 “Virtual prosumer” and the value of the multi-criteria assessment of variant 3 “Hydrogen sale”.

In the third decision-making situation, called “Increase 2” (Table 13), all analyzed factors had their values increased to the first limit changing the classification of variants. The euro/zloty exchange rate was increased by another 16 percentage points (to 47), the unit price of building a photovoltaic farm was increased by another 10 percentage points (to 20), and the price of hydrogen by another 16 percentage points (to 47) compared to the value from the third quarter 2023. The subsequent increase in the values of the analyzed parameters again resulted in the change in the multi-criteria assessment of all variants, causing changes in their order. Variant 3 moved to position 2, and variant 2 dropped to position 3. The change in classification did not occur in position 1, where variant 1 remained, and in position 4 with variant 4.

Table 10.

Decision matrix for selecting the underground pump station modernization variant for the third quarter of 2023

		Lowerin g costs	Investment expenditures	Company's independece	CO ₂ emission	Work- places	Multi-criteria evaluation
		[financial items]		[%]	[Mg CO ₂ / year]	[items]	[dimensionless]
1.	„Virtual prosumer”	0.27	1.00	3.12%	7413	3	0.9476
2.	„Energy turnover”	0.28	1.03	2.93%	1832	3	0.8936
3.	„Hydrogen sale”	0.25	2.74	2.57%	1832	6	0.6807
4.	„Hydrogen combustion”	0.23	3.06	2.40%	3331	8	0.6606

Source: Author's own study.

Table 11.

Decision matrix for selecting the variant in the decision-making situation “Downgrade” (Euro exchange rate - 18%, Hydrogen - 15%, Construction cost - 10%)

		Lowerin g costs	Investment expenditures	Company's independece	CO ₂ emission	Work- places	Multi-criteria evaluation
1.	„Virtual prosumer”	0.27	0.90	3.12%	7413	3	0.9476
2.	„Energy turnover”	0.28	0.93	2.93%	1832	3	0.8927
3.	„Hydrogen sale”	0.21	2.44	2.22%	1832	6	0.6091
4.	„Hydrogen combustion”	0.23	2.76	2.40%	3331	8	0.6606

Source: Author's own study.

Table 12.

Decision matrix for selecting the variant in the decision-making situation “Increase 1” (Euro exchange rate +31%, Hydrogen +31%, Construction cost +10%)

		Lowering costs	Investment expenditures	Company's independence	CO ₂ emission	Workplaces	Multi-criteria evaluation
1	„Virtual prosumer”	0.27	1.10	3.12%	7413	3	0.8810
2	„Energy turnover”	0.28	1.13	2.93%	1832	3	0.8275
3	„Hydrogen sale”	0.33	3.19	3.42%	1832	6	0.7695
4	„Hydrogen combustion”	0.23	3.51	2.40%	3331	8	0.6021

Source: Author's own study.

Table 13.

Decision matrix for selecting the variant in the decision-making situation „Increase 2” (Euro exchange rate +47%, Hydrogen +47%, Construction cost +20%)

		Lowering costs	Investment expenditures	Company's independence	CO ₂ emission	Workplaces	Multi-criteria evaluation
1.	„Virtual prosumer”	0.27	1.10	3.12%	7413	3	0.8095
2.	„Energy turnover”	0.28	1.23	2.93%	1832	3	0.7575
3.	„Hydrogen sale”	0.38	3.47	3.94%	1832	6	0.7697
4.	„Hydrogen combustion”	0.23	3.79	2.40%	3331	8	0.5451

Score:	The best	The second	The third
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Source: Author's own study.

In relation to the decision situation “Increase 1”, the modeled situation “Increase 2” reduced the multi-criteria assessment of variant 1 by 7.5 percentage points, variant 2 by 7.8 percentage points and variant 4 by 8.6 percentage points. However, variant 3 slightly increased its rating by 0.1 percentage point. A further decrease in the difference in the value of multi-criteria assessments of variant 1 “Virtual prosumer” and variant 3 “Hydrogen sale” was observed. It should be assumed that further increases in the values of the assessed parameters could promote variant 3 “Hydrogen sale” into the optimal variant, but such large increases in the euro/zloty exchange rate, the unit price of building a photovoltaic farm or the price of hydrogen are unlikely.

Tables (12, 13, 14 and 15) serve as decision matrices based on which the decision-maker makes the final decision regarding the scope of modernization of the underground pump station. The decision matrices of hypothetical decision-making situations presented in Tables (13, 14 and 15) give the decision-maker a broader perspective with potential changes in market

conditions. For the realities of the third quarter of 2023, in the multi-criteria assessment, the optimal variant was variant 1 “Virtual prosumer”, the next variant 4 “Hydrogen combustion”, and the third variant 3 “Hydrogen sale”.

4. Conclusions

The study analyzed the impact of changes in the euro/zloty exchange rate, the unit cost of building a photovoltaic farm and the price of hydrogen on individual evaluation criteria and the multi-criteria assessment of the energy self-sufficiency project of the underground pump station. To enable comparison of the impact of changes in these factors on individual assessment criteria and multi-criteria assessment, changes in the values of these factors were analyzed at the assumed constant price of electricity negotiated by the company in the third quarter of 2023.

The analyzed change in the euro exchange rate resulted in the change in the value of three evaluation criteria: “Reduction of expenses for electricity purchase”, “Investment expenditures” and “Energy independence of the company”. The change in the unit costs of building a photovoltaic farm was reflected only in the level of criterion 2 “Investment expenditures”. The change in the price of hydrogen resulted in a change in the value of two evaluation criteria adopted for the analysis: “Reduction of expenses for electricity purchase” and “Energy independence of the company”. The change in preferences for selecting variants for individual evaluation criteria resulted in the increase or decrease in the absolute value of the analyzed factors, most often exceeding 15 percentage points.

The lowest investment cost for the modernization of the underground pump station is provided for variant 1 “Virtual prosumer” and variant 2 “Energy turnover”. Variant 3 “Hydrogen sale” and variant 4 “Hydrogen combustion” require two or three times higher expenditures, but offer a much higher reduction in electricity bills. Variants 3 and 4, which provide for the storage of surplus energy generated in the form of hydrogen, ensure a much higher satisfaction of the underground pump station's energy needs, and their implementation is less dependent on external factors.

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BUSINESS FINANCING STRATEGIES IN POLAND'S FAMILY-OWNED BUSINESSES LISTED ON THE WSE

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Purpose: The aim of the article was to research business financing strategies of family-owned businesses listed on the Warsaw Stock Exchange during the 2007-2009 crisis.

Design/methodology/approach: The research methods included ratio analysis and Ward's clustering method.

Findings: The results showed that the conservative financing sources strategy adopted during the crisis impacted positively the profitability of family businesses.

Research limitations/implications: This article contributes to the discussion on a properly designed business financing strategy under crisis conditions.

Practical implications: The research results can be used by the company to develop its strategy for financing operations during the crisis and emerging difficulties.

Originality/value: The originality of the study consists in proposing a set of indicators and using Ward's method to assess the strategy in the area of solvency and financing sources.

Key words: family-owned companies, companies listed on the stock exchange, business financing strategy.

Category of the paper: Research paper.

1. Introduction

In the contemporary world, family-owned businesses constitute a significant proportion of all economic entities (Gomez-Mejia et al., 2011; Sharma, 2003). The economic importance of business entities of this type is mainly owed to their number, share in generating GDP, and the number of jobs they offer. According to research, the share of family companies on global stock exchanges is also growing (Culasso et al., 2012; Prencipe et al., 2014; Sraer, Thesmar, 2007).

As a result of the socio-economic changes that took place in Central and Eastern Europe after 1989, the number of family businesses in Poland increased significantly. The assessment of the condition of family businesses listed on the Warsaw Stock Exchange during the crisis is an interesting issue in the context of their financing strategies. It is a very interesting and significant research problem due to their relatively little experience in stock exchange activities and their specific functioning. Each company operating on the market should have a consciously formulated financial strategy, including the business financing strategy. The business financing strategy denotes a specific composition of business financing sources in a way that creates the basis for the achievement of the assumed goal of the enterprise (Brealey, Myers, 2000; Brigham, Houston, 2001).

The overriding goal of the article was to research the assessment of applied business financing strategies by family-owned businesses listed on the Warsaw Stock Exchange during the global financial crisis in the years 2007-2009. The research performed fits into research conducted in this field all over the world (Arrondo-García et al., 2016; Catuogno et al., 2018; Kwon, Han, 2020; Van Hoang et al., 2018). An important criterion for selecting a company's financing strategy is the cost of raising capital to finance the company's assets. The choice of financing strategy depends both on the decisions made in the enterprise and the decisions of investors making equity investments in the enterprise when it comes to external financing (Copeland, Weston, 1988).

2. Theoretical Background and Hypotheses

2.1. The specificity of the functioning of family-owned businesses

The concept of a family business has not been clearly defined in the literature on the subject. The lack of a uniform definition results from the significant complexity of the functioning of this type of entities, namely combining family and business. This complexity makes it difficult to adopt quantitative criteria that would allow a simple classification of these entities (Shanker, Astrachan, 1996). In the literature one can find many definitions of a family business. For instance, according to Barnes and Herson (1976), a family business is „a firm in which significant voting rights or ownership is controlled by a member or members of a single family”. La Porta et al. (1999) defined a family business as „a business that is partially owned by one or more family members who collectively control at least 20% of all votes”. In the case of Zahra et al. (2004), in a family business „there is both a family member with some identifiable ownership interest in the business and multiple generations of family members holding managerial positions in that business”. In numerous studies authors coin their own definitions of this concept (Bresciani et al., 2016; Halili et al., 2015; Saravanan et al., 2017;

Wellalage et al., 2012) or use a definition developed by other researchers (Ding, Pukthuanthong, 2013; Saidat et al., 2019).

Family businesses constitute a diverse group of enterprises. The main differences between them concern such aspects as age and period of operation, industry, organizational and legal form as well as the scale of conducted activity (Neubaum et al., 2019). The specificity of a family business lies in the fact that the shaping of the business and its forms of functioning by the family is so unique that it does not occur in other enterprises that are not run by several family members (Martyniuk, Gostkowska-Drzewiecka, 2022; Lewandowska, 2019, Lajstet et al., 2017). Running a family business together by a few family members is performed with greater commitment, dedication and faith in achieving success. It is worth emphasizing that in terms of management, family businesses follow a long-term business orientation (Jiraporn, DaDalt, 2009; Salvato, Moores, 2010) aimed at protecting the developed capital for future generations (Berrone et al., 2012; Hasso, Duncan, 2013) and focus on creating intergenerational value (Brune et al., 2019; Villalonga, Amit, 2006). In family businesses ownership and control are integrated, which in turn leads to the coherence of the interests of owners and managers (Fama, Jensen, 1983; Jensen, Meckling, 1976).

The specificity of a family business also leaves a significant mark in the process of creating its business financing strategy. Decisions regarding the choice of financing sources are fundamental. It is worth noting that in family businesses, financial decisions are not only based on value maximization, but also take into account factors such as running a business according to previously adopted rules, the possibility of offering work to family members, or a long-term strategic perspective (Gallo et al., 2004). Moreover, it was found that managers tend to be altruistic towards their companies and shareholders, ignoring the profit aspect (Bammens et al., 2011; Siebels, zu Knyphausen-Aufseß, 2012). With regard to risk, family businesses show a high degree of caution. This is evident in their significantly lower level of debt compared to non-family businesses (Anderson et al., 2012; Miller et al., 2007; Vasileiou, Samitas, 2015).

2.2. Factors influencing financial results achieved by family businesses

Research shows that there are significant differences in financial matters between family and non-family businesses. Most of these studies have proven a positive relationship between the company's performance and the family's capital structure (Eklund et al., 2010; Maury, 2006; Pindado, Requejo, 2015). The same significant relationship between the identity of owners and financial results is evident in relation to companies listed on the stock exchange (Garcia-Castro, Aguilera, 2014). Although also in their case the obtained research results turned out to be not entirely unambiguous, a significant part of them provided arguments for the claim that when it comes to companies of this type, family businesses achieve better financial results when compared to non-family ones (Carney et al., 2015; Jaskiewicz, 2005; Martínez et al., 2007; Vieira, 2014; Wagner et al., 2015). It should be noted, however, that some studies have shown the opposite or no relationship at all (Barontini, Caprio, 2006). It must be emphasized that

‘a concentration of family ownership’ is not the only factor that impacts the financial advantage of family businesses (Din, Javid, 2012; Halili et al., 2015; King, Santor, 2008; Poutziouris et al., 2015; Shyu, 2011). „Family ownership structures” (Ding et al., 2008; Kowalewski et al., 2010; Minichilli et al., 2016), „Independence (autonomy)” (Culasso et al., 2012) and „the family’s managerial positions” (Chu, 2011; Luo, Chung, 2013; Yammeesri, Lodh, 2004) are also significant.

The global host crisis in the financial markets that began in 2007 had a huge impact on the situation of companies listed on global stock exchanges. The financial results of stock exchange family businesses and their non-family counterparts in the time of the global financial crisis, mainly in the years 2007-2009, have been the subject of numerous empirical studies. It should be noted that the duration of the crisis adopted for the purpose of this study was different and resulted from the economic specificity of the country being analyzed (Arrondo-García et al., 2016; Catuogno et al., 2018; Kwon, Han, 2020; Van Hoang et al., 2018). Most of them confirmed the financial advantage of family businesses compared to non-family businesses. For example, research conducted on a sample of Japanese family and non-family businesses found that family businesses are more resilient both during and after the economic crisis, compared to non-family businesses (Allouche et al., 2008). Similarly, research based on the return on equity (ROE) and return on assets (ROA) ratios and performed on a sample of companies listed on the Australian Securities Exchange found that family businesses with concentrated ownership performed better than non-family businesses with dispersed ownership structures, both in the period of economic stabilization and recession (Saleh et al., 2017). The same results were obtained from research conducted in Europe, for example, on a sample of Spanish family and non-family businesses, based on economic indicators such as the minimum required rate of return and ROE (Ramírez, Romero, 2018), or on a sample of Portuguese companies, based on ROA and the market-to-book ratio (MB) indicators (Vieira, 2018). Therefore, family ownership can be an important factor increasing business efficiency and enabling family businesses to survive in times of crisis.

2.3. Business financing strategies

In theory and practice, there can be distinguished three types of business financing strategies (Brigham, Houston, 2001; DeAngelo, Masulis, 1980):

- 1) The aggressive strategy.
- 2) The moderate strategy.
- 3) The conservative strategy.

The aggressive strategy displays characteristic properties such as (Kołosowska et al., 2019; Levy, Sarnat, 1989; Modigliani, Miller, 1963): negative working capital, profit maximization relative to own capital, big risk and big benefits, low level of financial liquidity, high share of foreign capital in financing activities (even operating ones), negative assessment by creditors due to the risk of the entity's insolvency, exploiting the benefits of leverage.

The moderate strategy is characterized by the following properties (Corr, 1983; Kołosowska et al., 2019): fixed assets are paid for by equity or fixed capital, net working capital is low, close to zero, it is a strategy with average risk and benefits, the level of the tax cover and the applied financial leverage is average, absorbing average financial costs, recording average profitable equity, securing the company's solvency, but the readiness for the demand for short-term foreign capital must be maintained, causing moderate risk related to indebtedness, loans and credits.

The characteristics of the conservative strategy include (Copeland, Weston, 1988; Kołosowska et al., 2019): zero financial risk, increased positions of fixed capital in funding current assets, due to which the company can boast of financial stability, constantly growing need for net working capital financed from own funds, low return on equity, small benefits in relation to low risk, limited possibilities of using the tax shield and the effects of financial leverage, high costs related to the large-scale failure to use external capital, positive values of working capital, minimal risk of losing payment capacity, maintaining a high level of financial liquidity, total assets covered to a large extent by fixed capital.

2.4. Research hypotheses

Summarizing the considerations made so far, it can be concluded that the business financing strategy is one of the important decision-making areas of the enterprise, as it determines the size of the current and future financial needs related to business activities and determines the sources of obtaining funds necessary to meet these needs, which are the most advantageous from the point of view of expenditure and effects. The conducted literature research made it possible to learn about the behavior of companies in the separate business financing strategies as well as to put forward the following research hypotheses:

H1: During the crisis, family-owned businesses listed on the Warsaw Stock Exchange follow a conservative solvency strategy.

H2: During the crisis, family-owned businesses listed on the Warsaw Stock Exchange follow a conservative financing sources strategy.

H3: During the crisis, the adopted conservative strategy positively influences the profitability of family-owned businesses listed on the Warsaw Stock Exchange.

These hypotheses were verified at various stages of the empirical research.

3. Research Design

3.1. Description of the entities covered by the study

The research presented in the article concerned Polish family businesses listed on the Warsaw Stock Exchange. It was assumed that a family business is a company meeting the following criteria:

- a) 50% + 1 share belongs to natural persons,
- b) 50% + 1 share belongs to subsidiaries of natural persons without further checking whether these persons belong to one family,
- c) Shareholders directly or indirectly hold more than 5% of the shares, and together they hold more than 50%.

The adopted criteria were also connected with certain limitations. In particular, they concerned the inability to identify owners of closed-end investment funds who are shareholders of companies listed on the Warsaw Stock Exchange, as well as beneficiaries of foundations that are shareholders of companies listed on the WSE, and owners of foreign companies that are shareholders of companies listed on the WSE.

Due to the adopted criteria and the existing limitations, the following were initially selected for the study: in 2007, 222 businesses (including 60 family-owned businesses, which accounted for 27% of all surveyed subjects), in 2008, 236 businesses (including 64 family businesses, which accounted for 27% of all surveyed subjects), in 2009, 251 businesses (including 69 family businesses, which accounted for 27% of all surveyed subjects).

During the preparation of the sample for the study, a further selection of companies was made due to the lack of complete financial statements for the analyzed years or the bankruptcy of the company in the analyzed period. Furthermore, businesses whose results differed significantly from the average results were also eliminated.

As a result of limitations related to the adopted definition of a family business and additional exclusions made during the collection of data for the study, the study finally covered: 125 businesses in 2007 (including 45 family businesses, which accounted for 36% of all analyzed subjects), 130 businesses in 2008 (including 48 family businesses, which constituted 37% of all surveyed subjects), 127 businesses in 2009 (including 51 family businesses, which constituted 40% of all surveyed subjects).

3.2. Description of the method used in the study

The Ward's method was used in the study that allowed to identify, to the greatest possible extent, the behavior of family businesses in selected areas during the financial crisis of 2007-2009. The results obtained will form the basis for further research in this field covering the 2010-2022 time period.

The Ward's method (Ward, 1963) with the Euclidean distance was used for the purpose of this clustering. We decided to take this method because that method performed better than other clustering procedures (Blashfield, 1976; Hands, Everitt, 1987). The following characteristics were used: basic capital structure ratio, general debt ratio, ROE, ROA, 2nd-degree coverage ratio and 3rd-degree financial liquidity ratio. This study was carried out separately for family and for non-family businesses in 2007, 2008 and 2009 (each year separately). The starting point in clustering objects (companies) is the determination of the distance matrix D between individual objects. First, each object forms a separate cluster, then a pair of objects with the shortest distance is searched for. A few clusters with the smallest distance merge into one new cluster. The next step was to determine the distance of the new cluster from all the others (the distance between the clusters is defined as the difference between the sums of squared deviations of the distances of individual units from the center of gravity of the groups to which they belong) (Everitt et al., 2011; Grabiński, 1992; Ostasiewicz, 1998). The distances in the matrix D related to the objects occurring in the new cluster are removed, while inserting the distances of the new cluster from the other clusters. Thus, a new distance matrix is obtained. The process of combining the pairs of clusters was repeated until all of the objects formed one cluster (Everitt et al., 2011; Grabiński, 1992; Ostasiewicz, 1998).

4. Empirical Analysis

Using the Ward's method with the Euclidean distance, from among all family and non-family businesses, independently, three groups of companies were distinguished due to the business financing strategy applied. For the selected clusters of businesses, the average value was calculated for each index (Table 1), and then the t -test for the averages was used to verify the hypothesis of the equality of averages between the individual clusters of family and non-family businesses (Table 2).

The calculated values of the averages (Table 1) and the t -test results for these averages (Table 2) in 2007 allow to conclude that in the case of an aggressive strategy, the profitability and debt ratios for family businesses are significantly higher than for non-family ones. Exactly the opposite is true for subjects applying a conservative strategy, i.e., these ratios are significantly lower for family businesses compared to non-family businesses. With regard to the moderate strategy, only one debt ratio (basic capital structure ratio) is significantly higher for non-family than for family businesses.

The situation is different in 2008 when, in the case of companies using the moderate strategy, the debt and profitability ratios, as well as one solvency ratio (the 3rd-degree financial liquidity ratio), are statistically different for family and non-family businesses. With regard to the profitability and solvency ratios, these values are higher for non-family businesses than for

family ones. However, for the debt ratios, it is not possible to indicate one general direction of dependence (in one case the average of the ratio is higher for family businesses, in the other for non-family businesses). Companies applying an aggressive strategy significantly differ mainly in profitability ratios – they are higher for family businesses. Subjects applying a conservative strategy differ mainly in the overall debt ratio and the 2nd-degree coverage ratio, the former being higher for family businesses and the latter being higher for non-family ones.

The situation is quite different in 2009 when family businesses using both aggressive and conservative strategies had significantly higher profitability rates than in the case of non-family businesses. The situation is different in companies applying a moderate strategy. Then the debt ratios and ROE are significantly lower for family businesses than for non-family ones.

The results of family businesses applying a conservative strategy in 2007 and 2009 do not give grounds for rejecting H3. Profitability ratios are higher than the results of non-family businesses in each period, and in the mentioned years they are statistically significant.

The results of the research also pointed to very interesting observations regarding the behavior of family businesses in terms of debt. In 2007, family businesses following a conservative strategy had a much lower level of indebtedness than non-family businesses. In the following years, this situation was very diversified, which proves different ways of financing the activity, with the debt ratios for family and non-family businesses statistically at the same level. This proves that companies are taking steps to adapt to the situation.

A detailed analysis of the average nominal values contained in Table 1 will be presented below.

When assessing the data contained in Table 1 regarding the conservative strategy for family businesses, it can be observed that in all analyzed years the basic capital structure ratio was at a very low level and was contained in the range 0.01–0.08. Thus, at the end of 2009, it reached the highest level of 0.08 which was the value of interest liabilities in relation to equity on average in family businesses. Similar values of this relation can be observed in non-family businesses in all of the periods analyzed. A higher level of debt was shown by the general debt ratio, which for family businesses was in the range of 0.24–0.28. Thus, in the structure of liabilities of these businesses, foreign capital accounted for 28% in 2008. In non-family businesses, the highest share of foreign capital was observed in 2007 (34%). In the remaining periods, the level of indebtedness in non-family businesses was lower. For family and non-family businesses, the solvency and liquidity ratios were very different at the end of individual years. It is difficult to define any trends at this point. Based on this, it can be concluded that the hypothesis H1 should be rejected. This is also confirmed by the statistical analysis, in which the hypothesis of the equality of averages for family and non-family businesses was not rejected (see Table 2).

In 2009, family businesses applying a conservative strategy achieved higher profitability ratios than non-family ones. At the same time, non-family businesses achieved lower profitability ratios by applying a conservative strategy. This strategy ended with the

achievement of the highest profitability, which does not constitute grounds for rejecting the assumed hypothesis H3. This was presented in the previous statistical analysis. On the opposite side, we have an aggressive strategy that is characterized by considerable volatility of indebtedness ratios. This is also confirmed by the results of the statistical analysis that show the statistical difference in the averages for family and non-family businesses. Therefore, conclusions in this area should be formulated very cautiously.

Table 1.

Average values of selected ratios for companies grouped using the Ward's method that characterize the business financing strategy

Specification	2007					
	Non-family businesses			Family businesses		
	1 (A)	2 (C)	3 (M)	1 (A)	2 (C)	3 (M)
Basic capital structure ratio	0.80	0.05	0.10	0.32	0.01	0.25
Overall debt ratio	0.61	0.34	0.35	0.56	0.24	0.46
ROE	0.06	0.28	0.04	0.31	0.16	0.07
ROA	-0.02	0.16	0.03	0.15	0.11	0.04
2nd-degree coverage ratio	1.07	3.00	1.33	1.76	4.54	1.66
3rd-degree financial liquidity ratio	1.96	3.48	1.96	1.48	3.48	1.73
Specification	2008					
	Non-family businesses			Family businesses		
	1 (A)	2 (C)	3 (M)	1 (A)	2 (C)	3 (M)
Basic capital structure ratio	0.38	0.02	0.08	0.62	0.04	0.01
Overall debt ratio	0.54	0.19	0.24	0.60	0.28	0.63
ROE	0.06	0.08	0.06	0.26	0.09	-0.12
ROA	0.02	0.05	0.05	0.09	0.06	-0.06
2nd-degree coverage ratio	1.27	2.41	1.36	1.54	1.89	1.44
3rd-degree financial liquidity ratio	1.24	4.80	2.09	1.63	6.07	1.30
Specification	2009					
	Non-family businesses			Family businesses		
	1 (A)	2 (C)	3 (M)	1 (A)	2 (C)	3 (M)
Basic capital structure ratio	1.02	0.08	0.26	0.47	0.08	0.08
Overall debt ratio	0.47	0.19	0.41	0.58	0.25	0.35
ROE	-0.35	0.05	0.12	0.02	0.21	0.07
ROA	-0.22	0.04	0.06	0.01	0.12	0.04
2nd-degree coverage ratio	1.09	2.11	1.40	1.40	2.18	1.47
3rd-degree financial liquidity ratio	1.20	5.09	1.64	1.69	7.03	1.96

Abbreviations used:

1 (A) – The aggressive strategy.

2 (C) – The conservative strategy.

3 (M) – The moderate strategy.

Source: Own elaboration based on the results of own research.

Table 2.
t-Test for Averages (p value) of indicators for the family and non-family groups of businesses

Specification	2007					
	Assuming Equal Variances			Assuming Unequal Variances		
	1(A)	2(C)	3(M)	1(A)	2(C)	3(M)
Basic capital structure ratio	0.003	0.082	0.003	0.010	0.095	0.005
Overall debt ratio	0.057	0.071	0.236	0.116	0.067	0.245
ROE	0.000	0.009	0.374	0.001	0.016	0.373
ROA	0.001	0.083	0.142	0.003	0.109	0.175
2nd-degree coverage ratio	0.129	0.096	0.185	0.224	0.117	0.202
3rd-degree financial liquidity ratio	0.171	0.396	0.238	0.180	0.395	0.271
Specification	2008					
	Assuming Equal Variances			Assuming Unequal Variances		
	1(A)	2(C)	3(M)	1(A)	2(C)	3(M)
Basic capital structure ratio	0.095	0.228	0.022	0.115	0.207	0.009
Overall debt ratio	0.125	0.076	0.000	0.123	0.073	0.000
ROE	0.059	0.379	0.000	0.106	0.382	0.000
ROA	0.100	0.330	0.000	0.095	0.343	0.000
2nd-degree coverage ratio	0.131	0.091	0.347	0.176	0.093	0.352
3rd-degree financial liquidity ratio	0.189	0.366	0.001	0.259	0.364	0.001
Specification	2009					
	Assuming Equal Variances			Assuming Unequal Variances		
	1(A)	2(C)	3(M)	1(A)	2(C)	3(M)
Basic capital structure ratio	0.185	0.394	0.001	0.244	0.393	0.001
Overall debt ratio	0.199	0.283	0.050	0.254	0.296	0.044
ROE	0.004	0.025	0.056	0.020	0.061	0.049
ROA	0.005	0.020	0.112	0.037	0.036	0.106
2nd-degree coverage ratio	0.183	0.389	0.285	0.173	0.389	0.277
3rd-degree financial liquidity ratio	0.282	0.240	0.097	0.265	0.285	0.105

Abbreviations used:

1 (A) – The aggressive strategy.

2 (C) – The conservative strategy.

3 (M) – The moderate strategy.

Source: Own elaboration based on the results of own research.

The companies were characterized by similar solvency and financial liquidity ratios, with slightly higher levels in family businesses. Throughout the period, they achieved much higher profitability ratios. Their highest values appeared in 2007. In 2009, a significant decrease in the value of profitability ratios was observed, while non-family businesses recorded negative values of the analyzed ratios. The use of the aggressive strategy ended positively for these companies.

The moderate strategy was characterized in the first year of the analysis by high debt ratios in family businesses. Later, their average values systematically decreased and were similar in both studied groups. When assessing the solvency and financial liquidity ratios, we did not observe any significant differences. In family businesses, the fixed capital covered the fixed assets of these businesses to a greater extent. The effectiveness of the decisions made, assessed by profitability ratios, was much lower only in 2008. This year ended in many cases with a deficit of family businesses.

5. Conclusions

This study examines business financing strategies of family businesses listed on the Warsaw Stock Exchange in the 2007-2009 period. They are a signpost facilitating the rational management of enterprises. The financing strategy is a set of specific concepts of activities related to the determination of current and future capital needs. Each decision about choosing a strategy should be made dependent on a specific situation and depending on it, managers ought to choose the right one and use the opportunity in time. The basis of the company's success is high flexibility in operation and the ability to anticipate and adapt to changes that occur in the environment, especially under crisis. Therefore, it is so important for the management of the enterprise to be able to quickly adapt to these changes, thanks to which they will be able to make appropriate adjustments to the implemented financing strategy, so that the cost of raising capital is the lowest and the value of the company is the highest.

The results of the research made it possible to verify the research hypotheses presented in the article. For family and non-family businesses, the solvency and liquidity ratios were very different at the end of individual years. It is difficult to define any trends at this point. Based on this, it can be concluded that the hypothesis H1 should be rejected. This is confirmed by the statistical analysis, in which the hypothesis of the equality of averages for family and non-family companies was not rejected.

The results of the research also showed very interesting observations regarding the behavior of family businesses in the area of debt. In 2007, family businesses following a conservative strategy had a much lower level of indebtedness than non-family ones. In the following years, this situation was very diverse, which proves the search for methods of business financing adequate to the situation, therefore the debt ratios of family and non-family businesses are statistically at the same level. This proves that companies are taking steps to adapt to the situation. The most numerous group were companies that applied a conservative financing sources strategy, which does not provide grounds for rejecting the hypothesis H2.

The results of family companies applying a conservative strategy in all analyzed years do not provide grounds for rejecting the hypothesis H3.

It should be noted that for 2007 and 2009 the profitability ratios for family businesses are statistically significant, so they are higher than the results of non-family businesses.

One of the biggest barriers to the functioning of enterprises are capital limitations. Therefore, favorable and preferential solutions should be introduced to facilitate the acquisition of stable capital in the widest possible area. It becomes necessary to build lasting cooperation with the immediate environment, including financial institutions. It is the capital market that should be seen primarily as a very important place to raise capital.

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MANAGEMENT, SHARING AND DISSEMINATION OF RESEARCH RESULTS AT THE KOMAG INSTITUTE

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Purpose: The article presents the authors' multi-year experience in the domain of management sharing and transfer of knowledge inside a research organization as well as outside it to scientific and industrial partners dealing with an implementation of innovative technical and technological solutions.

Findings: Conventional forms of sharing knowledge still seem to be effective Example. Seminars, conferences and in disciplinary meetings of shareholders embalming brainstorming and a development of scientific and research projects.

Originality/value: The survey results concerning this subject matter reflect different forms of disseminating knowledge also with use of internet and the social media.

Conventional forms of sharing knowledge still seem to be effective Example. Seminars, conferences and in disciplinary meetings of shareholders embalming brainstorming and a development of scientific and research projects.

The scope of work described in the article concerns the phenomena events processes between creators and research results and their users from the industry.

In this case knowledge sharing and transfer words both ways.

Keywords: knowledge sharing, management research results, transfer of innovative solutions, dissemination of knowledge resources.

Category of the paper: Case study, Viewpoint.

1. Introduction

The term of knowledge sharing was popularized in the literature of economic and management sciences in the nineties of the last century together with a development of a concept and then of the research area named as knowledge management and also knowledge and information management. It is an interdisciplinary and multidisciplinary research area concerning human capital, intellectual capital, HR management as well as IT systems and tools

enabling knowledge gathering, storage, search, sharing and dissemination of knowledge and information resources.

Knowledge sharing is a phenomenon taking place through interactions among employees using different communication channels.

It is a component of managing knowledge, team work, quality, learning etc. It promotes changes and a development of organizational competences.

The COVID-19 pandemic formed challenges to economic mobility and corporate expansion. It had a negative impact on knowledge innovation, so to re-establish the flow of internal knowledge, organizations are compelled to refine their knowledge management strategy and amplify employees' motivation and eagerness to share and transfer information.

Strategic leadership styles: transformational, transactional and charismatic affect employee performance along with mediation effect of knowledge sharing. The success of knowledge sharing within an organization begins with individual cooperation. The moderating role of social media usage should be taken into consideration. The proactive personalities of employees positively influence knowledge sharing.

Knowledge management and sharing are indispensable in each organization. Both employees and outside partners must have an access to efficient and clear interface, being the knowledge base.

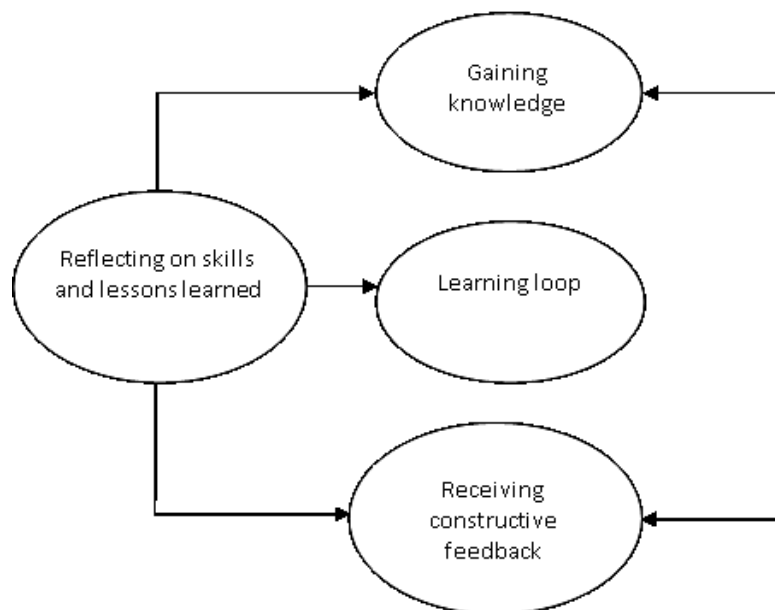


Figure 1. Data base as a tool for knowledge sharing.

Source: own.

The data base is a tool enabling knowledge sharing and dissemination as well as a construction of collaborative networks. A software for project management, on-line trainings, chat platforms for business as well as standard procedures promote an improvement of communication strategies. As it can be seen in Fig. 1 there is a learning loop encompassing gaining knowledge and receiving constructive feedback enabling a reflection on skills and lessons learned.

The article objectives consist in a presentation of research problems, identified by the authors, resulting from a use of different forms, methods and procedures for sharing and dissemination of knowledge as well as a successful management of knowledge resources based on the experience gained at the KOMAG Institute. So far the problem of sharing knowledge has been investigated at universities and industrial enterprises, but not in research institutes such as KOMAG.

The authors' scientific contribution concerns an identification of research problems, their systematization, detailed description and an elaboration of guidelines facilitating a process of efficient knowledge sharing and dissemination as well as their successful management. It should be highlighted that all these activities are oriented onto stakeholders of commercialization processes representing industrial enterprises. The scope of work, described in the article, concerns the phenomena, events and processes between creators of research results and their users from the industry. In this case, as it has already been mentioned, sharing and dissemination of knowledge works both ways which will be discussed explicitly in next chapters of this article.

2. Literature review

Nowadays, in the literature from the scope of management it is highlighted that knowledge is a special and most important asset of an organization. It is perceived as a source of more – than-average economic benefits (Goh, Hooper, 2009) as well as of economic rent (Stańczyk, Hugiet, 2011). Due to knowledge an organization gains an ability of solving problems (Krupski, Niemczyk, Stańczyk-Hugiet, 2009). As a strategic resource it should be subjected to an identification, measurement, gaining, development, usage and protection. In particular knowledge gains a strategic meaning when it is used (Yang, 2007). Unused knowledge has no value, and out-of-date inadequate knowledge, has a negative value (Krupski, Niemczyk, Stańczyk-Hugiet, 2009). Knowledge sharing ensures gaining a permanent market supremacy (van den Hoof, de Ridder, 2004), innovativeness (Liao, 2006), improvement of individual and organizational production rates (Quigley et al., 2007; Verburg, Andriessen, 2011) as well as possibilities of introducing changes and adaptations to the requirements of environment (Sharratt, Usoro, 2003).

In the literature beside the term 'knowledge sharing' there are other terms such as 'transfer', 'exchange', 'dissemination', 'transmission', 'flow' or 'diffusion'. These terms have different meanings. Knowledge sharing is a multi-directional activity, consisting in an exchange of knowledge in the direction which is not always determined explicitly. Knowledge transfer is a unidirectional activity having its objective. It encompasses passing knowledge, which is to find a determined application (King, 2006).

From the point of view of management sciences, the basis of knowledge sharing includes a collective activity consisting in an exchange of knowledge in the framework of teams, organizational centres and organizations (King, 2006). An empirical verification of impact factors as regards efficient knowledge sharing by scientific workers of universities is presented in (Kozuch, Lenart-Gansiniec, 2016). Knowledge sharing, as an essential competence, is connected with team work, communication and continuous learning of an organization (Słocińska, 2016). In the analysis of the knowledge subject-matter and of its management four basic conceptual categories should be distinguished. They are: data, information, knowledge and metaknowledge understood as wisdom. Two first categories can be treated as resources, but knowledge and metaknowledge should be analyzed in a multi-faceted way.

The data interpreted in a given context are called information, whereas the data used in a determined area of human activity gain the term 'knowledge' (Probst, Raub, Romhardt, 2004). Wisdom manifests itself through self-awareness of possessed knowledge or its lack. An essential role is played by a continuous search of new knowledge and also calling into question the truth and complexity of possessed knowledge (Fazlagic, 2004). Knowledge sharing is one of the factors enabling a construction of a research organization as learning and smart (Leja, 2013). The empirical results of the studies on knowledge and information sharing in the context of scholarly communication in Poland are presented in (Świgoń, 2016).

Knowledge can also occur in a hidden form which is not written down-tacit form unlike an explicit form which is written down (Li et al., 2014). In the available literature it is highlighted that knowledge sharing process is an important component of management strategies and that it determines knowledge development in organizations. However, it is indispensable to select proper knowledge sharing forms and to create stimulating conditions considering knowledge sender and knowledge receiver (Rudawska, 2013).

Analyzing a process of knowledge sharing other terms such as knowledge transfer, exchange of knowledge, dissemination can be found (Devenport, Prusak, 2000). W.R. King suggests that transfer of knowledge should be distinguished from knowledge sharing because transfer is a unidirectional activity, whereas knowledge sharing is a multidirectional activity (King, 2006). The research work, conducted so far in the scope of knowledge sharing, has concentrated mainly on stimulating or blocking factors of this process and also on an identification and categorization of activities within it (Von Krogh, 2011). The literature review should also include knowledge management (Durst, Foli, Edvardsson, 2024). The impact of generating and exchanging technical knowledge within France-England Channel region project and the mutual benefits it had on the research institutes, industrial partners and collaborative network established from the project was presented in (El Sour, Gao, 2022). It is interesting to know that the global hydrogen technological innovation system is explored by analyzing the three knowledge and technology transfer channels of publications, patents and standards (Ashari, Blind, Koch, 2023).

Within the rapid development of artificial intelligence and enterprise digital transformation, the standardization organization, storage and management of semantic knowledge in computers have become the current research focus (Yuan et al., 2025). It is worth examining determinants of openness at the project level, focusing on research, development and innovation projects within mature industries in Norway (Justvik, Aas, Smiljic, 2024). Knowledge sharing is commonly expected to enable exploration of different facilitators supporting this process. Theoretical and managerial implications and suggestions for future research within the field are described in (Katana, Glaa, Mirata, 2024). The influence of knowledge management processes on employees' knowledge sharing and transfer behaviours, viewed through the lens of the social exchange theory, is described in (Yao-Ping Peng). An informative perspective to quantify pairwise contributions during the knowledge sharing stage, meanwhile utilizing an exclusive Lasso to identify characteristics of tasks, plays an important role (Chang et al., 2024). R. Kusa, M. Suder, J. Duda (2024) focus on the points where knowledge, information and entrepreneurial management meet, with special attention paid to the relationship between information management and knowledge management as well as their mediating role in shaping firm performance. It should be borne in mind that strategic leadership styles affect employee performance through knowledge and information sharing (Yas et al., 2023). The success of knowledge sharing within an organization begins with individual cooperation. Some research work concerns the relationship between proactive personality and knowledge sharing in the organization (Jangsiriwattana, Duangkummerd, 2023). Public institutions should be attentive to people with more time of service because they may have difficulties with technological advances, reorganization of processes and adaptation to new ways of sharing knowledge (Alves et al., 2024). There are several difficulties and mechanisms for adopting a process of capturing and transferring tacit knowledge between projects (Correa, Silva, Scafuto, 2023). Some issues, concerning knowledge sharing and transfer, as management system objectives, are presented in (Malec, Stańczak, Ricketts, 2023) and in (Zajac, 2020). Based on the literature review it can be concluded that research work on knowledge management, sharing and dissemination in research institutes, has not been in depth investigated yet, so the authors decided to study these issues as a part of their research project.

3. Process of knowledge sharing, dissemination and management at the KOMAG Institute

3.1. General information about the KOMAG Institute

The KOMAG history of technical and technological activity dates back to 1950. During a nearly 75-year period it underwent numerous organizational and restructuring changes, but it has always been a bridge between science and industry as regards mechanical and mechatronic systems for the mining industry, environmental protection and work safety. At present it plays a significant role in the domestic and international scientific area, having at its disposal the state-of-the-art research and testing infrastructure enabling a realization of projects of interdisciplinary character. These projects are oriented onto smart solutions in the following branches of industry: mechanization, mechatronics, power engineering and ICT, operated in different branches of economy, including health protection, occupational safety, ergonomics and circular economy. Accredited testing laboratories continue to broaden their scope of activity to meet partners' requirements. KOMAG is a Notified Body within the Machinery, ATEX and Safety of Toys Directives. Its development model meets the requirements of the present market conditions according to the principles of the fourth industrial revolution. Knowledge, experience and innovativeness of solutions are confirmed by numerous patent letters, certificates and awards gained both in Poland and abroad. At present the research and development projects, realized at the KOMAG Institute concern a generation, transmission and storage of energy and hydrogen, a revitalization of post-industrial areas, including post-mining areas, biodiversity, electromobility, cybersecurity, renewable sources of energy as well as an integration of control, automation, monitoring and sensory systems.

3.2. Figures – second level numbering

The organizational structure of the KOMAG Institute encourages for an exchange of knowledge and for a collaboration within the framework of the whole Institute. A self-organization and a decentralization of the management system improve a process of knowledge sharing, enabling a creation of teams and a direct collaboration among employees. The Organizational Chart is presented in Fig. 2. It reflects in detail the knowledge management system at the KOMAG Institute.

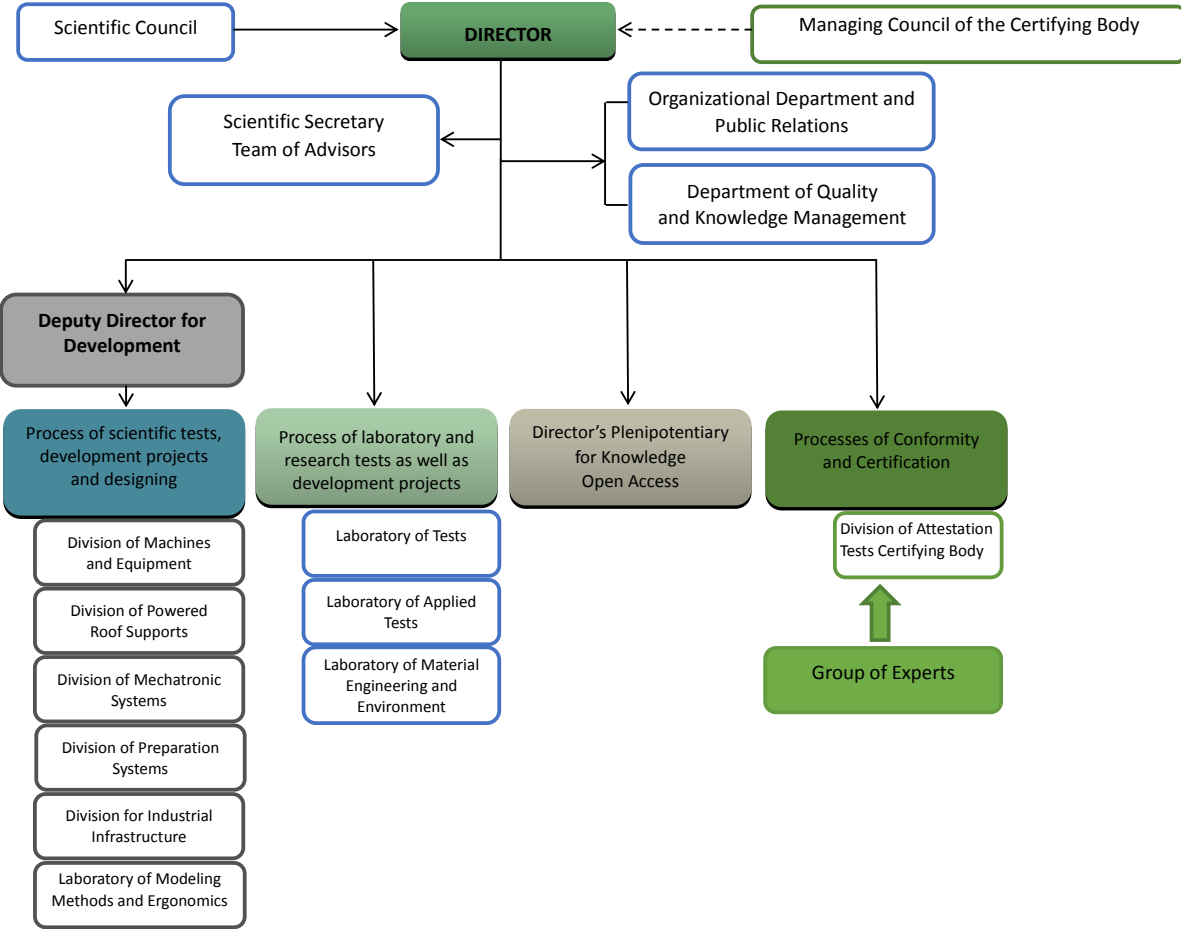


Figure 2. KOMAG Institute Organizational Chart.

Source: own.

The Organizational Chart shows three main processes conducted at the KOMAG Institute, i.e. processes of scientific tests, development projects and designing, processes of laboratory and research tests as well as development projects and processes of conformity and certification. The Development and Quality and Knowledge Management and the Director’s Plenipotentiary for Knowledge Open Assess are responsible for a realization of the objectives concerning the processes described above. A successful and efficient operation of all the researchers is guaranteed by the Quality Systems compulsory at the Institute, according to ISO 9001, ISO/IEC 17025, ISO/IEC 17065. As a dissemination and sharing of knowledge is a complicated and differentiated process, the authors decided to show it on the model developed by them.

3.3. KOMAG model of knowledge sharing and dissemination of research results

Based on multi-year professional experience, the authors developed their own model of knowledge sharing and transfer processes shown in Fig. 3.

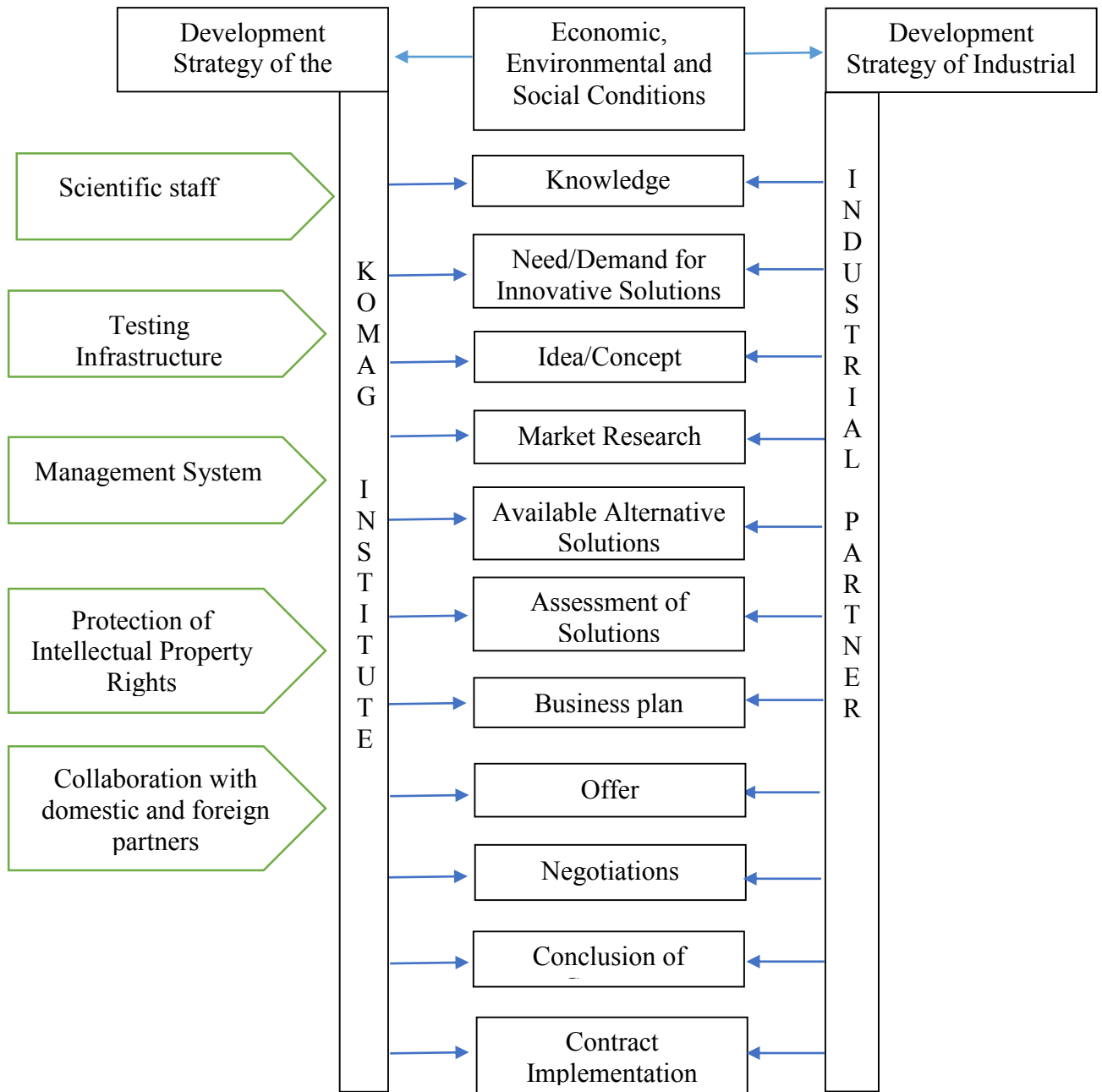


Figure 3. Model of knowledge sharing and dissemination of research results.

Source: own.

The model reflects a process, conducted at the KOMAG Institute to share and disseminate knowledge to industrial partners. It can be seen that a need or demand for implementing an innovative solution can result from the development strategy of the KOMAG Institute, from the development strategy of an industrial partner or from economic, environmental or social conditions. Knowledge resources are both at the Institute as well as at the industrial partners', so the idea/concept can be submitted by either of them or both of them. The same concerns market research, available alternative solutions, assessment of solutions and business plan. Then an offer is prepared by the Institute and negotiations start. The two last steps include a conclusion of contract and its implementation. Such an approach to the process of dissemination and sharing of knowledge is possible at the KOMAG Institute due to the scientific staff and researchers of high qualifications and the state-of-the-art testing infrastructure. The knowledge management system and well-developed protection of intellectual property rights are extremely important in this case. A collaboration with domestic and foreign partners from academia and widely understood industry is a source of information and challenges, stimulating a continuous development and progress of the Institute. While analyzing this diagram it can be seen how complex this process is and although the Institute plays the leading role, it should be highlighted that the activity of an industrial partner in the individual steps can have a crucial impact on the final success. The development model reflects a simplified, but clear image of real-life processes. This model is limited to a presentation of the factors whose impact on the process is significant from the point of view of conducted analysis, so it takes into consideration only the selected factors. It is a sort of an integrated model which indicates that its individual elements are based on a certain scope of knowledge, creating a frame structure. It is oriented onto an elaboration of information and guidelines of utilitarian character. A systematization of activities within the process of knowledge sharing, a classification of barriers to these processes and an identification of results plays a crucial role. Generally speaking, the main objective of this process consists in an increase of innovativeness, a quality improvement and safety increase leading to a successful commercialization of research results.

In practice at the KOMAG Institute three phenomena occur in the process, i.e. knowledge sharing consisting in an exchange of knowledge among the employees of the Institute, knowledge transfer oriented onto its transmission to industrial or scientific partners in a form of technical and technological solutions as well as knowledge dissemination enabling an access to knowledge for all the employees. All these activities cause a diffusion of knowledge. The subject-matter of knowledge sharing has a multi-aspect character, because it identifies factors which have an impact on efficiency of this process. It is indispensable to take into consideration knowledge sharing behaviour and knowledge acquisition behaviour.

Knowledge sharing is perceived to be an essential competence. It is also a personal, organizational and social development factor. The significance of Internet and other tools enabling to generate and store huge amounts of information has already been mentioned and will be presented in a further part of this chapter. The essence of knowledge sharing in the Institute is a two-side process, in which a knowledge exchange and a creation of new knowledge take place. This process is indispensable for transforming individual knowledge into organizational knowledge. On the individual level there are motivation and behavioural factors of knowledge sharing, whereas on the organizational level structural, cultural, communication, technological and managerial factors can be named. The organizational culture also promotes knowledge sharing. An issue of trust and intellectual openness is very important, because it encourages team work, unites teams and contributes to a generation of new ideas. An encouragement for critical thinking and for in-depth analyses of tasks, for creativity taking into consideration a possibility of making a mistake, within the risk under control, plays a significant role in the whole process. In relation to the organizational culture a significance of communication should be discussed. Dialogues and efficient flows of information support, in particular, the knowledge sharing system. The employees should be trained in the domain of communication and knowledge sharing skills. A use of complex IT solutions facilitates a knowledge codification and an open access to knowledge. Managerial skills and factors should be taken into consideration. Not only motivational activities, in particular financial incentives encouraging researchers for sharing knowledge, but also non-financial motivators in a form of a verbal praise, are important.

A responsibility of the managerial staff in the scope of creating the atmosphere promoting knowledge and experience sharing, a creation of mutual trust conditions, eliminating a fear of unfair competition, appropriation of ideas, lack of openness or apparent openness, envy, picking up ideas, malice and disapproval have a crucial impact on successful and efficient knowledge sharing, dissemination and management. However, it should be borne in mind that dominating competition leads to conflicts and hostility. On one hand an efficiency of knowledge sharing depends on the researchers' approach, their engagement in a realization of the KOMAG's strategic objectives, personal satisfaction, benefits resulting from knowledge exchange, communication skills but on the other one it depends on the management style, including motivation, encouragement, a generation of the trust atmosphere, openness as well as conditions which promote processes of knowledge sharing and transfer.

4. Survey results concerning knowledge sharing by scientific and research institutes and their industrial partners

The authors investigated interdisciplinary issues concerning widely understood processes of knowledge management, dissemination and sharing oriented onto a commercialization of innovative project results. Special attention was paid to a development of a new product, a modification of an existing product, an elaboration of a new process, a modification of an existing process, entering a new market, a participation in a creation of economic programmes and expert opinions. Different forms of sharing knowledge with the use of Internet and social media, such as the website of the Institute, branch web-site portals, social media e.g. Facebook, X portal (former Twitter), multimedia website pages e.g. YouTube, Flickr, Picasa, SlideShare were analyzed. Social media enable interactions, they concentrate on the recipient who moderates a two-directional dialogue (Bullock, Agbaimani, 2012). The questionnaire contained knowledge sharing determinants among scientific and research organizations (universities, research institutes, institutes of the Polish Academy of Sciences and industrial enterprises divided into four categories in relation to their size: microenterprise, a small enterprise, a medium-size enterprise and a single person enterprise. Then the surveyed persons were to mark their scope of activity: metal and machine industry, services, trade and transport, fuels, power engineering, extraction of raw materials, industrial production, agriculture and fishing, safety, construction, engineering and technical services, IT services, development of software, installation and maintenance of IT systems, customer support services, warehousing and storage. The area of the market activity was also identified: regional, domestic, European Union countries, world. The authors were particularly interested in an efficiency of knowledge sharing as a factor of successful knowledge transfer in the commercialization aspect of research results. It turned out that the following factors had crucial impact on a decision about a collaboration with a research organization: good knowledge about competences, innovativeness, experience, market recognition, an adaptation of the offer to the enterprise needs, price, quality, advertisements, reaction speed and a trouble-free communication enabling knowledge sharing.

As in the case of industrial partners, representatives of scientific and research organizations were asked for an efficiency assessment of the Internet and social media as tools of knowledge sharing and communication channels.

From the scientific point of view, it was worth investigating the frequency of using different sources by enterprises while searching information about offers of scientific organizations (Fig. 4.)

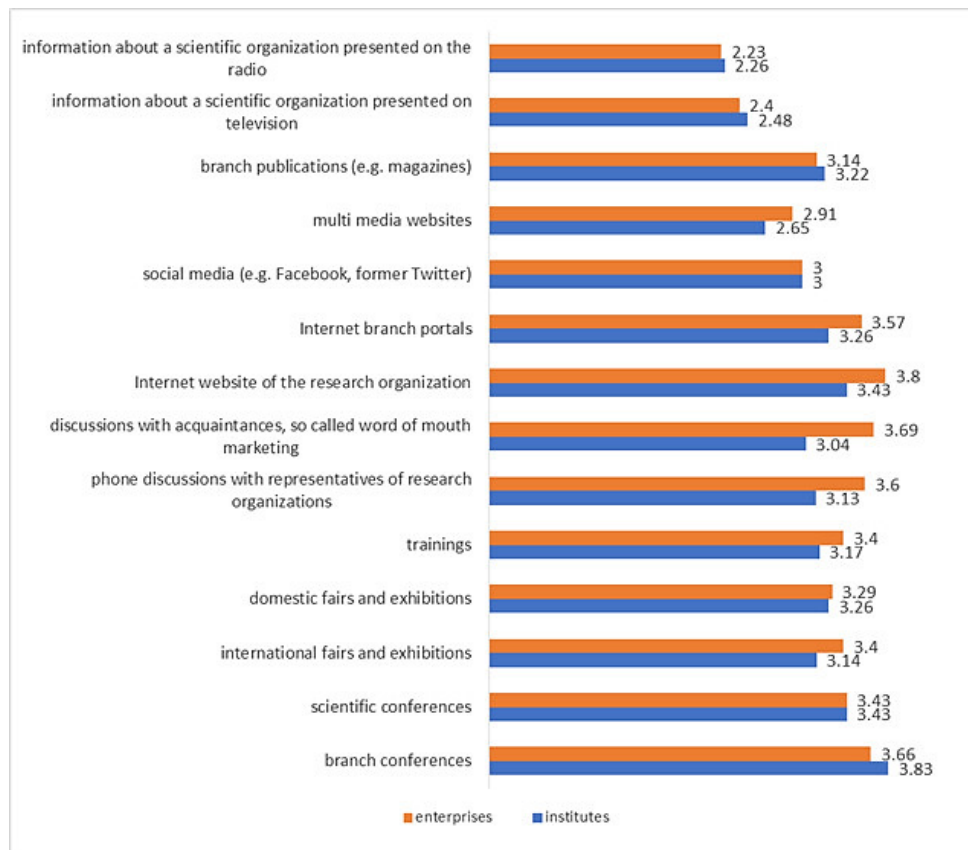


Figure 4. Frequency of using different sources of information by enterprises while searching information about offers of scientific organizations.

Source: Malec, Stańczak, Dróżdż-Szeplińska, 2024.

It is worth highlighting that the enterprises used mainly the Internet websites of research organizations as the source of knowledge, but they also indicated a use of a so-called word of mouth activities and branch conferences.

In Fig. 5 it can be seen that in the year 2023 different sources of knowledge sharing and transfer were used by representatives of enterprises. Phone information seemed to be assessed as very good (59%), then the website (34%) and conferences (21%). It is surprising to find out that 66% of respondents did not use social media, 59% did not use trainings, 70% did not use KOMAG publications, 56% did not take advantage of conferences and symposia and 52 % - of fairs and exhibitions. It is also worth assessing a use of different marketing tools in the year 2023 (Fig. 5)

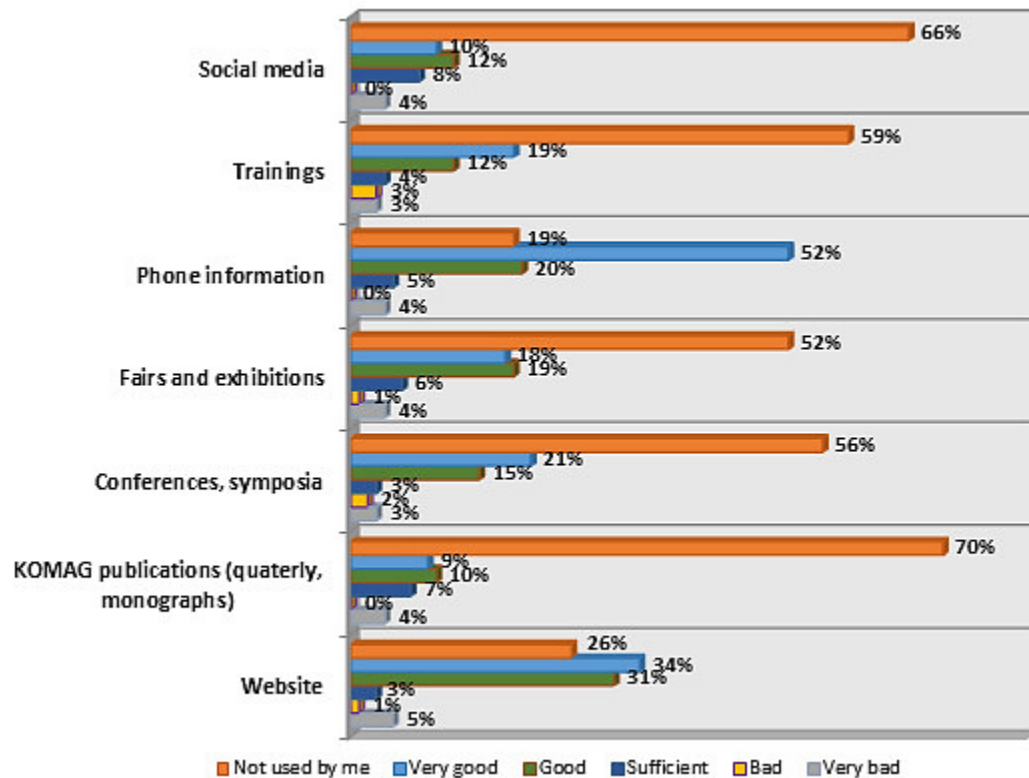


Figure 5. Assessment of different marketing tools in the year 2023.

Source: Malec, Stańczak, Dróždź-Szeplińska, 2024.

The respondents assessed trainings as bad and very bad – 6% in total, conferences – 5% and website – 6%, so corrective measures should be taken as soon as possible.

The survey results enabled to analyze KOMAG processes against the background of other research institutes which will definitely promote more efficient knowledge sharing and transfer sources. Bearing that in mind, studies on knowledge sharing and dissemination of research results should be continued as there is still a possibility of improvement.

5. Conclusions

Based on the literature review and the results of their own scientific investigations the authors presented a research problem consisting in an analysis of knowledge management, sharing and transfer between research institutes, in particular the KOMAG Institute of Mining Technology, and industrial partners.

- The article is primarily of cognitive values, emphasizing the importance of knowledge sharing in communication process of research results of innovative character.
- The obtained survey results enabled to compare opinions of industrial partners versus scientific and research institutes, but special attention was paid to the systems used at the KOMAG Institute. It should be highlighted that these results can be used for building better and more reliable relationships between research organizations and industrial enterprises. These relations should be based on mutual interests, trust and understanding and they should promote a two-directional dialogue moderated by recipients.
- Based on multi-year professional experience the authors developed their own model of knowledge sharing and dissemination processes which reflected the most crucial components such as a development strategy of the KOMAG Institute, economic, environmental and social conditions and also a development strategy of industrial partner. Five impact factors were taken into consideration: qualifications of scientific staff, testing infrastructure, management system, protection of an intellectual property rights as well as a collaboration with domestic and foreign partners. All these factors form an in-input from the part of the KOMAG Institute.
- The model can be used as a sort of guidelines of utilitarian character because a systematization of activities within the process of knowledge management, sharing and transfer, a classification barriers to these processes and an identification of results play a crucial role in a commercialization of research results.
- In practice, at the KOMAG Institute three phenomena occur in the process of knowledge management, sharing and transfer, i.e.: knowledge sharing consisting in an exchange of knowledge among employees of the Institute, knowledge transfer oriented onto its transmission to industrial or scientific partners as well as knowledge dissemination. All these activities cause a diffusion of knowledge.

Bearing in mind the survey results, obtained by the authors, it was possible to analyze knowledge sharing processes at the KOMAG Institute against the background of other research institutes. It turned out that some processes should be modified to make them more efficient and reliable.

As knowledge sharing process is an important component of management strategies and determines knowledge development in organizations, so it is indispensable to select properly and correctly knowledge sharing forms and to create stimulating conditions as regards knowledge sender and knowledge receiver.

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THE EFFECTIVENESS OF INVESTING IN PRECIOUS METALS, CURRENCY RATES AND STOCK INDICES IN THE ERA OF SIGNIFICANT INFLATION IN THE 21ST CENTURY

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Purpose: The aim of the work is to show the profitability of selected investments on the Polish capital market, taking into account inflation at the beginning of the 21st century. The subject of the research are selected exchange rates, precious metals and stock indices.

Design/methodology/approach: Selected quantitative methods were used in the work, including the methodology of descriptive statistics, financial engineering and financial mathematics.

Findings: In the difficult period of the first 30 years of the 21st century, there are investments that allow you to make a profit, but they involve high risk.

Research limitations/implications: There are many investment opportunities on the Polish capital market, including investing on the stock exchange, in precious metals. However, major economic and political changes in the first 30 years of the 21st century imply great uncertainty and the risk of financial loss.

Practical implications: Investing is part of the economic activity of many entities on the market. Therefore, the analysis of investment profitability is a current and important research problem and is applicable in economic practice.

Social implications: Both individual and collective investors are interested in effective investing. Banks also want to invest funds and achieve the highest possible profits. Therefore, the analysis of investment opportunities is important for various economic entities, but also for households.

Originality/value: The article presents a comparison of various investments in terms of their profitability and risk in the first 30 years of the 21st century.

Keywords: long-term investing, investing in precious metals, investing in currency rates, investing on the stock exchange, investment risk.

Category of the paper: research paper.

1. Introduction

Investing is a complex, difficult process that requires knowledge, methodology, experience and also intuition. The decision-maker is often required to achieve above-average profits regardless of the economic and political situation. This is sometimes impossible. However, the search for effective investment methods is still a current task, because profitable investment of financial resources and their constant multiplication is one of the problems of the modern economy (Begg et al., 2007; Dorosz, 2014; Partridge, 2022; Petzel, 2021; Stevart et al., 2019; Taylor, 2009 Wojewoda, 2023).

Choosing how to invest capital is difficult and may turn out to be crucial due to the environmental conditions and economic conditions. The appropriate choice of investment depends on many factors, including the size of financial resources and the investor's attitude to risk. Risk-averse and risk-averse investors will choose low-risk investments, for example savings deposits in banks, while investors who are more risk-averse will buy, for example, precious metals.

Investors willing to take risk will reach for shares on the stock exchange. The greater the expected benefits from an investment, the greater the investor's risk. Therefore, it is worth considering different investments or diversifying them to reduce the risk of possible financial losses.

The key question that the author asks himself is whether there is a significant relationship between the effectiveness of investing in currency rates, metals, or securities offered on the stock exchange. Is diversification of portfolio components necessary, how does diversification affect investment risk, does it significantly reduce it? Introducing many components to a portfolio increases the costs of its maintenance. Do the benefits obtained through diversification therefore cover the costs?

There are many research works on most popular investment strategy applied to the Polish capital market, as well as many works on optimal investment strategies using less popular investment methods (Mastalerz-Kodzis, 2014, 2015, 2016; Mastalerz-Kodzis, Pośpiech, 2015; Pośpiech, Mastalerz-Kodzis, 2015). This work focuses on investing in three areas: precious metals, currencies and securities from the Warsaw Stock Exchange.

2. Research methodology – effective rate of return taking into account inflation

The effective interest rate is an indicator that takes into account the total income from capital with total interest, or the total cost of capital with interest paid. The factor that is taken into account when calculating the effective interest rate is the capitalization of interest. This indicator is used to determine the increase in capital value per year (Bieszk-Stolorz, 2022; Tarczyński, 1999).

Effective interest is also known as the effective interest rate. This term means the exact interest rate for the entire year. It indicates the amount that the bank client will have to pay as interest for taking out the loan or how much he will be able to earn on his savings saved as a deposit.

The nominal interest rate is a specific interest rate that determines how much borrowers will have to pay to the bank and how much people with deposits will gain. The nominal rate is often attractive to the bank's client.

The effective interest rate includes not only the nominal amount, but also all possible additional costs, such as the initial fee, all administrative fees and the monthly fee. For this reason, it is also called the real or actual interest rate. It is definitely higher than the nominal value and is also very variable.

The offer of Polish banks includes a promotion that is beneficial to the customer, ensuring, for example, 6 percent of revenues throughout the year. However, it is crucial to determine the period over which the offered interest will be capitalized. There are several types of effective interest rate settlement periods: daily, calculated on all days of the year, monthly, quarterly, half-yearly, continuous, i.e. infinite.

Which type of settlement period will be the best solution for a given person depends primarily on his or her own needs, capabilities and contract terms. However, the tables available on the websites of various banks show that the best option is to choose a continuous interest rate.

Formula for the effective interest rate per year:

$$r_e = \left(1 + \frac{r}{m}\right)^m - 1 \quad (1)$$

where:

r_e - effective annual interest rate,

r - nominal annual interest rate,

m - number of capitalizations per year.

When calculating the final value of capital, we must take into account any changes in interest rates.

Let us assume that over the next n years the annual interest rate was equal to $r^{(1)}, r^{(2)}, \dots, r^{(n)}$ whereas in a situation where interest was capitalized in periods shorter than one year, in the calculations we assume

$$r^{(i)} = r_{ef}^{(i)} \quad (2)$$

In the described case the value of the initial capital K_0 after n years will be equal to

$$K_n = K_0 \prod_{i=1}^n (1 + r^{(i)}) \quad (3)$$

The interest rate that meets the above condition is called the average interest rate over n years and is denoted by \bar{r} .

The rate \bar{r} can be determined from the equation:

$$K_0 (1 + \bar{r})^n = K_0 \prod_{i=1}^n (1 + r^{(i)}) \quad (4)$$

It is expressed by the formula:

$$\bar{r} = \left[\prod_{i=1}^n (1 + r^{(i)}) \right]^{\frac{1}{n}} - 1 \quad (5)$$

Real interest rate r' (taking into account inflation), r_i is the inflation rate

$$r' = \frac{r - r_i}{1 + r_i} \quad (6)$$

For a small inflation rate, there is an approximate equality

$$r' \approx r - r_i \quad (7)$$

The relationship between interest rates r , r' and r_i written in the form

$$1 + r = (1 + r_i)(1 + r') \quad (8)$$

is sometimes called the Fisher formula (Irving Fisher, American economist, 1867-1947).

By denoting by $r_i^{(1)}, r_i^{(2)}, \dots, r_i^{(k)}$ inflation rates in k consecutive periods (subperiods), we can calculate the total inflation rate in k periods from the formula

$$r_i = \prod_{j=1}^k (1 + r_i^{(j)}) - 1 \quad (9)$$

and the average inflation rate in k periods from the formula

$$\bar{r}_i = \left(\prod_{j=1}^k (1 + r_i^{(j)}) \right)^{\frac{1}{k}} - 1 \quad (10)$$

If an investor wants to multiply profits and take advantage of a loan, it is also worth using the formula for the effective interest rate of the loan. Then, it is worth calculating the effective cost of the loan, which consists of the sum of interest paid, which should be divided by its amount. To calculate its height yourself, use the formula:

ESPK – effective loan interest rate, where:

$$ESPK = \frac{\sum_{i=1}^n \frac{O_i}{\left(1+\frac{r}{n}\right)^i}}{K} \quad (11)$$

where:

K - loan amount,

r - annual interest rate used to calculate the present value of interest,

O_i - interest installments,

n - number of interest payment periods per year.

When deciding to take out a mortgage or cash loan, or to open a deposit, it is worth being aware that not only the regular interest rate affects the amount of costs that the client will incur. The element that should primarily attract the attention of a future borrower is the effective interest rate, which will realistically indicate the amount of all costs that will have to be incurred or that can be gained by having a deposit. Therefore, in order to properly understand the content of the contract signed with the bank, it is important to familiarize yourself not only with the definitions of unclear terms, but above all with the bank's offer itself and the details contained in the signed contract.

3. Research results - Analysis of investment profitability -

3.1. Subject of research

The following assets are analyzed: currencies, precious metals, and leading stock market indices. Currencies - leaving cash is beneficial when the amount of money in circulation decreases, leaving people and businesses with less cash than they expected, which usually leads to an economic recession. Cash allows you to limit overall losses and buy assets at low prices (Figure 1).

There is a visible relationship between exchange rates, however, the Swiss franc is the least susceptible to the geopolitical situation, the euro and US dollar are strongly correlated. The British pound, also due to Brexit, is not attractive for investment reasons.

The financial crisis in 2009-2011 was very visible for all currency rates. The exchange rates of the Euro, Swiss franc and US dollar are positively correlated, but the exchange rate of the British pound sterling behaves slightly differently. Currency rates may be related to geopolitical changes or geopolitical diversification of capital investments. The introduction of exchange rates as a component of the investment portfolio reduces geopolitical risk.

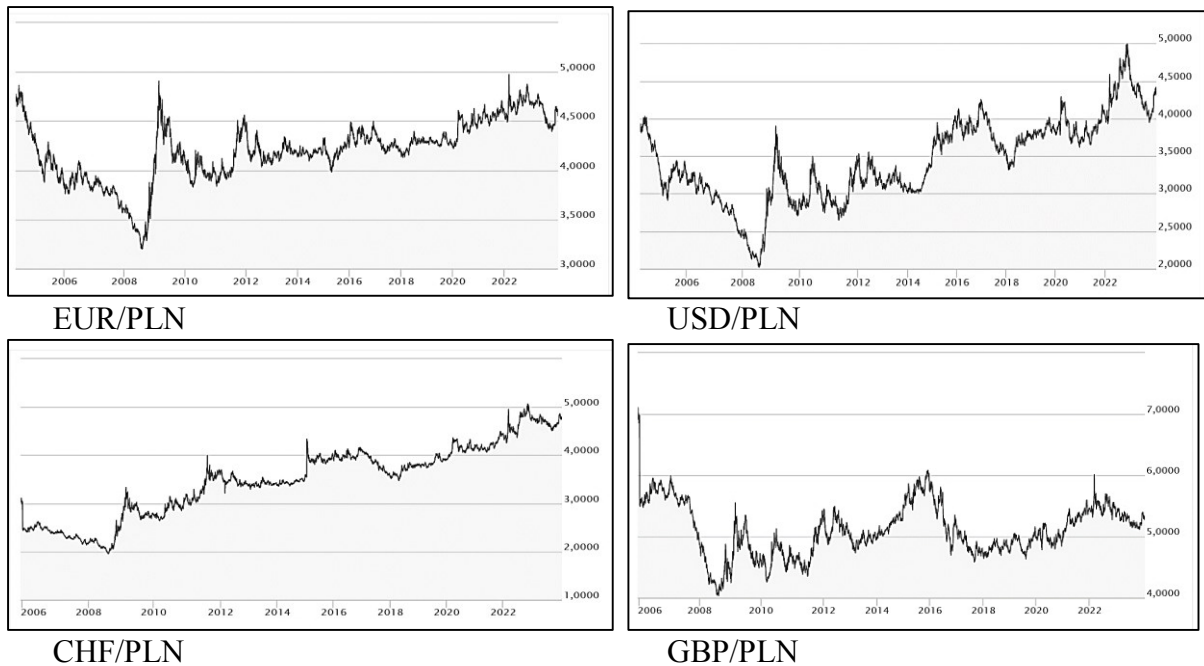


Figure 1. Exchange rates depending on PLN in the 21st century.

Source: <http://notowania.pb.pl/instrument>

Investing in precious metals allows you to protect yourself against inflation and currency crises. As paper money loses its value, precious metals remain valuable (Figure 2).

In the 21st century, the prices of precious metals have changed significantly. This was caused by the economic and political situation in the world. The Covid-19 pandemic and the military situation in Europe also had a significant impact on metal prices. It is impossible to clearly indicate a metal in which the investment would be 100% profitable, the price of which increased in the first three decades of the 21st century. However, looking at charts 1, it seems that the safest investment was to invest funds in gold.

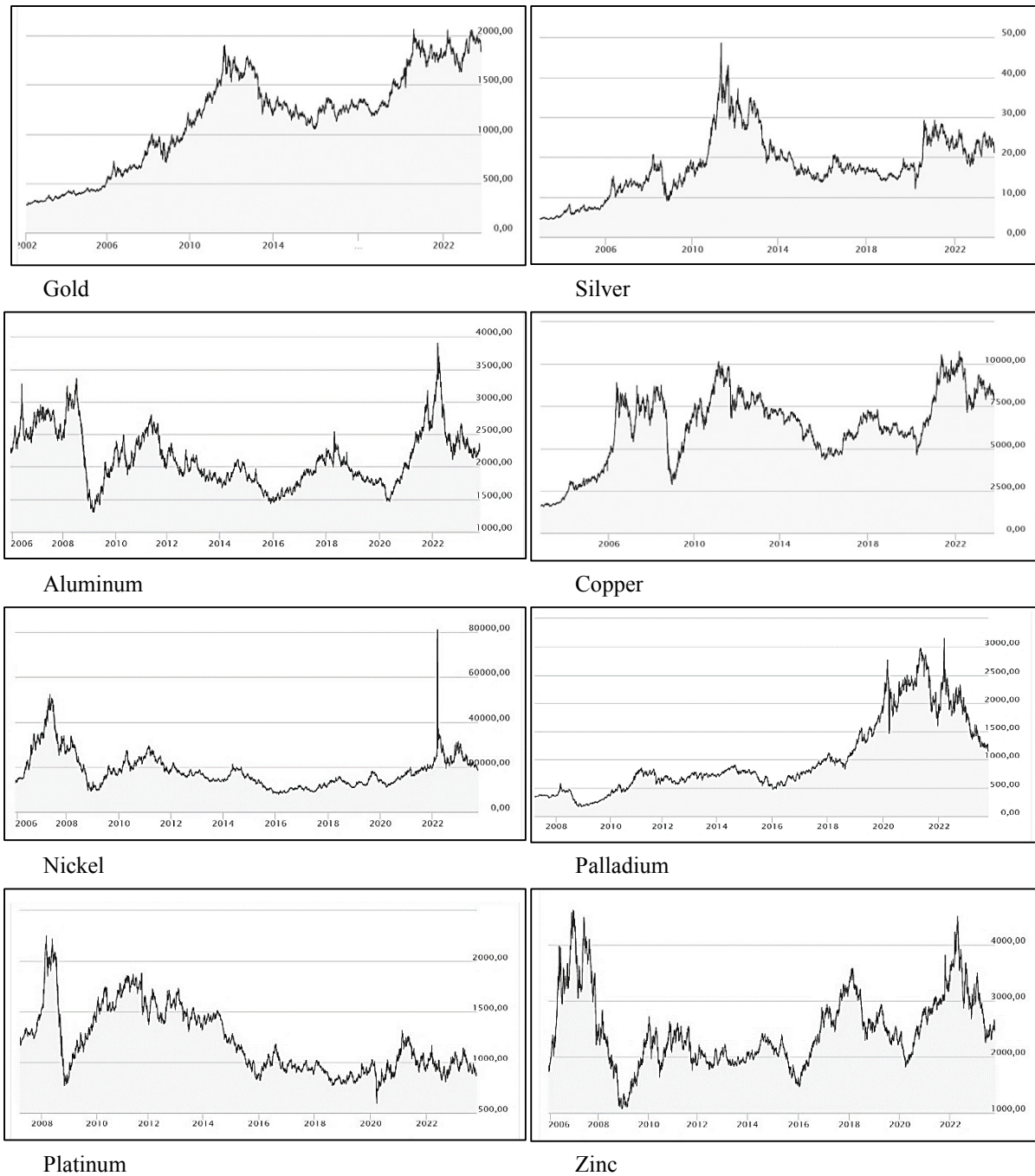


Figure 2. Prices of selected metals in the 21st century.

Source: <http://notowania.pb.pl/instrument>

Third - Stocks exchange shares (Figure 3). Methodical stock investing is beneficial at a time when living standards are rising, the economy is growing, unemployment is falling, interest rates are low, the financial system is healthy, and credit is readily available.

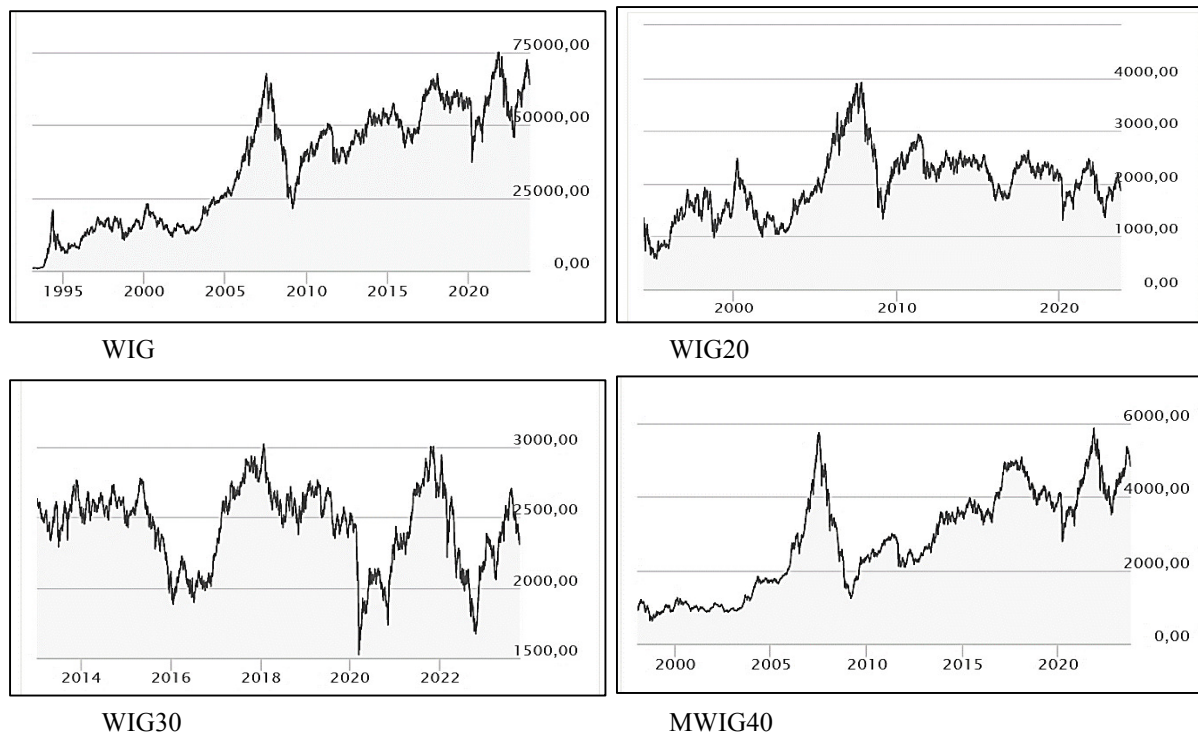


Figure 3. Stocks exchange shares index in the 21st century.

Source: <http://notowania.pb.pl/instrument>

Various stock indices were considered:

- WIG - The oldest stock index, calculated from the first trading session. The basic index values are calculated on the basis of share prices of all listed companies if at least 10% of shares worth EUR 1 million are in free circulation.
- WIG 20 - stock exchange index of the 20 largest joint-stock companies listed on the Warsaw Stock Exchange. The base date for the index is April 16, 1994, and the base value is 1,000 points. This is a price type index
- WIG30 - stock exchange index of the 30 largest and most liquid joint-stock companies listed on the Warsaw Stock Exchange, which was introduced on September 2013.
- MWIG40 - stock exchange index of medium-sized companies listed on the Warsaw Stock Exchange, which replaced the MIDWIG index after the session on March 16, 2007. It consists of a fixed number of 40 companies.

Depending on the composition of the index and its complexity, the charts vary. indexes show a certain general tendency on the stock exchange for a given group of companies. They are a synthetic measure showing price developments in a given period. There is a strong positive correlation between the WIG and MWIG indices. WIG30 and WIG20, on the other hand, are characterized by greater volatility over time.

3.2. Results of empirical analyses on the Polish capital market

Table 1 shows investment results - annual rates of return without taking into account inflation. There are very large differences in profitability depending on the value.

Table 1.

Investment efficiency without taking into account inflation, average annual rate of return, percentage value

Investment period/ average annual rate of return	01.2005- 01.2024	01.2010- 01.2024	01.2015- 01.2024	01.2020- 01.2024	01.2021- 01.2024	01.2022- 01.2024	01.2023- 01.2024
Exchange rate EUR/PLN	0,06	0,98	0,93	0,85	0,75	0,33	-1,09
Exchange rate USD/PLN	3,51	6,08	7,41	8,78	10,53	17,57	25,00
Exchange rate CHF/PLN	2,47	4,85	3,81	5,92	6,84	7,32	-6,00
Exchange rate GBP/PLN	-1,43	0,61	0,00	2,13	0,00	-2,78	-15,00
Gold	15,57	6,43	6,48	11,54	8,89	5,88	-5,00
Silver	12,03	3,81	3,09	13,33	-5,95	-5,77	27,78
Aluminum	0,53	1,59	3,27	11,67	15,56	-21,05	-12,00
Cooper	12,13	3,71	0,95	13,00	19,44	-12,00	-30,91
Nickel	0,29	-0,36	1,31	6,67	6,25	-38,13	-5,00
Palladium	7,89	16,67	4,76	-8,33	-20,00	-33,33	-68,75
Platinum	-0,53	-2,55	1,39	7,14	-3,33	-15,38	50,00
Zinc	1,75	0,00	2,92	2,27	1,45	-10,00	14,29
WIG	10,09	12,09	5,09	5,17	4,92	-3,33	45,83
WIG20	6,32	3,33	-0,93	25,00	23,08	-2,17	46,67
WIG30	X	X	0,51	-3,70	11,76	-11,67	43,75
MWIG	6,65	8,21	11,64	1,88	0,79	-12,93	-28,33

Source: own study based on data taken from: www.bankier.pl, www.gpw.pl, www.mennica.com.pl, www.nbp.pl.

When considering investment effects, the level of inflation should also be taken into account. As a result of the Covid-19 pandemic and the Russian-Ukrainian war, the level of inflation in the country has significantly affected the return on investment. Table 2 shows average rates of return after taking into account the level of inflation. Inflation, especially during the Covid-19 pandemic, significantly reduced the profitability of investments. The tables mark the stocks with the highest and lowest profits.

Table 2.

Investment efficiency taking into account inflation, average annual rate of return, percentage value

Investment period/ average annual rate of return	01.2005- 01.2024	01.2010- 01.2024	01.2015- 01.2024	01.2020- 01.2024	01.2021- 01.2024	01.2022- 01.2024	01.2023- 01.2024
Exchange rate EUR/PLN	-1,94	-2,02	-3,07	-15,15	-11,25	-8,67	-7,09
Exchange rate USD/PLN	1,51	3,08	3,41	-7,22	-1,47	8,57	19,00
Exchange rate CHF/PLN	0,47	1,85	-0,19	-10,08	-5,16	-1,68	-12,00
Exchange rate GBP/PLN	-3,43	-2,39	-4,00	-13,87	-12,00	-11,78	-21,00
Gold	13,57	3,43	2,48	-4,46	-3,11	-3,12	-11,00
Silver	10,03	0,81	-0,91	-2,67	-17,95	-14,77	21,78
Aluminum	-1,47	-1,41	-0,73	-4,33	3,56	-30,05	-18,00
Cooper	10,13	0,71	-3,05	-3,00	7,44	-21,00	-36,91
Nickel	-1,71	-3,36	-2,69	-9,33	-5,75	-47,13	-11,00
Palladium	5,89	13,67	0,76	-24,33	-32,00	-42,33	-74,75
Platinum	-2,53	-5,55	-2,61	-8,86	-15,33	-24,38	44,00

Cont. table 2.

Zinc	-0,25	-3,00	-1,08	-13,73	-10,55	-19,00	8,29
WIG	8,09	9,09	1,09	-10,83	-7,08	-12,33	39,83
WIG20	4,32	0,33	-4,93	9,00	11,08	-11,17	40,67
WIG30	X	X	-3,49	-19,70	-0,24	-20,67	37,75
MWIG	4,65	5,21	7,64	-14,13	-11,21	-21,93	-34,33

Source: own study based on data taken from: www.bankier.pl, www.gpw.pl, www.mennica.com.pl, www.nbp.pl.

Table 3.

Investment efficiency annual rate of return taking into account inflation and credit costs

Investment period/ average annual rate of return	01.2005- 01.2024	01.2010- 01.2024	01.2015- 01.2024	01.2020- 01.2024	01.2021- 01.2024	01.2022- 01.2024	01.2023- 01.2024
Exchange rate EUR/PLN	-6,94	-9,02	-13,07	-37,15	-31,25	-25,67	-22,09
Exchange rate USD/PLN	-3,49	-3,92	-6,59	-29,22	-21,47	-8,43	4,00
Exchange rate CHF/PLN	-4,53	-5,15	-10,19	-32,08	-25,16	-18,68	-27,00
Exchange rate GBP/PLN	-8,43	-9,39	-14,00	-35,87	-32,00	-28,78	-36,00
Gold	8,57	-3,57	-7,52	-26,46	-23,11	-20,12	-26,00
Silver	5,03	-6,19	-10,91	-24,67	-37,95	-31,77	6,78
Aluminum	-6,47	-8,41	-10,73	-26,33	-16,44	-47,05	-33,00
Cooper	5,13	-6,29	-13,05	-25,00	-12,56	-38,00	-51,91
Nickel	-6,71	-10,36	-12,69	-31,33	-25,75	-64,13	-26,00
Palladium	0,89	6,67	-9,24	-46,33	-52,00	-59,33	-89,75
Platinum	-7,53	-12,55	-12,61	-30,86	-35,33	-41,38	29,00
Zinc	-5,25	-10,00	-11,08	-35,73	-30,55	-36,00	-6,71
WIG	3,09	2,09	-8,91	-32,83	-27,08	-29,33	24,83
WIG20	-0,68	-6,67	-14,93	-13,00	-8,92	-28,17	25,67
WIG30	X	X	-13,49	-41,70	-20,24	-37,67	22,75
MWIG	-0,35	-1,79	-2,36	-36,13	-31,21	-38,93	-49,33

Source: own study based on data taken from: www.bankier.pl, www.gpw.pl, www.mennica.com.pl, www.nbp.pl.

Of course, taking into account credit costs and inflation significantly reduces the profitability of the investment. You can also use a loan when investing. Taking into account inflation and the cost of credit, the investor mostly makes losses

4. Summary

In the introduction to this article, the author asked a number of questions. The first question asked by the author was: is there a significant relationship between the effectiveness of investing in currency rates, metals, or securities offered on the stock exchange? Looking at the results of the analyses, it can be stated that depending on the precious metal, currency, and stock exchange index, the investment result is different. Therefore, it is worth taking securities from different groups in the investment process: metals, currencies, and stock exchange.

The second question: Is diversification of portfolio components necessary, how does diversification affect investment risk, does it significantly reduce it? Introducing many components to the portfolio increases the costs of maintaining it. Do the benefits obtained

thanks to diversification therefore cover the costs? Certainly, considering the values of the rates of return of securities, diversification reduces the risk when creating a portfolio while simultaneously increasing its maintenance costs.

In times of significant changes in the economy, armed conflicts, and global diseases, it is difficult to find a safe investment. Investing your savings in gold does not always result in a profit.

Investing is an art. When starting the investment process, you need to determine the size of the investment, its time horizon and the acceptable level of risk. The selection of investment securities depends on the level of risk. As empirical analyses have shown, the profitability of long-term investments depends on the security and period. Investments in precious metals were not always characterized by lower risk than stock market investments shown in the study on stock market indices.

In the analyzed period, the smallest price changes were characterized by exchange rates, which, however, during significant inflation becomes a major investment problem, reducing the effectiveness of investments. However, it should be emphasized that the period studied was very specific, both in Poland and in the world. The effects of the coronavirus pandemic and the Russian-Ukrainian conflict have a negative impact on both world economies and their capital markets. There is a very high risk of failure or even bankruptcy of business and investment activities. Therefore, searching for safe investments in the long term is a current and important problem in the economy, it is an important and necessary element of an efficient and effective management process.

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AVATAR AS A TOOL SUPPORTING MODERN MARKETING AND STRATEGIC MANAGEMENT PROCESSES IN LOCAL GOVERNMENT UNITS

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Purpose: The aim of the publication is to present the results of own research on the use of traditional channels of conveying marketing messages with comments.

Design/methodology/approach: The study used theoretical and empirical research methods. among the theoretical ones, an analysis and a literature query. On the other hand, as far as empirical methods are concerned, the results of research carried out by the War Studies University as part of a project financed by from EU funds, and concerning the possibility of using the avatar in local government units (Przysucha, Sulejówek).

Findings: The results of the research, combined with the analysis of the activity of petitioners and elements of strategic management, allow us to believe that the avatar has been very well received in the offices subjected to the pilot study, which in turn entitles us to put forward a thesis that the proposed solution can be an innovative and innovative tool used in the processes of supporting marketing communication and strategic management. This thesis is confirmed by the current global trends in the development of both modern marketing and management, development based on about virtualization, digitization, VR, MR or Avatars and industry 4.0.

Research limitations/implications: The main research limitation is that the issue is a new topic that has not yet been widely discussed in the literature.

Practical implications: The avatar was very well received in the offices subjected to the pilot, which in turn entitles us to make a thesis, that the proposed solution can be an innovative and innovative tool used in the processes of supporting marketing communication and strategic management.

Originality/value: The topic addressed is new and original, rarely discussed in the literature so far. The article presents the results of original research.

Keywords: strategic management, new technologies, avatar, local development, local government units.

Category of the paper: Research paper.

1. Introduction

In the 21st century, the traditional classic forms of communication with the customer, mentioned so far in the literature, do not fulfill their original functions - the influence of the Internet and social media on consumer decisions can be seen more and more often (Mikołajczyk, 2023, p. 12). This is where most of the most up-to-date and opinion-forming information comes from, which makes it easier to make the right consumer (and other) decisions. In order to assess the importance of individual marketing information exchange channels, a survey was conducted among a group of respondents aged 25-29 in the period 03-06.2020. The research was carried out using a questionnaire sent by e-mail to a selected group of students who met the age criterion indicated above. As a result of the conducted research procedure, answers were obtained from 124 people who were asked to indicate the marketing communication channels that are used by them most often (and why). Therefore, respondents had the opportunity to assess the most frequently used marketing communication channels from among those listed below (Kotler, 2021, p. 12):

1. TV,
2. radio,
3. press,
4. advertising banners - wall advertisements,
5. Leaflets,
6. e-mailing campaigns,
7. telephone marketing,
8. marketing szeptany,
9. fairs, exhibitions,
10. sponsoring,
11. Mobile visual ads.

On the basis of the analysis of the answers given, it should be concluded that the traditional (classical) means of communication are losing their importance. This is reflected in the data shown in Figure 1, which illustrates the structure of the response to the question about the use of television as a news channel.

According to the presented data, 35% of respondents declare that they do not watch TV at all or watch it sporadically, once a week (another 32%). The above results allow us to believe that the role of television in providing information and marketing communication is becoming marginal among the studied group of people.

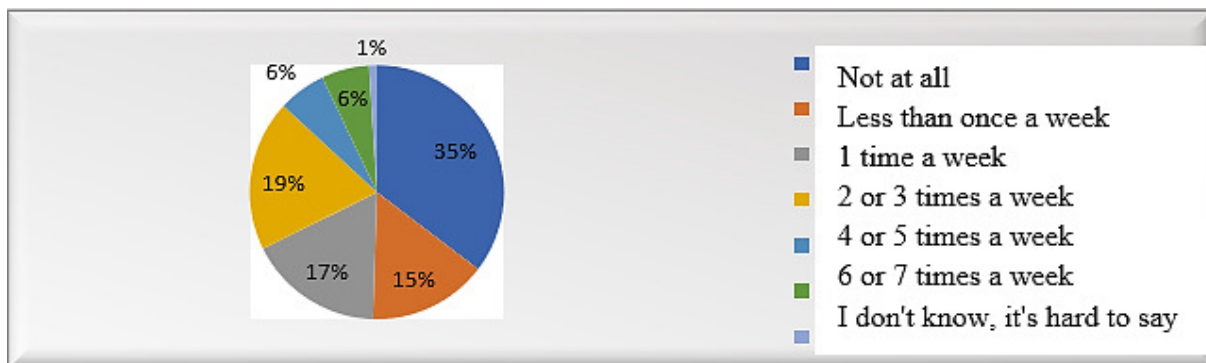


Figure 1. Structure of the answer to the question: How often do you use television as a means of communication?

Source: In-house analysis based on surveys.

A very similar situation exists with regard to the press. It is extremely common for contradictory information about the same event to be reported in different editions of newspapers. Catchy and, unfortunately, manipulated article titles are used in order to attract as many readers as possible. The respondents' answers about the importance of the press in marketing messages are presented in Figure 2.

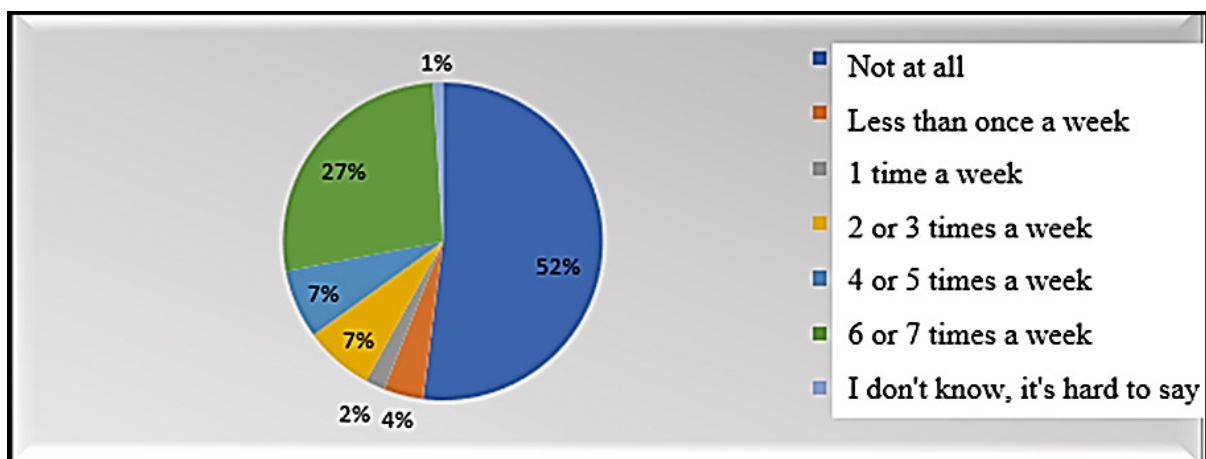


Figure 2. The importance of traditional press in marketing messages – answers to the question: How often do you buy and reads a paper newspaper?

Source: In-house analysis based on surveys.

It should be noted that over the last few years, an increase in demand for newspapers published in electronic form has been observed. According to M. Thompson, head of the New York Times, the newspaper will cease to be published in paper form within the next 20 years (Sherman, 2020, p. 5). On the other hand, according to the data presented by Empik and the TaniaKsiążka.pl portal, in 2020 an increase in the sales of e-books was recorded by as much as 20%. This report confirms the results of our own empirical research, on the basis of which it can be clearly stated that traditional editions of the paper press are a marginal way of conveying marketing messages with an emerging downward trend in the demand for the press.

Another popular medium that has been highlighted in marketing activities is radio. In the survey, the question was asked not about the fact of listening to the radio message itself, but about the degree of interest, understanding and remembering of marketing and advertising messages. The answers to the question about the problems indicated are shown in Figure 3.

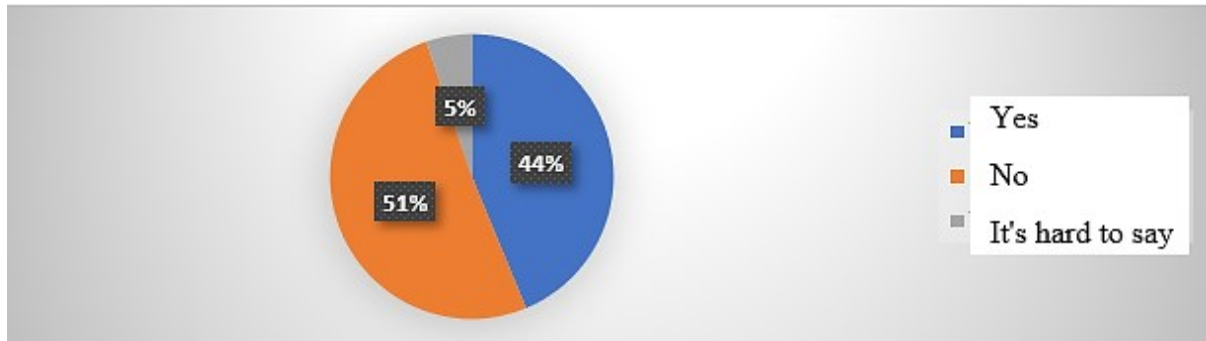


Figure 3. Structure of the answer to the question: Do you pay attention to radio advertisements?

Source: In-house analysis based on surveys.

It is worth emphasizing that in this case, it is not only the structure of the answers that is important, but also the commentary on them. In addition to their answers, the respondents claimed that although the radio receiver is turned on (e.g. while driving a car), focusing on other activities allows only a limited way to perceive advertising messages transmitted through the discussed medium.

Another traditional form of information transfer are (former) mailing campaigns and newsletters. Figure 4 presents the results of the answers to the question about the respondents' interest in mailing campaigns and newsletters.

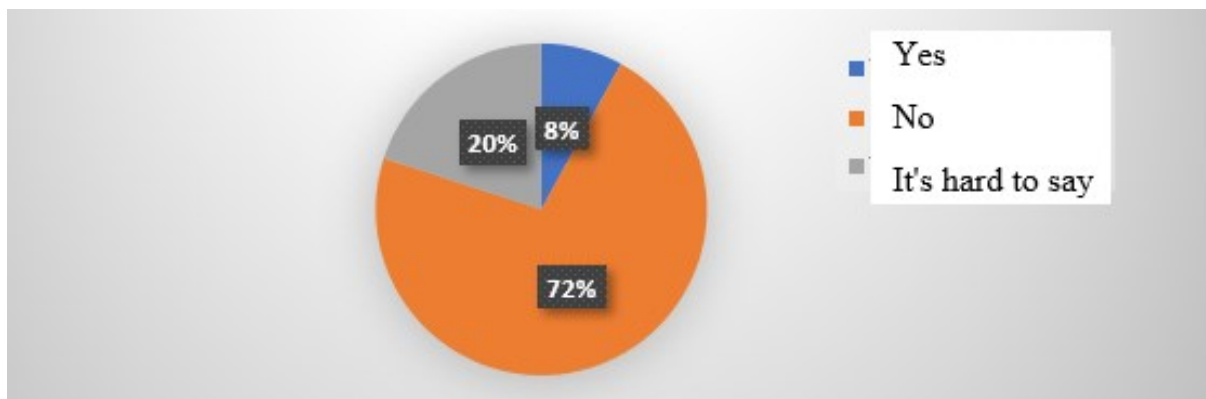


Figure 4. Structure of the answer to the question: Are you interested in mailing campaigns and newsletters as a form of marketing communication?

Source: In-house analysis based on surveys.

According to the conducted analyses, mailing campaigns or newsletters, until recently indicated as an interesting and effective marketing tool, do not fulfill any of the functions previously attributed to them.

Similar conclusions were formulated by the research team of First Orion Corporation, which proved that in 2020 as many as 90% of email users would be most willing to permanently block spam messages (FirstOrion, 2021). The results obtained by First Orion Corporation confirm the answers obtained in the presented results of its own empirical research.

Another issue of interest to the authors was the reception of marketing and advertising messages placed on banners, posters and leaflets. The distribution of responses to these questions is shown in Figure 5.

Fairs and exhibitions have been another popular form of marketing communication so far – unfortunately, in the face of the pandemic, this form of communication has practically ceased to exist and play any role. What's more, according to the authors, it should not be assumed that fairs and exhibitions will once again become part of the canon of effective marketing activities after the pandemic.

The situation is slightly different in the case of word-of-mouth marketing. This form of communication is still important in the sphere of services, which, due to their immateriality, are subject to specific marketing activities. According to the analysis of the results of the research, the role of word-of-mouth marketing, understood as a traditional channel of information transfer, is also decreasing, but it is being replaced by tools such as the Internet and social media. As confirmed by the respondents, advice is more often sought on the forum of social networking sites – it is easy to see how important the opinion of Internet users is to evaluate products or services and what impact it has on consumer decisions.

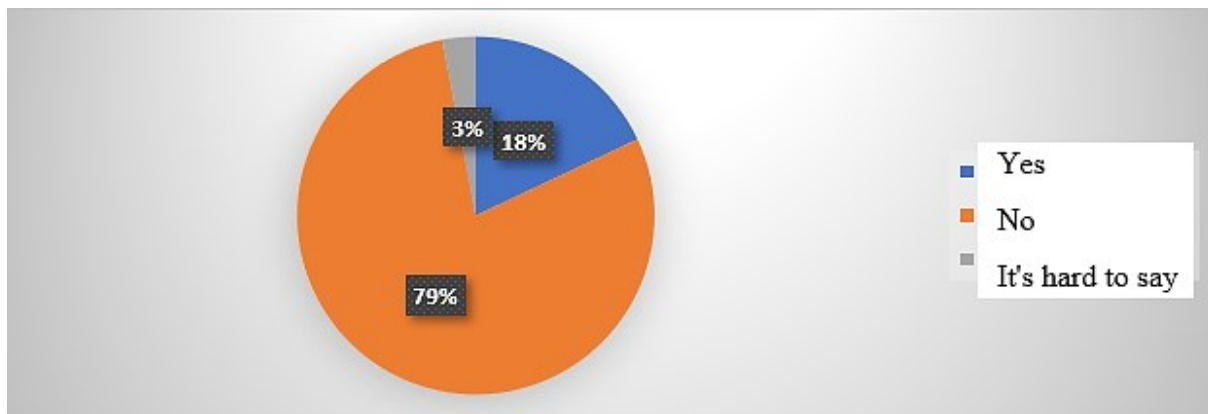


Figure 5. Structure of the answer to the question: Do you pay attention to marketing messages (advertisements) on banners, posters, leaflets?

Source: In-house analysis based on surveys.

According to the analysis of the results of surveys, traditional communication channels offered by marketing are not very attractive for people under 30 years of age. What's more, the respondents practically do not use them in everyday communication and do not pay attention to e.g. advertising campaigns posted there. Out of the proposed set of channels of information transfer, practically all of them were rejected, except for social media and the Internet. Therefore, other, even more innovative solutions for mutual communication and customer service should be proposed. This tool is an avatar with elements of artificial intelligence.

2. Strategic Management and Local Government Instruments

Management is a process that involves making various decisions and actions through a governing body. Its main goal is to ensure the effective and acceptable functioning of the organization while implementing the organization's policy (Sierak, 2013, p. 20). Throughout the management process, five basic functions can be distinguished, such as: planning, organizing, transmitting instructions, coordination, and controlling.

Strategic management, preceded by an appropriate strategic analysis, consists in formulating strategic goals and methods by which the organization will achieve its goals (Czekaj, Stabryła 2023, p. 15). In the longer term, strategic management focuses mainly on monitoring and controlling the implementation of strategic action plans. In addition, it works on the basis of a cyclical analysis of the state of development conditions of the organization, as well as identification and determination of main and intermediate goals. The main focus is on the periodic comparison of the objectives with the implemented activities.

Strategic management in local government refers to the direction of the entire planning process, the selection of individual development goals and tasks that will be implemented in the future, the implementation of adopted studies, monitoring and control of the adopted ones. There are some differences between strategic management in an organization and strategic management in local government. They result mainly from the fact that the activities of local government units in the public sphere are regulated by administrative law. Additionally, the source of managerial power is based on public trust, as power is democratically elected. Moreover, local government units are institutions of public life, therefore they cannot be assessed on the basis of measurable economic figures. On the other hand, the costs of public services are assessed in relation to the quantity and quality of services provided. Another aspect is the subjective measure of the effects of strategic management for the common good of local communities (Orłowska, 2022, p. 443).

An important tool in strategic management is the local development strategy developed by the local government, but in order for it to be a relative whole, it must be considered multidimensionally. This means that it is necessary to take into account the changes taking place within the territorial unit and in its surroundings (external and internal factors), to identify the potential and strategic intention of individual entities. Its main purpose is to see the potential, the implementation of measures whose end product will be the provision of a sufficient number of jobs, and the associated income from employment, providing long-term financial and social security, which translates into the quality of life of the society. To this end, the local government is working to stimulate activity through three methods. Firstly, it is trying to maintain its existing activities by pursuing a policy of survival strategy. The second method is to implement an expansion strategy, which involves acquiring activities that induce economic growth. Last but not least, there is the strategy of creation, which consists in the implementation

of activities aimed at transforming the business, its aim is to ensure an increase in competitiveness (Wojciechowski, 2015, p. 32). The entity that manages the strategy is the local community, acting through its representatives, i.e. local authorities. It should be emphasized that this is possible by empowering local government units in the administrative and legal system of the state, as well as by providing them with the appropriate scope of tasks and financial resources for their implementation in the process of decentralization. Thanks to such conditions, the local government is assured of decision-making autonomy, i.e. the freedom to make decisions and choose the expected values and goals, activities for the creation and planning of local development, as well as the formulation of strategies and programs. Strategic management consists in estimating the current level of socio-economic development of a territorial unit, assessing its spatial development, i.e. taking into account internal factors. In addition, it is necessary to take into account its external conditions resulting from the relationship with the environment, i.e. external factors broken down into individual levels, e.g. social, economic, technological, the possibility of using natural resources. In addition, it focuses on the needs of local communities, which are often reported by them themselves by means of applications and requests, and which may be quantitative and qualitative in nature (Ziółkowski, 2015, p. 12).

As noted by the researchers, the basis of the strategic management process is creativity, which has been defined as the ability of local government authorities to formulate and solve problems of a municipality or county through the use of methods and techniques of planning in functioning, aimed at the development of local government units (Lisowska-Szron, 2018, p. 232). Therefore, the development of the region depends on the appropriately directed creativity of local governments. This means that in local government, as well as in an enterprise, in the event of management problems, a non-standard approach should be applied, i.e. going beyond the framework of thought. With the help of these actions, an opportunity arises that allows you to gain an advantage over a potential competitor. These actions may be based on new assumptions and their results may be surprising. An example of the creativity of local governments is the support of participatory budgets submitted by local communities or the formation of teams that are responsible for the creative search for solutions affecting the development of the region. In the studies of the Central Statistical Office, we can find data that prove that for several years participatory budgets, or in other words, participatory budgets, have been very popular in local and regional development.

The Supreme Audit Office indicates that in 2018, as many as 170 cities in Polish created participatory budgets (Figure 6 and 7) and the amount of participatory budgets ranged from PLN 3950 to PLN 89,772.

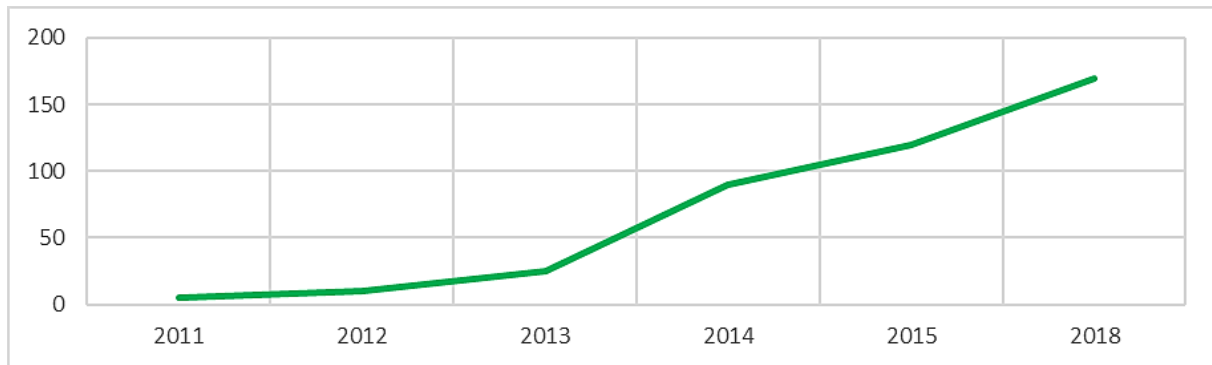


Figure 6. Number of participatory budgets in Poland.

Adapted from: GUS <https://stat.gov.pl/>

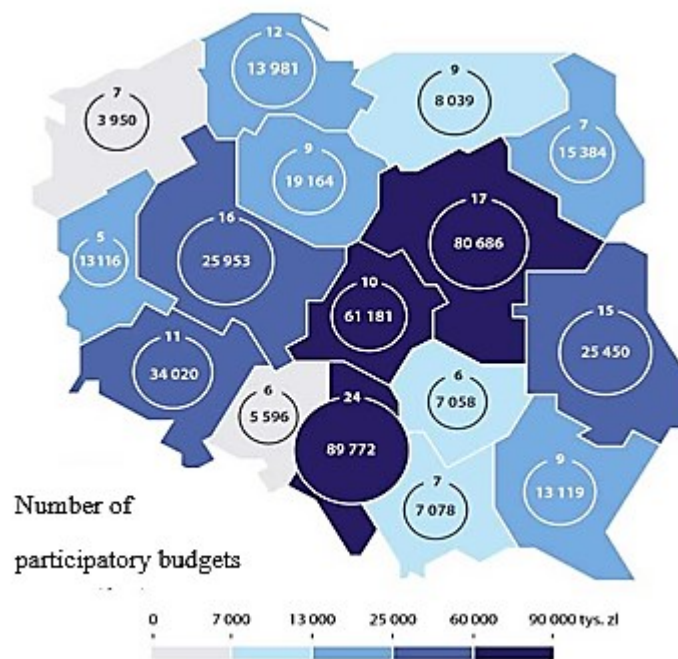


Figure 7. Number of cities and the amount of participatory budgets in Poland in 2018 by voivodship.

Adapted from: <https://www.nik.gov.pl/aktualnosci/budzety-partycypacyjne.html>

Another innovative activity of local authorities is the adoption of strategic management from the private sector – organization and adapting it to the conditions and needs of public institutions. Long-term development and economic growth would not be possible if it were not for planning and making investments in a given administrative area, by means of which pro-development activities are implemented.

The basic tools of strategic management in local government include: development strategy, investment and financial plans, as well as spatial development studies and plans. In the process of formulating them, the following questions should be answered: what should be done and where? What are the costs associated with the implementation of individual tasks? How long does it take to achieve your goals? Which entities will be responsible for the implementation of these tasks? What sources of funding will be responsible for the planned tasks? Are there any obstacles or limitations to these tasks?

The process of strategic management of a given territorial unit can be divided into two stages: the first stage, strategic planning, i.e. planning the development strategy, planning activities implemented in the form of programmes and plans, e.g. long-term investment and financial plans, and the second stage, controlling the implementation of strategic arrangements, consisting in checking the degree of achievement of the set goals, as well as monitoring the course of these processes. The analysis of the literature on the subject proves that the basic and most frequently used financial and infrastructural instruments used to support and implement local development are: development strategies, spatial development planning, issuing location decisions and permits for the use of environmental resources and introducing changes in it. In recent years, there has been a significant increase in the activity of local governments – hosts, as investors in their area (Szewczuk, 2015, p. 32). This growth was mainly observed in the sphere of public utilities. In addition to the budget amounts allocated to salaries for the administration and the operation of local administrative institutions (schools, kindergartens, hospitals, nursing homes), there was an increase in investment expenditure to 35% of the total budgets of municipalities. These investments make it possible to increase the commune's budget in the future, and in turn this budget has a significant impact on the quality of life of residents. When making decisions about planned and accepted investments, local authorities are guided by the fact that they affect the development and competitiveness of the company and are consistent with the adopted development strategy and the strategic objectives contained therein. Local government pursues the goals of the local community, the state and fulfils the functions assigned to it by law to enable the development of society (Mańka-Szulik, 2015, p. 170). It plays the most important role in territorial units, to which the state entrusts its interests at the local level. The tasks of local government are characterized by their public nature and the fact that they serve to meet the collective needs of the inhabitants of a given local government community (Grycuk, Russel 2014, p. 71).

3. Avatar as a modern tool for marketing communication and supporting strategic management processes in local government units

The idea of the avatar tool. Test Results

The idea of creating the Avatar tool appeared at the time of defining the needs of local government customers. As part of the development of the solution concept, based on the available literature, the problems occurring in the process of customer service in the management of public services were defined. As J. Trischler and D. Scott point out, the process of public service management focuses on meeting the following requirements (Trischler, Scott, 2018, p. 201):

- customer orientation, which ultimately evaluates the quality of the service provided,
- continuous improvement, deepening of knowledge, innovation in solving problems, taking advantage of the opportunities offered by the organization's employees,
- development and commitment of employees, which is related to an organizational culture based on trust and the transfer of full competences to employees,
- management based on processes and facts, based on the effective use of resources, obtaining the desired results, managing information that should be true, complete, reliable, professional,
- leadership and consistency of objectives. Leaders at all levels of a public organization are responsible for its development, the promotion of its values, its mission and vision,
- development of partnerships. Mutually beneficial relations between partners result in full integration in both knowledge creation, implementation of plans and public objectives, applying generally accepted rules of conduct,
- public responsibility, ethical approach and conduct of employees, meeting the expectations of customers, employers, society,
- results-oriented, where excellence depends on the ability to balance and satisfy the interests of groups, individuals who are responsible for the functioning of a public organization.

The customer service process is a number of interrelated activities that determine the level of customer satisfaction when purchasing a product (service), which is the last step in the process that usually begins with the order and ends with the delivery of the product to the customer (Turban et al., 2018, p. 102).

The psychological aspect plays an important role in the process of customer service, especially among the elderly. It is worth emphasizing that psychological needs are an area that for the vast majority of customer service employees in local government units is a completely unconscious area, and paradoxically – the most important one (Bartels, Turnbull, 2020, p. 1321). Therefore, it becomes necessary to use methods to support customer service employees in the most challenging situations by seeking answers to several questions:

1. As a result, there are misunderstandings, difficult, often conflictual situations in contacts with customers.
2. Why the client is still dissatisfied with the service despite meeting their substantive needs.
3. Why the accepted arguments do not have the desired effect and what are the motives of the clients.

The activities described above constituted preparatory activities for conducting pilot surveys in 2020, which resulted from the implementation of an international research and scientific project entitled Innovative model of assistance avatar of a caregiver for the elderly, co-financed by the EU (Maśloch, 2023, p. 103).

The questionnaire consisted of a main section of 23 questions and a meter of 4 questions. The main issues raised in the survey concerned two main research areas:

1. Firstly, devoted to the assessment of respondents in the field of functioning and service of petitioners (clients) in public administration offices.
2. The second one, which focuses on the expectations and requirements of petitioners (clients) in terms of service in public administration offices.

The aim of the research was to verify the correctness (elimination of defects) of the adopted research procedure, the appropriate selection of people and the use of research tools (questionnaires). This study was not used to verify hypotheses, its purpose was to provide information enabling the construction of a prototype of the avatar tool with the widest possible functionalities, which were determined after the analysis of the information obtained as a result of the empirical study.

The study was qualitative (questionnaire test) and was conducted in the form of a meeting of people from a deliberately selected sample with the number $N = 40$. The pilot study was carried out using the conventional method (verification, m.in, whether the respondents correctly understand all the questions asked, whether the instructions attached to the questionnaire are understandable, whether the questionnaire contains a complete set of answers), supplemented with a cognitive demonstration (suggestions for changes/supplementation of the scope and type of questions, analysis of the respondents' target group).

The statistical analysis showed that all participants of the study used the services of public administration offices, but most of them (85%) used the services of the city or municipality, while the rest - the services of the County Office. In the course of the survey, it turned out that in most cases the respondents deal with official matters once a year (50%) or once every few years (25%), 10% of the respondents could not precisely determine the frequency of visits to the office, and 5% of the respondents did not give any answer (the above data is presented in Figure 8).

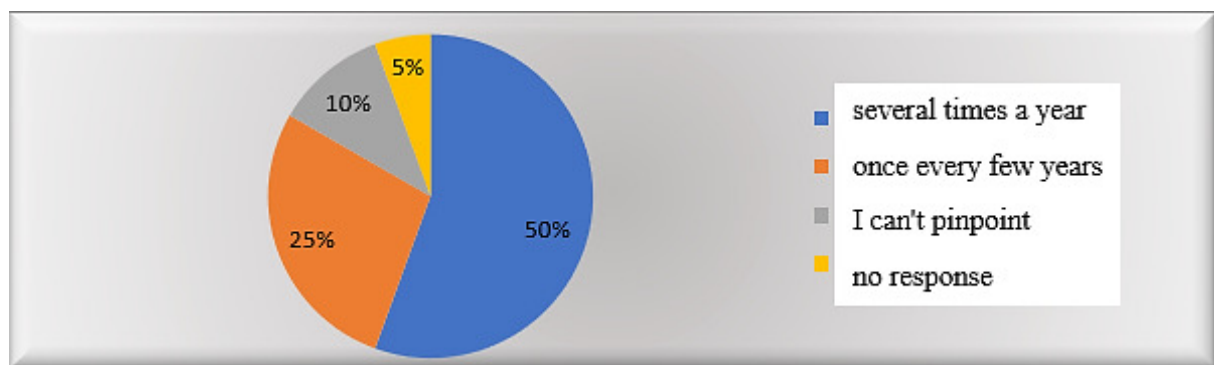


Figure 8. Structure of the answer to the question: How often do you deal with official matters in local government units?

Source: In-house analysis based on empirical research.

In the next part of the study, participants were asked about how they most often contact from local government units – two answers could be selected in the survey. Respondents indicated that they most often contact in person (80%), by phone (15%) and by letter (5%). There were no indications regarding electronic contact via the e-PUAP platform. The structure of the answer to this question is shown in Figure 9.

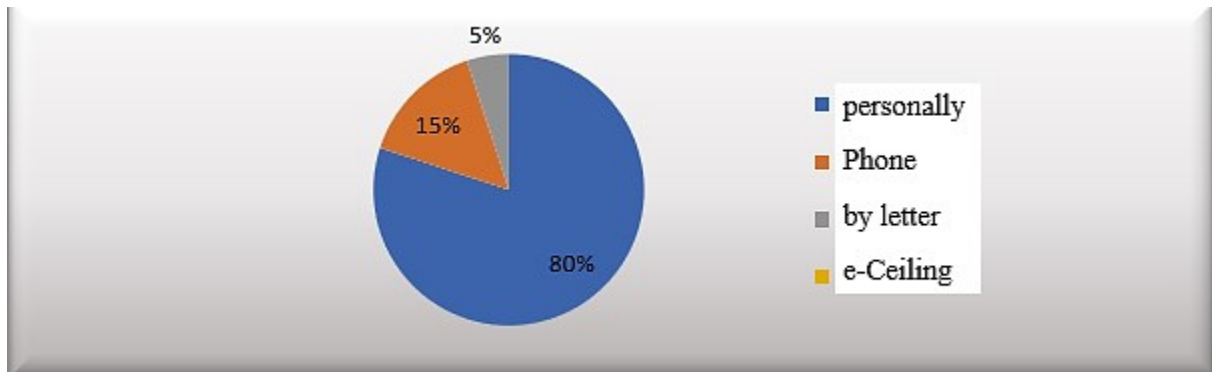


Figure 9. Structure of the answer to the question about how to handle matters in local government units. Source: In-house analysis based on empirical research.

It should be emphasized that this publication presents only a general introduction to the subject of the research and indicates the structure of the answers to the two most important questions from the point of view of the topic of the article.

The conceptual avatar devices were installed for testing in November 2020 in Przysucha and Sulejówek. The purpose of the 6-month testing program was to identify major changes in the software and the scope of the avatar's handling of affairs compared to its original version. On the basis of the analysis of matters handled by the petitioners, on the basis of continuous interviews with avatar users and the analysis of the device's information sets, the most important conclusions resulting from the implementation of the avatar device should be indicated:

1. reference to the quality of customer service (customers),
2. analysing the number and types of cases handled by obtaining electronic feedback,
3. increasing the safety of residents through the possibility of electronic handling of an increasing number of matters,
4. efficient and fast transfer of information to clients,
5. in verifying and controlling the status of official matters,
6. availability, unlimited time,
7. the possibility of using digital data obtained by the Avatar tool for use in the strategic management processes of local government units.

4. Summary

The empirical research and the concept of the avatar presented in the publication, the implementation of further research and development works, the preparation and testing of prototypes and the development of the final version of the tool are carried out as part of the project financed by the European Union entitled Innovative model of assistance for the caregiver of the elderly, contract number: POWR.04.03.00-IP.07-00-006/18, coordinated by the War Studies University, in partnership with the Częstochowa University of Technology, Przysucha District, Sulejówek City Hall and a foreign partner, Education & Information Technology from Cyprus.

According to the analyses presented in the first part of the publication, traditional forms of marketing communication are not and will certainly not fulfill the role attributed to them in the literature. As mentioned earlier, social media and the Internet dominate among young people. In the absence of the possibility of developing traditional forms of communication, an avatar tool was designed, which is a combination of a digital form of communication with elements of interaction with the customer (client), interaction in the form of e.g. the ability to talk to a virtual person. It should also be emphasized that the avatar device has been subjected to a number of tests aimed at analysing its capabilities, introducing modifications in the scope of the implemented cases and assessing the interest in the device by the petitioners.

As mentioned earlier, based on the research and analyses conducted, the avatar device works well in communication between the applicant and the office and is a valuable source of information used in the strategic management of local government units. After the completion of the project and the introduction of modifications resulting from the adaptation of the device's software to the needs of specific institutions, it should be assumed that this solution will be recommended as a completely new, innovative marketing communication channel.

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THE IMPORTANCE OF QUALITY AND STANDARDIZATION IN BABY FOOD PRODUCTION: A BOST METHOD PERSPECTIVE

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Purpose: The article aims to promote initiatives in the field of food safety within a company producing products for infants and children. It focuses on the types of non-conformities and the opinions of respondents (employees) regarding the importance of quality, visual control, and standardization, as assessed through the BOST survey. Since quality systems are flexible, each company must adapt system requirements to the nature of its business and its specific capabilities. The requirements set by ISO standards can be met in various ways. In line with the principle of continuous improvement, the method of gathering data for efficient system operation and management should be tailored to the company's current capabilities and the tools available on the market. In the era of ubiquitous electronics, it is possible to collect information directly from production devices automatically, significantly reducing the time required to transfer information from production to supervision. This approach not only enhances the quality of information but also accelerates the detection of non-conformities in finished products.

Design/methodology/approach: This study is based on a review of literature sources, report from the company and the results of our own empirical research carried out using the BOST method based on a prepared questionnaire.

Findings: The article highlights the significance of evaluating both quality and standardization in the production process. By identifying key factors influencing quality and implementing practical recommendations, manufacturers can enhance their processes. The results obtained for small and medium-sized enterprises align with findings from tests conducted in other companies.

Originality/value: An innovative tool called the spread scale was used to assess the importance of factors describing Toyota's 2nd, 6th management principle and the roof of the Toyota House, enabling the evaluation of relationships between them. The practical use of surveys allows companies to leverage the practical knowledge of employees at the production level. This approach can contribute to identifying key areas critical to the enterprise's functioning.

Keywords: toyotarity, quality, BOST, standardization.

Category of the paper: Empirical research paper.

1. Introduction

The health of society is an invaluable asset, and food safety is a top priority. It is closely linked to the assessment and classification of various levels of hazards posed by food products at the point of consumption. Since such risks can be introduced at any stage of the food chain, effective control is essential at every step. Modern consumers, increasingly aware of the risks associated with food products, their sourcing, and processing, seek food that is not only safe for health but also rich in nutrients, flavorful, and environmentally friendly. To meet these expectations, entities in the food market must demonstrate their commitment to producing food that aligns with consumer demands.

In response to these expectations, food producers have recognized the need to develop and implement advanced food safety and quality assurance systems. Over the years, numerous systems have emerged in the food industry, designed to achieve and maintain high standards of product quality and safety. Among the most widely adopted are Good Hygienic Practices (GHP), Good Manufacturing Practices (GMP), Hazard Analysis and Critical Control Points (HACCP), ISO 9001, and ISO 22000. A defining feature of these systems is their integrated, systemic management of food quality and safety, which includes comprehensive supervision and control throughout the food chain, adhering to the "from farm to table" principle. By obtaining certifications for these systems, producers not only enhance their market image but also build greater trust with customers and business partners. The implementation of automation provides companies with opportunities to enhance production processes and improve product quality. Investing in automation offers financial benefits by reducing the number of non-compliant products and qualitative advantages by decreasing consumer complaints, which in turn fosters greater consumer trust in the company (Sagan, 20212).

The survey and research method known as BOST was developed as a result of the author's fascination with Toyota Motor Company, particularly its management and production systems, which was further deepened after reading Jeffrey Liker's book *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*.

BOST studies, also known as Toyota's management principles in the form of questions, were created to assess the practical application of these principles among various manufacturing and service companies in Poland. Toyota's management principles in the BOST method are described with specific characteristics, where a set of factors is grouped into "areas". Some principles are divided into two or even three areas. This method outlines Toyota's management principles through its defining factors.

The idea for an article on the quality and standardization of baby products may have emerged as a result of several key factors. Modern consumers, especially parents, are setting higher standards for baby food products. They expect these products to not only be tasty but, most importantly, safe, healthy, and free from artificial additives. As a result, manufacturers

must adjust their production processes to meet these expectations. The article could explore how producers manage to meet these requirements and how quality and standardization play a key role in maintaining consumer trust. Baby products are subject to strict regulations regarding quality and safety, both at the national and international levels. Standards such as ISO 22000, HACCP, GMP (Good Manufacturing Practices), and other quality guidelines are necessary to ensure that these products are safe for infants and young children. The article could examine how these regulations impact the production of baby food and how companies navigate compliance with these rules in the context of quality and standardization (Salgar et al., 2023).

The quality of baby products is not just about the product itself, but also the production processes, quality control, packaging, and transportation. Understanding the role of standardization in this context is crucial to ensuring that consumers have confidence in the products they purchase. The article aims to understand how quality and standardization affect the safety of products for children, as well as consumer satisfaction. Children, especially infants, are particularly sensitive to contamination and poor food quality, which is why it is so important that production processes comply with high quality standards. The article may also aim to indicate areas where the quality and standardization of children's products can be improved, taking into account the latest technologies, changing regulations and growing consumer demands. With these tips, companies can better adapt their production strategies to meet market expectations. The article may introduce a new approach to assessing the quality of children's products, e.g. by using advanced analysis methods, such as correlation analysis, preference scales (e.g. BOST), or three-dimensional models of assessing the impact of various factors on quality. This may provide new tools and assessment methods that will be used not only in scientific research, but also in industrial practice.

The scientific development of the article is valuable for several reasons. Baby food is a highly sensitive product category, where maintaining quality and standards is essential to safeguarding the health of young consumers. The article addresses a research gap by exploring how standardization and quality influence production processes and demonstrating their optimization through the BOST methodology. By emphasizing decision-making tools like the BOST method, it supports businesses in enhancing production efficiency and meeting evolving consumer and regulatory demands. Additionally, the publication provides valuable insights for researchers and practitioners, highlighting the importance of quality and standardization in building consumer trust and achieving long-term success. The study's conclusions also have broader relevance, extending beyond baby food production to other sectors of the food industry, thereby offering significant practical and scientific benefits.

The aim of the article is to analyze the importance of quality and standardization in baby food production from the perspective of the BOST method. The study focuses on identifying key factors influencing the maintenance of high production standards and evaluating the role of the BOST methodology in optimization and decision-making processes within this industry.

2. Safety Systems

The production of baby food is a specialized area within the food industry that combines the principles of nutrition, food safety, and quality control. It requires careful attention to ingredients, processing methods, and packaging to ensure that products are safe, healthy, and suitable for infants. With growing consumer awareness of food quality and safety, baby food manufacturers must prioritize both nutritional standards and sustainable practices to meet the needs of modern parents. Ensuring health safety (Berdowski, 2008) as well as the broadly understood quality of food is achieved through the implementation of quality management systems in a facility. One such system is the Hazard Analysis and Critical Control Points (HACCP) system, which is specifically focused on ensuring the health safety of food (Odintsova, Panin, 2021). For this reason, it is often referred to as a food safety management system (Turlejska, 2003). The HACCP system is inseparably linked to the implementation of Good Manufacturing Practices (GMP) and Good Hygienic Practices (GHP). From the perspective of food producers and processors, these practices can be integrated into a single food safety system. The Food Safety and Nutrition Act provides the following definition of GHP: “Good Hygienic Practice (GHP) refers to actions that must be taken and hygienic conditions that must be met and controlled at all stages of production or trade to ensure food safety”.

Every enterprise is required to develop its own in-house program or instruction for Good Hygienic Practices, which forms the basis for implementing the principles of the HACCP system. Such a program should consider the organizational structure and specific activities of the facility. All techniques and methods used in the facility, as well as hygiene recommendations, should be described through appropriate procedures or instructions that address the specific requirements to be met. Procedures and instructions for GHP/GMP must be strictly followed by all employees. In the awareness of the average person, including employees working in the food industry, the concept of hygiene or Good Hygienic Practice is associated with cleaning and disinfection processes, as well as the personal hygiene of employees. In reality, it is a much broader concept, encompassing several closely integrated areas aimed at achieving one goal: food safety (Leonov, Shkaruba, 2018).

The Food Safety and Nutrition Act provides the following definition of GMP: “Good Manufacturing Practice (GMP) refers to actions that must be taken and conditions that must be met to ensure the safety of food, materials, and products intended for contact with food, in accordance with their intended use”. GMP is a combination of effective production procedures and efficient control and supervision of production, ensuring that production occurs under conditions that allow the creation of products that meet predetermined quality requirements (Silverman, 2012, p. 380). The general principle of GMP is to eliminate any improvisation and randomness from the manufacturing process. All activities must be performed exactly as outlined by written instructions and procedures. Each activity must be

recorded and confirmed in the appropriate documents, and production verification strictly follows the documentation. GMP principles may include, for example, supplier control, building, room, and equipment maintenance; waste and sewage management; operation of utilities (e.g., water, steam, ice, airflow); pest and rodent control; storage, movement, and segregation of raw materials, semi-finished products, and products; cleaning and disinfection schedules; personal hygiene, work clothing; and management of guests and employees (Hamrin, Hoefl, 2012).

Analyzing the recommendations that a food producer must adhere to, ten basic principles or slogans of Good Hygienic and Production Practices can be distinguished:

- Before starting any work, ensure you have the required procedures and instructions.
- Always follow the instructions precisely, do not use "shortcuts" or "improvements". If you don't know or understand something, ask your superiors or consult the relevant documentation.
- Before starting work, ensure you are using the correct raw material or semi-finished product.
- Ensure that the technical condition of equipment and devices is correct and that they are clean.
- Work to minimize the risk of product contamination, and contamination of premises, equipment, and devices.
- Be attentive and prevent errors and mistakes.
- Report any irregularities and deviations from established process parameters to management.
- Take care of personal hygiene, maintain your workplace in cleanliness and order.
- Take responsibility for your actions (Turlejska, 2003).

The genesis of the HACCP system dates back to the 1960s in the United States when Pillsbury, in collaboration with NASA and the Natick Research Laboratory, received a contract to prepare food for the "Apollo" space program (Szczyrba, Ingaldi, 2024). In 1975, the HACCP concept was publicly presented at a food protection conference. Experts from the World Health Organization (WHO) endorsed HACCP (Kielesińska, 2018). In 1980, general HACCP principles and definitions were presented by the International Commission on Microbiological Specifications for Foods of the WHO. In 1983, HACCP principles were incorporated into the Codex Alimentarius. The Codex Alimentarius (Food Code) is a collection of internationally accepted nutrition standards, practices, recommendations, and guidelines used by international food control services, the agri-food industry, and scientific communities (Sharma et al., 2019). It is a source of global standards for ensuring food safety and consumer interests, as well as a guarantee of access to up-to-date information on global scientific achievements in the field of food safety and quality (Rosak-Szyrocka, Abdulhassan, 2020). It also provides an opportunity to address national and transnational interests related to facilitating international trade in food (Silverman, 2012).

3. Research Methodology

The survey for the study on the quality and standardization of children's products was created following several key steps. Initially, the main objectives of the survey were defined, which included assessing the quality of children's products and the extent of their standardization in the studied enterprise. The goal was also to understand consumer preferences and evaluate the impact of various factors on the perceived quality of the products. Before conducting the actual study, the survey underwent a pilot test to ensure that the questions were clear, the answers were understandable, and the overall structure of the survey was appropriate. The pilot test also allowed for the assessment of the time required to complete the survey. Respondents were selected based on the characteristics of the studied enterprise. The study involved employees from the production department, as well as individuals from various age groups and educational backgrounds, ensuring a diversity of opinions. This process of survey development enabled the collection of reliable data, which could then be used to analyze the quality and standardization of children's products in the studied enterprise. The research was conducted in a company producing food for infants and young children. The study was conducted in 2023. The questionnaire survey was carried out in the researched enterprise producing baby food product 45% production workers. i.e. nearly half of workers. Such a large research group of directly production workers will allow to precise identification of areas requiring improvement in the surveyed enterprise. The second part of the research involved conducting surveys using the BOST questionnaire (Liker, 2005; Borkowski, 2012a, 2012b). In the survey, participants were asked to provide personal characteristics, namely:

Please mark "+" in the appropriate box.

Gender: Male, Female.

Education: 1 – Below average, 2 – Average, 3 – Higher I degree, 4 – Higher II degree.

Age: 1 – Up to 25 years, 2 – 26-35 years, 3 – 36-45 years, 4 – 46-50 years, 5 – 51-55 years, 6 – 56-60 years, 7 – 61-65 years, 8 – Over 65 years.

Total work experience: 1 – Up to 5 years, 2 – 6-15 years, 3 – 16-20 years, 4 – 21-25 years, 5 – 26-30 years, 6 – 31-35 years, 7 – 36-40 years, 8 – Over 45 years.

Current employment is your place of work: 1 – First, 2 – Second, 3 – Third, 4 – Fourth, 5 – Fifth, 6 – Further.

I was admitted to the current company in the mode: (You can select two answers)
1 – Normal, 2 – On the basis of transfer, 3 – Due to better financial conditions.

This article presents an analysis of the answers given to the question contained in the BOST questionnaire (Borkowski, 2016b). In order to form an opinion, it is essential to understand the viewpoints of workers from different ranks in the enterprise. This allows for a better understanding of the enterprise through the eyes of its workers. BOST is a survey where the questions are well-matched, making it possible to assess the enterprise and its intangible assets

(Taiichi, 2008). First question referring to the roof of Toyota's house (E1 area). Employees have answered the following question: "Which factor is the most important in your enterprise?" Please fill in the blanks with 1, 2, 3, 4, 5 (5 the most important factor):

JA		Quality
KO		Cost
CR		Execution time
BP		Work safety
MZ		Staff morale

The second question refers to the second Toyota principle (E3 area). Principle 2. Create a continuous and smooth process of problem revelation. Area E3. Set of factors describing Toyota's second management principle. Employees answered the following question: "Rank the importance of production process factors?" Please fill in the blanks with 1, 2, 3, 4, 5, 6 (6 the most important factor) (Mielczarek, 2021):

CP		Continuous system for identifying problems
PE		Halting production upon detecting a quality issue
SZ		Standardized tasks, processes, and documents
EU		Granting authority downward
ST		Using only reliable technology
SW		Implementing visual control

The third question refers to the sixth Toyota principle (E6 area) (Liker, Hoseus, 2009). Principle 6: Standard tasks are the basis for continuous improvement and empowering employees. Area E6: A set of factors describing Toyota's second management principle. Employees were asked to answer the following question: " Rank the importance of types of standardization in ensuring continuous improvement of processes in your company?". Please fill in the blanks with numbers 1, 2, 3, 4, 5, 6,7 (7 the most important factor):

CW		Standardization of task completion time
PU		Standardization of the process
MP		Standardization of workstation storage
DO		Standardization of documents
SN		Standardization of training
PI		Standardization of information flow
ZA		Standardization of employment

To assess the structure and properties of the research sample, statistical analysis measures such as arithmetic mean, quartile deviation, and coefficient of variation were used (Pułaska-Turyńska, 2011).

To determine the degree of variability in the studied statistical feature, the following ranges of the coefficient of variation were adopted: 0-20%: low variability of the feature, 20-40%: moderate variability of the feature, 40-60%: high variability of the feature, 60% and above: very high variability of the feature.

Consumer preferences reflect and formalize consumer tastes and are not influenced by product prices or the consumer's budget but solely by the satisfaction, happiness, or utility they provide. Preferences enable consumers to make choices when faced with various alternatives.

Consumer preferences arise from the desire to satisfy their needs. Among the many goods available in the market, consumers select those that meet their expectations. These choices reflect their tastes, preferences, and personalities, forming a determinant of demand that specifies what people want to buy.

When selecting appropriate goods, consumer decisions are significantly influenced by factors such as age, family status, taste, education level, existential needs, and socio-economic development. A consumer, aiming to maximize the satisfaction of their needs, is guided by rational considerations as well as the standards prevailing within the social group to which they belong (Rosak-Szyrocka, Ulewicz, 2016).

In the BOST method, the term "preference" is understood in the context of making choices regarding the importance of factors describing Toyota's management principles (Knop, Borkowski, 2017). Respondents prioritize factors, assign importance, determine priority, rank one over another, and make decisions about their significance (Knop, Mielczarek, 2018).

In similarity studies, the most widely used assessment method is the interval-based unidimensional comparative scale developed by Thurstone, referred to as the comparative scale (Sagan). The BOST method employs a proprietary scale (Borkowski, 2012), based on arithmetic means, which is called the range scale. This scale is divided into five zones:

- 0 – lowest preference,
- 0-20% – weak preference,
- 20-40% – moderate preference,
- 40-60% – average preference,
- 60-80% – strong preference,
- 80-100% – very strong preference,
- 100% – highest preference.

Subsequently, the similarity criterion was dependent on the number of factors: 4 factors - 18; 5 factors - 16; 6 factors - 14; 7 factors - 12; 8 factors - 10; 9 factors - 8; 10 factors - 7; 11 factors - 6; 12 factors - 5% of the scale length.

4. Respondents' Opinion on Perceived Quality

According to the principles of good practices in scientific research, it is essential to specify the conditions under which the results were obtained. As mentioned, the quality-related results were obtained from the production department. However, the assessment of the importance of selected factors was conducted by respondents (operational-level employees). Respondents identified their personal characteristics, the description of which is presented in Table 1.

Table 1.*Characteristics of respondents: percentage structure*

Symbol	Features' marking and their rate characteristic					
	MK	WE	WI	SC	MR	TR
1	28	0	13	9	9	47
2	72	28	23	16	34	22
3		63	16	28	3	31
4		9	16	9	16	
5			13	13	16	
6			13	9	22	
7			6	13		
8	32		0	3		

Source: Author's contribution.

The data provided the following information: in the company producing porridge with additives, the majority of employees are women (72%). The analysis of discrepancies in production revealed that, in addition to quality, visual control is crucial in the company (Knop, 2018). Visual control helps identify non-conforming products, and standardization guarantees the repeatability of good results (Selejdak, 2013). Therefore, a survey was conducted in the company covering areas E1, E3, and E7, with limitations imposed by technical conditions. According to good research practices, the collected ratings should be statistically evaluated first. The importance measures of factors in the area are presented in Figure 1. Based on its data (Fig. 1a), a hierarchy of factor importance can be constructed:

$$JA > BP > MZ > CR > KO \quad (1)$$

The observed order of factors in the hierarchy is very rare because *Staff morale* (MZ) usually occupies the fifth or fourth position. In this case, it ranked third, following *Quality* (JA) and *Work safety* (BP). It is noteworthy that the *Cost* (KO) occupies the last position. Quality takes precedence because the produced product is a nutritional item for children, and the occurrence of accidents is also prohibited as they could lead to contamination of the porridge.

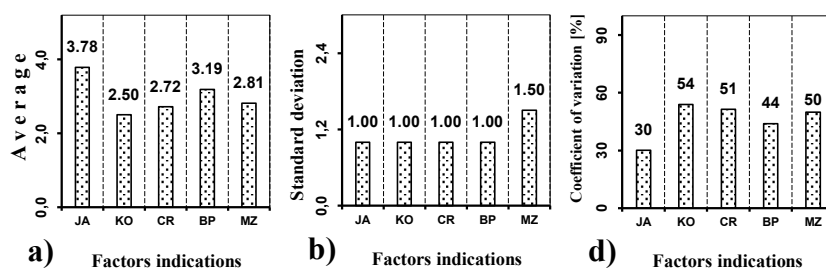


Figure 1. Roof of the Toyota House. Comparison: a) averages, b) standard deviation, c) coefficient of variation for factor ratings in Area E1.

Source: Author's contribution.

The data from Figure 1b indicate that 50% of the central units fall within the range of two assessments, and this applies to the set of assessments for factors: JA, KO, CR, BP. However, for the set of assessments Staff morale (MZ) factor, this range includes three assessments.

The coefficient of variability (Fig. 1c) ranges from 30% to 54%, encompassing two zones of feature differentiation. The sets of assessments for factors occupying the top two positions in the hierarchy have moderate feature differentiation (20-40%), while the sets of assessments for the remaining factors have strong feature differentiation (40-60%).

In reference to the data sets of assessments for factors in areas E3 and E6, two statistical characteristics have been determined: the arithmetic mean and the coefficient of variation (Fig. 2). Regarding the factors in area E3 (Fig. 2a), the hierarchy of importance is as follows:

$$CP > SW > ST > PE > EU > SZ \quad (2)$$

The processes in the examined company are organized in such a way that, according to the respondents, *Continuous system for identifying problems* (CP) is considered the most important. In the second place is the factor *Implementing visual control* (SW), which helps reveal quality issues in the packaging of porridge with additives. The sets of assessments for this area (Fig. 2b) have a coefficient of variation ranging from 32 to 60, thus covering two ranges. The sets of assessments for factors CP, ST, SW have moderate feature differentiation (20-40%), while the remaining factors have strong feature differentiation.

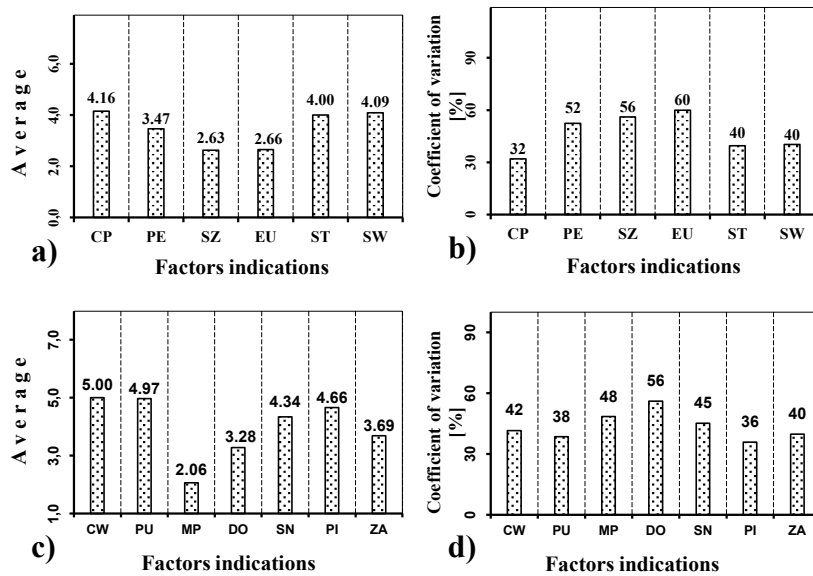


Figure 2. Comparison of averages (right column) and coefficient of variation (left column) for factor ratings in Areas: a), b) E3, c), d) E6.

Source: Author's contribution.

The data from Figure 2c authorize the construction of the following hierarchy of importance for factors in area E6, describing the foundations of continuous improvement through standard tasks.

$$CW > PU > PI > SN > ZA > DO > MP \quad (3)$$

According to the respondents, *Standardization of task completion time* (CW) is considered the most important, followed by *Standardization of the process* (PU), and *Standardization of information flow* (PI) is also important. It is noteworthy that *Standardization of training* (SN) is placed in the fourth, middle position. This suggests the existence of a train-ing system that

employees are not entirely satisfied with. The coefficient of variation falls within the range of 36-56%, covering two ranges: 20-40% with moderate feature differentiation (applies to sets of assessments for factors PU, PI), and the sets of assessments for the remaining factors have strong feature differentiation.

The relationships between the importance of factors in the BOST method are deepened by their similarities. The results regarding the similarity of factors in areas E1, E3, E6 are presented in Figure 3. Area E1 contains 5 factors, and the similarity criterion is 16% of the length of the scale range. The data in Figure 3a show that the most preferred factor is *Quality* (JA), emphasizing the importance of this factor by the absence of factors in the zones of very strong and strong preferences. The factor *Execution time* (CR) shows similarity to the employee *Staff morale* (MZ). The distribution of factors on the range axis for the data in area E3 (Fig. 3c) indicates the clustering of two factors in the zone of weak preference (0-20%) and three in the zone of very strong preference (80-100%). The similarity criterion for the area of 6 factors is 14% of the length of the scale range.

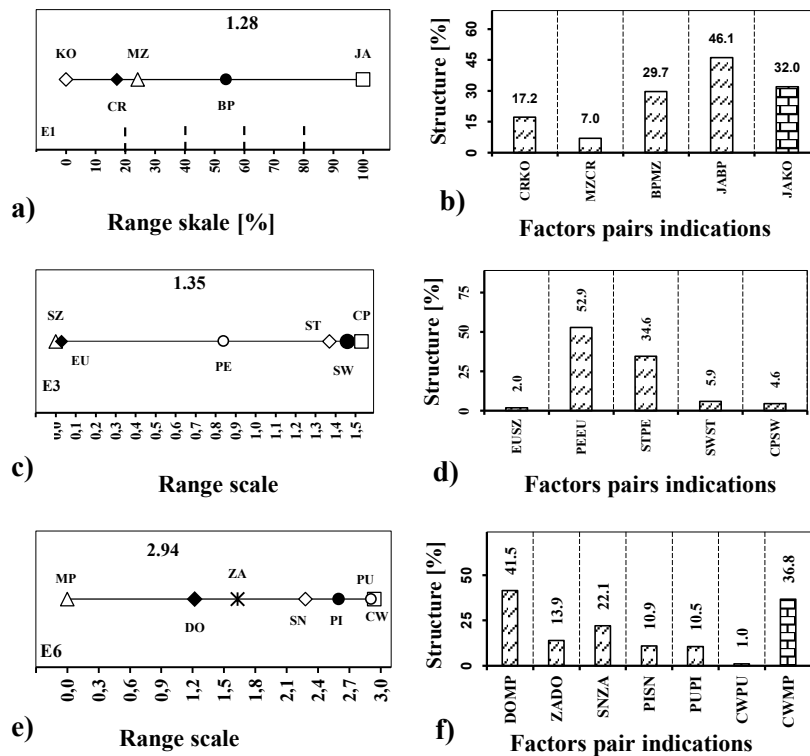


Figure 3. Assessment of factor similarity based on the range scale: left column - distribution of factors on the range scale, right column - structure of the scale. Related to data from areas: a), b) E1, c), d) E3, e), f) E6

Source: Author's contribution.

Factors such as *Continuous system for identifying problems* (CP), *Implementing visual control* (SW), and *Using Only Reliable Technology* (ST) show relative similarity in terms of preferences. This implies that visual control is supported by the other two factors, as reliable technology generates fewer quality problems than outdated (declining) technology.

The similarity in preference among factors in area E6 is shown in Figures 3e and 3f, with a similarity criterion of 12% of the scale length. Factors such as *Standardization of task completion time* (CW), *Standardization of the process* (PU), *Standardization of information flow* (PI), and *Standardization of training* (SN) form a cluster in the zone of very strong preference. As indicated by the data in Figure 3f, the factor *Standardization of Information Flow* (PI) shows similarity to the mentioned factors in terms of preference, meaning it supports these factors through the standardization of information flow.

An essential part of the BOST method is the assessment of the impact of respondents' characteristics on the ratings of factors. The results of this relationship are presented in Figure 4, in the form of 3D charts. The direction of the cone rotation indicates the correlation direction, with the top representing a positive correlation and the bottom a negative correlation, and the α level is given on the X-axis.

From the data in Figure 4a, it can be concluded that there are 20 correlation variations, including 11 positive ones. *Respondents' education* (WE) has only a positive influence on the ratings of the *Quality* (JA). *Respondents' mobility* (MR) does not have an impact on the ratings of any factor in area E1. The most active characteristics of respondents are their *Age* (WI) and *Tenure* (SC) – both with seven correlation variations. However, the factor most sensitive to respondents' characteristics is *Staff morale* (MZ), with six correlation variations. The following characteristics have an impact: gender (one variation, only at the $\alpha = 0.2$ level), *Age* (WI) at two levels ($\alpha = 0.2$ and $\alpha = 0.1$), and *tenure* (SC) at all three levels ($\alpha = 0.2$, $\alpha = 0.1$, and $\alpha = 0.05$).

The characteristics of respondents influence the assessments of factors in area E3 as follows:

- There are 21 correlation variations, including 8 positive ones.
- No personal characteristic influences the ratings of two factors: (PE) and (ST).
- Two respondent characteristics, *Gender* (MK) and *Mode of employment* (TR), do not affect the ratings of any factor in area E3.
- The most sensitive factor to the ratings in area E3 is the factor *Standardized tasks, processes, and documents* (SZ) – seven correlation variations, influenced by three respondent characteristics: *Age* (WE), *Work tenure* (SC), and *Mobility* (MR).
- The ratings of *Continuous system for identifying problems* (CP) are influenced by four respondent characteristics: *Education* (WE), *Age* (WI), *Work tenure* (SC), and *Mobility* (MR), with six correlation variations.
- The ratings of *Implementing visual control* (SW) are shaped by three respondent characteristics: *Age* (WI), *Work tenure* (SC), and *Mobility* (MR) – three correlation cases and six variations.

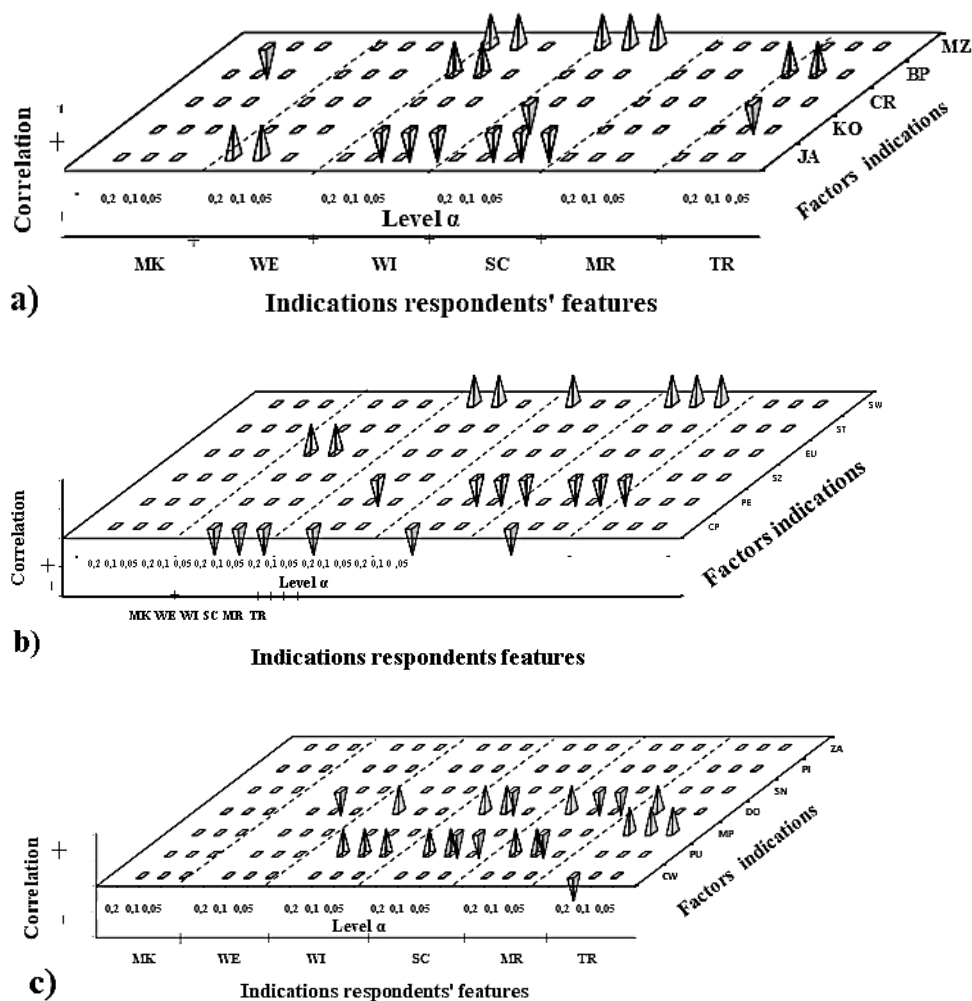


Figure 4. 3D compilation of correlation analysis results: influence of respondent characteristics on the importance of factors in Areas: a) E1, b) E3, c) E6.

Source: Author's contribution.

The characteristics of respondents influence the assessments of factors in area E3 as follows:

- There are 21 correlation variations, including 8 positive ones.
- No personal characteristic influences the ratings of two factors: (PE) and (ST).
- Two respondent characteristics, *Gender* (MK) and *Mode of employment* (TR), do not affect the ratings of any factor in area E3.
- The most sensitive factor to the ratings in area E3 is the *factor Standardized tasks, processes, and documents* (SZ) – seven correlation variations, influenced by three respondent characteristics: *Age* (WE), *Work tenure* (SC), and *Mobility* (MR).
- The ratings of *Continuous system for identifying problems* (CP) are influenced by four respondent characteristics: *Education* (WE), *Age* (WI), *Work tenure* (SC), and *Mobility* (MR), with six correlation variations.

- The ratings of *Implementing visual control* (SW) are shaped by three respondent characteristics: *Age* (WI), *Work tenure* (SC), and *Mobility* (MR) – three correlation cases and six variations.

The results of the correlation analysis suggest that, according to respondents, the "physical" perception of factors such as *Standardized tasks, processes, and documents* (SZ) and *Continuous system for identifying problems* (CP) indicates malfunctioning (negative correlation).

Data from Figure 4c, concerning the results of the correlation analysis in the area of E6, indicate 23 correlation variations, including 15 positive ones. For the ratings of two factors, *Standardization of information flow* (PI) and *Standardization of employment* (ZA), no personal characteristic of respondents has any influence. Ratings of *Standardization of the process* (PU) are most dependent on respondent characteristics – the number of correlation variations is 7, with three correlation cases influenced by three characteristics: *Age* (WI), *Work tenure* (SC), and *mobility* (MR), all correlations being positive. For the ratings of the Standardization of Documents factor (DO), four characteristics influence: age (WI), *Work tenure* (SC), *Mobility* (MR), and *Mode of employment* (TR), with a smaller number of correlation variations (5) and all correlations being positive.

During the analysis of the BOST survey results, it was decided to determine correlations between the ratings of factors in the surveyed areas. The results in this regard are presented in the form of histograms. The appearance of the histogram above the axis confirms positive correlation, below the axis indicates negative correlation. The values 1 and -1 represent correlation at the $\alpha = 0.2$ level; 2 and -2 at the levels $\alpha = 0.2$ and $\alpha = 0.1$; 3 and -3 at the levels $\alpha = 0.2$, $\alpha = 0.1$, and $\alpha = 0.05$. Zero means no correlation under the adopted conditions of result analysis.

In Figure 5, the results show the impact of assessments of factors in area E3 on the assessments of factors in areas E1 and E6. No influence was observed, for the adopted conditions, of ratings of factors in area E3 on the ratings of factors such as *Quality* (JA) and *Mode of employment* (MZ). There are 4 correlation cases (two positive and two negative) and 9 correlation variations, including 4 positive ones. The most sensitive factor in area E1 is the *Cost* (KO) – two correlation cases, 5 variations, and the most active factor in area E6 is the (EU) factor (two cases, 5 correlation variations).

From the data in Figure 5b, it can be inferred that there are 12 correlation cases, 25 correlation variations, no correlation for *Standardization of employment* (ZA) factor, and the most sensitive factor to the ratings in area E7 is *Standardization of information flow* (PI) factor. The most active factor in the area is *Continuous system for identifying problems* (CP) factor (three correlation cases, six variations). The same number of correlation cases exists for *Granting authority downward* (EU) factor, but the number of variations is significantly smaller, standing at 3.

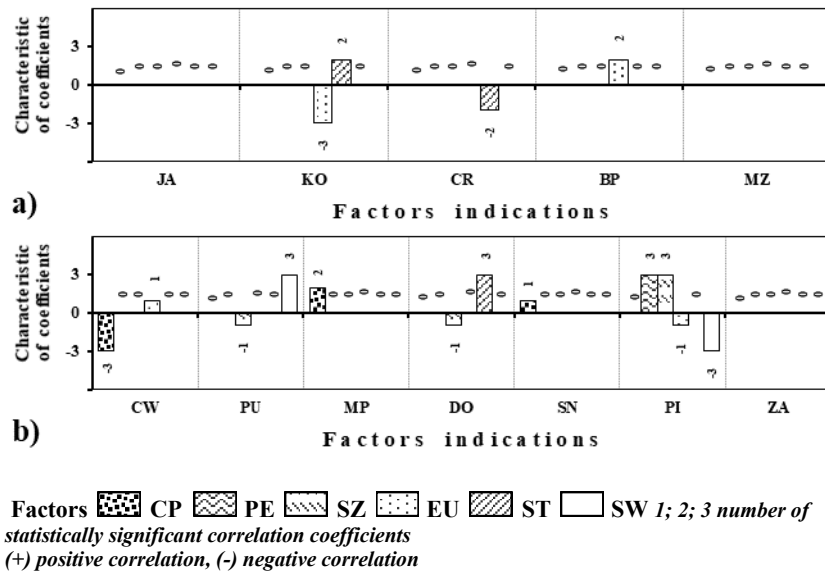


Figure 5. Summary of correlation analysis results: determining the impact of factor ratings in area E3 on factor ratings in Areas: a) E2, b) E6.

Source: Author's contribution.

Three areas are formed by their three pairs: E3-E1, E3-E6, and E1-E6. The results related to correlations for the third pair, E1-E6, are presented in Figure 6. In this case, on the X-axis, there are five factors for each area because Area E1 contains such a number of factors. The data in Figure 6 indicate the existence of 9 correlation cases and 15 correlation variations. Regarding the factors (CW) and (MP), no correlations were observed. *Quality* (JA) from area E1 shapes the ratings of three factors in area E6: (DO), (SN), (PI). Ratings of *Standardization of training* (SN) factor in area E6 are influenced by the ratings of three factors in area E1: (JA), (CR), (MZ).

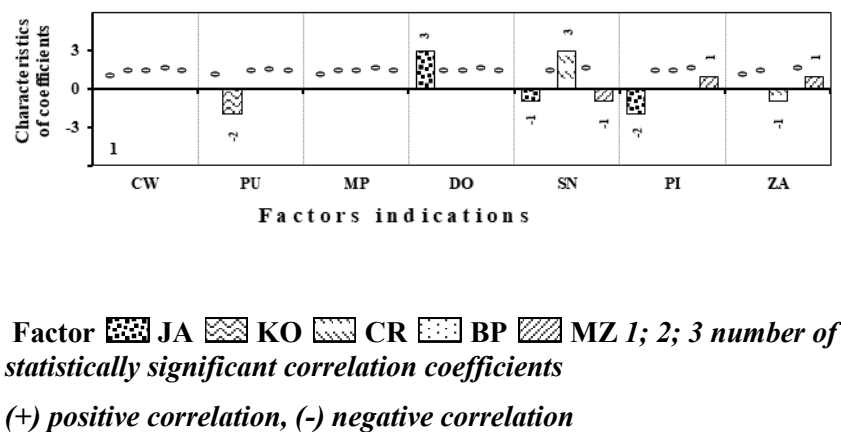


Figure 6. Summary of correlation analysis results: determining the impact of factor ratings in Area E1 on factor ratings in Area E6.

Source: Author's contribution.

5. Summary

The article presents systems that ensure food security. According to the research, the core of these systems is based on the ISO 22000 standard, which applies the principles of GHP, GMP, and the ISO 9001 system. This multi-dimensional approach to quality stems from the fact that the studied company produces products for children and infant. Thanks to the courtesy of the company management, a BOST survey was conducted in the areas of E1, E3, E6, and E12. Based on the structure of respondent characteristics (area E12), it was shown that the company has human resources that guarantee the achievement of goals. The majority of employees are women (typical for the food industry), 71% of the employees have higher education (63% with a Bachelor's degree), and 68% are in the most productive age range (25-55 years old). One in four employees (28%) has 28 years of experience, and only 9% of the employees have not worked in other companies before. Management takes care of specialists – 21% were hired with consideration for financial conditions.

It was shown that, according to the respondents, quality (area E1) is the most important of the five factors in Area E1 in their company. The respondents rated staff morale highly (a factor also from Area E1), indicating that the employees identify with the company's goals and are aware of their responsibility in adhering to procedures. The importance of visual control (Area E3) was emphasized by the respondents, and it ranked second in the importance hierarchy of the six factors, showing a similar preference to the most important factor – Continuous system for identifying problems.

Three factors from Area E6, namely the standardization of: task completion time, process standardization, and information flow standardization, fall within the very strong preference zone (80-100% of the range scale), showing a similarity in preferences.

Considering the theoretical analysis of the studied issue, the practical results, and their analysis, it can be concluded that the research objective has been achieved.

One of the main limitations is the small sample size of respondents, which predominantly consisted of employees from the production department. This could lead to a potential bias in the results, as the views of the production staff may not fully represent the perspectives of other departments, such as management, quality control, or logistics. These departments might have different insights or experiences regarding the importance of various factors affecting food safety and quality, and their absence in the study might skew the results.

Additionally, the lack of feedback from management or other decision-makers, who are responsible for setting strategic goals and overseeing the implementation of quality systems, represents another limitation. Managers often have a broader, more strategic view of the company's operations, which could differ significantly from the more operational perspectives of the production staff. The results of this study are specific to one particular company. While this case study approach provides valuable detailed insights into the practices and

challenges of a single organization, it limits the ability to generalize the findings to other companies or industries. For example, another company in the food industry might have a different organizational structure, a more diverse workforce, or a different approach to training and quality management, which would influence the results of a similar survey. Another limitation is the inherent subjectivity of the BOST survey used in the study. While the BOST method is a useful tool for assessing organizational quality and management practices, it relies on the perceptions and opinions of the respondents, which may be influenced by individual biases or experiences. Respondents' personal preferences, work-related attitudes, and even their understanding of the questions can affect the results. Given these limitations, future studies could expand the sample size to include a more diverse set of respondents from different departments, including management, quality control, and logistics. This would provide a more comprehensive view of how different parts of the organization perceive and contribute to food security and quality management. Furthermore, future research could consider conducting similar studies across multiple companies or industries to identify common trends and best practices. By expanding the scope of the research, a more generalized understanding of the factors affecting food safety and quality can be achieved. In conclusion, while the article provides valuable insights into the systems ensuring food security, it is essential to recognize the limitations related to sample size, company specificity, and the subjective nature of the BOST survey. Acknowledging these limitations allows for a more nuanced understanding of the findings and opens up avenues for further research that can address these gaps and provide more robust conclusions.

Future studies could expand the research to other companies within the same industry. By comparing the situations and practices of different organizations, researchers would be able to confirm or refute the results obtained in the current study. This comparative approach could highlight industry-wide trends, challenges, and best practices, contributing to a deeper understanding of food safety and quality management systems across a broader range of companies. It would also help determine whether the findings are specific to one company or applicable to others in the same sector. In summary, future research directions focus on broadening the scope of the current study by including a larger sample, exploring other companies in the industry, and providing a foundation for future investigations. By addressing these areas, future studies can enhance the understanding of food security systems, improve the reliability of findings, and contribute to the continuous improvement of food safety practices across the industry.

In conclusion, the integration of quality and standardization practices, as evidenced by the company's adherence to ISO standards and the proactive measures identified in the BOST survey, is crucial for ensuring the safety and quality of baby food products. These practices not only comply with regulatory requirements but also build consumer trust, which is essential for long-term success in the food industry.

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NEW PACKAGING SOLUTIONS IN FOOD SECTOR FOR CIRCULAR BUSINESS MODELS

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Purpose: The objective of the paper is to present some evidence from food packaging sector on the use of circular business models within their current products.

Design/methodology/approach: The paper explores the concept of circular business models from the perspective of its metrics and applicability. As an illustration the sector of food packaging is used. The objective is achieved through application of circular business models criteria to assess the parameters of new packaging materials and the way of developing them by selected companies. Carbon footprint (CF) methodology is used to estimate the environmental impact of new and currently used packaging. CF results are then used to feed circularity criteria together with circularity specific parameters. The set of environmental, economic and operational criteria is used to assess the circularity of business models applied in packaging sector.

Findings: The results of the assessment showed that there are different approaches or decision driving factors among analyzed cases. Some new packaging solution follow the circularity path mainly through achieving higher recyclability parameters. There are also solutions, that has more environmental or economic orientation with no visible development towards circularity.

Research limitations/implications: In order to get more reliable results it is advised to focus more on select types of food in order to get a better coverage on circularity supporting solutions. The limitation of the study is related to the lack of access to sensitive economic data, like costs of packaging, and therefore imperfect and not complex analysis of the issue.

Practical implications: The results of the assessment show clearly the circularity supporting decisions, as well as its relationship with environmental impacts. Such a dataset is certainly significant support for decision making within packaging and food manufacturing sectors.

Originality/value: The paper present original study over impact of specific packaging material innovation on circularity of business models. The study is addressed for science, academic and industry based stakeholders, as well as for public authorities and its actors, which are responsible for the optimization of packaging and waste flows.

Keywords: circular business models, packaging materials development, carbon footprint, packaging sector, circularity metrics.

Category of the paper: research paper.

1. Introduction

Circularity assessment criteria are fundamental in evaluating the sustainability and effectiveness of circular business models. Geissdoerfer et al. (2020) outline key criteria for circularity assessment, such as recycling measures, efficiency improvements, use phase extensions, intensifying use phases, and dematerialisation. These criteria aim to enhance material circulation, extend product lifetimes, and improve production efficiency to achieve circularity objectives. What's more important, these criteria need adequate measuring and assessment frameworks that are done within specific and standardized tools and frameworks, including such tools as life cycle assessment or carbon footprint assessment (Nitekiewicz, 2021).

Additionally, Brändström & Eriksson (2022) introduce the Material Efficiency Metric (MEM) and Product Circularity Indicator (PCI) as criteria for evaluating circularity at the value chain and product levels, respectively. These metrics consider material flows, product lifecycles, and production efficiency to assess the circularity of business models.

Circularity assessment criteria encompass recycling measures, efficiency improvements, use phase extensions, intensifying use phases, dematerialization, material flows, product lifecycles, and production efficiency. These criteria are crucial for businesses to measure and enhance their circularity performance in alignment with circular economy principles. The circularity concept has highly dematerialization oriented priorities and therefore any product or packaging manufacturing issues gain additional importance (Wojnarowska et al., 2022).

Circular business models are increasingly recognized as a strategic approach for organizations to align with the principles of the circular economy. These models aim to create, deliver, and capture value through strategies that emphasize resource efficiency, waste reduction, and sustainable practices.

To evaluate the circularity of business models, tools such as the Circular Rebound Tool Das (2023) are developed to guide companies towards more sustainable circular business models. Artificial intelligence capabilities Madanaguli (2024) and dynamic capabilities Eeoud & Ganzaroli (2023) are leveraged as tools for innovation in circular business models, enabling businesses to adapt and thrive in circular economy contexts. Sustainability reports Ibáñez-Forés et al. (2022) are also utilized as tools for measuring and monitoring the transition towards circular economy practices within organizations.

Several common circularity criteria for business models have been identified in the literature:

1. **Degree of Circularity:** Circular business models are classified based on the degree of adoption of circularity principles, particularly in the customer value proposition and interface (Urbinati et al., 2017). Circular business models in the packaging industry often prioritize end-of-life management strategies, such as recycling and recovery, to ensure that packaging materials are reused or repurposed rather than treated as waste (Stewart, Niero, 2018).
2. **Value Creation Logic:** A key aspect of circular business models is the conceptual logic for value creation, which involves utilizing the economic value retained in products after their initial use to produce new offerings (Kanda et al., 2021). Another essential aspect of circular business models in the packaging industry is emphasizing circular product design. This involves designing packaging that is easily recyclable, reusable, or compostable to minimize environmental impact (Stewart, Niero, 2018).
3. **Resource Efficiency:** Circular business models aim to improve resource efficiency by extending the lifespan of products and parts, leading to environmental, social, and economic benefits (Frishammar, Parida, 2018).
4. **Orchestrating Circular Networks:** Effective circular business models often involve a focal actor orchestrating a circular ecosystem that includes suppliers, customers, research centers, and public authorities (Zucchella, Previtali, 2018). Establishing collaborative ecosystems within the packaging industry, involving stakeholders such as suppliers, manufacturers, and waste management companies, is essential for the successful implementation of circular business models.
5. **Loop Closure Strategies:** Circular business models are characterized by strategies that close, narrow, slow, intensify, and dematerialize material loops to reduce material inputs and waste leakage (Voukkali, 2023). Circular business models in the packaging industry often incorporate the use of reverse logistics systems to facilitate the collection and recycling of used packaging materials, contributing to a more closed-loop system (Guarnieri et al., 2020).
6. **Innovation and Differentiation:** Circular business models can help organizations increase differentiation, reduce costs, generate new revenues, and mitigate risks associated with resource scarcity (Husain et al., 2021). Developing innovative packaging designs that promote circularity, such as incorporating recycled materials or designing for easy disassembly and recycling, is a key aspect of circular business models in the packaging industry (Liu et al., 2023).
7. **Communication Strategies:** Effective communication with consumers regarding the disposal and end-of-life pathways of packaging materials is integral to circular business models in the packaging industry. Clear communication can guide consumers in proper waste disposal practices (Baskoro et al., 2023)

The common circularity criteria for business models revolve around integrating circular economy principles, emphasizing resource efficiency, fostering collaboration within circular networks, promoting loop closure strategies, and driving innovation and differentiation. By adhering to these criteria, organizations can develop sustainable business models that contribute to a more circular and resource-efficient economy. Circular business models in the packaging industry focus on end-of-life management, circular product design, supply chain circularity, communication strategies, reverse logistics, innovative packaging design, and collaborative ecosystems. By adhering to these criteria, companies in the packaging industry can enhance sustainability, reduce waste, and contribute to a more circular economy.

The objective of the paper is to present some evidence from food packaging sector on the use of circular business models within their current products. The paper explores the concept of circular business models from the perspective of its metrics and applicability. As an illustration the sector of food packaging is used. The paper explores the results of project titled “Functional & recyclable coated paper packaging for food products (REPAC²)”, which was realized in 2022-2023 by consortium of Belgium, German and Polish partners. One of the major objectives of the project was to investigate the potential of the coated paper packaging for the food products with regard to its environmental impact and recyclability (Sirris, 2023). The objective of the paper is achieved through application of circular business models criteria to assess the parameters of coated paper packaging materials from REPAC² and explore the way of developing them by selected companies. CF methodology is used to estimate the environmental impact of new and currently used packaging. CF results are then used to feed circularity criteria together with circularity specific parameters. The set of environmental, economic and operational criteria is used to assess the circularity of business models applied in packaging sector.

2. Materials and methods

The methods used for the assessment are organized within two-step process. Firstly, LCA framework and its carbon footprint assessment is used in order to assess the environmental impact of different packaging materials. Environmental scores are subsequently used to feed circularity criteria.

The environmental assessment is made with Carbon Footprint method – namely Global Warming Potential (GWP) that was developed by International Panel on Climate Change (IPCC) in 2013 and later updated in 2021. This approach to the assessment of food product packaging is quite common, but the preference is to use more advanced variants of life cycle assessment. The method used for the assessment is IPCC 2021 GWP100 v. 1.01. The method takes the time horizon of 100 years as a point of reference. The method is based on

characterization of impacts, which are expressed in single unit of emitted kg of CO₂-eq. Impact factors within GWP100 are referring to the source of generated carbon footprint and include such categories as fossil, biogenic and land transformation sources (PRé Sustainability, 2022). The assessment is made in form of CF screening. The detailed assessment procedure is presented in one of the previous publication by Nitkiewicz et al. (2023).

The assessment of circularity is made on six innovative coated paper packaging for different food products. All the packaging are being considered for application to the food products that are listed in Table 1. For CS2, CS3 and CS6 the coated paper is the only packaging, while for CS1, CS4 and CS5 other packaging materials are used.

Table 1.
The list of products and its packaging

No.	Food product	Proposed Coated Paper packaging
CS1	diced salami	vacuum metallized paper
CS2	fruit rolls	acrylic- and vinyl copolymer CP
CS3	oil based crackers	extrusion coated Polyolefin
CS4	chocolate truffles	PVOH CP
CS5	dried herbs for tea	extrusion EVOH coated paper
CS6	chocolate tablet	coated paper with cold seal

In the following step the circularity of business models is assessed with the literature based circularity criteria. Due to data access limitation, the 6 out of 7 abovementioned criteria are assessed. Table 2 presents the circularity criteria and its characteristics. Each of the criterion is assessed with 0 to 5 scale, where 0 is lowest possible score while 5 is the highest score. The assessment is made with either quantitative parameters or qualitative parameters that are both transformed into ordinal parameters. The assessment is made on the basis of coated paper packaging parameters but also on the alternative packaging that is currently used. The implementation status is different for all the cases, varying from already implemented packaging (CS6), advanced testing of packaging line (CS2 and CS1), through analyzing the parameters of a packaging (CS4), to already abandoned solutions due to some operational or economic issues (CS3 and CS5).

Table 2.
Circular business model assessment criteria

Circularity Criteria [Acronym]	Characteristics	
	Description	Interpretation
Degree of Circularity [DC]	Share of packaging material volume that is recovered at end-of-life phase	The higher share of material volume that is recovered the better
Value Creation [VC]	Relative economic value of the remaining packaging. Level of meeting food product requirements.	The higher economic value of the packaging that remains after the use of the product the better. The higher level of meeting food product requirements the better.

Cont. table 2.

Resource Efficiency [RE]	Decrease of packaging weight, decrease of materials use in packaging manufacturing process	The lower weight of the packaging for transportation the better. The lower material use during packaging manufacturing process the better
Loop Closure [LC]	Share of closed loops within packaging life cycle	The higher share of the closed loops within packaging life cycle the better
Innovation and Differentiation [ID]	Share of recycled or repurposed content within packaging. Share of packaging CF in overall CF of product life cycle.	The higher share of secondary materials and resources the better. The lower share of packaging CF in overall product CF the better.
Communication Strategies [CS]	Number of material recovery streams	The lower number of material streams for recovery the better

It is important to notice that the current assessment is based on assumptions and not market related feedback. The criteria of degree of circularity, resource efficiency and loop closure are based on CF results, while the remaining criteria are assessed on the basis of packaging parameters itself or in relation to the currently used packaging of the product.

3. Results

The result section presents only the results of CF assessment and its related variables. In this paper we do not present life cycle inventory stage of CF assessment, which is presented in its complexity within REPAC² project websites.

3.1. Carbon footprint assessment of coated paper packaging

Functional unit for the assessment is 1 kg of packaging. The following life cycle phases are included in the study: supply of resources for manufacturing, packaging manufacturing, transport to distribution and end of life processing. Since the packaging is the functional unit for the assessment, the distribution and use phase are excluded from the assessment. It is justified with omitting the product within assessment, which is crucial for distribution and use phase. As mentioned before GWP100 method is used to calculate carbon footprint for the functional unit. The assessment is made within SimaPro 9.4 software.

3.2. Recyclability of packaging

The overall recyclability score is a qualitative parameter calculated on the basis of yield, visual impurities and sheet adhesion properties, expressed in %. Recyclability score can have values within the range of -100 to 100, and its score below 0 indicates that recycling in a traditional mechanical recycling process is not favorable. Additionally, sheet adhesion properties are assessed as coherent (could be recycled) and non-coherent (could not be recycled) and influence the recyclability score accordingly despite other factors.

3.3. Closed loops within packaging life cycle

Each packaging life cycle is analyzed within the waste flows and the possibilities to turn them into secondary flows. The classification as closed loops is dependent on the following issues: recyclability score of coated paper packaging, overall number of waste loops and share of closed loop within.

Table 3 presents the values of CF dependent parameters that are used to calculate circularity criteria. In the following step, the numerical parameters are transformed into ordinal parameters.

Table 3.

The values of CF related parameters for circularity criteria

Criteria	CS1	CS2	CS3	CS4	CS5	CS6
Overall CF [kg of CO ₂ eq.]	5,04	1,31	1,51	1,53	0,87	2,99
Recyclability score [pts]	69	70	-10	89	-2	-21
Share of closed loops [%]	50	100	0	100	50	0

4. Conclusions and discussion

The results of CF assessment and interpretation of LCI parameters concerning recyclability scores, recycling content and share of closed loops are used to evaluate circularity parameters for investigated packaging. The remaining parameters are assessed on the basis of LCI data, CF results and additional insights on coated paper packaging, its alternatives and the technical and economic parameters of the packaging. The assessment is made by authors themselves. Table 4 shows the results of circularity assessment for investigated cases.

Table 4.

The assessment of circularity criteria for investigated packaging

	CS1	CS2	CS3	CS4	CS5	CS6
Degree of Circularity [DC]	4	4	1	5	2	0
Value Creation [VC]	4	5	2	3	1	3
Resource Efficiency [RE]	3	4	2	3	5	2
Loop Closure [LC]	3	5	0	5	4	0
Innovation and Differentiation [ID]	2	1	1	3	4	1
Communication Strategies [CS]	3	5	5	2	1	5
Average score	3,17	4,00	1,83	3,50	2,83	1,83

The results of circularity assessment should be interpreted from the perspective of food producers and packaging producers, as well as from the general perspective. As we could see the circularity assessment results only some of the cases could claim to have good circularity features or perspectives to achieve them. The assessment of business model circularity is certainly not complex while the assessment of single product / packaging is performed but it still gives some important insight on the situation. The coated paper based products have been developed in order to increase the recyclability level of waste packaging but it seems that this assumption is heavily dependent on the type of the coating that is applied. Certainly, the average recyclability is higher than the recyclability of alternative packaging, which regularly are some plastic based laminates, but it is surely not a constant variable.

The business models of food producers cannot be completely turned into circular through optimization of packaging only. Nevertheless, since the objective of the business entities involvement were to increase the recycling rate and decrease environmental impact, the optimization of packaging show significant potential for adopting to circular business models. It is important to notice that coated paper based packaging introduction is not automatically turning business model a circular one. Some solutions, like diced salami, fruit rolls and chocolate truffles have very promising results, but also, some of them showed that coated paper based packaging have still long road of development or even are not the proper way to circularity.

The perspective of packaging producers gives us even more ambivalent conclusions. The major conclusion could be that packaging material producers could turn into fully circular business models only together with food producers, or some other packaging users, that support the process along the way and help to find appropriate design of packaging. Food sector is very demanding in the sense of requirements, and has rather high entry barriers that include also practical know-how on cooperating with food producers on operationalization and application of specific packaging solution. Circular packaging could become a vital component of any circular business models within packaging sector, but still it needs to be accepted by food producers and for some part by consumers. It seems that the consumer awareness and their active contribution could be a vital point in closing the loops of packaging streams and moreover, to impact the food and packaging producers decision making (Koszevska, Zakrzewska-Bielawska, 2024).

There is also a strong commitment of different business sectors towards another scenarios of packaging material and life cycle development. It could be observed that some monomaterial solutions, often based on fossil plastics (Gasde et al., 2020) but also based on bioplastics (Baskoro et al., 2023), could also give some good circularity perspectives. The question that arises is if these type of solutions would be supported by regulatory framework.

In order to get more reliable results it is advised to focus more on select types of food in order to get a better coverage on circularity supporting solutions. The limitation of the study is related to the lack of access to sensitive economic data, like costs of packaging, and therefore

imperfect and not complex analysis of the issue. Introducing full set of parameters would certainly lead to better outcome and more reliable results.

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LOGISTICS AND CUSTOMS HANDLING – NEW TECHNOLOGIES AND OPERATIONAL EFFICIENCY AND COMPLIANCE WITH INTERNATIONAL REGULATIONS

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Purpose: The aim of this article was to analyse the impact of modern technology on logistics and customs handling processes, with a particular focus on operational efficiency and compliance with international regulations.

Design/methodology/approach: Both theoretical and empirical research methods were used to develop the article. An analysis and search of the literature on the subject and legal acts in the field of logistics and customs services was carried out, with a particular focus on their use of new technologies in international goods traffic. In addition, empirical data from border and customs services were analysed. An added value was, the own observation allowing to complete the analysis in the field of logistics and customs handling.

Findings: One of the most significant challenges in managing logistics and customs operations is balancing the efficiency of processes with current regulations on security, transparency and compliance of international transactions. Process automation, information management systems, blockchain technologies and artificial intelligence (AI) are increasingly being introduced into the logistics sector to improve the fluidity of operations and minimise the risk of errors and discrepancies in customs documentation. However, the introduction of new technologies also poses challenges for companies in terms of their integration and adaptation to international regulatory standards.

Research limitations/implications: Limitations of the research primarily relate to the limited availability of operational data, the variety and variability of international regulations and the difficulty in measuring the impact of technology on operational efficiency and compliance. The pace of technological change and the need for organisational adaptation also limit the generalisability of results. Future research could focus on analysing the impact of specific technologies, such as IoT or blockchain, and comparisons between different countries in terms of regulation and implementation levels. It would also be worth investigating how regulatory regimes adapt to new technologies and how the development of employee competencies affects operational efficiency.

Practical implications: The article can provide companies with valuable insights into process optimisation and cost reduction. It can help companies understand which technologies, such as blockchain or artificial intelligence, best support security and speed in the supply chain, while minimising the risk of non-compliance.

Social implications: Lessons learned from this article can help improve the security and fluidity of the global flow of goods, which can translate into supply stability and product availability. More efficient customs processing, supported by technology, can reduce the costs associated with importing and exporting, which can ultimately lead to lower prices for consumers. Additionally, the use of innovations such as blockchain and artificial intelligence can improve supply chain transparency, which is particularly important in the fight against illegal trade and counterfeit products.

Originality/value: The novelty of the article lies in its analysis of the impact of the latest technologies - such as blockchain and artificial intelligence - on logistics and customs in the context of operational efficiency and compliance with international regulations. The article adds value by providing companies and institutions with concrete guidance on how they can use new technologies to increase efficiency, reduce costs and better comply with global regulations. It is primarily aimed at logistics managers, customs professionals and decision-makers and analysts responsible for strategy in companies operating in international markets. In addition, the article may be of interest to researchers and students in the fields of logistics, management and new technologies looking for modern solutions and inspiration for further research.

Keywords: logistics service, customs, new technologies, development, international trade in goods.

Category of the paper: Research paper, Literature review.

1. Introduction

Current globalisation processes, the dynamic growth of international trade and the increasing complexity of supply chains are making logistics and customs handling key elements in ensuring the smooth functioning of international transport operations. The requirements of today's economy, based on the rapid flow of goods and information, force companies to implement new technologies that not only increase operational efficiency, but also allow compliance with increasingly complex regulations at the international level.

One of the most significant challenges in managing logistics and customs operations is balancing the efficiency of processes with current regulations on security, transparency and compliance of international transactions. Process automation, information management systems, blockchain technologies and artificial intelligence (AI) are increasingly being introduced into the logistics sector to improve the fluidity of operations and minimise the risk of errors and discrepancies in customs documentation. However, the introduction of new technologies also poses challenges for companies in terms of their integration and adaptation to international regulatory standards.

The aim of this article was to analyse the impact of modern technologies on logistics and customs handling processes, with a particular focus on operational efficiency and compliance with international regulations. The article discusses technological innovations and their impact on optimising logistics processes, as well as the challenges of ensuring operations are compliant

with regulations in different jurisdictions. The article also attempts to assess the benefits of implementing new technologies, as well as the risks associated with their implementation in the logistics and customs sector.

2. Literature review

Logistics is nowadays becoming a key element of gaining advantage, and the proper alignment of strategies provides enterprises and supply chains with an appropriate level of customer service, timeliness or reliability of execution of individual processes. Consequently, these elements create not only a competitive advantage, but also the added value of the enterprise (Niedzielski, Tundys, Łozińska, 2021; Huk, Goń, Pękalska, 2019). One of the elements of creating this advantage is logistical customer service, associated and often equated with delivery. However, before delivery occurs, many activities are performed throughout the supply chain (Ying et al., 2016). The term 'logistics customer service' (LOC) itself consists of two terms: logistics and customer service. Logistics in its scope includes, but is not limited to: the planning, implementation, execution and control of accepted product flows. A logistical customer service strategy, on the other hand, aims to increase customer satisfaction, i.e. to maintain the level of customer service at the highest possible level (Gricer, 2021). Smyk, defined logistic customer service as the ability to act within the area of a company's logistics system, aiming to meet the needs of customers and provide them with optimal delivery times, high efficiency of operations and a high level of communication with the customer (2014). Logistical customer service, can be analysed from different perspectives (producers, suppliers, vendors and customers (Kadłubek, 2014; Wozniak 2017). In operational terms, it defines the need for standards and technologies through which flows of a physical and informational nature are possible (Sułkowski, Morawski, 2014). Nowadays, it is thanks to logistic customer service that it has become possible to form long-term and positive relationships with customers, which translate into satisfaction, the quality of services provided and company profit (Wojcik, 2022; Kolasińska-Morawska, Fernówka, 2018). Logistical customer service is divided into three types of elements: pre-transactional, transactional and post-transactional (Brząkała, 2023). Logistical customer service is supported by information systems that can contribute to competitive advantage in the market (Jedynak, 2017). Three categories of these systems are mainly used in the area of logistical customer service: ERP (from Enterprise Resource Planning), CRM (from Customer Relationship Management) and ECR (from Efficient Consumer Response). ERP systems are comprehensive IT tools that support the management of a company's resources in many business areas (finance, production, warehousing, sales, purchasing or logistics (Orłowska, 2023). In the context of customer logistics service, ERP systems integrate all processes related to supply chain management,

inventory planning, stock control, transport management and order processing (Galinska, Kopania, 2016). CRM systems, on the other hand, are focused on managing customer data and building customer relationships. In logistics, CRM is used to handle orders, personalise offers, manage customer contacts and analyse customer preferences (Tien, Diem, Van On, Anh, Van Dat, Hung, Tam, 2021). CRM systems can also support after-sales service and manage complaints, which the authors argue is crucial in B2C (Business-to-Consumer) and B2B (Business-to-Business) logistics (Chatterjee, Nguyen, Ghosh, Bhattacharjee, Chaudhuri, 2020). ECR is a system focused on collaboration between business partners (manufacturers, suppliers, retailers) to maximise supply chain efficiency and optimise customer service (Brząkała, 2023). ECR systems are designed to oversee the delivery of products to points of sale or directly to end customers in an efficient manner (in the minimum possible time and with reasonable transport and storage costs; (Wirtz, 2024). Extremely important for international business, especially in the context of logistics, is the process nature of the supply chain. The process approach is related to its construction within transnational corporations (Gołemska, 2022). The more important strategic objectives of companies, links in the supply chain, in the context of combining industrial and logistics policies, include: optimising the company's assets by reducing the level of inventories, transport costs and the costs of operating logistics centres; reducing transaction costs and undertaking value-creating activities for the customer; reducing the effects of market information asymmetry by rationalising logistics operations within the supply chain. Designing business models for future international supply chains is one of the most important tasks of logistics, although it is dependent on: the ability to converge logistics service levels at both the supplier and receiver of goods moving through the international supply chain; the magnitude of turbulence in global goods and services markets, with particular emphasis on exchange rate changes, price fluctuations, political and random factors; the level of diversification in the supply of natural raw materials, intermediate goods (Gołemska, 2021). Within the European Union, the implementation of policies to ensure the safety and security and legality of the import and export of goods is carried out, *inter alia*, by the customs authorities. Customs service plays a key role in international trade in goods, ensuring the smooth flow of goods across borders, the control and prevention of smuggling and illegal trade, the collection of customs and tax duties, the control of documents and the application of certain customs procedures (Chackiewicz, Orłowska, 2024). It is implemented multilaterally depending on the complexity of the customs clearance. In the case of standard clearances, which do not require the opinion of specialised bodies, the handling is carried out by the customs authority, the operator, the customs agency and the carrier. For more complex situations involving the movement of goods, freight forwarders, employees of free zones, warehouses, logistics centres, customs and tax warehouses are involved in the handling. In addition: sanitary, phytosanitary, veterinary and sanitary inspectorates depending on the type of goods being transported (e.g. plants, animals). In his reflections (Witkowski, 2018) on the importance of customs handling in the international supply chain, he assumed that it is a process constituting

a broad spectrum of specialised activities relating to the planning, organisation, execution and control of the flow of goods and services between its links located in different customs territories, from the producer through intermediate distribution stages in order to satisfy the needs of the final consumer. In terms of the activities carried out in this process, it is important to highlight the customs service's most often provided by a professional logistics company. Customs risk management (customs compliance) is obligatory in order to increase security in international trade in goods. This refers to activities involving, among other things, analysing, diagnosing, proposing appropriate solutions both organisational and procedural in the enterprise of international goods trade (Czyzhovich, Gafrikova, 2017). Activities carried out during customs handling include calculating the profitability of importing goods, selling or purchasing goods by an entrepreneur, authorising a customs agency to make a customs declaration, loading goods, transporting goods to the relevant customs office, ordering controls by other services or authorities (e.g. veterinary control, phytosanitary control, sanepid, environmental inspector), storage of the goods, completion of documents and preparation of the goods for customs and fiscal control, verification of documents by the customs authority, revision of the goods and means of transport (partial or 100%) in case of doubts as to the authenticity of the goods, taking and examining samples of the goods, presentation of the goods for customs control giving explanations, making the required documents available, loading of the goods, storage of documents for five years for the purposes of customs control (Chackiewicz, 2022). According to (Czyżowicz, Gwardzińska, 2011), customs services are part of the broadly defined logistics services. They constitute the object and effect of customs activities, which are directly related to the customs clearance of goods. They are also complementary to the processes of international trade in goods. IT systems in customs handling not only streamline customs processes, but also increase security and compliance with international regulations are used during certain customs procedures. These systems are compatible with those of the customs authorities, the Border Guard and other border services in EU countries. The following are selected systems: export, import, transit and a system for monitoring the transport of specific goods by road and rail. AIS (Automated Import System) is an IT system used for the handling of customs declarations, statistical declarations and other import documents. It checks the correctness of customs declarations, which speeds up clearance and minimises errors. It allows the status of customs declarations to be tracked, which consequently increases control over imports. AES - (Automated Export System) deals with the handling of customs export declarations and export summary declarations (WDS) and is uniform across EU countries. It ensures the electronic exchange of information between economic operators, customs authorities and guarantees efficient customs supervision. NCTS2 (New Computerised Transit System) - is used for lodging customs declarations for the transit procedure and monitoring transit operations. Thanks to the electronic form of communication, the system ensures the smooth completion of transit operations, the release of security, the reduction of costs, and the transparency of transit operations. SENT - System of Electronic Transport Supervision -

concerns the monitoring by the customs authorities in Poland of the transport of 'sensitive goods' and fuels by road and rail. Operators are obliged to declare transport in the SENT electronic register, to supplement and update it, and, in the case of a carrier, to equip the means of transport with a device transmitting geolocalisation data. The following goods, among others, are subject to control: alcohol, dried tobacco, oils, fuels, medicinal products, a complete list is included in (List of commodities under monitoring system). Access to the SENT System for entrepreneurs can be found on the Platform of Treasury and Customs Electronic Services (PUESC) in the e-Carriage tab. The system of control of carriage of commodities under monitoring, which is based on the provisions of the Act of 9 March 2017. Pursuant to Article 32 para. 2, the control is performed by the Customs and Fiscal Service, the Police, the Border Guard and the Road Transport Inspection. The following entities are responsible for sending, completing and updating notifications in SENT: shippers, carriers and consignees. Penalties of between PLN 2000 and 46% of the gross value of the goods transported, but not less than PLN 20,000, are applicable for non-compliance (Chackiewicz, 2021). From 1 November 2024, an obligation was introduced to report transport to the SENT register by foreign entities which are not based in a European Union Member State, the Swiss Confederation or a member state of the European Free Trade Association (EFTA) and perform transport on the territory of Poland for which a: a permit to carry out international road haulage on the territory of the Republic of Poland, an ECMT permit which entitles to carry out an unlimited number of transports between member states (Conférence européenne des ministres des Transports associating 43 countries from Europe), an exemption from the obligation to hold these permits, a permit for cabotage transport (<https://puesc.gov.pl/updates...>).

3. Research methodology

Both theoretical and empirical research methods were used to develop the article. An analysis and search of the literature on the subject and legal acts in the field of logistics and customs services was carried out, with a particular focus on their use of new technologies in international goods traffic. In addition, empirical data from border and customs services were analysed. An added value was the own observation allowing to complete the analysis in the field of logistics and customs handling.

4. Results

The analysis concluded that in international trade, new technologies play a key role in streamlining logistics processes, thereby increasing their efficiency and ensuring regulatory compliance. Blockchain technology is increasingly used in international trade, especially in the area of documentation and monitoring of supply chains. Blockchain enables the secure and immutable storage of data, which translates into better control over processes and also minimises the risk of fraud (Ar, IM, Erol, Peker, Ozdemir, A. IMedeni, Medeni, 2020). Blockchain-based commodity tracking is becoming increasingly common and allows for real-time monitoring of the origin of products, their transport and any activities in the supply chain. Which makes it possible to verify the authenticity of products and track every stage of their transport, which is particularly important in the pharmaceutical and food industries (Kucharczyk, Kucharczyk, Szpilko, 2021). This technology can also be used to store electronic versions of customs documents (invoices and certificates of compliance, which significantly speeds up control processes and reduces errors associated with manual data entry) (Brzezinski, 2020). AI and machine learning are used to automate processes and to predict future market trends based on data analysis. AI is also used to plan as well as optimise logistics operations (Kozłowska, 2024; AI analyses data on weather conditions, traffic volumes, market changes) to optimise routes, delays or reduce costs (Mroczko, 2023). Woschank, Rauch, and Zsifkovits (2020) describe the use of AI to forecast product demand based on available historical data and current trends which, in their view, translates into inventory management and the adjustment of production to market needs (Orłowski, 2022). The Internet of Things (IoT), on the other hand, allows goods, vehicles to be tracked and monitored in real time using a network of sensors and devices. The application of IoT in international trade, according to Guzowski, Aneszko, Giegiel and Szpilko (2022), has significantly improved supply chain control and security. In addition, IoT sensors in containers and vehicles enable the monitoring of transport conditions (e.g. temperature, humidity) and the location of goods, which is particularly important for sensitive products such as pharmaceuticals (Bielecki, 2022). In warehouses, IoT sensors are used to monitor inventory levels in real time and automatically generate replenishment orders and optimise warehouse layout (Drozd, 2022). New technologies also contribute to the automation of customs handling (EDI data exchange and digital platforms) making it possible to speed up border handling, reduce documentation errors and improve compliance with international regulations (Czaja, Boleska, 2024). Electronic customs clearance involves sending customs documents and invoices electronically, which speeds up border clearance processes, minimises the need for physical inspection of goods and reduces waiting times at the border (Zaborowski, Antonowicz, 2023). Another technology used in international trade in goods is single window systems. Platforms that allow companies to submit customs and transport documents through a single platform (the so-called 'single window' system) (Kim, Kim, 2020).

Another not to be missed technology that has been gaining popularity recently are drones and autonomous transport vehicles. Their use is expected to contribute to faster and more efficient delivery of goods, especially over short distances and to hard-to-reach regions. This is particularly true for delivery over the so-called 'last mile'. Unmanned aerial systems are used to make deliveries over short distances, including in hard-to-reach areas (e.g. mountains, islands), reducing delivery times and operational costs (Orłowska, Orłowski, 2024). Autonomous vehicles, i.e. self-driving trucks and ships, can significantly reduce transport costs, and the risks associated with human error, while increasing safety and operational efficiency (Abosuliman, Almagrabi, 2021). E-commerce and marketplace platforms, are technologies associated with e-commerce platforms that enable multinational companies to sell products in global markets, integrating sales, customer service and logistics processes (Walczynski, 2023). Platforms such as Amazon, Alibaba or eBay enable companies to access global markets, providing them with logistics, payment and customs support (Reikowska, 2023).

5. Discussion

In the area of logistics and customs operations, there are many regulations in place at international, regional and national levels. These regulations aim to ensure that logistics and customs operations comply with international trade and security rules. International Convention on the Simplification and Harmonisation of Customs Procedures (Revised Kyoto Convention): This is one of the main documents governing customs procedures, developed by the World Customs Organisation (WCO). The Convention seeks to simplify and harmonise customs procedures, which is crucial for logistics operations at a global level. Harmonised System (HS): The Harmonised Commodity Description and Coding System developed by the World Customs Organisation is a global standard for classifying goods that facilitates international trade and ensures compliance with customs procedures. The system is regularly updated, which means that companies have to keep up with changes in order to comply. In addition, the European Union has a number of regulations for customs and logistics handling, such as the Union Customs Code (UCC). The UCC regulates many aspects of customs, including the movement of goods, classification rules and customs controls within the EU. The UCC also provides guidance on digitalisation and the implementation of technological solutions such as electronic declarations. The World Customs Organisation has created the AEO programme (<https://www.podatki.gov.pl/clo/informacje-dla-przedsiębiorcow/aeo-i-uproszczenia-celne/aeo/>), which allows logistics and customs companies to become Authorised Economic Operators. AEO promotes security and simplified procedures for companies that meet certain standards for security and compliance management. The introduction of modern technologies, such as blockchain, can support the fulfilment of the AEO criteria. When transporting goods

related to endangered species, logistics and customs handling must comply with CITES regulations. This convention regulates the trade in plant and animal species, introducing restrictions that require special permits and supervision. It is also important to remember that in logistics and customs handling, the processing of personal data, especially that of customers and business partners, must comply with RODO. This requires advanced technological safeguards, which is important when implementing new technologies. International Maritime Dangerous Goods Code (IMDG): Regulations for the transport of dangerous goods by sea require logistics and customs handling to comply with IMDG. This requires appropriate labelling, notification and compliance with international transport rules. ISO standards for logistics and supply chain risk management: ISO standards, such as ISO 28000 (specific to supply chain security management), are voluntary standards that support companies in meeting international security and compliance requirements. The type and importance of customs services is embodied in the regulations of the Union Customs Code (UKC). The tasks of the customs authorities include the supervision of the Union's international trade, the support of free trade, the implementation of aspects of the internal market, the common commercial policy on trade in goods and supply chain security (Chrzęszcz, Walczuk, 2017). Customs authorities perform control activities to ensure compliance with customs and other legislation that regulates the import, export, transit, movement, storage and end-use of goods moved between the customs territory of the Union and third countries and the presence and movement within the Union of non-Union goods and goods placed under the end-use procedure. Customs authorities shall cooperate with economic operators and other authorities involved in international trade in goods. Traders involved in international trade in goods exchange information with the customs authority other than that required by the customs legislation, inter alia, with regard to cooperation in the identification and prevention of risks (Laszuk, 2016; Grottel, 2014). It is important to point out the dynamics of the changes taking place in, inter alia, customs handling of international trade in goods, which consequently involves following the changes in customs regulations. An important tool for entities is the Treasury-Customs Electronic Services Platform (<https://www.gov.pl/web/kas/platforma-uslug-elektronicznych-skarbowo-celnych-puesc>), run by KAS and updated on an ongoing basis. The 1956 Convention on the Contract for the International Carriage of Goods by Road (CMR), which aims to unify the rules for the international carriage of goods by road and to introduce simplifications and improvements. The Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention), done at Geneva on 14 November 1975, which aims to simplify and unify customs procedures in the international transport of goods by road. The TIR Convention is based on an international guarantee chain which provides security for customs and tax duties. The Convention on a common transit procedure, drawn up in Interlaken on 20 May 1987, ensures that the contracting parties are obliged to assist each other in the recovery of claims and to cooperate in the simplification of customs formalities. Regulation (EU) No 952/2013 of the European Parliament and of the Council of 9 October 2013 laying down the Union Customs

Code, Commission Delegated Regulation (EU) 2015/2446 of 28 July 2015. Commission Implementing Regulation (EU) 2015/2447 of 24 November 2015. Law of 19 March 2004. Customs Law. Act of 16 November 2016 on the National Fiscal Administration. Several of these regulations and standards relate directly or indirectly to new technologies used in logistics and customs handling. The Union Customs Code (UCC), places a strong emphasis on the digitalisation of customs procedures, such as electronic declarations and entries. The Authorised Economic Operator (AEO) programme of the World Customs Organisation (WCO): promotes the use of digital technologies and security systems for companies seeking Authorised Economic Operator (AEO) status.

Kyoto Convention on the Simplification and Harmonisation of Customs Procedures (Revised Kyoto Convention): recommends that AI supports the automation of simplification processes and the standardisation of customs procedures. In addition, the World Customs Organisation, which manages HS, is working with member countries to digitise and automate the goods coding system. In the context of the processing of personal data in logistics and customs, RODO requires the implementation of appropriate technological safeguards, for which blockchain technology and advanced data management systems (data management systems) are being used.

6. Conclusions

Logistics and customs handling are key elements in ensuring the smooth functioning of international trade in goods. Logistics and customs operators are faced with the need to implement new technologies to increase operational efficiency in accordance with current EU and international legislation. Within the EU, policies to ensure the safety and security of the transport of goods in accordance with international law are implemented by, among others, customs authorities. Customs handling is carried out in two ways: on the one hand by customs authorities and on the other by traders, customs agents, freight forwarders, carriers. It should be emphasised that customs handling plays a significant role in international trade in goods by, inter alia, ensuring the smooth flow of goods across borders, controlling and preventing smuggling of goods, observing the import/export of goods in accordance with established restrictions and prohibitions, controlling documents, protecting the fiscal policy of the Union through the collection of customs duties and the application of certain customs procedures. The integrated IT systems used in customs handling significantly streamline customs processes, but also increase security and comply with legislation. New technologies used in logistics and customs handling are contributing to operational efficiency through the use of advanced technologies such as artificial intelligence, blockchain and the Internet of Things (IoT). Among other things, these technologies support process automation, improve the accuracy and speed

of data exchange and enable better supply chain management, which consequently minimises delays and reduces operational costs. In addition, they are used to support compliance with international regulations and standards for logistics and customs handling. Compliance management systems, based on machine learning, enable automatic verification of documentation, which speeds up the customs clearance process and minimises the risk of legal violations. Additionally, they improve transparency and enable tracking of shipments (blockchain) at every stage of the supply chain. This minimises the risks associated with document forgery and increases trust among trading partners. However, it should be borne in mind that, despite its many benefits, the implementation of new technologies brings with it various challenges, for example: the need to adapt infrastructure, investment in staff training and the need to harmonise technology with various national systems and regulations. Therefore, according to the authors, this also translates into employment and professional qualifications and, consequently, changes in the employment structure in logistics and customs. The growing need for IT and data analytics specialists suggests that technological developments require intensive training measures to improve the professional qualifications of employees. Given the dynamic development of technology, further research into its impact on logistics and customs handling is recommended. Changing international regulations should also be monitored in order to maximise the technological potential as well as to develop optimal operational practices.

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**SUSTAINABLE DEVELOPMENT OF HIGHER EDUCATION
INSTITUTIONS IN PERCEPTION OF STUDENTS OF MANAGEMENT
AND PRODUCTION ENGINEERING AS FIELD OF STUDY IN
UNIVERSITY OF TECHNOLOGY AND ARTS IN APPLIED SCIENCES
IN WARSAW AND THE TECHNICAL UNIVERSITY OF WARSAW**

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Purpose: The aim of this study was to assess the awareness of sustainability among higher education students, as well as their perceptions of sustainable development in higher education institutions and their expectations in this regard.

Design/methodology/approach: The study was quantitative and survey-based, utilizing a questionnaire method, and consisted of two stages. In the first stage, a literature review was conducted to provide a foundation for selecting the issues to be included in the questionnaire. Proper definition of the research topics was essential to ensure the reliability of the study.

The next stage involved administering a survey to the aforementioned research group using a computer-assisted web interview (CAWI) format. This method was chosen primarily due to facilitating anonymity, which may contribute to the reliability of responses and improve response rates. The advantages of this method also include its reach, the time required to conduct the study, and cost minimization.

Findings: The study clearly revealed a high level of awareness among students on this topic, with 100% of ATA students and more than 93% of TUW students demonstrating awareness. The surveyed students identified features they believe should characterize a sustainable university. Of the 26 proposed features, students from both Polish universities highlighted all of them with varied number of votes. The least score obtained a feature “Offers a study program in Sustainable Development”. These findings suggest a noticeable lack of program solely dedicated to sustainable development neither as major or minor in none of the surveyed universities.

Moreover, the students of the same major of two different universities, perceive their higher education institution completely different in terms of sustainable development. Students of TUW, firstly see the university as any other institution (apart from educational mission) that cares about ecology and their internal and external stakeholders. While the students of ATA primarily perceive their university as sustainable developed institution through the prism of the program of studies.

The most surprising finding was no participation in extracurricular activities and initiatives among both Polish universities' students.

The study thus suggests that, the Polish surveyed universities still incorporate considerably fewer sustainable development topics in their curricula and organize limited extracurricular activities to support these competencies. Nevertheless, overall students' awareness of the concept of sustainable development is considerably high and highly satisfactory.

Research limitations/implications: Due to the sample selection and non-representative sample size, the study's results cannot be generalized to all students at higher education institutions in Poland. Nevertheless, the study provides new insights and can serve as an initial attempt at empirically verifying the awareness of students from all higher education institutions regarding sustainable development, their perceptions of the phenomenon of a sustainable higher education institution, and their expectations in this area. This is especially relevant given that the research questionnaire, due to its comprehensiveness, universality, and reliability, offers the potential for replication.

Practical implications: This article presents original research on the sustainable development of higher education institutions in perception of their students' expectations, which has several implications for both researchers and university authorities and may serve as a starting point for developing analytical frameworks to assess the level of sustainable development implementation and measurement models for sustainable development in both Polish and foreign universities.

Social implications: Universities can contribute to the solutions of major challenges of the 21st century such as increasing environmental and socio-economic crises, inequalities of income and wealth and political instabilities by integrating the concept of sustainable development (SD) in research, organization, and by educating future decision makers. For instance, by integrating sustainability into the organization, universities can lead by example. Furthermore, through the curriculum, future decision makers can learn the competences needed to solve ecological, social, and economic problems in societies.

Originality/value: This paper has implications for both researchers and university authorities and may serve as a starting point for developing analytical frameworks to assess the level of sustainable development implementation and measurement models for sustainable development in both Polish and foreign universities.

Keywords: sustainable development, higher education.

Category of the paper: Research paper.

1. Introduction

The concept of sustainable development was first described in the 18th century (Meadows, 1972) and has evolved over the centuries to gain a central place in development discourse in the latter half of the 20th century (Du Pisani, 2007). Increased discussion about sustainable development has emerged in recent years due to growing ecological and social awareness, following years of focus primarily on economic growth. The approaching ecological crisis, along with global wealth inequality, has led to a renewed focus on sustainable development in global terms and across three dimensions (ecological, social, and economic). This has resulted in the adoption of the Paris Agreement in 2015, which includes measures to limit global warming, adapt to and mitigate the effects of climate change, implement low-emission development in a way that does not restrict food production, and ensure that financial sector

activities align with climate goals (Adoption of the Paris Agreement, December 2015). However, this concept will be difficult to implement without the involvement of traditional sources of social legitimacy in science and education, which are related to knowledge creation (Sulejewicz, 2008).

This article presents original research on the sustainable development of higher education institutions in perception of their students' expectations, which has several implications for both researchers and university authorities and may serve as a starting point for developing analytical frameworks to assess the level of sustainable development implementation and measurement models for sustainable development in both Polish and foreign universities.

2. Theoretical approach

Although there have been proven and successful developments in the field of Higher Education for Sustainable Development over the past 15 years or so, there are still numerous challenges to be overcome. Among these challenges is the need for Higher Education Institutions to improve the integration of sustainability in the curriculum and in research, and most importantly, to integrate it holistically in their systems (Walter Leal Filho, Yen-Chun Jim Wu, Luciana Londero Brandli, Lucas Veiga Avila, Ulisses Miranda Azeiteiro, Sandra Caeiro, Lucia Rejane da Rosa Gama Madruga, 2017).

Universities can contribute to the solutions of major challenges of the 21st century such as increasing environmental and socio-economic crises, inequalities of income and wealth and political instabilities by integrating the concept of sustainable development (SD) in research, organization, and by educating future decision makers. For instance, by integrating sustainability into the organization, universities can lead by example. Furthermore, through the curriculum, future decision makers can learn the competences needed to solve ecological, social, and economic problems in societies. However, despite their possible importance, some universities fall behind internationally in implementing sustainable strategies (von Hauff, Nguyen, 2014).

- Universities can be major actors for supporting sustainable development (SD) in developing SD strategies through research, educating future generations and in implementing sustainability in their organization. At the international level, the United Nations (UN) has proclaimed the years 2005-2014 as the UN “Decade of Education for Sustainable Development”. It proposes that education for sustainable development (ESD) be integrated at all levels of education. At the national level, the *Hochschulrektorenkonferenz* (Committee of chancellors and principals of German universities, colleges, and schools) and the German Commission for UNESCO issued a joint statement in 2010 entitled “Universities for sustainable development” which

expressly requests universities to act on the principle of SD and to develop “Education for Sustainable Development as a constituting element in all areas of activity” (Hochschulrektorenkonferenz (HRK) und Deutsche UNESCO Kommission e.V. (DUK) Hochschulen für nachhaltige Entwicklung).

- The universities with their three core functions, research, teaching, and services, are called upon- to accept their responsibility and contribute to SD (Moore, 2005). The challenge and importance of SD for universities is underscored by numerous international networks like the network of international elite universities “International Sustainability Campus Network (ISCN)”. As one of Europe’s largest research institutes, Fraunhofer-Gesellschaft has anchored the principle of sustainability in its current mission statement and initiated the internal project “Sustainability Strategy” in 2011 to promote the shaping of a sustainable society, economy, and environment (Fraunhofer-Gesellschaft Jahresbericht, 2011). As major research centers and important institutions in the education system, universities contribute sustainable solutions to the challenges of the 21st century through basic and applied research and by generating knowledge and suitable responses to complex interrelationships. Future decision makers in government, business, and other types of institutions and entities acquire the knowledge and skills required to shape the future through the integration of sustainability issues in the curricula at their universities (Barth, Godemann, Rieckmann, Stoltenberg, 2007).
- Due to the nature of their activities and their mission, universities have an important responsibility in transforming societies, and in particular, in contributing to the development of a more sustainable humanity (Barth, Rieckmann, 2012). HEIs can implement sustainability concepts and implement them to practices in different domains: e.g. education and curricula, research, facilities/campus operations, community outreach, organisational change management/institutional framework, and assessment and reporting (UNESCO, 2012; Lozano et al., 2015). They can achieve this either by applying just one or more of these domains or by adopting a whole-institution approach (UNESCO, 2012).
- Indeed, diverse efforts are being made by universities worldwide to make sustainable development (SD) part of their institutional frameworks by proposing new teaching and pedagogical approaches and curricula, collaborating with other HEIs, encouraging campus sustainability life experiences and running ‘educating-the-educators’ programmes (Lozano et al., 2013; Ramos et al., 2015). Across the world, but particularly in Europe, some universities have become leaders in the field with very good practices. But unfortunately, many of those efforts address only one or two of the sustainability domains at HEIs, which continue to compartmentalisation, instead of a holistic approach (e.g. an approach which is inclusive and takes into account inputs and knowledge from different subjects) and a systems thinking approach (Ramos et al., 2015). Lozano et al. (2015), developed an exploratory literature review to identify the different practices and

domains among HEIs within sustainability, and the results revealed that most are focused on education (including curricula, pedagogies, competences and ‘educating the educators’), followed by campus operations, institutional framework, outreach, and assessment and reporting. The least applied area seems to be research. Curriculum practices can vary from simple coverage of some environmental issues and material in existing courses to modules or new courses within a program, at both the undergraduate and postgraduate levels.

3. Materials and Methods

3.1. Research Objective

The literature presents numerous studies on sustainable development, especially concerning businesses, cities, or regions. There is also research focusing on sustainable development in higher education institutions.

The aim of this study was to assess the awareness of sustainability among higher education students, as well as their perceptions of sustainable development in higher education institutions and their expectations in this regard.

The main research questions were:

1. Are students aware of what sustainable development is?
2. What characteristics should define a sustainable higher education institution, and which of these characteristics are present at the institution where the students are studying?

3.2. Sample and Data Collection

The study was conducted in the first quarter of 2024 using a non-random sample. The respondents to the research questionnaire were students of a field of study: Management and production engineering from two universities in Warsaw: the University of Ecology and Management in Warsaw (a private institution with a technical-artistic and management sciences profile, currently operating under the name of University of Technology and Arts in Applied Sciences in Warsaw, hereinafter referred to as ATA) and the Technical University of Warsaw (a public institution with a technical profile, hereinafter referred to as the TUW).

The material used in the study was collected from a total of 150 respondents, including 82 from ATA and 61 from TUW.

Among the respondents, the majority were men—112, representing 74.67% of the sample. The study included 38 women (25.33%). It is worth noticing that the gender spread in TUW is almost equal, while in ATA the male representation is more than ten times higher than women’s.

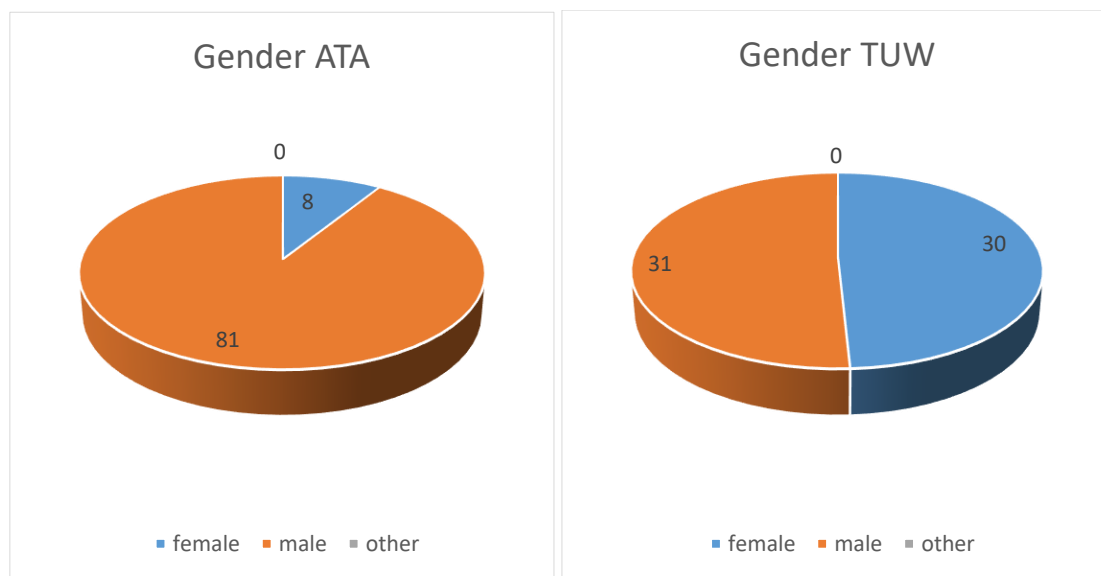


Figure 1. Gender representation in the surveyed sample.

Source: own research.

Regarding the type of studies, the largest group consisted of 1st cycle students—129 (86%). The second-largest group were students of 2nd cycle studies—21 (14%). None of the respondents was enrolled in postgraduate studies. Moreover, the students of ATA were entirely students of 1st cycle program.

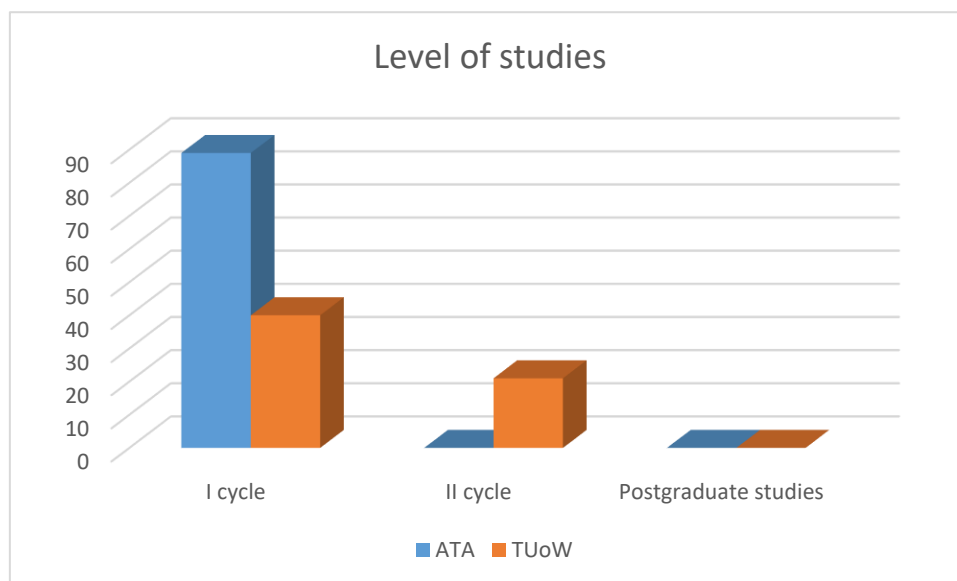


Figure 2. Level of studies by respondents.

Source: own research.

The predominant group by year of study was first- (55 students) and second-year (46) students, numbering 101 (68.24%). The third- and fourth-year students, totaling 47, were represented by 24 and 23 students respectively. None of the respondent was fifth-year student. Moreover, none of TUW students were at their third- and fourth-year of studies.

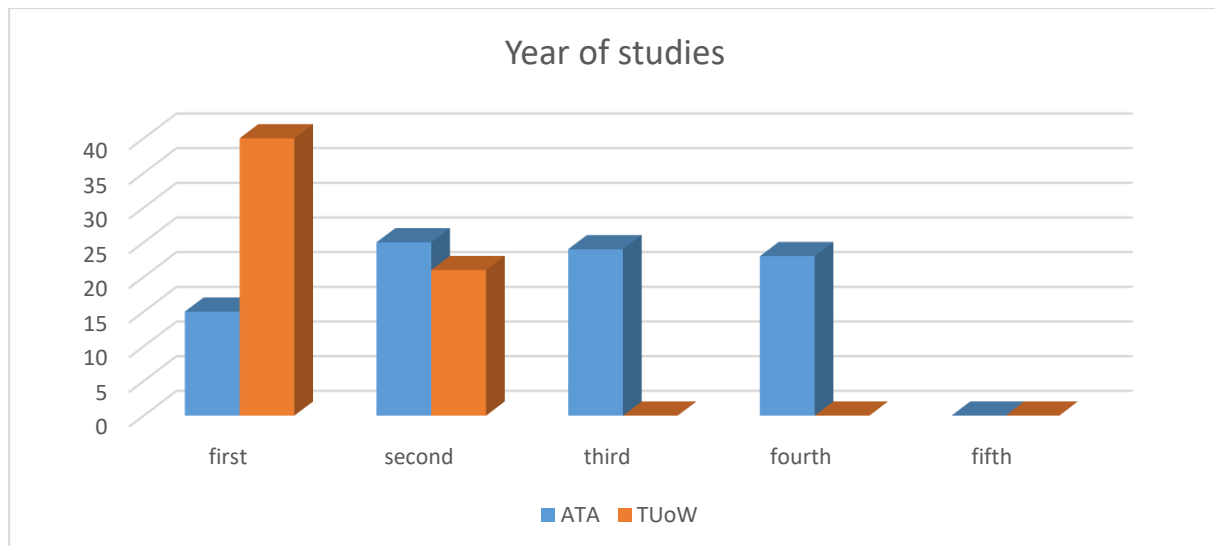


Figure 3. Year of studies by respondents.

Source: own research.

Respondents were categorized into four work experience groups:

- 0-3 years,
- 4-6 years,
- 7-9 years,
- Over 9 years.

The vast majority of respondents fell into the 0-3 years work experience category—82 students (54.67%), with majority of TUW students (56). The smallest group, consisting of 12 students were with over 9 years of experience represented 8% of the sample. The second-largest group, representing 21.33% of respondents, were students with 4-6 years of experience—32 individuals with majority of ATA students (29). Twenty-four respondents (16%) reported having 7-9 years of work experience.

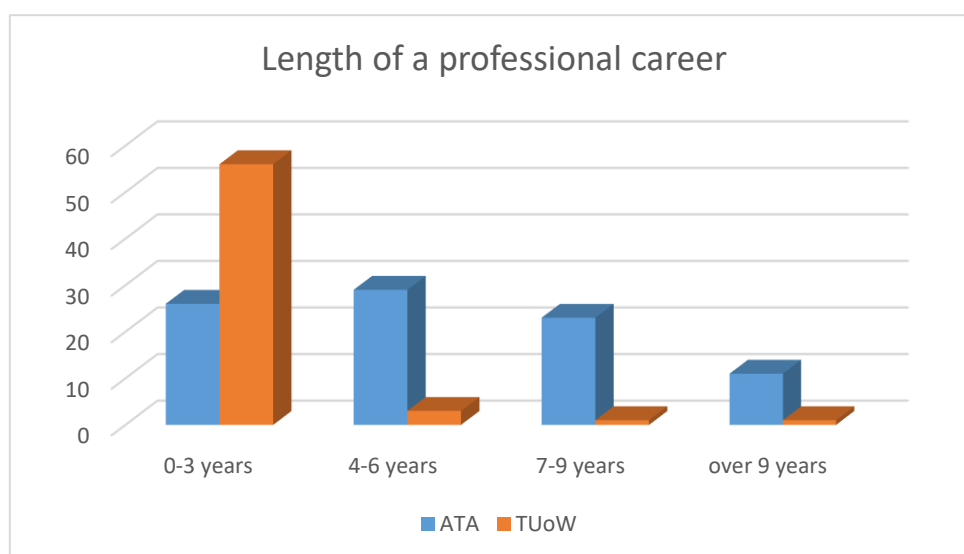


Figure 4. Length of a professional career by respondents.

Source: own research.

3.3. Research Methods

The study was quantitative and survey-based, utilizing a questionnaire method, and consisted of two stages. In the first stage, a literature review was conducted to provide a foundation for selecting the issues to be included in the questionnaire. Proper definition of the research topics was essential to ensure the reliability of the study.

The next stage involved administering a survey to the aforementioned research group using a computer-assisted web interview (CAWI) format. This method was chosen primarily due to facilitating anonymity, which may contribute to the reliability of responses and improve response rates. The advantages of this method also include its reach, the time required to conduct the study, and cost minimization.

The study employed methodological triangulation, primarily data triangulation—i.e., comparing research conducted across different populations and locations—such as two universities in Warsaw conducting studies in the field of Management and production engineering: the University of Ecology and Management in Warsaw (a private institution with a technical-artistic and management sciences profile, currently operating under the name of University of Technology and Arts in Applied Sciences in Warsaw, hereinafter referred to as ATA) and the Technical University of Warsaw (a public institution with a technical profile, hereinafter referred to as the TUW).

Additionally, comparisons were made with theoretical studies. To a lesser extent, researcher triangulation was used, as the study was conducted by two researchers.

Due to the sample selection and non-representative sample size, the study's results cannot be generalized to all students at higher education institutions in Poland. Nevertheless, the study provides new insights and can serve as an initial attempt at empirically verifying the awareness of students from all higher education institutions regarding sustainable development, their perceptions of the phenomenon of a sustainable higher education institution, and their expectations in this area. This is especially relevant given that the research questionnaire, due to its comprehensiveness, universality, and reliability, offers the potential for replication.

4. Research

The first question of the survey concerned students' awareness of what sustainable development is. A total of 146 students, representing 97.33% of the study sample, responded that they are aware of the concept of sustainable development. The remaining 2.67% of respondents answered this question negatively.

Among ATA students, 100% gave a positive answer to the question about their awareness of sustainable development, while 4 of TUW students (6,56%) responded negatively. The responses are presented in figure 5.

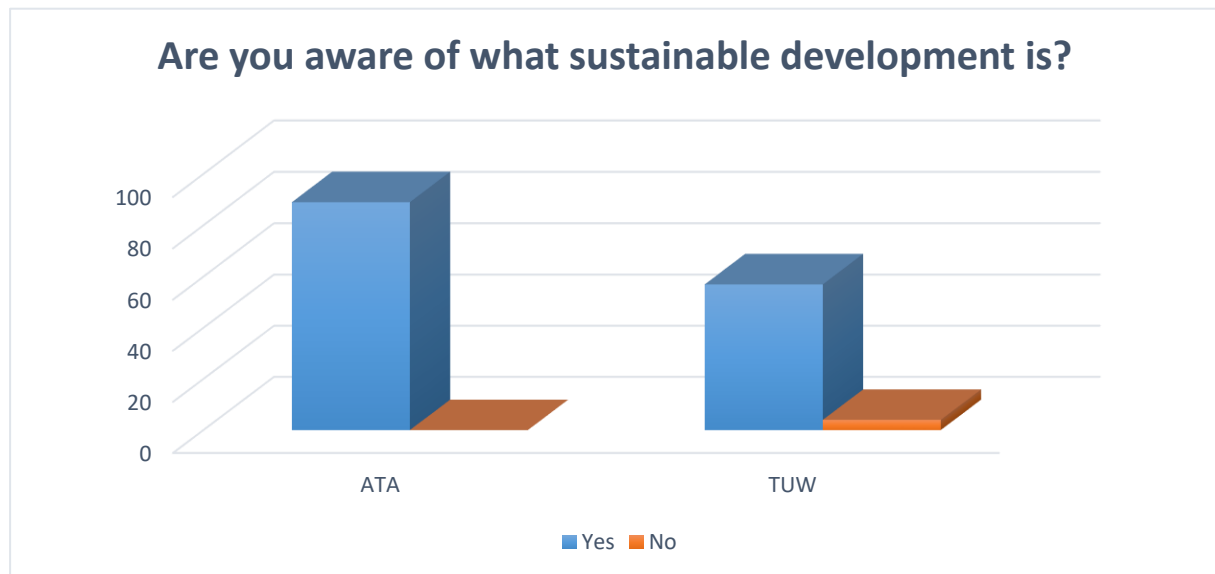


Figure 5. Students' awareness of sustainable development concept.

Source: own research.

Next, students were asked to indicate the characteristics they believe define a sustainable university. They could select any number of features from the list of responses:

- provides knowledge on sustainable development in courses not directly related to sustainable development,
- offers courses specifically on sustainable development,
- provides extracurricular activities that promote sustainable behaviors,
- offers a study program in "Sustainable Development",
- uses renewable energy sources,
- implements solutions aimed at saving water, heat and electricity,
- promotes sustainable waste management (sorting, recycling, reuse),
- promotes green mobility for students,
- promotes green mobility for employees,
- reduces the consumption of natural resources, including paper,
- encourages students to reduce their consumption of natural resources,
- encourages employees to reduce their consumption of natural resources,
- eliminates exclusion of people with disabilities among employees,
- eliminates exclusion of minorities among employees,
- eliminates exclusion of disadvantaged groups among employees,
- eliminates exclusion of people with disabilities among students,
- eliminates exclusion of minorities among students,
- eliminates exclusion of disadvantaged groups among students,

- eliminates exclusion of people with disabilities among prospective students,
- eliminates exclusion of minorities among prospective students,
- eliminates exclusion of disadvantaged groups among prospective students,
- promotes gender equality, minority rights and inclusion of disadvantaged groups within the organization,
- promotes high standards of environmental and social behavior through projects and initiatives,
- encourages charitable work and volunteer projects,
- implements projects aimed at social inclusion,
- provides scholarship programs for economically disadvantaged students.

Students provided answers grouped in Table 1.

Table 1.

Students' indication of characteristics of sustainable university

6. What do you think are the characteristics of a sustainable university?	ATA	TUW
Provides knowledge about sustainable development in classes not directly related to sustainability	44	25
Offers courses specifically on sustainable development	36	23
Provides extracurricular activities that promote sustainable behaviors	38	24
Offers a study program in "Sustainable Development"	10	6
Uses renewable energy sources	34	29
Implements solutions aimed at saving water, heating, and electricity	28	39
Promotes sustainable waste management (sorting, recycling, reuse)	30	45
Promotes green mobility for students	32	26
Promotes green mobility for staff	31	25
Reduces the consumption of natural resources, including paper	36	33
Encourages students to reduce their consumption of natural resources	24	29
Encourages employees to reduce their consumption of natural resources	22	25
Eliminates exclusion of people with disabilities among employees	18	30
Eliminates exclusion of minorities among employees	18	27
Eliminates exclusion of disadvantaged groups among employees	16	25
Eliminates exclusion of people with disabilities among students	20	28
Eliminates exclusion of minorities among students	16	23
Eliminates exclusion of disadvantaged groups among students	18	21
Eliminates exclusion of people with disabilities among prospective students	18	25
Eliminates exclusion of minorities among prospective students	18	22
Eliminates exclusion of disadvantaged groups among prospective students	16	18
Promotes gender equality, minority rights and inclusion of disadvantaged groups within the organization	20	27
Promotes high standards of environmental and social behavior through projects and initiatives	40	32
Encourages charitable work and volunteer projects	38	29
Implements projects aimed at social inclusion	38	18
Conducts scholarship programs for economically disadvantaged students	34	30

Source: own research.

The results were also visualized on the following figure. Firstly, ATA students identified the following as the most important characteristics of a sustainable university: "Provides knowledge about sustainable development in classes not directly related to sustainability" – 44 responses; "Promotes high standards of environmental and social behavior

through projects and initiatives” – 40 responses; “Provides extracurricular activities that promote sustainable behaviors”, “Encourages charitable work and volunteer projects”, “Implements projects aimed at social inclusion” each with 38 responses. The full set of ATA students responses is presented both in Table 1 as well as in figure 6.

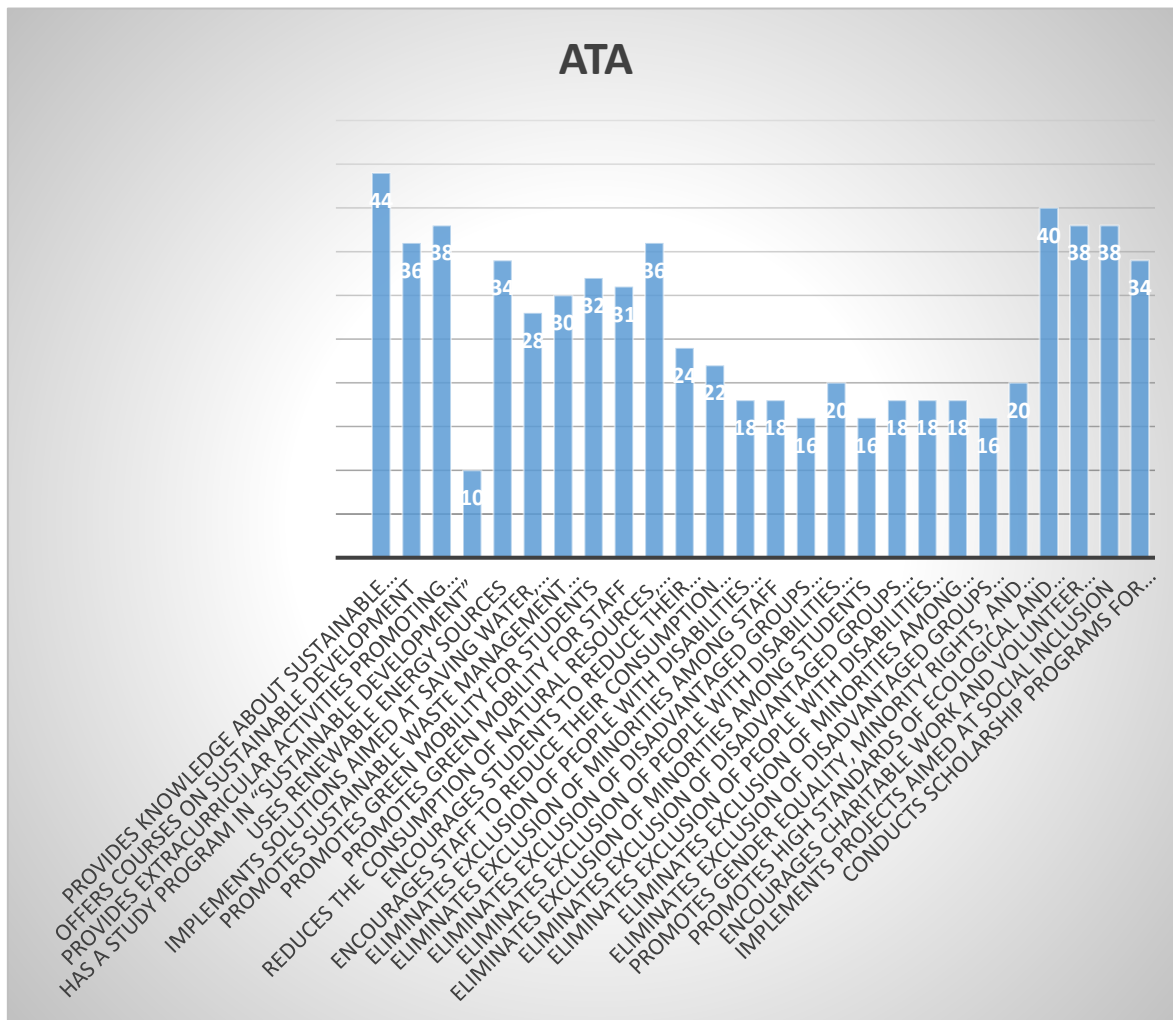


Figure 6. ATA students' indication of characteristics of sustainable university.

Source: own research.

At the same time TUV students provided highly different answers indicating “Promotes sustainable waste management (sorting, recycling, reuse)” – 45 responses, “Implements solutions aimed at saving water, heating, and electricity” – 39 responses, “Reduces the consumption of natural resources, including paper“ – 33 responses, one less response was provided to “Promotes high standards of environmental and social behavior through projects and initiatives” while 30 responses were approached to: “Eliminates exclusion of people with disabilities among employees“ and “Conducts scholarship programs for economically disadvantaged students”. The full set of TUV students' responses is presented both in Table 1 as well as in figure 7.

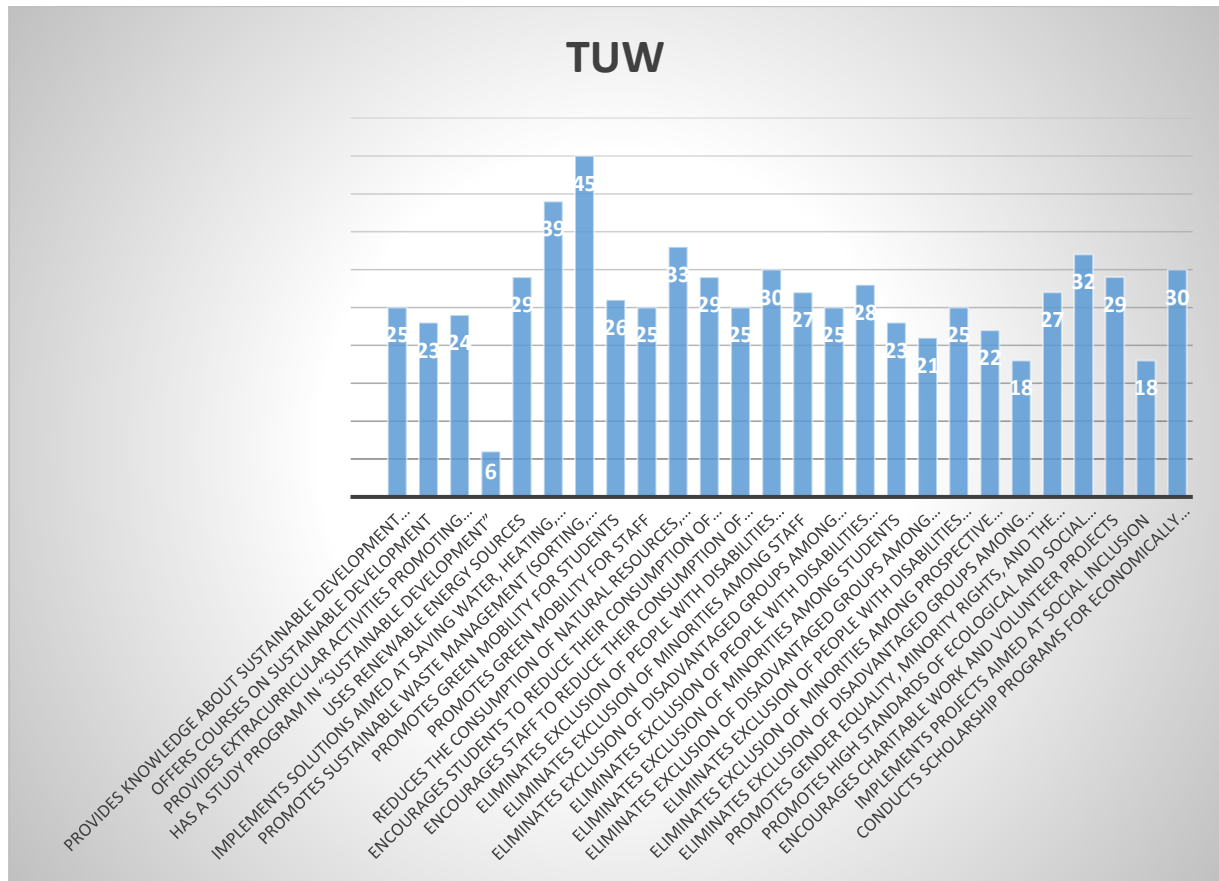


Figure 7. TUW students' indication of characteristics of sustainable university.

Source: own research.

Students of ATA and TUW indicated different characteristics they believe define a sustainable university. While Students of ATA provided more indicators of sustainable development of the university from the point of view curricular and non-curricular courses and classes provided by the university, students of TUW had more institutional approach to sustainable development of the university. For better visualization of the difference in responses between students of the two universities, two radar charts were introduced. Figure 8 presents ATA students' indication of most specified fields of sustainable university, while figure 9 TUW students' indication of most specified fields of sustainable university.

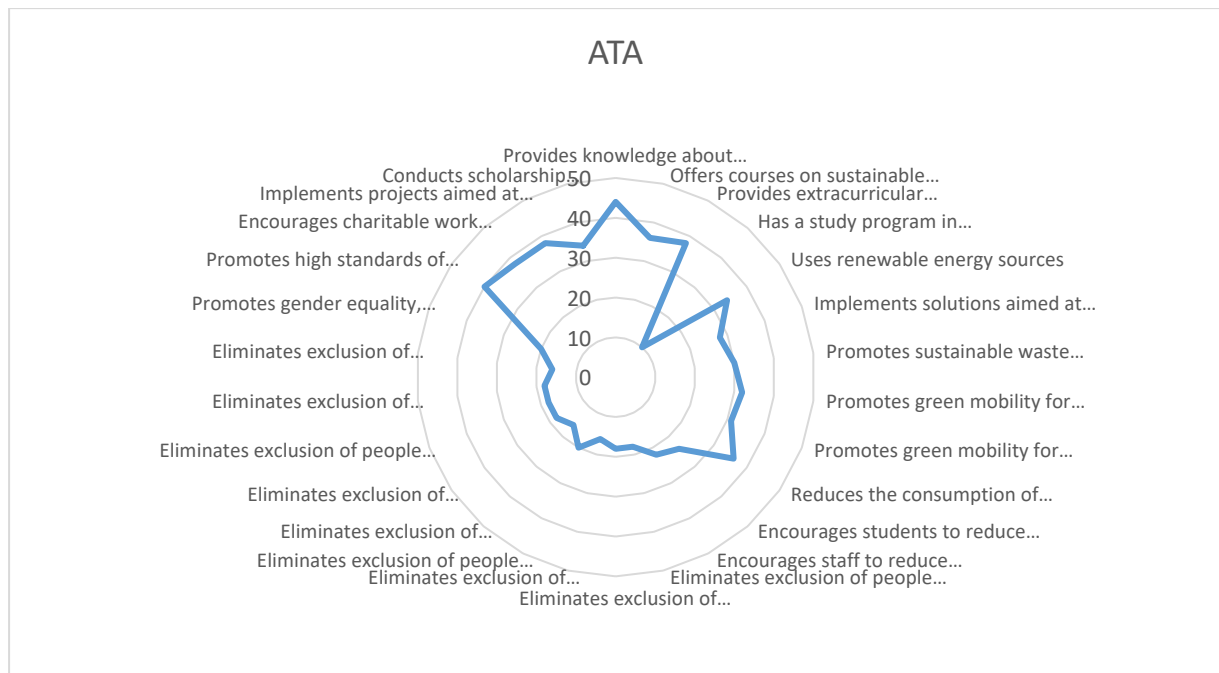


Figure 8. ATA students' perception of most indicated fields of sustainable university.

Source: own research.

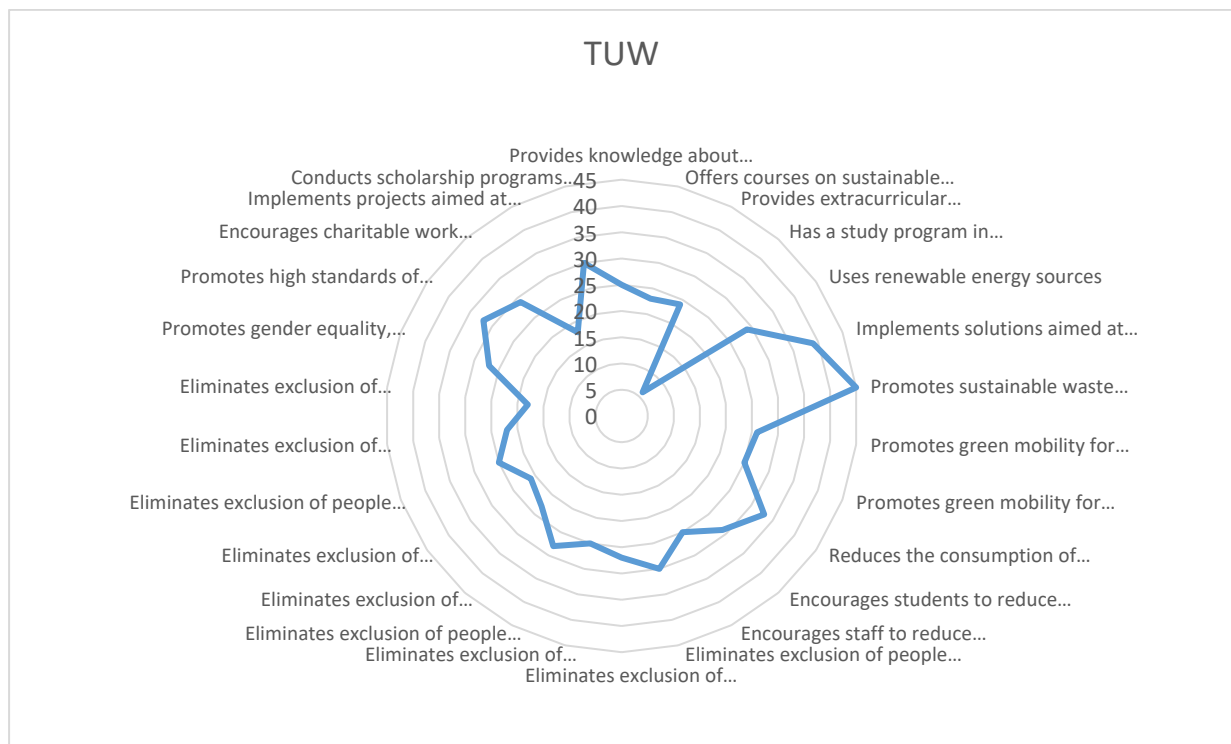


Figure 9. TUW students' perception of most indicated fields of sustainable university.

Source: own research.

The next question asked respondents to identify characteristics of sustainable development that are present at their own university. Once again, they could select any number of responses they deemed appropriate. The response options were the same as in the previous question.

ATA students most frequently selected: "Provides knowledge on sustainable development in courses not directly related to sustainable development" chosen by 34 out of 89 students, and "Promotes green mobility for staff" as well as "Conducts scholarship programs for economically disadvantaged students" which was selected by 26 students. Other characteristics received scattered selections, ranging from a dozen to 24 mentions. Notably, only one characteristic—"provides knowledge on sustainable development in courses not directly related to sustainable development"—aligned with WSEiZ students' vision of a sustainable university. Moreover, majority of characteristics of sustainable development university was not aligned to ATA by its students. A detailed breakdown of these characteristics is shown in Table 2 and figure 10.

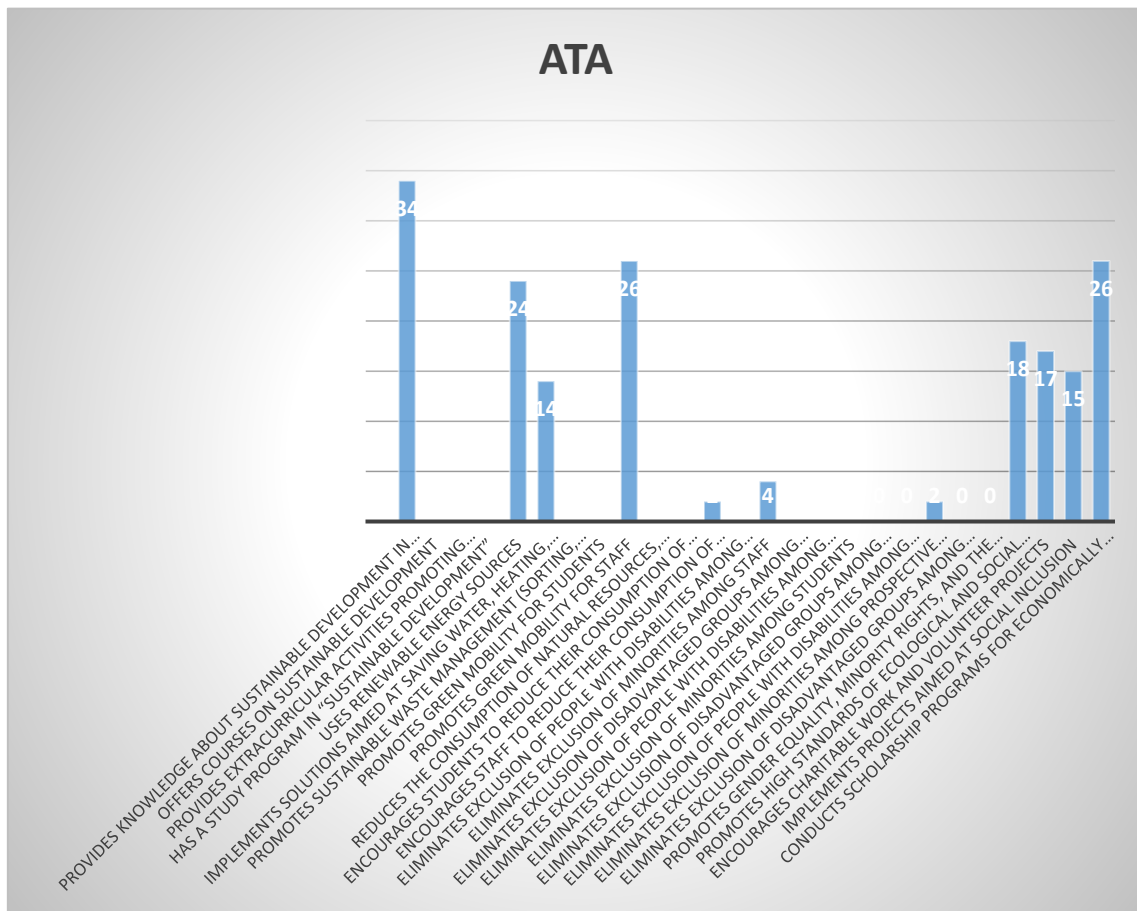


Figure 10. ATA students' specification of most indicated fields of sustainable university.

Source: own research.

Table 2.
Students' sustainability indications of their university

7. What characteristics of a sustainable university do you think WSEIZ possesses?	ATA	TUW
Provides knowledge about sustainable development in classes not related to sustainability	34	21
Offers courses on sustainable development	0	12
Provides extracurricular activities promoting sustainable behaviors	0	8
Has a study program in "Sustainable Development"	0	1
Uses renewable energy sources	24	11
Implements solutions aimed at saving water, heating, and electricity	14	14
Promotes sustainable waste management (sorting, recycling, reuse)	0	25
Promotes green mobility for students	0	10
Promotes green mobility for staff	26	6
Reduces the consumption of natural resources, including paper	0	15
Encourages students to reduce their consumption of natural resources	0	9
Encourages staff to reduce their consumption of natural resources	2	8
Eliminates exclusion of people with disabilities among staff	0	12
Eliminates exclusion of minorities among staff	4	15
Eliminates exclusion of disadvantaged groups among staff	0	16
Eliminates exclusion of people with disabilities among students	0	15
Eliminates exclusion of minorities among students	0	13
Eliminates exclusion of disadvantaged groups among students	0	12
Eliminates exclusion of people with disabilities among prospective students	0	14
Eliminates exclusion of minorities among prospective students	2	17
Eliminates exclusion of disadvantaged groups among prospective students	0	15
Promotes gender equality, minority rights, and the rights of disadvantaged groups within the organization	0	12
Promotes high standards of ecological and social behavior through projects and actions	18	13
Encourages charitable work and volunteer projects	17	18
Implements projects aimed at social inclusion	15	16
Conducts scholarship programs for economically disadvantaged students	26	29

Source: own research.

All the TUW students except two indicated different characteristics identifying a sustainable university than ATA students (figure 11 and Table 2). The only two similar appointed features were: "Provides knowledge about sustainable development in classes not related to sustainability" and "Conducts scholarship programs for economically disadvantaged students" which were also together with "Promotes sustainable waste management (sorting, recycling, reuse)" the most frequently chosen characteristic, with 21, 29 and 25 selections respectively. "Has a study program in "Sustainable Development"" was the least frequently chosen characteristics among TUW students. Remarkably, non of the features of sustainable development of the university of TUW was defined as non-existent.

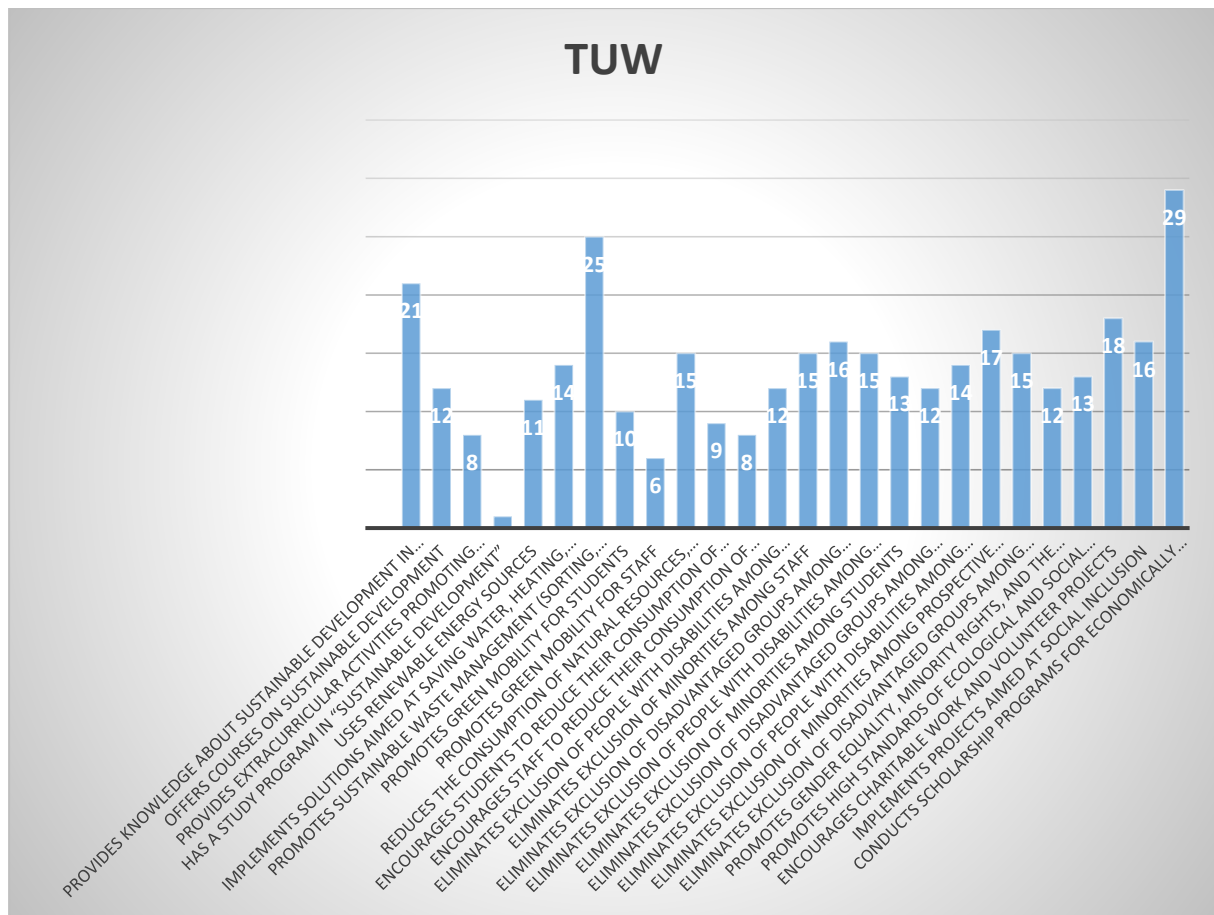


Figure 11. TUV students' specification of most indicated fields of sustainable university.

Source: own research.

The next question aimed to determine whether the universities surveyed provide their students with opportunities to engage in extracurricular activities, beyond the curriculum—such as social, charitable, organizational, and scientific activities—that help build sustainable development competencies.

45 out of 89 (50,56%) investigated ATA students indicated that the university does not provide such opportunities. Meanwhile, only 2 out of 51 responding students of TUV provided the same answer. Moreover, 44 out of 89 (49,44%) investigated ATA students indicated are unaware of these activities, while 18 of TUV respondents (30,51%) pointed out the same answer. None of ATA students are aware of opportunities to engage in extracurricular activities outside of the curriculum, including social, charitable, organizational, and scientific activities that build competencies in sustainable development. More than 66% of TUV students are aware of these types of activities (see figure 12).

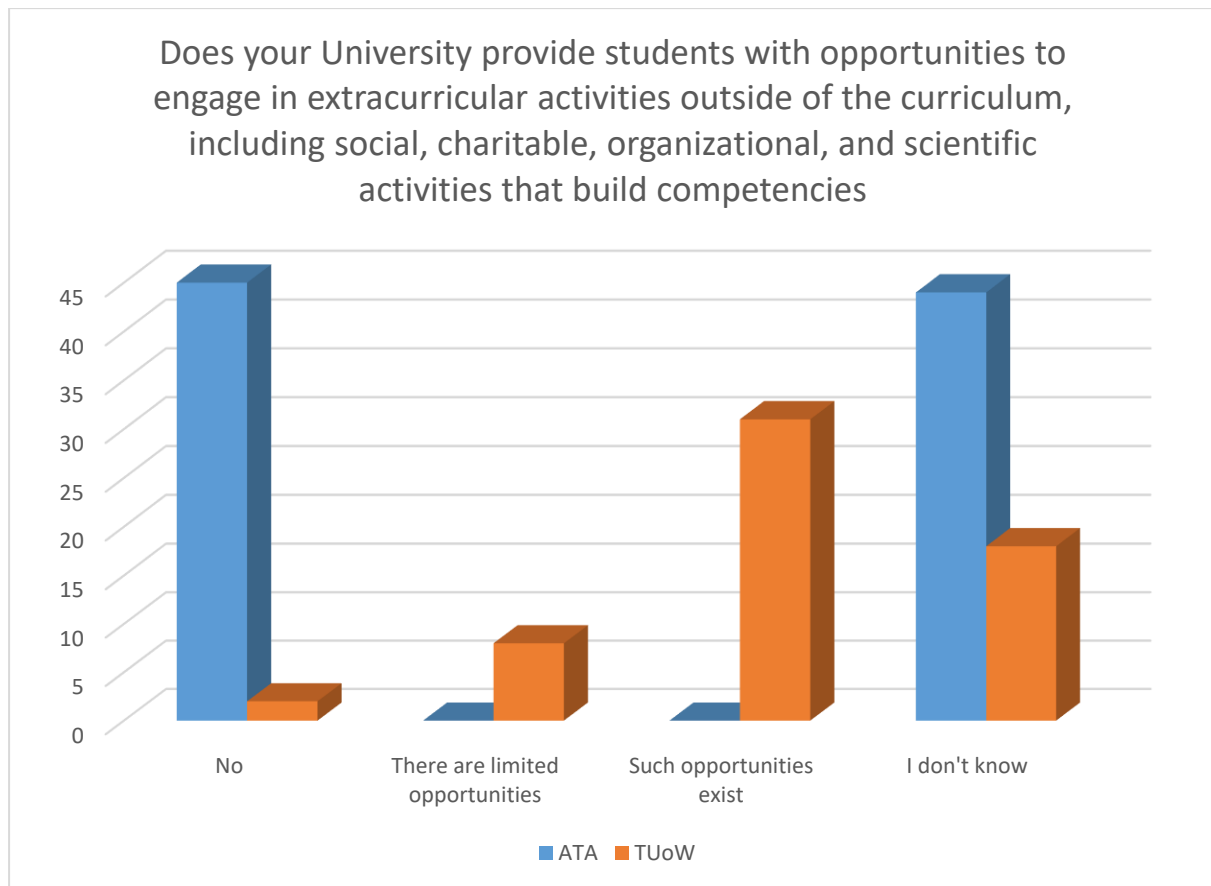


Figure 12. Students' awareness of opportunities to engage in extracurricular activities outside of the curriculum, including social, charitable, organizational, and scientific activities that build competencies in sustainable development organized by their universities.

Source: own research.

In response to the question of whether they participate in extracurricular activities, beyond the curriculum—such as social, charitable, organizational, or scientific activities organized by their university that build sustainable development competencies—100% of both ATA as well as TUW students answered negatively, as did 93% of Academy students (see figure 13).

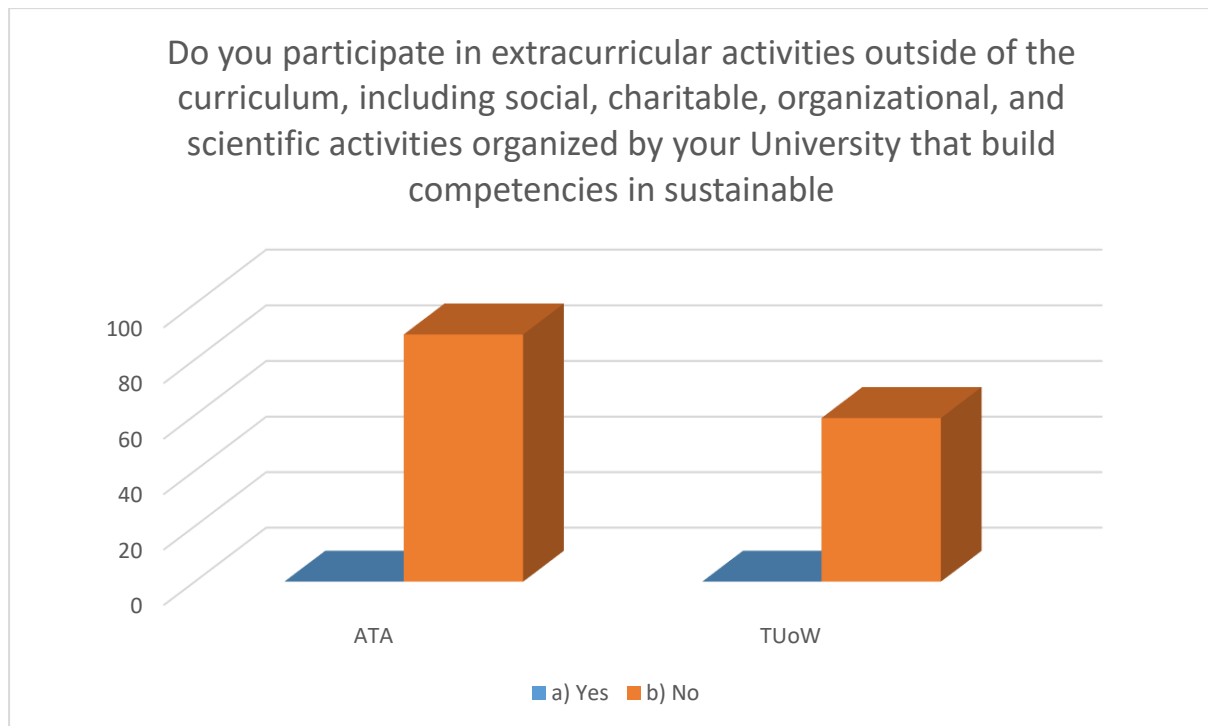


Figure 13. Participation in extracurricular activities building sustainable development competencies of students.

Source: own research.

Consequently, students of both universities did not appoint their motives of participation in such activities.

The next question asked which types of activities offered by their university students felt most effectively developing sustainable development competencies. The students of ATA did not appoint any. According to students from TUW, projects were the top choice, with 38 choices and workshops with 30. The detailed responses are presented in figure 14.

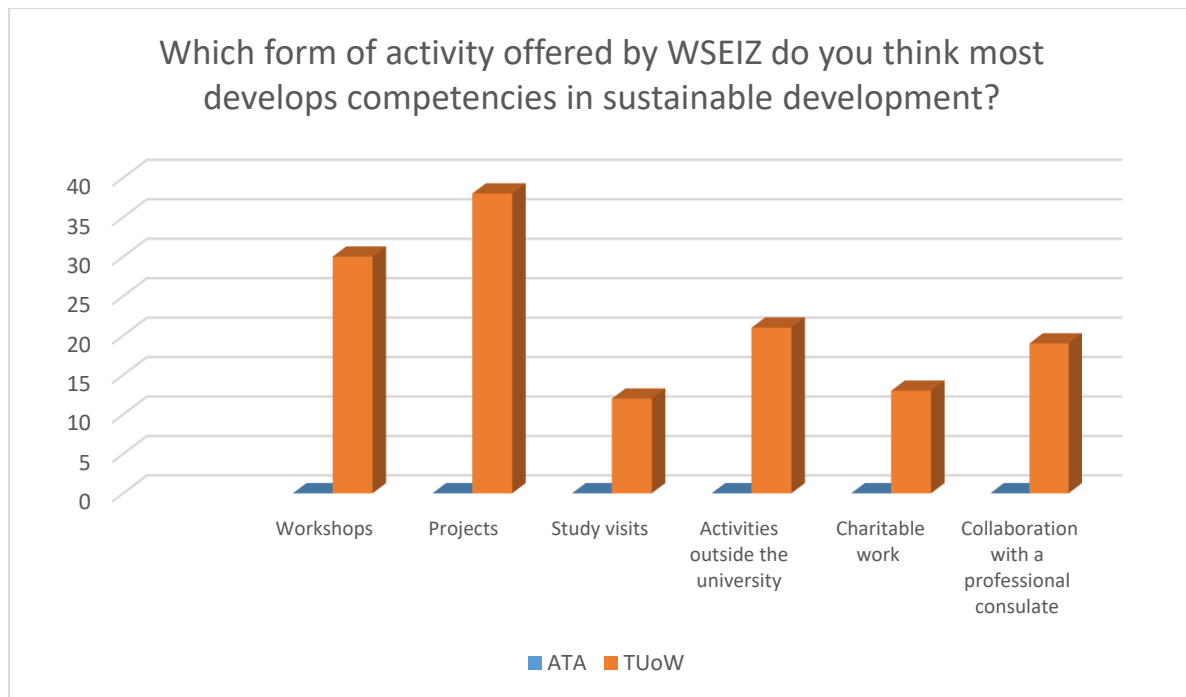


Figure 14. Types of activities offered by universities students felt most effectively developing sustainable development competencies.

Source: own research.

The final question asked how students plan to develop their competencies in sustainable development. Students from ATA and TUW prioritized participating in courses, training sessions, or workshops, with 46 and 34 students selecting this option, respectively. 43 students of ATA and 16 of TUW do not plan to develop their competencies in sustainable development. For detailed answers, see figure 15.

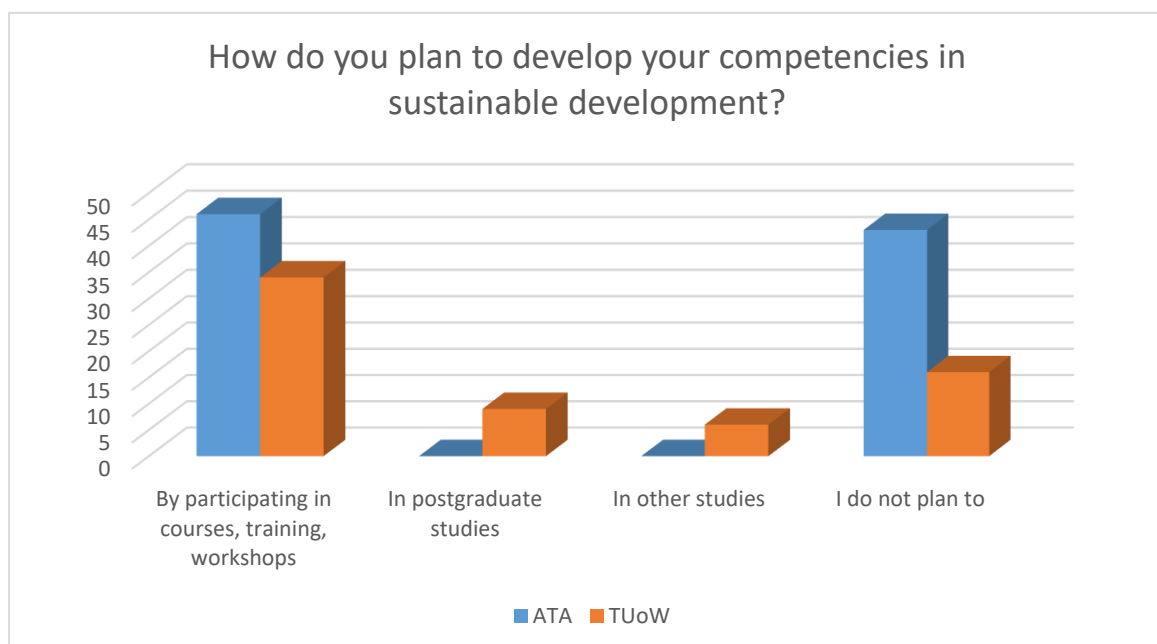


Figure 15. Students' plans to develop their competencies in sustainable development.

Source: own research.

5. Results and conclusions

The purpose of this study was to assess the awareness and expectations of university students from ATA and TUW regarding sustainable development at higher education institutions. The analysis focused on the students' perspectives. The study clearly revealed a high level of awareness among students on this topic, with 100% of ATA students and more than 93% of TUW students demonstrating awareness.

The surveyed students identified features they believe should characterize a sustainable university. Of the 26 proposed features, students from both Polish universities highlighted all of them with varied number of votes. The least score obtained a feature “Offers a study program in Sustainable Development”. These findings suggest a noticeable lack of program solely dedicated to sustainable development neither as major or minor in none of the surveyed universities.

Moreover, the students of the same major of two different universities, perceive their higher education institution completely different in terms of sustainable development. Students of TUW, firstly see the university as any other institution (apart from educational mission) that cares about ecology and their internal and external stakeholders. While the students of ATA primarily perceive their university as sustainable developed institution through the prism of the program of studies.

The most surprising finding was no participation in extracurricular activities and initiatives among both Polish universities' students. These activities, which include social, charitable, organizational, and scientific endeavors, are essential for developing sustainable development skills find no interest among surveyed students.

The study thus suggests that, the Polish surveyed universities still incorporate considerably fewer sustainable development topics in their curricula and organize limited extracurricular activities to support these competencies. Nevertheless, overall students' awareness of the concept of sustainable development is considerably high and highly satisfactory. Considering the current labor market and the growing demand for sustainability specialists in Poland, Polish universities could benefit from implementing a model based on a holistic approach to sustainability education, integrating these topics widely across educational programs and fostering the development of practical skills in this critical area. That approach could be reached by including the business environment entities as well as by introducing micro-credentials to the program of studies.

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TO BE BETTER – ANOTHER STEP ON THE WAY TO MORE EFFECTIVE IMPLEMENTATION STRATEGY AT UNIVERSITIES

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Purpose: The main objective of the study is to verify the relationship between the factors influencing the strategy implementation process, the degree of achievement of strategic goals (as a measure of the effectiveness of the strategy implementation) and the strategic approach.

Design/methodology/approach: Standardized research questionnaire was used. 152 universities in Poland were subject to the study. The research sample included public and private universities

Findings: At the outset, it should be noted that among the studied sample, the largest number of universities is characterized by an adaptive 36% and a classic 31% strategic approach. In turn, the visionary approach is characteristic of 20% of universities, and the shaping approach to the strategy - only 13%. In the case of the classic approach to strategy, almost 75% of respondents indicated that the level of implementation of strategic goals is at the level of 25 to 74%. However, none of the respondents indicated the level of achievement of the goals at the level of 75 to 100%, which confirms the well-known statements about the variability and unpredictability of the environment of modern universities.

Originality/value Due to the increasing variability and unpredictability of the environment of contemporary universities and the relatively large number of publications examining the barriers to strategy implementation at universities, it seems that the verification of the relationships between the factors influencing the strategy implementation process, the degree of achieving strategic goals or the strategic approach may increase the percentage of effectively implemented strategies at universities. The article presents the detailed results of the analysis of a questionnaire survey covering the management staff and employees influencing the implementation of the strategy at universities.

Keywords: Higher education, university, strategy, strategy implementation, strategic management.

Category of the paper: Research paper.

1. Introduction

Over the past decades, universities across Europe have undergone a series of profound changes. Due to the specific nature of an institution such as a university, these changes are particularly interesting, and the results of the activities carried out are often even surprising. The literature on the subject also emphasizes the variability, unpredictability and turbulence of the university's external environment, as well as the influence of stakeholder groups. It is indicated that these pressures significantly influenced the management of contemporary universities. It seems reasonable to quote here the words of Bisbee & Miller: "The challenges faced by higher education institutions are becoming larger and more complex and require a continuous line of leaders who can make the changes needed for sustained performance" (Bisbee, 2015). There are also widespread opinions that modern universities are developing a disturbing imbalance with their environment. Often struggling with a significant overload of requirements and a shortage of rapid response capabilities. Traditional university management models, in which collegial decision-making plays an important role, are considered outdated and completely mismatched to the changing environment. The increase in competitiveness, globalization or the influence of the knowledge-based economy also have a significant impact on the management of modern universities. This new dimension of reality forces universities to develop and effectively implement future development concepts. In the light of the above considerations, numerous attempts to change this weak situation can be observed both in the literature on the subject and in the management of the contemporary university. There are numerous empirical as well as theoretical publications (Siegel et al., 2015; Holstein et al., 2016; Deem, 2007; Rothaermel et al., 2007; Buckland et al., 2009) showing that modern universities are moving towards strategic management based on planning, formulation, implementation of strategies and control of implemented activities. In the light of the conducted research, however, it should be emphasized that there is a huge gap between the empirical research conducted in the area of universities and the implemented activities in the real world. As, for example, Taylor & Machado note: this disconnection undermines the ability to formulate effective strategies for their conceptual understanding in terms of how they can be more effective (Taylor et al., 2006).

In the light of the considerations, it seems justified to deepen the research in the presented area in order to propose measures to increase the percentage of successfully implemented strategies at universities. The subject of this study is to verify the relationship between the factors influencing the strategy implementation process, the degree of achievement of strategic goals (as a measure of the effectiveness of the strategy implementation) and the strategic approach. The study used the method of collecting data in an open (explicit) and standardized way. For this purpose, a standardized research questionnaire was used. 152 universities in Poland were subject to the study. The research sample included public and private universities.

2. The necessity to use strategic management at universities

When analyzing the literature on the subject, it can be stated that today when referring to the concept of management, it most often refers to strategic management. Due to the fact that nowadays the concept of strategic management at universities is grossly overused, for the purposes of this study, it was decided to quote a definition that will be the basis for further considerations. Therefore, strategic management is understood as a comprehensive process consisting of many elements that must effectively interact and function together. These elements include (but are not necessarily limited to) institutional culture, strategic planning, leadership, institutional research, resource allocation, financial, personnel and human resource management, leadership, research and academic activities, and considering the needs of its stakeholders, including: in students, employees or companies.

Over the last decades, not only in Europe, but also around the world, a number of changes have been observed, which, to a different extent and with a different frequency, are subject to universities. The need to strengthen the role of universities in shaping the knowledge-based economy (Mosey et al., 2012; Chapple et al., 2012; Rasmussen et al., 2007) the need for commercialization of scientific research (Rothaermel et al., 2007) and (Rasmussen et al., 2015), the development of multidisciplinary institutes (Mosey et al., 2012), and (Mitchell et al., 2010), (Graham et al., 2006; Wilson et al., 2011; Rabin et al., 2015) or the transfer of university technologies (Chapple et al., 2012) are just some of the aspects influencing the change of expectations towards modern universities. Not without significance is also a marked increase in competition on the market of educational services, globalization, or the need to take into account the needs of university stakeholders in the management process. In light of the above, it is indicated that goal-oriented strategic management is of key importance for the success of the university. In the case of universities, it is also important to act in the field of education, research as well as the mobility of employees and students (Bakoğlu et al., 2016). It is well known that the effective implementation of the strategy is of key importance for the development of any organization. Although the literature on the subject is rich in works on strategic management (Buckland et al., 2009) and (Boyce et al., 2008; Sager, 2009; Etzkowitz, 2015) in universities, as well as methods or tools to support this process, there are still numerous examples of universities in the presented area that were not able to implement their strategic plans. It is indicated that this is largely due to inappropriate implementation of the strategy. The problem with the implementation of future development concepts is closely related to the fact that it covers a wide range of issues. It is usually very difficult for management to take into account all the elements, and also requires considerable knowledge and experience in the presented area. The management focuses only on selected aspects, which unfortunately fails in many cases. Because, as Segatto, de Padua, & Martinelli point out, the implementation of the strategy must be a holistic system, focused on the integration of individual components.

(Segatto et al., 2013) Ferlie, on the other hand, emphasizes that in most universities the strategy is formalized systematically by more and more professional management (Ferlie et al., 2008), however, in many cases it leads to a "quasi-strategy" (Buckland, 2009).

In the light of the considerations, it should be noted that despite numerous research works, the area of strategic management in universities is still characterized by a research gap. As it has been shown, the percentage of successfully implemented strategies in universities is very low, and the very process of strategy implementation in universities still requires improvement. Therefore, there is a justified necessity and need to study the entity which is the university, as well as to study the relationships between the factors influencing the process of strategy implementation, the degree of achievement of strategic goals and the strategic approach.

3. Operational risk in strategic management

3.1. Method

The considerations presented above indicate the legitimacy of considering the issue of factors influencing the strategy implementation process at universities. Therefore, it is indicated that the analysis of factors should be included in individual stages of the strategy implementation process at universities. This analysis was the basis for the conducted research. Their main goal was to test the relationship between the occurrence of individual factors influencing the strategy implementation process at universities, the degree of achievement of strategic goals (as a measure of the effectiveness of the strategy implementation) and the implemented strategic approach. Due to the nature of the data, testing of these relationships was performed using a difference test and a correlation test.

In the light of the research conducted, the author of this paper would like to draw attention to a significant phenomenon, also articulated in the literature on the subject, referred to as "execution holes". It is still effectively implemented, for reasons that seem irrational, i.e. impossible to explain by the heuristic of behavior or any economic law (Powell, 2004). As J. Radomska rightly points out, in such a case it should be taken into account that the nature of the implemented development concept also has an impact on the implementation of the strategy. This element determines the very process of the strategy implementation, its scope, course and intensity of the influence of factors supporting or hindering the implementation of the adopted development concepts (Radomska, 2014). In the light of the above considerations, it should be noted that the conducted research, in addition to the analysis of the factors influencing the strategy implementation process in universities, will also concern the analysis of the nature of the strategy itself as an element determining not only the way of using resources,

but also the aggressiveness of the actions taken, as well as the comprehensiveness and scope of necessary analyzes. This is confirmed by the results of research showing that the type of the implemented strategy can be treated as a determinant of the achieved results and a factor influencing the competitive position of the organization (Angel, 2008).

With regard to the research objective described above, two research hypotheses have been formulated, which are as follows:

1. There is a relationship between the presence of specific factors influencing the strategy implementation process at universities and the degree of achievement of strategic goals.
2. There is a relationship between the degree of achievement of strategic goals at universities and the implemented strategic approach.

The hypotheses described above were tested as a result of the research. The research methodology adopted the concept of Dorminey and Mohn according to which a descriptive scale and risk assessment in terms of likelihood and impact should be applied to the risk analysis (Dorminey et al., 2007). The probability has been defined as: 1 - very unlikely, 2 - unlikely, 3 - medium probability, 4 - probable and 5 - almost certain.

In turn, the strength of the impact was determined: 1 - very low impact, 2 - low impact, 3 - medium impact, 4 - high impact and 5 - very high impact. The risk level was calculated as the product of the likelihood of a given factor occurring and the impact assessment (Dorminey et al., 2007).

The starting point for the conducted empirical research was an in-depth analysis of the literature on the subject, mainly research areas concerning factors influencing the process of strategy implementation and strategic management at universities¹. The result of this analysis was the preparation of a research tool in the form of a questionnaire consisting of three parts. It was the basis for the research. The study was conducted using the PAPI (Paper and Pencil Interview) technique, based on a research questionnaire. The first part concerned the definition of the implemented strategic approach. On the other hand, the second section includes questions concerning the determination of the strength of influence and the probability of 113 factors influencing the strategy implementation process.

Variables determining the significance of a given factor influencing the process of strategy implementation at universities were defined using an ordinal scale. The aim was to obtain information on the factors influencing the strategy implementation process at universities in Poland and the probability of their occurrence in the surveyed organizations. The degree of achievement of strategic goals was also distinguished using an ordinal scale.

The reliability and reliability of the measurement scales was verified by calculating the Cronbach's alpha reliability coefficient for aggregated measures. Due to the fact that the value of the coefficient is 0.93 (Hair et al., 2006), the measurement tools used can be considered reliable.

¹ The web of science database, Elsevier, was analyzed in the years 2007-2024, using keywords: strategic management in universities, risk of strategy implementation, strategy implementation factors.

As it has already been mentioned, the research aimed at identifying the interrelationships between the occurrence of individual factors influencing the strategy implementation process at universities, and the degree of achievement of strategic goals (as a measure of the effectiveness of strategy implementation) and the strategic approach. A closer description is presented below, adopted as the basis for the conducted analyzes. The first area of research was related to the effectiveness of the strategy implementation process defined by the degree of achieving strategic goals. It is presented on a scale from 1 to 5, where:

- 1 - Means a very low probability (5%),
- 2 - Unlikely (25%),
- 3 - Moderately likely (50%),
- 4 - Probable (75%),
- 5 - Almost certain (90%).

In the next stage, the data was grouped. The second of the specified areas concerned the implemented strategic approach. The research was based on the questionnaire proposed by Reeves, Haanaes and Sinha (Reeves et al., 2015). The proposed concept makes it possible to forecast changes in the environment, both internal and external (determining how much in advance and with what detail it is possible to forecast the results of the organization, competition dynamics, market expectations and demand) as well as the ability to influence them (determining susceptibility to influences, i.e. the degree of impact to the above factors). Respondents were asked to identify one of the statements that best describes the current strategy implementation practices, the approach to the strategies they intend to implement, and the perception of the university environment. It was assumed that two out of three indications for a specific strategic approach will allow the classification of a university to one of the five specified types (their characteristics are presented below):

- Classic - a university is able to predict changes in the environment (the environment is stable), however, it cannot influence them. This approach is based on the classic method of creating and implementing a strategy, assuming a planning approach and the use of quantitative forecasting methods in subsequent stages of planning.
- Adaptive - a university cannot predict changes in the environment and cannot influence this environment. This requires universities to react quickly to the diagnosed changes and experiment with the implemented strategy. Close integration between operating activities is essential and the implemented development concept, subject to constant modification.
- Visionary - a university has the ability to predict and influence changes in the environment, which gives the opportunity to shape new consumer and market needs. This approach is characterized by the possibility of achieving bold strategic goals. However, the necessity to follow the chosen course and the willingness to engage the necessary resources in the activities is indicated.

- Formulating - a university cannot predict changes in the environment, but it can influence them. Shaping the market situation enables universities to maximize benefits and increase their competitive advantage. This approach is based on short-term planning and the flexibility of the organization.
- Renewing - an approach characteristic of universities which, due to their weak competitive position, are first forced to undertake actions to overcome the crisis situation, and only in the next steps can they allow themselves to choose a different strategic approach. As a rule, this approach is defensive in nature, primarily focusing on cost reduction and capital protection. In the initial phase, the university implements a short-term strategy whose main goal is survival. After the end of the crisis phase, there is a transition to a long-term strategy.

The third area of research concerned factors influencing the strategy implementation process. The respondents were asked to assess the impact and probability of occurrence of each of the 113 factors classified under three areas: strategy, management and employees, taking into account the four stages of the strategy implementation process: planning, formulation, implementation, and control and monitoring. These areas have been specified on the basis of the adopted research concept based on the assumptions of the aforementioned EFQM model and taking into account the results of pilot studies carried out in universities in Poland. An in-depth analysis of the literature on the subject showed the application value of the EFQM model from the point of view of the strategy implementation process, because the presented model contributes to the integrative development and implementation of the development concept (Revuelto-Taboada et al., 2011). In addition, it should be noted that the analysis of many research studies on the strategy implementation process allowed to identify areas, also included in the EFQM model, which the author of this paper considered the most important from the perspective of the strategy implementation process, i.e. strategy, management and employees. Additionally, each of the categories has been divided into four stages of the strategy implementation process: planning, formulation, implementation as well as control and monitoring.

From the specified areas and stages of the strategy implementation process, a set of factors constituting its components was developed. The presented factors are treated as formal indicators (determinants of a complex phenomenon), and thus building elements of the presented concept. The table presenting the individual factors influencing the strategy implementation process was presented and discussed in detail in our previous work, it was also an element of the questionnaire.

In the first stage of the quantitative study, the method of collecting data in an open (explicit) and standardized manner was used. For this purpose, a standardized research questionnaire was used. 152 universities in Poland were subject to the study. The research sample included various universities, both public and private. The sample size was determined taking into account the constraints associated with the implementation of the study (difficult availability of people in

managerial positions in universities, responsible for the implementation of the strategy). The research sample accounted for 43% of the population. The list of universities in Poland prepared by the Ministry of Education and Science was used as the survey². The website contains an up-to-date and complete list of both public and private universities in Poland.

The study used the stratified random method, based on dividing the statistical population into subsets, which were distinguished on the basis of features significant for the study. This results in the division of the frame into quantitatively and qualitatively different parts. The drawing of research units within individual subgroups was simple, which means that each unit within a given stratum had the same probability of being found in the sample. Due to the fact that direct drawing of independent samples is performed within each layer in a manner that is separate from the other layers (the set is exhaustive, which means that each element is included in one of the layers). Based on the calculations made for the significance level specified at the level of $\alpha = 0.05$, the level of the presumed maximum fraction error in the main part of the study was set at a level close to 0.1%.

The subject of the study were factors influencing the strategy implementation process, the effectiveness of the strategy implementation process (expressed by the degree of achievement of strategic goals) and the implemented strategic approach. In the next stage, statistical tools were used to analyze the obtained values. The research sample was selected in a disproportionate way. This means that the sample structure does not reflect the general population. Thus, in order to compensate for the inhomogeneous probabilities of the population units entering the sample, the sample weighting was performed. The decrease in the share of the smallest higher education layers was due to their dominance in the population. The respondents in the study were people holding managerial positions who have an impact on the strategy implementation process in universities in Poland.

When summarizing, it should be pointed out that the literature on the subject lacks research results concerning the relationship between a specific type of strategy implemented at universities and the achieved result (Salavou, 2010). There is a certain discrepancy in the presented area, as some researchers argue that the implementation of one classic strategy positively influences the results achieved by the organization (Thornhill et al., 2010). On the other hand, other authors emphasize that combining several development concepts may result in a significant improvement in business results. The analysis of the research on the strategy implementation process allowed for the specification of the areas classified in the EFQM model as the potential category, i.e. those having the greatest impact on the process of implementing development concepts. One can indicate here: management (leadership), employees or strategy (Radomska, 2014). In each of the presented areas, the factors that are its components have been specified.

² <https://www.gov.pl/web/edukacja-i-nauka/szkolnictwo-wyzsze>, 13.11.2023.

3.2. Result and discussion

In order to test the first of the formulated hypotheses, assuming the relationship between the presence of factors influencing the strategy implementation process at universities and the degree of achieving strategic goals, a number of analyzes were carried out, the results of which are discussed in detail later in the study. In the first stage of the research, the overall level of risk was analyzed, broken down into individual target achievement ranges. The level of operational risk was calculated as the product of the average probability of occurrence and the assessment of the impact of all operational risk factors. Figure 1 shows the results obtained for universities in Poland.

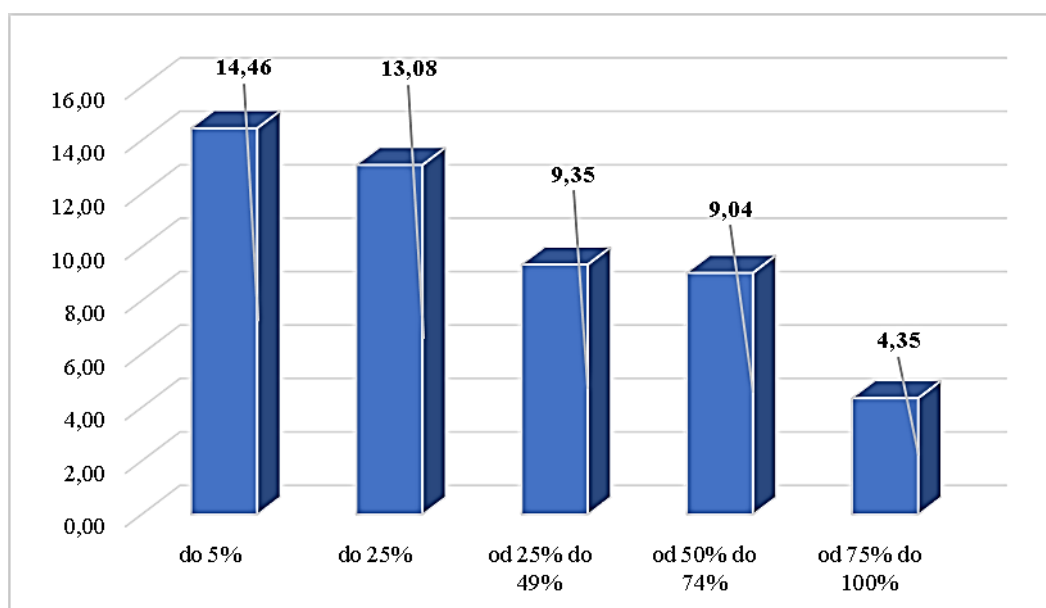


Figure 1. Operational risk level in individual achievement ranges complex strategic goals at universities.

Source: Own study.

The analysis of Figure 1 allows for the observation of a certain regularity indicating a decrease in the level of operational risk with a simultaneous increase in the percentage of goals achieved. In the light of the above, it seems that it can be assumed that those universities that demonstrate greater effectiveness in achieving the assumed goals feel less threatened by operational risk factors. This may be related to the elimination and elimination of the negative impact of risk factors, resulting, inter alia, from greater awareness of their existence among universities.

The correlation between the overall level of risk and the degree of achievement of strategic goals was also calculated. The result is presented in Table 1.

Table 1.

Correlation between the overall level of operational risk and the degree of achievement of strategic goals at universities

	The degree of achievement of strategic goals and the level of operational risk (total average)
Pearson's correlation	0,456**
Significance (two-sided)	0,000
N	152

Source: Own study.

The average level of correlation in the case of universities indicates the existence of the assumed correlation and allows for a positive test of the research hypothesis (Hypothesis No. 1).

In the next stage, an analysis of the correlation between the degree of achievement of strategic goals at universities and the probability and assessment of the occurrence of risk elements, broken down by individual factors, was performed. The obtained results indicate the lack of a statistical correlation with an average strength of the relationship between the degree of achievement of strategic goals and the probability of occurrence of individual risk factors ($r = 0.156$). On the other hand, there was a statistical correlation between the degree of achievement of statistical goals and the assessment of significance ($r = 0.611$).

Table 2.

Correlation between the degree of achievement of strategic goals and the probability and assessment of the occurrence of the factor at public and private universities

		Universities	
		Risk factors - probability	Risk factors - assessment
The degree of implementation of strategic goals	Pearson's correlation	0,156	0,611
	Significance (two-sided)	0,054	0,000
	N	152	152

Source: Own study.

Interesting results were obtained by analyzing the relationship between the degree of achievement of strategic goals and the assessment of the impact of risk factors. Significantly statistically positive correlations were found ($r = 0.626$). The obtained results allow to conclude that in the case of universities, an increase in the assessment of the impact of individual factors on the failure to implement the university's strategy translates into an increase in the degree of implementation of strategic goals. Therefore, it can be concluded that being aware of the high impact of operational risk factors may be used to take actions aimed at reducing it.

In order to obtain more detailed relationships, the correlations between the level of achievement of strategic goals and the areas and stages of operational risk were calculated. The results are presented in Table 3.

The specified correlations are moderate. On the other hand, a positive correlation indicates that with the increase in the level of risk, the degree of achievement of strategic goals increases, which seems to be a quite surprising result. These dependencies are characteristic of the stages:

formulation and implementation of strategies, described in the literature as the most problematic. Therefore, it can be concluded that the management staff of universities is fully aware of the numerous difficulties occurring in these stages of the implementation process, and the higher probability of the emergence of risk factors does not adversely affect the possibility of a satisfactory implementation of development concepts in the indicated areas, management and employees. In light of the above, it seems justified to consider the most sensitive area: management (stages: formulation and implementation of the strategy) and the area: employees (stage: implementation).

Table 3.

Correlations between the level of operational risk for the areas and stages of the strategy implementation process and the degree of achievement of strategic goals at universities

Areas	Stage	Universities		
		Pearson's correlation	Significance (two-sided)	N
Strategy	Planning	0,222	0,510	152
	Formulating	0,469	0,106	152
	Implementation	0,555	0,121	152
	Control and monitoring	0,970	0,155	152
Management	Planning	0,959	0,141	152
	Formulating	0,652	0,008	152
	Implementation	0,5768	0,015	152
	Control and monitoring	0,201	0,702	152
Employees	Planning	0,760	0,136	152
	Formulating	0,767	0,233	152
	Implementation	0,570	0,033	152
	Control and monitoring	0,201	0,702	152

Source: Own study.

In the opinion of the authors of this paper, the obtained results can be considered interesting, as it would seem that the most critical stages of the strategy implementation process at universities in the area of management and employees are slightly more controlled and measured than, for example, those related to the strategy at all stages of the process. Its implementation. The analysis of the obtained results allows us to accept the research hypothesis only partially.

The second of the proposed hypotheses assumed that the existence of the relationship between the degree of achievement of strategic goals and the strategic approach implemented would be checked at universities. In order to verify the hypothesis, the Kruskal-Wallis difference test was performed for independent samples, which showed the significance level at the level of 0.000. The results are presented in Table 4.

Table 4.

Comparison of the degree of achievement of strategic goals at universities implementing different strategic approaches

Tested variables	Significance level
The degree of achievement of the statistical goals and the implemented strategic approach	0,000*

Source: Own study.

The obtained value of the significance level allows to state that the degree of achievement of strategic goals and the implemented strategic approach are related. In the light of the above, one can accept the hypothesis. Due to the fact that both variables were not nominal, we cannot talk about the direction of this relationship. Interesting, however, is the existence of significant differences.

When analyzing the data, it can be concluded that for the visionary strategy, the average level of achievement of goals, between 50 and 74%, at the level of 77%, and 13% of indications for the highest level from 75% to 100% and the level from 25% to 49%. The lowest number of indications in the visionary strategy was recorded by the lowest target achievement level of 6%. In the light of the obtained results, it can be concluded that the level of achievement of the objectives is high, which is a somewhat surprising result. It is worth recalling here that this type of strategic approach is based on anticipating and initiating changes in the environment.

When analyzing the results obtained for the classic strategic approach, it can be seen that 60% of respondents indicate the level of achievement of goals between 25% and 49%. A very high level of achievement of the goals was indicated by 15% of the respondents from 50 to 74%. Interestingly, none of the respondents indicated the achievement of goals at the level of 75 to 100%, which seems to be an extremely disturbing result. Considering the fact that the basis of this approach is to conduct a detailed strategic analysis and careful planning aimed at predicting changes in the environment, the obtained results confirm the well-known statements about the variability and unpredictability of the environment of contemporary universities.

When analyzing the results obtained for the shaping strategic approach, it can be concluded that the level of achieving goals in this approach is much lower than in the case of previous approaches. Interestingly, none of the respondents indicated the implementation of strategic goals at the level of up to 25% and from 25 to 49%. In turn, the highest level of implementation of strategic goals was indicated by 30% of respondents.

The adaptive strategic approach was indicated by the largest number of respondents. The lowest level of implementation of strategic goals was indicated by as many as 70% of respondents. On the other hand, only 12% of respondents indicated the average level of implementation of strategic goals and 3% each for the achievement of goals at the level of 50 to 74% and 75-100%. The obtained results should not be surprising, as there is no possibility of making predictions and impact on changes in the environment may result in the need to take reactive measures. The chart does not present the answers obtained in the case of the implementation of the renewing strategy, as this approach was not indicated by any respondent.

3.3. Conclusion

The obtained research results lead to conclusions that will be the subject of further discussion. At the outset, it should be noted that among the studied sample, the largest number of universities is characterized by an adaptive 36% and a classic 31% strategic approach.

In turn, the visionary approach is characteristic of 20% of universities, and the shaping approach to the strategy - only 13%. It should also be emphasized that none of the respondents indicated in the study of renewing the strategic approach. Such differentiation in the approach to the implemented strategy gives the possibility of obtaining heterogeneous information and allows for more complex conclusions. However, it does not provide full representativeness within the specified subgroups. It should be emphasized, however, that the research results indicate the existence of some relationships that can be considered statistically significant. It allows to make some generalizations and to indicate the observed regularities.

One of the subjects of considerations in this study was the search for relationships between the level of operational risk and the degree of achievement of strategic goals. The results of the conducted research indicate the existence of correlation between the specified areas. It is indicated that along with the increase in the level of achievement of the assumed goals, the level of operational risk accompanying these activities decreases.

The second of the formulated hypotheses concerned the study of the relationship between the degree of achievement of strategic goals and the strategic approach. The conducted analyzes allow for the assumption of the hypothesis. The results showed that the visionary strategy is characterized by a high level of implementation of strategic goals. O seems a somewhat surprising result, considering the fact that this type of strategic approach is based on predicting and initiating changes in the environment. In the case of the classic approach to strategy, almost 75% of respondents indicated that the level of implementation of strategic goals is at the level of 25 to 74%. However, none of the respondents indicated the level of achievement of the goals at the level of 75 to 100%, which confirms the well-known statements about the variability and unpredictability of the environment of modern universities. The adaptive strategic approach was indicated by the largest number of respondents. On the other hand, the lowest level of implementation of strategic goals was indicated by as many as 70% of respondents. The obtained results should not be surprising, as the inability to predict and influence changes in the environment may result in the necessity to take reactive measures. When analyzing the results obtained for the shaping strategic approach, it can be concluded that the level of achieving goals in this approach is much lower than in the case of previous approaches.

As it has already been indicated, the conducted research did not confirm all the assumed relationships. There is a link between the implemented approach and the degree to which strategic goals are achieved, primarily pointing to the greater effectiveness of approaches based on the possibility of predicting changes in the environment. The conducted research also confirms the existence of a relationship between the degree of achieving strategic goals and the level of operational risk. The next direction of research will be further analysis of factors influencing the strategic management process at Polish universities.

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REVERSE VENDING MACHINES VS. OTHER WAYS OF SELECTIVE WASTE COLLECTION – RESEARCH RESULTS

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Purpose: The paper presents outcomes of the qualitative research on the use of reverse vending machines (RVMs) as equipment to facilitate the segregation and disposal of beverage packaging in Poland, in comparison with other ways of selective waste collection. The topic of innovative tools to support waste management gains particular importance in the context of the introduction of the deposit system for packaging in Poland.

Design/methodology/approach: Our qualitative research aimed at identifying consumer behaviour and preferences regarding the selective waste collection. Simultaneously we evaluated experiences with the RVMs and related incentive programs. The research technique was focus group interview, supported by perceptual mapping. 5 interviews were conducted with citizens of Malopolska & Silesia Provinces, in localities where recyclomats from the pilot program were installed.

Findings: The results show positive attitudes towards the RVMs among participants of pilot testing of such devices. RVMs are perceived as easy-to-use and environmentally friendly. Compared to other methods of selective waste collection, the highest rated in terms of cost to the user and suitability for the user were the containers for segregated waste. When evaluating incentive systems, respondents accepted only financial benefits. It can be assumed that RVMs can support the newly introduced deposit system for beverage packaging in Poland.

Research limitations/ Most of the focus group participants had been familiar with RVMs from the pilot program, but the mobile app dedicated to the devices was inactive during the study. This affected the overall user experience.

Practical implications: The outcomes suggest that the comprehensive waste collection and recycling system in Poland should be supported by RVMs, and that such devices should be popularized.

Social implications: RVMs could play an important role in environmental education for children and young people. The dissemination of recyclomats by retail chains and local governments will increase their availability and influence the formation of pro-environmental behavior of other consumer groups.

Originality/value: The originality of our study is based on identifying Polish individuals' views toward innovative waste management technologies and demonstrating their influence on sustainable consumption.

Keywords: reverse vending machines, recyclomats, consumer behavior, selective waste collection, research, Poland.

Category of the paper: research paper.

1. Introduction

Municipal waste management continues to be a focus of the European Commission (EC), particularly in the transition to a circular economy (CE), which is a priority of the European Union's (EU's) economic policy (Smol et al., 2020).

Countries that want to enhance their waste management systems should also focus more on promoting sustainable consumption and manufacturing (Chow et al., 2017). This requires the cooperation of various stakeholder groups: business, administrative and individual, as well as coordination of actions taken at the local, regional and national levels (Dagilienė et al., 2022; Puntillo, 2023). A substantial amount of study has been conducted on the practical elements of municipal waste management (transport, treatment, and disposal), as well as how individuals feel about waste segregation, recycling or incineration (Wilson et al., 2001, Alwaeli, 2015; Minelgaitė, Liobikienė, 2019). Understanding the factors that explain individual acceptance of different waste management policies and circular economy in general is essential for implementing proactive approaches to improve sustainable consumption and consumer involvement (Triguero et al., 2016; Puntillo, 2023).

The result of unsustainable consumption is the overproduction of packaging, which requires the implementation of effective and widespread tools for its disposal (Siddiqui, Pandey, 2013; Idumah, Nwuzor, 2019; Khan et al., 2022; Hordyńska et al., 2023).

The purpose of the study is to obtain an answer to the question of whether and to what extent the Comprehensive Waste Collection and Recycling System in Poland (Kutyna-Bakalarska et al., 2020) should be supported by reverse vending machines for selective waste collection (RVM, 'recyclomats'), and whether the dissemination of such equipment should be expanded on a regional scale (Małopolska-Silesia), and in the long term, throughout the country.

Based on currently available knowledge, it can be concluded that reverse vending machines (Kaplan et al., 2016), are already supporting waste collection and recycling systems in the European Union (Scandinavian countries, Lithuania, among others). It should be noted, however, that these solutions operate in conjunction with the deposit system for bottles or cans, so the motivation for residents to use RVMs is the expectation of deposit recovery for the packaging, previously paid in the price of the product. Deposit systems are already in place in countries such as Croatia, Denmark, the Netherlands, Iceland, Finland, Germany, Norway, Sweden, Lithuania, Estonia, Slovakia and Latvia, and work is underway in another 15 countries. (Spiller, 2022). In Poland the system, under which a certain deposit will be added to the price of a bottle or can, is due to come into force at the beginning of 2025. Customers will be able to reclaim the deposit upon returning the packaging (Wiński et al., 2023).

RMV is a device which automatically sort packaging (plastic bottles and beverage cans) and the central IT system records data about waste and rewards the user for segregation by assigning the appropriate number of points to user's account (Stroncsek, Waksmundzki, 2020).

“Eco-Points” are exchanged for prizes and discounts offered by business partners, as part of municipal loyalty systems or crowdfunding campaigns. To be able to use the system in a given area, it is enough to install a mobile app dedicated to the RVM. The first observations of the pilot testing of RVMs in Poland indicate a favorable attitude of Polish users towards this type of device (in the context of evaluation of technical solutions).

Preliminary assessment of the preferences and attitudes of the residents of the Malopolska and Silesian provinces allows us to conclude that from the perspective of individual users, such technical solutions seem promising (among other things, thanks to the possibility of reducing the amount of unsegregated waste and linking the devices to a bonus system, attractive to young people and young adults (up to about 26 years of age), who are rather “resistant” to traditional ways of influence).

Currently, one of the motivations for using recyclomats is the measurable gratification for the collected packaging, which would otherwise simply be thrown to traditional segregated waste bins - without any compensation. Other motivations for using such devices need to be verified through social research.

It is necessary to verify how the transition to a deposit system in Poland (e.g., for food and primary product packaging) will affect Poles' attitudes and preferences with regard to waste management and attitudes toward selective packaging collection and recycling facilities.

Features of the national waste collection and recycling system, such as the universality and general availability of waste collection outlets, stability of collection, costs for the user and the public sector, externalities (impact on the landscape and nature), etc. have a holistic impact on the quality of the functioning of the economy, society and the environment. Therefore, taking into account the potential target group of the study's participants from the Malopolska and Silesian Provinces, it is important to recognize that society as a whole can gain from the development of new, reliable, attractive, user-friendly and environmentally friendly waste collection solutions.

2. Research methodology

The study was aimed at assessing the knowledge and experiences of residents from the Malopolska and Silesian provinces related to the use of reverse vending machines (RVMs, recyclomats), which are intended to support the Comprehensive Waste Collection and Recycling System in Poland.

The subject of the study, therefore, was users' experiences and attitudes toward innovative devices (recyclomats) supporting selective waste collection.

The purpose of the survey was to obtain an answer to the question of whether the Comprehensive Waste Collection and Recycling System in Poland should be supported by innovative reverse vending machines for selective waste collection (so-called recyclomats), what incentive programs associated with recyclomats are attractive to users, and whether such devices should be popularized - in the context of the respondents' perceptions of the possibilities and limitations of selective waste collection devices. Consequently, the following specific objectives were identified:

- comparative assessment of the societal satisfaction with currently available segregation and waste management solutions,
- assessment of social acceptability of RVMs (recyclomats) and the perceived benefits and limitations associated with their introduction in the whole country,
- comparative assessment of RVMs and other currently available waste collection solutions,
- assessment of the propensity and willingness to use RVMs - depending on their location and supporting incentives,
- evaluation of incentive programs associated with RVMs - with reference to current programs and the possibility of introducing a deposit system and philanthropic programs.

In the research we used qualitative and quantitative research methods build an in-depth picture of citizens' behavior and preferences towards selective waste collection, as well as expectations of innovative solutions to support Circular Economy. This article presents the result of the qualitative study on the evaluation of recyclomats against other methods of separate waste collection.

The qualitative research and its results described in this article were directed at identifying routines and preferences concerning selective waste collection. At the same time, RVMs and related incentive programs were evaluated. The qualitative research also aimed to recognize the experience of using recyclomats and mobile applications dedicated to these devices, and to prepare a cognitive platform for conducting quantitative research.

The research was conducted in the form of focus group interviews with residents of Malopolska province: in Krakow (FGI1) and Klucze (FGI2), and with residents of Silesia province in Zawiercie (FGI3) and Ruda Śląska (FGI4). In each group, the participants were diverse in terms of age, gender and socioeconomic position, while adhering to the condition that each group included students and people over 60 (seniors). In addition, one focus group interview (FGI5) was conducted only with a group of students in Krakow. In each group there were respondents who previously had been users of EcoTech recyclomats. The research scenario included a multimedia presentation with an explanation of the idea of RVMs, followed by a video presenting the incentive system connected to recyclomats. Supportively, a perception mapping and other heuristic techniques were used during these focus groups (Maison, 2020; Glinka, Czakon, 2021). The interviews were conducted in June 2022.

During the evaluation of the innovative solutions supporting the use of the recyclomats, a text mining technique was also used to extract data from comments and opinions of app users, available in the Google Play store and App Store.

During the research period (May-August 2022), 10 EcoTech recyclomats and dedicated ECO-wallet mobile application (as a pilot program for the project: Comprehensive Waste Collection and Recycling System in Poland) were tested in Poland. These recyclomats were available in Silesia and Małopolska provinces. According to Prymon-Ryś et al. (2022) several brands or retail networks also conducted their pilot testing of RVMs i.e. Coca Cola's (Warsaw), Żabka retail network (Poznan and Warsaw), Lewiatan retail network (Włocławek), Decathlon stores (Legnica). These programs used a variety of incentive and reward programs that could be obtained for the points collected.

In the first stage of the research, we obtained information on the waste management and segregation systems used in Silesia and Małopolska provinces, we gathered respondents' opinions on recyclomats and the incentive systems currently in use, as well as suggestions for their own new solutions.

3. Research results

According to the interviewees, waste segregation is *good, important and beneficial to the environment*. The statements are dominated by positively-oriented opinions on the need or even *necessity of segregation*, which, according to respondents, is *is in high demand*. Negatively-oriented statements occur much less frequently - there are individual opinions that it is "inconvenient" or even unnecessary – which is justified by the lack of knowledge about the waste sorting and recycling processes.

In the Silesian province, the waste collection system was evaluated positively, *nothing is missing in it*. In respondents' households waste is segregated. Several interviewees claimed that in their settlements, garbage had to be thoroughly segregated. Otherwise, the garbage would not be collected by the cleaning-service providers.

The waste collection system in Małopolska is not evaluated very positively due to the high price of the services, higher than in other municipalities or provinces. However, it is worth noting that the perception of high costs is very subjective - a comparison of waste collection prices in Małopolska and Silesia provinces shows that there are no significant differences between regions.

There is a belief that *by segregating waste, residents increase their workload without any benefit*. Nevertheless, citizens generally encourage their children to sort waste. Teachers also pay attention to educational projects in this area.

A major problem for residents is the lack of space for waste separation bins. This is a practical and challenging aspect of sorting. In many individual households, containers for segregated waste require a significant amount of space to be set aside. This is a problem that occurs in both apartments and homes. Therefore, respondents note that, *not everyone segregates waste. People throw garbage into forests*. This behaviour is perceived as harmful by all focus participants.

The overall assessment of the solutions available in Poland is positive: "Despite everything, waste management in Poland is also changing. In the past, there was no segregation at all".

3.1. Evaluation of recyclers based on presentations during focus groups

Recyclomats are perceived by focus participants as a trendy, modern solutions environmental-friendly; they should be universally available, but the list of material benefits should be expanded. According to interviewers, positive aspects of RVMs include an incentive system for segregation, simplicity of the solution, positive impact on the environment, speed and automation of operation, 24/7 availability, ability to retrieve the deposit without contacting a shop assistant.

On the other hand, the disadvantages of recyclomats pointed out by focus participants include low availability of RVMs (*There is an inconvenience here, because if I have a Coke bottle with me I'll throw it in, and that's not a problem, but if I had to bring a bag of uncrushed bottles from home, it's more difficult. I wouldn't want to do so*), low popularity, large space occupied by recyclomats and possible breakdowns. Several people pointed to the high cost of purchasing/implementing and maintaining RVMs. Several seniors noted that it is a problem for the elderly to operate the recyclomats, as well as to use the app. They also noted that dropping a package into the recyclomat requires scanning a barcode, which is a hassle. *The recyclomat will accept a bottle without a barcode - but it won't charge a point* - which automatically limits the attractiveness of using RVMs. There were frequent statements that without tangible benefits, there is no point in using such devices.

The target audience for recycling solutions according to participants is basically everyone, but the most common suggestions are young people, smartphone owners who can handle the technological side of the solution, buyers of beverages in plastic bottles; but also stores and local governments.

According to respondents, interest in recyclomats depends on *the size of the city, the population and the amount of waste generated*, on environmental awareness and on the individual mobility. Thus, the aspect of the availability of recyclomats and the reluctance of users to *walk around town with a bag of bottles* resonates again.

According to interviewees, the best motivation for using recyclomats would be awareness of the need for selective waste collection. Several people suggested that in order to increase interest in recyclomats, the public should be made more aware of them. One person suggested something like a state law that would make segregation mandatory, thereby increasing the

demand for RVMs. In general, interviewers suggested introducing a deposit system and supported this idea.

A suggestion from respondents was to educate the younger generations, and that *they [recyclomats] should be better promoted*. Suggestions for an advertising and information campaign appeared quite often - the example of a school where a RVM was installed on a pilot basis was given as an argument: *Before, the children didn't even know what a recyclomat was. Now everyone in and around the school knows.*

3.2. RVMs vs. other ways of selective waste collection

Participants in the focus interviews were asked to mention the most convenient ways of selective waste collection. Opinions varied widely. In addition, there was a divergence between convenient and eco-friendly solutions. For example, many young people consider ordinary trash cans as environmentally friendly *Why? Because they are available everywhere, if there are a lot of them it is more likely that someone will not throw in the bushes, if I have some papers to throw away, I will not look for a container for segregated waste*. The responses of young adults shows that ease of use is the biggest advantage of *user-friendly* ways of segregation: *what is suitable for students must be easily accessible*. Older people, on the other hand, emphasize more the economic aspect: *Thrash bags are not accepted because they are not very environmentally friendly and the average cost is so high*.

The use of the perception map technique (Glinka, Czakon, 2021) made it possible to compare recyclomats with other methods of separate waste collection. Participants were asked to evaluate the following methods of waste disposal:

- K - Trash cans (available to the public, e.g., on streets, at stores).
- PZ - Containers for mixed waste - next to a residential building or inside.
- PS - Containers for segregated waste (green, yellow, blue) next to a individual family house or multi-family residential building, e.g., next to chutes or separate containers for residents.
- D - Publicly accessible containers for segregated waste so-called "dzwony" – bells.
- SK - pick-up points for recycling materials.
- R - RVMs (recyclomats).
- L - Garbage sorting plant/[in Polish "lamusownia", KSZOK].
- W - Thrash bags in different colors (yellow, green, blue).

The respondents' task was to mark on the map the evaluation of each way of separating and collecting recyclable waste (plastic, metal, glass) according to the following criteria:

- A1. Environmentally friendly/ Not environmentally friendly.
- A2. Very user-friendly/ Little user-friendly.

Map A (Figure 1) shows the summary of all responses concerning recyclomats. A size of circles is determined by number of repeated ratings.

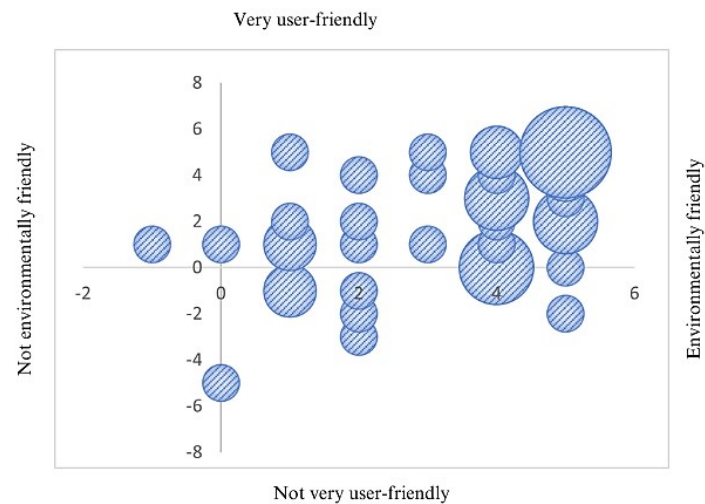


Figure 1. Perception map (A) for recyclomats - summary of findings of focus participants, [rating scale from -5 to +5; circle size determined by number of repeated ratings].

Source: own research – using software available at www.perceptualmaps.com

According to the combined criteria in this group, recyclomats are rated as both environmentally friendly and user-friendly (see Figure 1), as the overwhelming number of ratings fall within the range of positive ratings.

With SPSS software, an analysis of the ratings of the focus participants was carried out, creating scatter plots. However, when compared with other ways of waste collection, recyclomats (Rx, Ry) do not dominate in areas of positive perception. By far the best perceived are containers for segregated waste (PSx, PSy).

Compared to other waste sorting and disposal methods, recyclomats according to environmental friendliness are rated quite positively - and better than other solutions (see fig. 2) - Rx-median = 4.0. Containers for segregated waste (PSy) are rated highest here in terms of “user friendliness”. The analysis conducted using the multidimensional scaling method confirms the convergence of the survey participants' ratings.

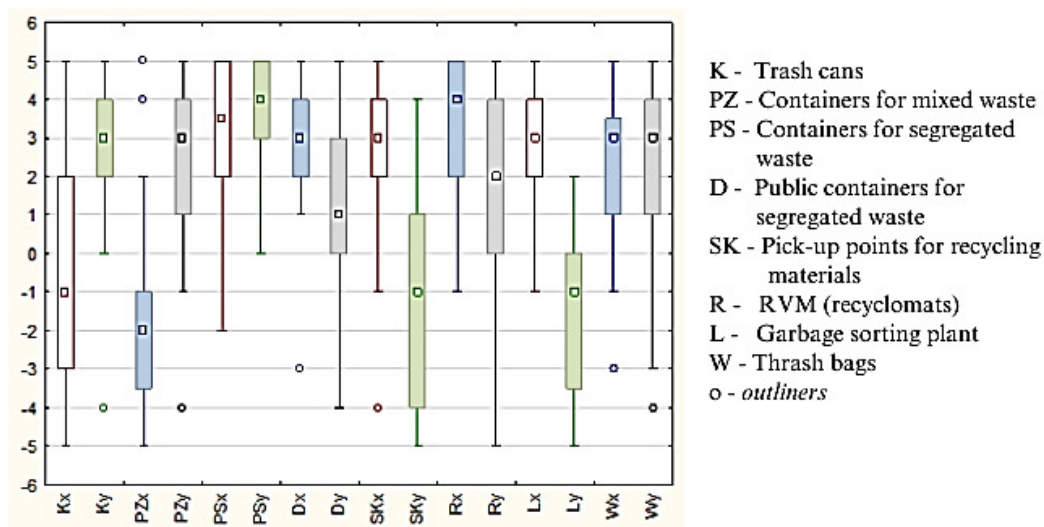


Figure 2. Box-and-whisker chart for the variables environmental friendliness (x) and user friendliness (y).

Source: own research.

The following factors evaluated were the eco-friendliness of the studied solutions and the cost of use, see Map B (fig. 3) with criteria:

- B1. Environmentally friendly/Not environmentally friendly.
- B2. High cost of sorting for the user/Low cost of sorting for the user (ie., cost of waste collection, cost of trash bags, cost of getting to the bin, opportunity cost of time, etc.).

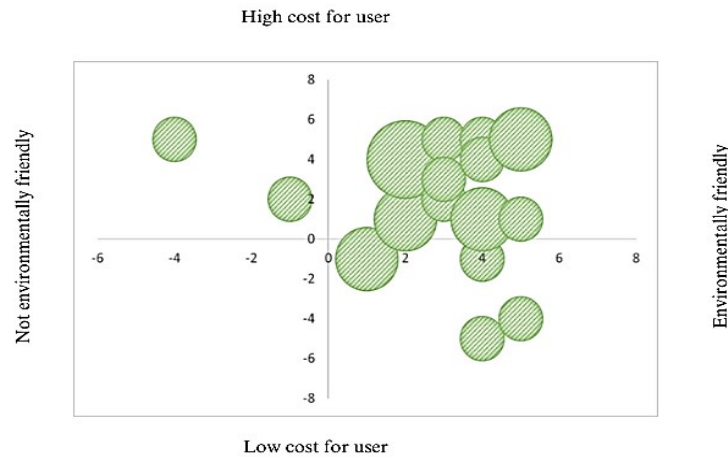


Figure 3. Perception map (B) for recyclomats - summary of findings of focus participants, [rating scale from -5 to +5; circle size determined by number of repeated ratings].

Source: own research – using software available at www.perceptualmaps.com

Again, the evaluation of RVMs' environmental friendliness was positive, while in terms of cost, recyclomats were rated as expensive solutions; respondents' evaluations were located in the 1st quadrant of the map: positive – high (see fig. 3).

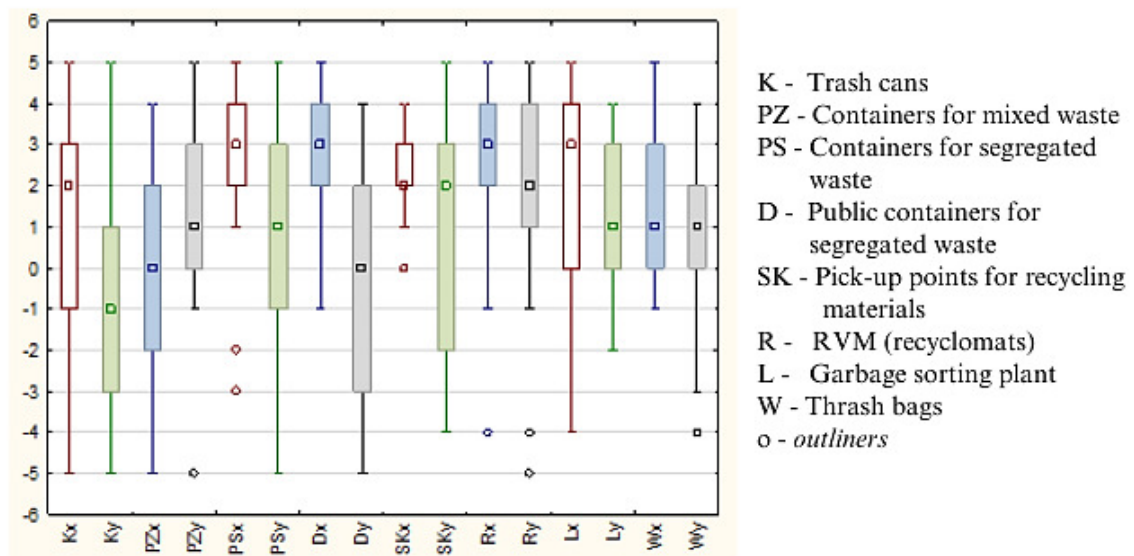


Figure 4. Box-and-whisker chart for the variables environmental friendliness (x) and cost (y).

Source: own research.

Overall, however, most solutions tend to be rated lower (see Figure 4). In any case, the median does not exceed the value of 3. As for the variables PSx, PSy (containers for segregated waste), Rx and Ry (RVMs), they are rated quite well in comparison, although there

are a few outlier observations. Lx (garbage sorting plant) and Dx (publicly accessible containers for segregated waste) in terms of environmental friendliness also received good ratings.

The last perceptual map C (as seen on fig. 5) covered the following criteria:

- C1. Environmentally friendly/Not environmentally friendly.
- C2. Suitable for me form of sorting/Not suitable for me form of sorting.

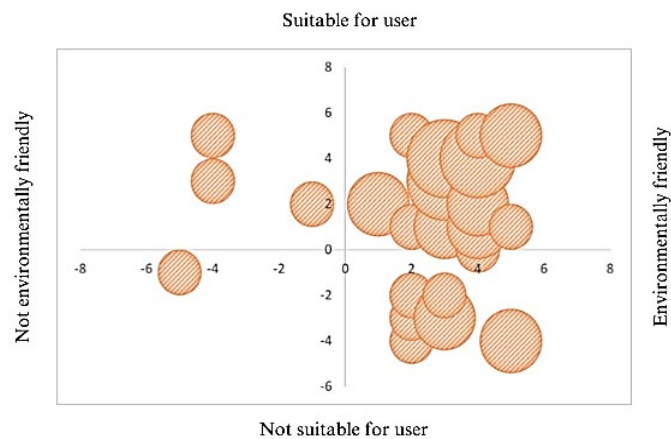


Figure 5. Perception map (C) for recyclomats - summary of findings of focus participants, [rating scale from -5 to +5; circle size determined by number of repeated ratings].

Source: own research – using software available at www.perceptualmaps.com

As shown in Figure 5, the ratings of the focus group participants are less clear and the range of ratings is wider. There were more negative responses – some respondents felt that recyclomats were unsuitable for them and therefore less environmentally friendly. At the same time, there were more very positive statements (ratings of 4 and 5), which ultimately confirmed similar results to the analysis of Map A (see Figure 6).

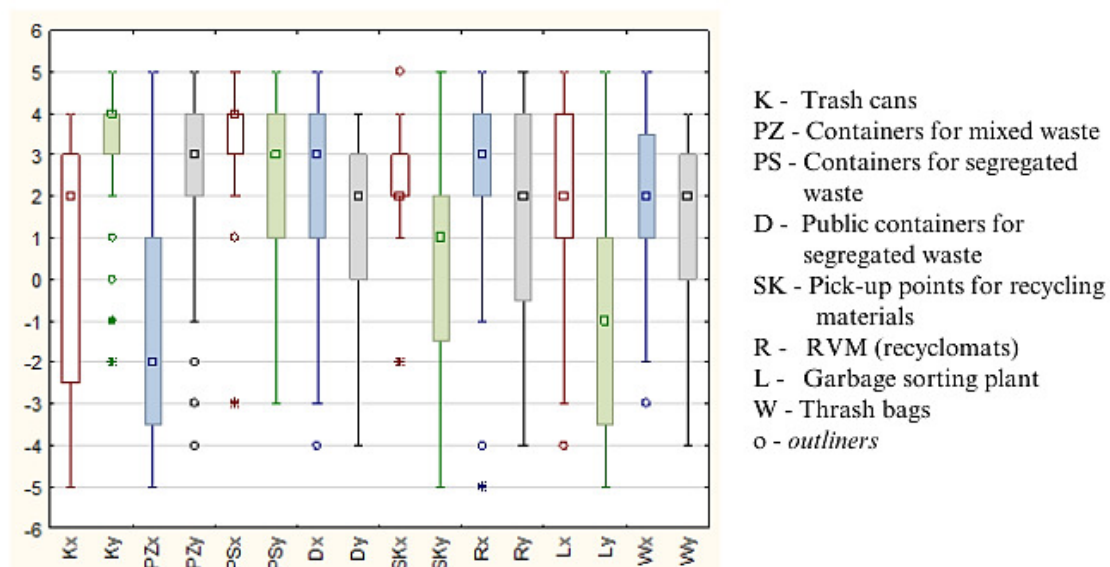


Figure 6. Box-and-whisker chart for the variables environmental friendliness (x) and suitability for user (y).

Source: own research.

In this part of the study, the responses obtained give a similar picture to the results of the perception map A. The best ratings were given to the PSx (containers for segregated waste) and Ky (trash cans) variables (with a few outliers and extreme responses). The high ratings for regular trash cans confirm the results of the focus interviews, where particularly young respondents indicated ordinary trash cans as the most user-friendly. Recyclomats in this evaluation were rated quite positively (Ry-median = 2.0).

4. Conclusions

Improving waste management strategies through more collaborative participation of consumers and the introduction of innovative tools is of increasing concern to researchers and policy makers. Obtained results, combined with the outcomes of our quantitative research (Prymon-Ryś et al., 2022), indicate the extent to which recyclomats can support the implementation of a deposit system in Poland. The presented research is innovative not only because of the technical novelty of the described devices, but also because of the relevance of the use of RVMs in selective waste collection systems.

Waste sorting, according to respondents, is both required and beneficial to the environment. Waste is separated in the majority of Małopolska and Silesia households. Respondents indicate that they sort rubbish in accordance with the guidelines established by the municipality in which they live. Those who do not follow standard sorting criteria explain this mostly through practical factors: a lack of segregation conditions in the household and a lack of separated waste bins in the region. Young people (students) prefer easily accessible ways to dispose of trash - whether they use selective waste collection or simple trash cans placed by the sidewalk.

For the majority of focus participants, the most environmentally friendly form of trash selection was the containers for segregated waste. Similarly to recyclomats, they were also described as user friendly. Negative eco-friendliness ratings were given to containers for mixed waste. In terms of cost to the user, the RVMs received the highest ratings, although, obviously, interviewers did not refer to the cost of installing the devices or servicing them. Recyclomats are the only devices that provide tangible gratification for disposed waste. Interestingly, ordinary trash cans were indicated by respondents as the most convenient form of garbage disposal. Also, containers for mixed waste and containers for segregated waste received high scores. The small number of recyclomats, long distances to these facilities and the need to install a mobile app contributed to RVMs' lower ratings.

According to respondents, increasing residents' willingness to segregate requires the following incentives: material benefits (e.g., free garbage containers or garbage bags) and financial benefits (deposit system), more solutions to facilitate segregation and publicly available equipment/containers, financial penalties for those who evade segregation and

consistent enforcement of selective collection, and supporting citizens' awareness and knowledge through educational programs and information campaigns. While the study results revealed favourable opinions regarding separate waste collection, respondents claimed that they would be more likely to do so if they received tangible benefits, such as discounts or financial bonuses, and if it was cheaper and simpler.

Recyclomats, as devices supporting the waste collection and recycling system, have a very positive image among those who have had the opportunity to get to know the idea of their operation. At the same time, however, not all respondents who rated the RVMs positively considered them suitable or necessary in their local community.

Recyclomats are seen as easy to use, encourage separation and are environmentally friendly. Respondents indicated that the availability of these devices and their ease of use were the most important factors in persuading them to use recyclomats. An analysis of the following responses shows that the possibility of receiving cash is more attractive to respondents than other material rewards. This is indeed an expected attitude, in the context of the introduction of a deposit system in Poland. Consequently, the spread of recyclomats will require them to be adjusted to pay a deposit for disposed beverage packaging.

Although these devices are unlikely to become the primary method of waste disposal, given the interest in gamification-based programs (Santti et al., 2020; Hsu, Chen, 2021), it is crucial to note that recyclomats may play an important role in the environmental education of children and young people.

Surveys show that residents are favorably disposed to recyclomats as devices that could support the Comprehensive Waste Collection and Recycling System.

Features of the national waste collection and recycling system, such as the universality and general availability of waste collection sites, stability of collection, costs for the user and the public sector, externalities (impact on the landscape and nature), etc. have a holistic impact on the quality of the functioning of the economy, society and the environment. Therefore, regardless the sample of the survey participants from the Małopolska and Silesian provinces, it can be suggested that the whole society can gain from the development of new, reliable, attractive, user-friendly and environmentally friendly waste collection solutions.

As with any innovative solution, reverse vending machines require a number of improvements to be a significant alternative to “traditional” means of selective waste collection. However, the basic condition here is the widespread availability of these devices. A cost-benefit analysis (Cygler, Dubel, 2022) and an analysis of the financial effectiveness of the investment associated with the expansion of the network of reverse vending machines should answer the question of the economic sense of such an investment from a national perspective. However, based on the research conducted, it can be concluded that there is a “green light” for such solutions.

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STUDENTS' PERCEPTION OF SOFT SKILLS: SIGNIFICANCE AND CHALLENGES WITHIN EDUCATIONAL AND EMPLOYMENT CONTEXTS

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Purpose: The significance of soft skills is rising in the employment market; however, young people's perceptions of them may differ. The objective of the study was to comprehend students' perceptions on soft skills and their importance in professional environments.

Design/methodology/approach: A survey was conducted utilizing the CAWI technique to attain the research objective. The research cohort comprised 486 students from four Polish universities. They were students of management and quality sciences, specializing in bachelor's and engineering degrees. The participants were inquired about soft skills, their significance in professional environments, and their cultivation during academic pursuits.

Findings: The study's findings indicated that students are aware of soft skills; however, their perceived significance in professional contexts differed by the field of study. It has been demonstrated that there is a need to incorporate soft skills training courses into academic curricula, particularly in engineering fields.

Research limitations/implications: The research's limitation was the sample confined to students from Polish universities, perhaps impeding the application of the findings to other countries.

Practical implications: The study's findings offer pragmatic recommendations for educational institutions. Implementing mandatory practical training in academic curricula might enhance students' readiness for the requirements of the employment market.

Social implications: The cultivation of students' soft skills might influence their subsequent personal and professional lives, especially regarding interpersonal relationships.

Originality/value: The finding is significant for organizations tasked with developing and assessing educational programs for students across a variety of academic fields.

Keywords: soft skills, hard skills, engineering studies, bachelor's studies, academic curricula.

Category of the paper: Research paper.

1. Introduction

In the evolving business landscape, personnel competencies substantially influence organizational performance and market success. In recent years, much emphasis has been placed on soft skills, which have also garnered the attention of scholars. Soft skills encompass a collection of abilities and personality characteristics pertinent to social interactions, adaptability, and collaborative teamwork. These competencies influence the quality of work. Their presence primarily fosters positive interactions with both internal and external clients, enhancing work efficiency and effectiveness, which eventually influences the organization's relevance and market position. Consequently, it is increasingly vital to cultivate these competencies and enhance awareness of their importance for both employers and employees, present and prospective.

2. The issue in the context of the literature

2.1. Concept and classification of soft skills

Employers anticipate that employees possess suitable competencies, defined as the extent of authorities and authorizations, alongside the breadth of knowledge, responsibility, and skills (Drabik, Kubiak-Sokół, Sobol, 2005). Competence is described as possessing knowledge that allows an individual to make judgments and articulate authoritative opinions on matters within their adjudicative capacity, due to their relevant experience and knowledge. This enables us to ascertain that a competent individual is one who has the requisite preparation for particular tasks (Drabik, Kubiak-Sokół, Sobol, 2005). Spencer and Spencer identified competency as "an underlying characteristic of an individual that is causally related to criterion referenced effective and/or superior performance in a job or situation" (Spencer L.M., Spencer S.M., 1993). In this context, competencies regarded as personnel credentials comprise three primary components: knowledge, abilities, and responsibility (Drabik, Kubiak-Sokół, Sobol, 2005). These competencies establish the qualifications of individuals across diverse professions and act as a form of assurance for excellent work and the attainment of success (Konieczna-Kucharska, 2015; Gorustowicz, 2019).

There are numerous classifications of competencies. One categorizes them into hard and soft skills. The initial category comprises specialized competencies in a particular domain or practical skills that can be acquired with considerable quickness. These competencies are readily assessable, verifiable, and measurable. This encompasses, among other qualifications, fluency in foreign languages, expertise with various computer applications, and possession of a driver's license. In the literature, soft skills are characterized as personal, social, interpersonal,

and communication abilities, along with those related to time management and problem-solving (Adler, Rosenfeld, Proctor, 2006). Robbins and De Cenzo equated them to interpersonal skills, defined as "the capacity to collaborate with others, comprehend their perspectives, mentor them, and inspire them both individually and collectively" (Robbins, De Cenzo, 2002). Cimatti similarly characterized them as interpersonal competencies, including communication, leadership, and dispute resolution. The author stated that they are essential for professional achievement across multiple economic sectors (Cimatti, 2016). Grzesiak characterized soft skills as the skills required for regulating thoughts, emotions, and actions that facilitate the attainment of personal and professional objectives (Grzesiak, 2022). These competencies are developed through socialization, are hard to quantify, and are tough to assess. They can be cultivated by self-education and self-discipline.

A variety of soft skills exist. The Spencers assert that soft skills encompass emotional intelligence and adaptive abilities that enhance teamwork (Spencer L.M., Spencer S.M., 1993). Goleman identified four primary areas of soft skills: self-awareness, self-regulation, motivation, and social skills (Goleman, 1997). Each of these areas influences the ability for self-management and relationships with others. Chamorro-Premuzic and others identified that soft skills encompass components such as communication abilities, problem-solving, teamwork, conflict resolution, and leadership competencies (Chamorro-Premuzic et al., 2010). Modern literature identifies numerous other abilities associated with soft skills. Key attributes are emotional intelligence, elevated personal culture, reliability, dependability, and integrity. Emotional intelligence refers to the capacity to comprehend and regulate one's own emotions (Goleman, 2016). Emotional intelligence comprises three categories of competencies: psychological, social, and praxeological. The initial group encompasses self-awareness, self-esteem, and self-regulation. The second group includes abilities essential for cultivating relationships, namely empathy, assertiveness, leadership, cooperation, and persuasion. The final group referenced relates to competencies that characterize the disposition towards tasks. These encompass abilities including motivation, reliability, creativity, organizational skills, time management, teamwork, and team leadership, among others (Goleman, 1997, p. 1). Mayer and Salovey assert that emotional intelligence is essential for managers or team leaders as it facilitates successful team management and dealing with stress (Mayer, Salovey, 1999). Empathy is defined as the ability to perceive the emotional states of others (emotional empathy) and the ability to adopt their cognitive framework and perceive reality from their viewpoint (cognitive empathy) (Drabik, Kubiak-Sokół, Sobol, 2005). According to Goleman, empathy is the foundation for developing strong relationships with employees and clients, which influences loyalty and job satisfaction (Goleman, 1997). In interpersonal relationships, efficient communication is crucial since it promotes transparency, resulting in heightened involvement and efficiency (Blume, Baldwin, Ryan, 2013).

The aforementioned competencies are essential for teamwork and effective collaboration. They are frequently needed for personal development and professional success (Konieczna-Kucharska, 2015).

2.2. The significance of soft skills in the employment sector

Nowadays, soft skills are indispensable in the labor market. Research reveals that employers increasingly value these competencies, expecting individuals to possess advanced specialist knowledge alongside skills in adaptation, negotiation, effective communication, and leadership (Weber et al., 2009). They regard attributes such as work ethic, communication, and interpersonal skills as essential (Robles, 2012). Lippman and colleagues also suggested that soft skills influence employment and job retention (Lippman et al., 2015). They are sought after by candidates for roles in management, sales, consulting, and, more lately, engineering, IT, accounting, or auditing (Fastnacht, 2006). Fastnacht referred to them as transferable skills, which are vital in any professional occupation. Soft skills enable job transitions, retraining, and adaptability to novel situations and professional responsibilities (Fastnacht, 2006).

The significance of these competencies is increasing due to globalization, the digitalization of work, and the merging of professional roles inside businesses, where interdepartmental collaboration has become commonplace (Robles, 2012). Deloitte Access Economics' analysis indicates that by 2030, soft skills would be essential for 66% of all occupations, with key competencies comprising emotional intelligence, critical thinking, problem-solving, and self-directed learning capabilities (Deloitte, 2024).

2.3. Students' perception of soft skills

Research studies demonstrate that students' knowledge and perception of soft skills are influenced by several aspects, including their field of study, educational level, and individual academic and professional experiences. Itani and Srour indicated that students in technical disciplines, such as engineering, primarily value communication skills, leadership, and creativity, while conflict resolution and negotiation are less usually regarded as essential competencies (Itani, Srour, 2016). This study indicates that educational programs in technical disciplines may inadequately prioritize widely recognized soft skills. Another study reveals variations in the perception of soft skills across students from different disciplines (Kohlbeck et al., 2021). Students in the humanities typically see interpersonal skills as paramount, whereas those in the sciences and technical disciplines predominantly emphasize analytical skills and problem-solving abilities (Ramlan, Ngah, 2017). The increasing significance of soft skills in the labor market, along with the diverse awareness of students regarding these competencies, has prompted colleges to progressively implement programs focused on their development. These programs encompass workshops on interpersonal communication, time management, negotiation, and public speaking, all aimed at equipping students with essential competencies for the labor market.

Despite the widespread acknowledgment of the significance of soft skills, the instruction of these competencies within educational curricula continues to encounter many obstacles. Their development necessitates a pragmatic approach, which is frequently challenging to execute within a conventional academic setting. Furthermore, numerous students regard soft skills as inferior to technical expertise, possibly resulting in a diminished appreciation of their significance in career development (Succi, Canovi, 2020).

The literature review indicated that soft skills are progressively esteemed in the labor market, although students' perceptions of them may differ.

The purpose of the study was to comprehend students' perceptions of soft skills and their importance in professional environments. The subsequent research questions have been formulated:

1. Which soft skills do students regard as the most significant?
2. In what manner do students evaluate their own abilities in these competencies?
3. What significance do students attribute to soft skills in relation to their professional careers?
4. Are soft skills cultivated during academic pursuits?

3. Methods of research

A study was conducted employing the diagnostic survey method, the questionnaire method, and the CAWI technique to get answers to the research questions provided. This strategy facilitated rapid access to a diverse cohort of students from various universities in Poland, expedited the research procedure, and diminished study expenses. The research utilized a validated proprietary questionnaire, administered to a cohort of 30 randomly selected engineering and bachelor's degree students. This facilitated the eradication of inaccuracies and enhanced the validity and trustworthiness of the responses. The questionnaire included a demographic part, in which respondents provided particular demographic data, followed by 14 substantive questions. Closed and semi-closed questions, together with a conjunctive cafeteria list, position scales presented in tabular format, and an open-ended question were utilized. The ordinal scale utilized was a 5-point scale featuring verbal descriptors ranging from "strongly agree" to "strongly disagree". For statistical analysis, these terms were assigned point values from 5 to 1. Respondents were inquired about the significance of soft skills in professional settings and their cultivation during university studies. A positional scale was employed to analyze the characteristics that most accurately depict the respondents and to assess the significance of specific soft skills in professional settings. The results are shown as the mean value (M). The study's results were reported as a percentage of replies (%), the mean value (M) accompanied by the standard deviation (SD), and a descriptive analysis. (in the case

of an open-ended question). A ranking (R) of competencies was established to reflect the significance of selected competencies in professional activity, based on the computed mean value. The chi-square test (χ^2) was utilized to ascertain the variations in responses among the respondent groups and Kruskal-Wallis test (H).

The survey questionnaire was published on the Google Forms platform. A link to the survey was distributed to a selected group of respondents. Purposive sampling was employed. Students from four Polish universities were invited to participate in the study, comprising three economic universities (Universities 2, 3, 4) and one non-economic university (University 1) that offers education in managerial disciplines within the social sciences. The study encompassed 486 students, and this number of questionnaires was incorporated into the ensuing research process. The examined cohort comprised students in their concluding semester of undergraduate studies in Management (bachelor's degree) and Quality Management (engineering degree). All participants were between the ages of 22 and 24 years. Table 1 delineates the demographic attributes of the surveyed students, classified by university, field of study, and gender.

Table 1.

Demographic attributes of the surveyed students

University 1				University 2				University 3				University 4							
Engineering degree N = 92		Bachelor's degree N = 100		Bachelor's degree N = 96		Bachelor's degree N = 100		Bachelor's degree N = 98											
Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male		
N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%		
52	56	40	44	58	58	42	42	54	56	42	44	62	62	38	38	57	58	41	42

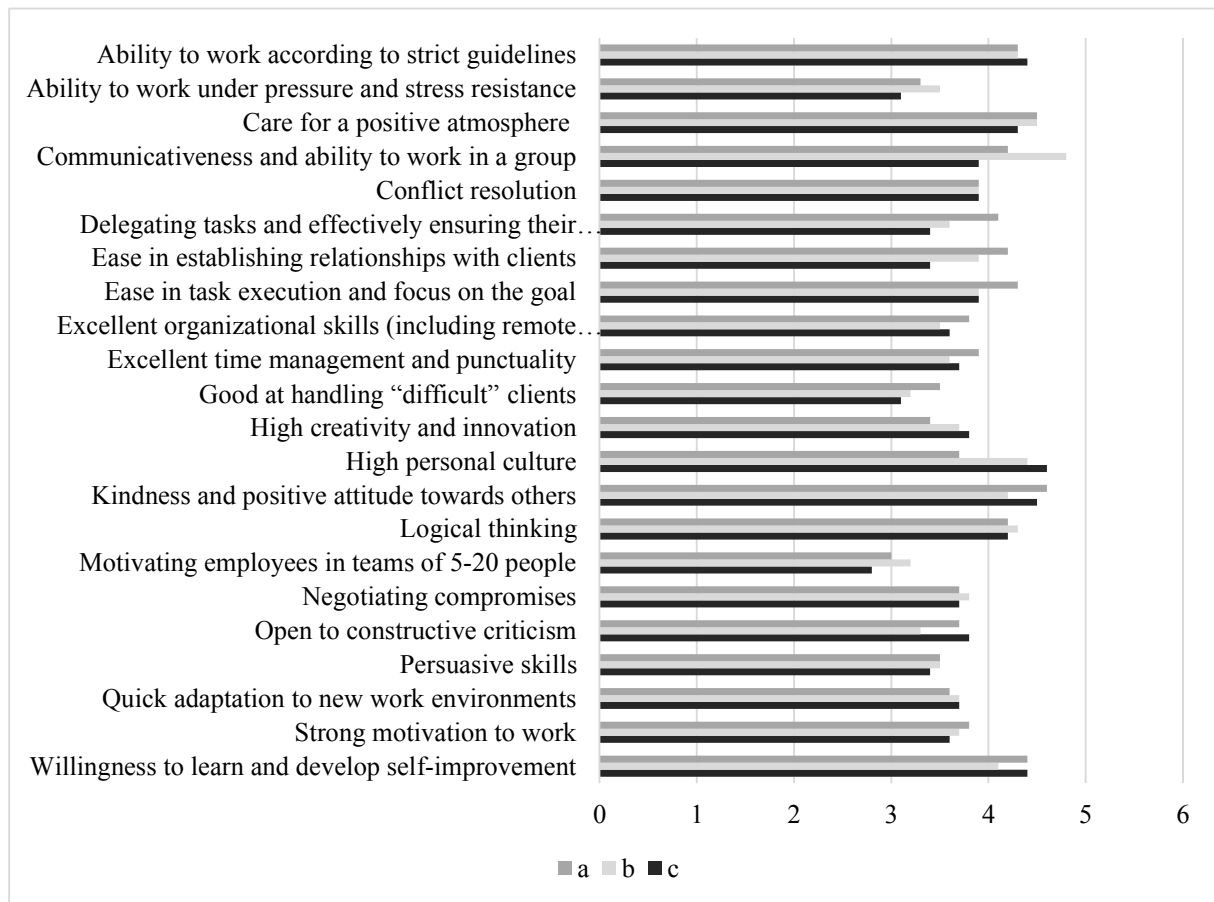
Source: own study.

The participants agreed to partake in the study, which was voluntary and anonymous. The research at multiple universities was carried out from January to March 2024.

4. Results of own research

The initial phase of the statistical analysis involved assessing the significance of response differentiation among various student groups from distinct specializations and universities. No statistically significant differences were observed in the responses of participants from economic universities. Consequently, in the study, students from these universities were aggregated into a single group, their responses averaged, and represented as the opinions of students from "other universities". Statistically significant differences were found in the responses of bachelor's and engineering students, as well as between students of University 1 and other universities ($H = 46.54$, $p = 7.85e-11$).

At the outset of the study, participants were inquired about the characteristics that most accurately depict them. Students' perspectives differed based on the university and the field of study (engineering or bachelor's). The results are illustrated in Figure 1.



where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

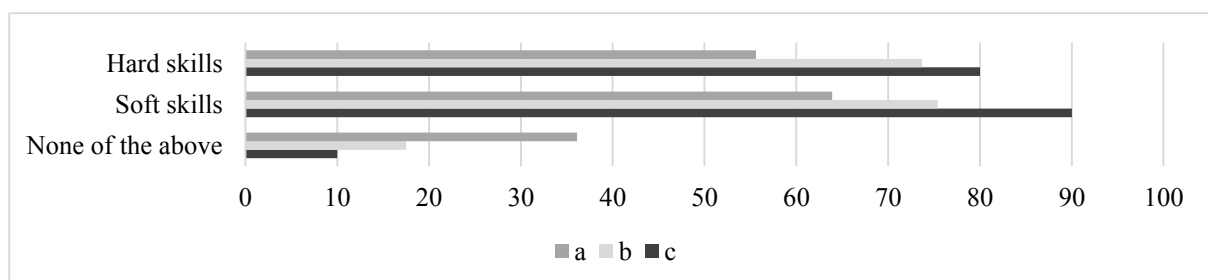
Figure 1. Characteristics that best describe the surveyed students (M).

Source: own study.

Engineering students recognized 10 of the 22 enumerated features in themselves, rating them as very good ($M > 4.5$) and good ($M \in (4.0-4.5)$). These students said that they exhibit kindness and positive attitude towards others ($M = 4.6$) and care for a positive atmosphere ($M = 4.5$). The characteristics that accurately depicted them were: willingness to learn and develop self-improvement, ease in task execution and focus on the goal, ability to work according to strict guidelines, logical thinking, ease in establishing relationships with clients, communicativeness and ability to work in a group, and finally delegating tasks and effectively ensuring their completion. The characteristics that least characterized students in this group were high creativity and innovation ($M = 3.4$) and ability to work under pressure and stress resistance ($M = 3.3$). Bachelor's students from the same university identified six attributes that accurately represented them. In the initial group, two characteristics were identified: communicativeness and ability to work in a group ($M = 4.8$) and taking care for a positive atmosphere ($M = 4.5$). The characteristics that accurately depicted the individuals in this group

were: high personal culture, ability to work according to strict guidelines, logical thinking, kindness and positive attitude towards others, and finally willingness to learn and develop self-improvement. The minimum score ($M = 3.2$) was assigned to two attributes: good at handling “difficult” clients and motivating employees in teams of 5-20 people. Bachelor's students from other universities exhibited the least number of matching characteristics. The group was characterized by two attributes: high personal culture ($M = 4.6$) as well as kindness and positive attitude towards others ($M = 4.5$). Additionally, this group was distinguished by the following characteristics: the ability to work according to strict guidelines, willingness to learn and develop self-improvement, care for a positive atmosphere, and logical thinking. These participants were unable to motivate groups of people to work ($M = 2.8$).

The subsequent inquiries in the questionnaire pertained to soft skills. The surveyed students reported familiarity with the concepts of "soft skills" and "hard skills," with approximately 77% and 70% of respondents, respectively. Just over 20% of respondents indicated that they are unfamiliar with either of these concepts. Statistically significant disparities were identified in the responses of bachelor's and engineering students ($\chi^2 = 0.70$, $p = 0,02$). No discrepancies were noted in the responses of students from different universities in bachelor's programs ($\chi^2 = 0.80$, $p = 1.0$). The concept of soft skills was more familiar to students from other universities than to those from University 1, particularly among bachelor's students. The study's results are illustrated in Figure 2.

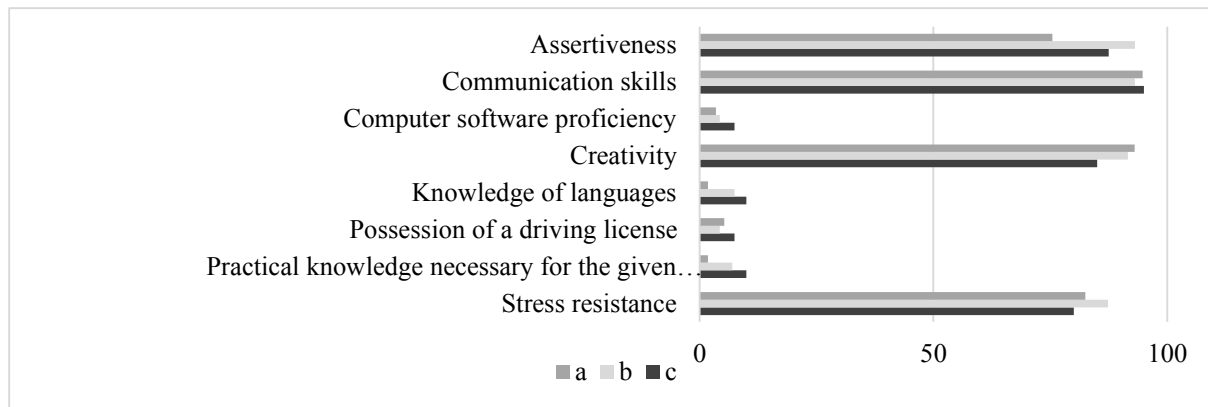


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 2. Recognition of the concepts "hard skills" and "soft skills" among the surveyed students (%).

Source: own study.

The respondents were subsequently queried regarding which competencies they identify as soft skills. In the cafeteria list, specific hard skills (foreign language proficiency, possession of a driver's license, computer program expertise, and profession-specific knowledge) and soft skills (assertiveness, communication skills, stress resilience, and creativity) were showcased. These were the most esteemed competencies essential in a professional career. The respondents predominantly identified soft skills accurately, though their responses varied (Figure 3).



where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

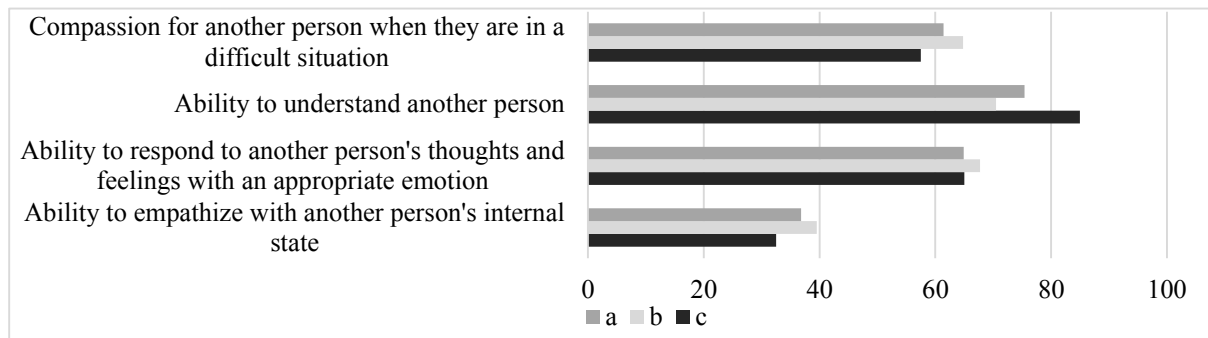
Figure 3. Knowledge of soft skills among the surveyed students (%).

Source: own study.

Engineering students frequently linked them to communication skills, creativity, and stress resilience. Bachelor's students from the same university identified assertiveness, communication skills, creativity, and resilience to stress as essential soft skills. Students from other universities exhibited more polarized responses. They included the same competencies as soft skills, but with a lower percentage of indications. Simultaneously, a greater proportion of students associated hard skills with soft skills, including language proficiency or profession-specific knowledge (10% each-compared to 1.8% and 7.75%, as well as 1.8% and 7% in other groups). Among the respondents, 7.5% of the students identified computer programming proficiency and possession of a driver's license as soft skills. The findings indicated that students, although acquainted with the notion of soft skills, are incapable of accurately discerning which competencies belong to this category. The results indicate the necessity for clearer definitions of these concepts in educational programs, consistent with the observations made by Benek (Benek, 2024).

To assess knowledge of soft skills, respondents were queried regarding their understanding of empathy in the subsequent question. The term derives from Greek, signifying "co-feeling or identifying with the emotions of others" (Breczko, 2014). Empathy is defined as "the ability to immerse oneself in the internal state of another individual" (Drabik, Kubiak-Sokół, Sobol, 2005). In the social sciences, it is defined as "a process through which an individual can identify with the emotions of others, anticipate their behaviors, and comprehend their motivations" (Encyklopedia zarządzania, 2024). The respondents were unfamiliar with such definitions of empathy. Merely 36% of them asserted that empathy constitutes the ability to immerse oneself in another individual's internal state. Additional responses from the participants demonstrated their comprehension of this concept. The majority perceived empathy as the "ability to comprehend another person" (77%) and as the "ability to respond to another's thoughts and feelings with an appropriate emotion" (66%) (Figure 4). The respondents' responses were coherent. No statistically significant differences were observed among the responses of various

respondent groups ($p > 0.05$). The results indicated that insufficient comprehension of the concept and importance of individual soft skills may hinder their development in the academic setting.

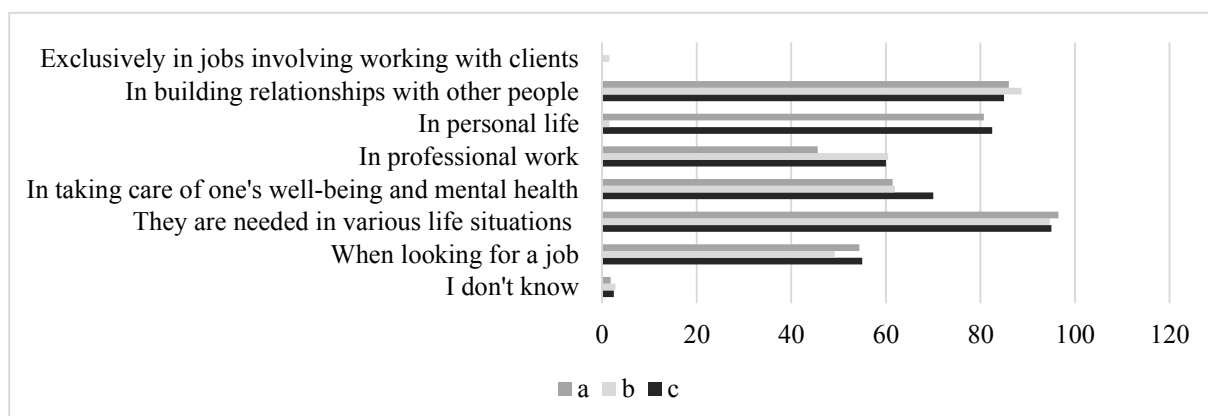


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 4. Awareness of the concept of empathy among the surveyed students (%).

Source: own study.

The respondents were inquired about the circumstances in which soft skills are crucial. Their viewpoints were exceedingly varied (Figure 5). The respondents recognized that such competencies are essential in diverse life situations, both personal and professional (95% of respondents affirmed this), in fostering interpersonal relationships (87%), and in maintaining one's well-being and mental health (64.5%). More than 55% of participants asserted that soft skills are significant in personal life. An equivalent number of them recognized their necessity in professional endeavors. A mere 2.3% of the respondents were unaware of when soft skills are required. Statistically significant disparities were observed in the responses of engineering and bachelor's degree students ($\chi^2 = 0.69$, $p = 0.009$). Engineering students more often emphasized the significance of soft skills in professional contexts (55%) compared to personal life, likely due to their pragmatic perspective on these competencies.

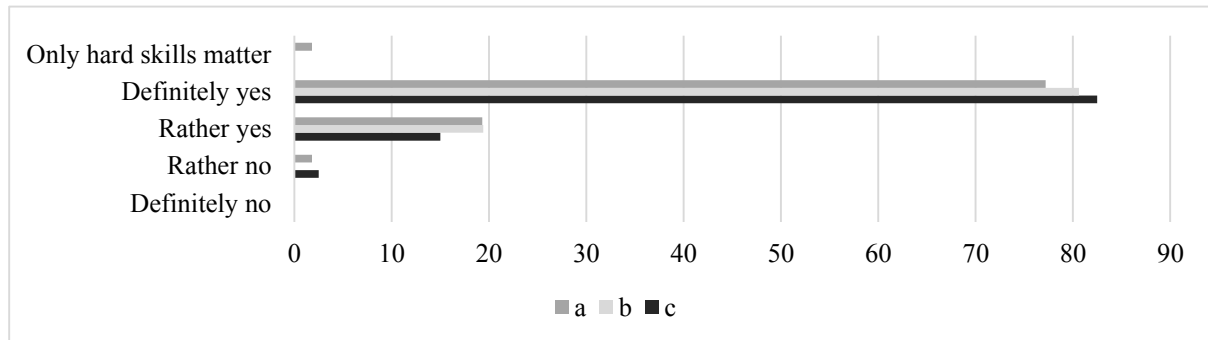


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 5. The significance of soft skills in diverse life scenarios as reported by the questioned students (%).

Source: own study.

Numerous researchers assert that soft skills are crucial in professional environments (Succi, Canovi, 2020; Benek, 2024), and this was asked of the surveyed students. A significant majority either strongly agreed (80.1%) or agreed (17.9%) that these competencies are essential in professional settings (Figure 6).



where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 6. The significance of soft skills in professional employment as reported by the questioned students (%).

Source: own study.

In an open-ended query, respondents were asked to identify the professions in which soft skills are essential. Participants specified certain professions (psychologist, teacher, doctor, salesperson), work titles- predominantly management (director, manager, supervisor, president) - and work environments (corporations, offices, restaurants, stores). A significant proportion of students deemed these competencies beneficial across all professions: 25% of engineering students, 35% of bachelor's students from the same institution, and 40% of respondents from other universities affirmed this view. The latter indicated that these competencies are essential for individuals in managerial positions (25% of replies). Students also expressed that soft skills are essential in careers requiring interaction with others and dealing with clients. Bachelor's degree students from University 1 more often than their fellow students identified managerial roles as ones where soft skills are essential. This response occurred 35 times in this group, representing 35% of the total indications. Students specializing in engineering identified numerous occupations; nevertheless, none said that such competencies are essential in the engineering field. The responses most commonly mentioned are encapsulated in Table 2.

Table 2.
Students' perspectives on professions requiring soft skills

Attribute	University 1		Other Universities
	Engineering degree	Bachelor's degree	Bachelor's degree
Profession	<ul style="list-style-type: none"> – across all professions, and occupations – in occupations that involve working with people, – work with clients, – in work with children and seniors, – psychologist, doctor, dietitian, journalist, teacher, caregiver, salesperson, cashier 	<ul style="list-style-type: none"> – across all professions – in occupations that involve working with another people, – psychologist, sales consultant, doctor, teacher, salesperson, journalist 	<ul style="list-style-type: none"> – in professions where relationships with other persons are established, – work with clients, – salesperson, teacher, telephone consultant, office worker, clerk, small business owner customer advisor, merchant
Position	<ul style="list-style-type: none"> – manager, president 	<ul style="list-style-type: none"> – manager, president, – team leader, – managerial positions 	<ul style="list-style-type: none"> – president, director
Workplace	<ul style="list-style-type: none"> – in services, – in companies, in corporations, – in restaurants, in stores 	<ul style="list-style-type: none"> – in corporation 	<ul style="list-style-type: none"> – own business, – business companies, – marketing department

Source: own study.

Among the various soft skills, certain ones are especially significant in professional environments. The respondents were requested to specify these competencies. The findings are displayed in Table 3.

Table 3.
Essential soft skills in professional environments, as identified by the questioned students

Soft skills	University 1						Other Universities		
	Engineering degree			Bachelor's degree			Bachelor's degree		
	M	SD	R	M	SD	R	M	SD	R
Ability to deal with stress	3.5	2.4	10	3.4	1.2	8	3.5	1.1	7
Ability to delegate tasks	3.8	1.3	2	3.4	0.9	7	3.5	0.7	6
Ability to manage time	3.8	0.9	3	3.5	0.6	5	3.8	0.4	4
Ability to resolve conflicts	3.5	1.8	11	3.8	0.9	4	3.3	1.1	11
Assertiveness	3.6	1.8	5	3.2	1.5	10	3.8	1.1	2
Communication skills	3.4	2.4	12	3.0	1.4	12	3.1	1.2	12
Creativity	3.9	1.3	1	4.0	1.1	1	3.9	1.1	1
Empathy	3.5	0.4	9	2.9	0.6	13	3.0	1.0	13
Ethical behavior	3.6	1.2	7	3.2	1.2	11	3.4	1.2	9
Flexibility	3.5	1.1	8	3.4	1.3	6	3.4	1.1	8
Motivating others to work	3.6	2.4	6	3.9	1.4	2	3.6	1.3	5
Persuasive skills	3.2	1.8	13	3.3	1.3	9	3.6	1.2	5
Work organization	3.7	1.0	4	3.8	0.9	3	3.8	0.8	3

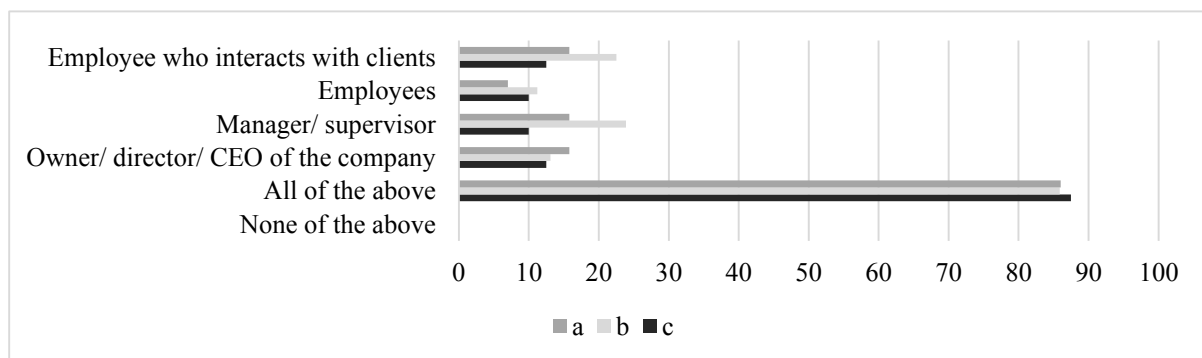
R - rank (the position occupied by a given attribute in a sequence)

Source: own study.

Students from different fields had divergent views on the significance of particular soft skills in professional contexts. Statistically significant disparities were identified in their responses. All respondents concurred that creativity is vital in professional endeavors, securing the top position in all three rankings ($M = 3.9$). Engineering students believe that the most

crucial soft skills for professional work are task delegation and time management, which ranked equally in second place ($M = 3.8$). The subsequent role pertained to work organization. The respondents identified communication skills with clients and colleagues ($M = 3.4$) and persuasive skills ($M = 3.2$) as the least significant competencies. Bachelor's students had divergent viewpoints on this subject, with replies differing between students from University 1 and those from other institutions. The former assigned the ability to motivate others a second rank ($M = 3.9$), whereas students from other colleges ranked it fifth ($M = 3.6$). Discrepancies also pertained to additional competencies. Bachelor's students from University 1 rated work organization and conflict resolution abilities ($M = 3.8$) as the most significant, whereas they deemed communication skills ($M = 3.0$) and empathy ($M = 2.9$) as the least important. In the rating of soft skills for students from other universities, assertiveness, work organization, and time management skills were jointly ranked second ($M = 3.8$). The participants considered communication skills ($M = 3.1$) and empathy ($M = 3.0$) as the least significant, consistent with the previously analyzed cohort. The findings indicate that although there is widespread acknowledgment of the significance of soft skills, the view of their practical implementation may differ based on the field of study. This signifies the necessity to tailor study programs to the particularities of the disciplines to equilibrate the advancement of technical and interpersonal competencies.

Respondents were inquired about which individuals inside the corporation should possess soft skills. Most respondents (86%) asserted that all employees should have these attributes. Others suggested that these competencies should be inherent to managers, executives, and employees who interact with the organization's external customers. In these assertions, bachelor's students from University 1 were prominent. Statistically significant discrepancies were seen between their opinions and those of engineering students from the same university ($\chi^2 = 0.73$, $p = 0.035$), as well as from other universities ($\chi^2 = 0.69$, $p = 0.007$). The results indicate variations in the assessment of soft skills' significance based on the respondents' anticipated professional roles. The responses are depicted in Figure 7.

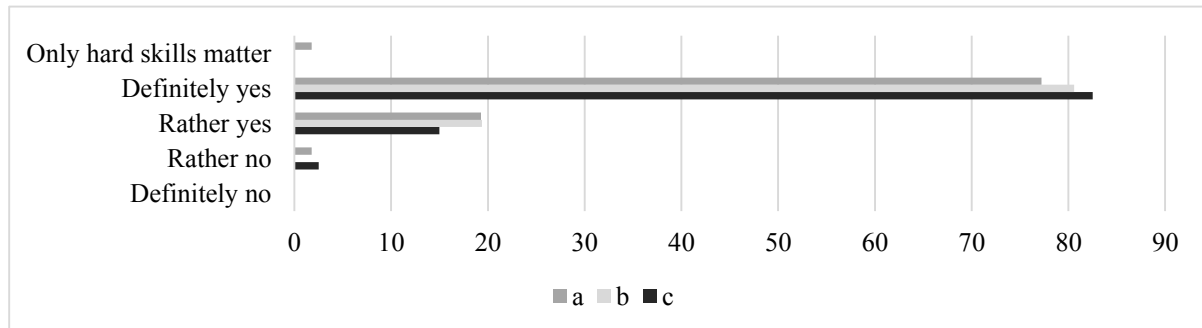


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 7. The person in the company who should possess soft skills as reported by the questioned students (%).

Source: own study.

All surveyed students either strongly agreed or agreed that soft skills will be essential in their professional endeavors following the completion of their studies in a specific field (Figure 8). These results align with the observations of other researchers, who have highlighted the growing significance of soft skills in the employment sector (Robles, 2012; Deloitte, 2024).

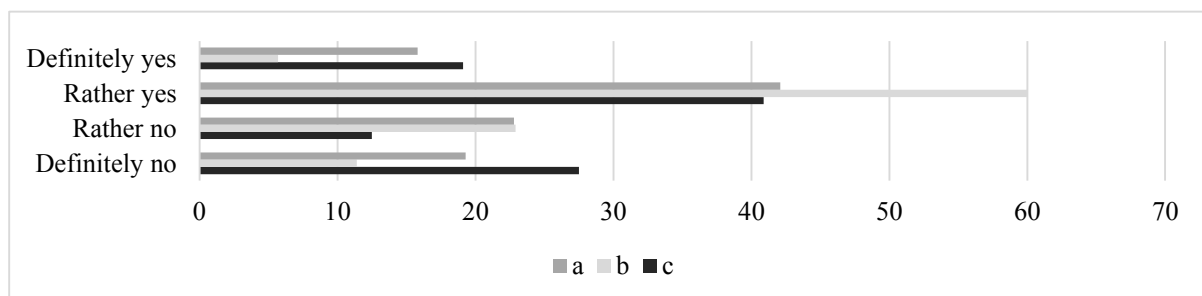


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 8. The significance of soft skills in the professional endeavors of students post-graduation in a specific discipline (%).

Source: own study.

Respondents were inquired about the emphasis placed on soft skills and their development during their studies. The responses varied, although the majority of participants indicated that they were either somewhat or significantly developed during their studies. Nonetheless, several students held divergent views on this issue. Students from University 1 indicated that they were either somewhat (23% of replies) or definitely not (on average 15% of responses) influenced. Likewise, several students from other universities perceived that these competencies were somewhat (12.5%) and definitely not (27.5%) cultivated during their university study. Statistically significant disparities were identified in the responses of students from University 1 compared to those from other universities ($\chi^2 = 0.8$, $p = 0.018$). The study's results are illustrated in Figure 9.

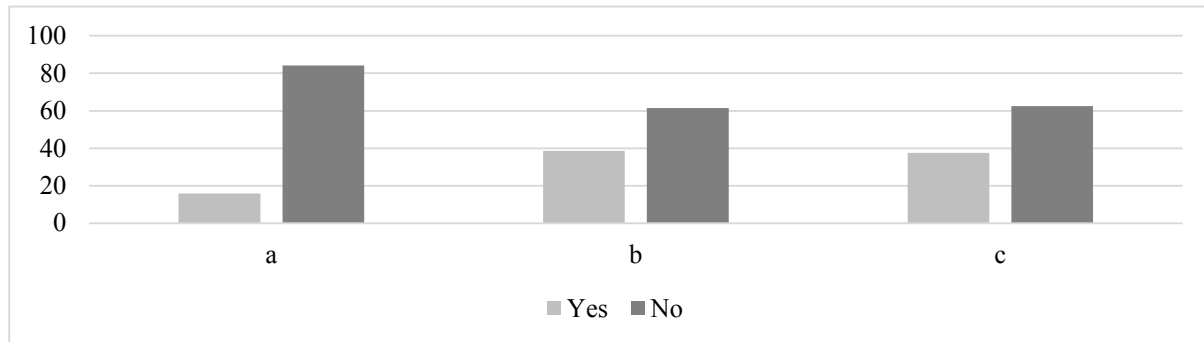


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 9. Student perceptions regarding the emphasis on soft skills and their cultivation during academic education (%).

Source: own study.

The respondents indicated that there were no workshops on soft skills included in their studies (Figure 10). 84.2% of respondents from engineering disciplines and 62% of bachelor's students provided such a response. These findings underscore the necessity of cultivating soft skills throughout higher education, particularly in technical disciplines.

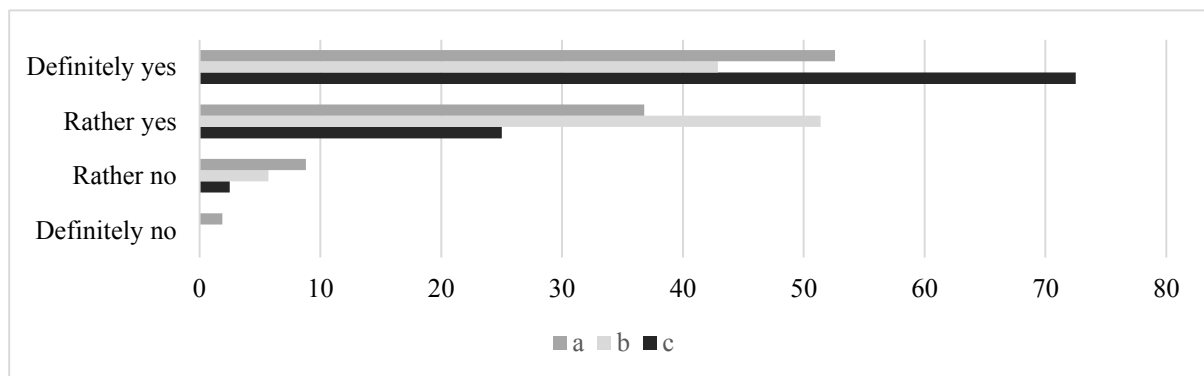


where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 10. The prevalence of soft skills workshops in the academic curricula of the surveyed students (%).

Source: own study.

Students asserted that academic curricula had to incorporate courses focused on the cultivation of soft skills (Figure 11). These opinions were predominantly articulated by bachelor's students. Engineering students expressed a similar viewpoint; nevertheless, within this cohort, some individuals contended that such subjects should rather (8.8%) and definitely not (1.9%) be incorporated into the curriculum.



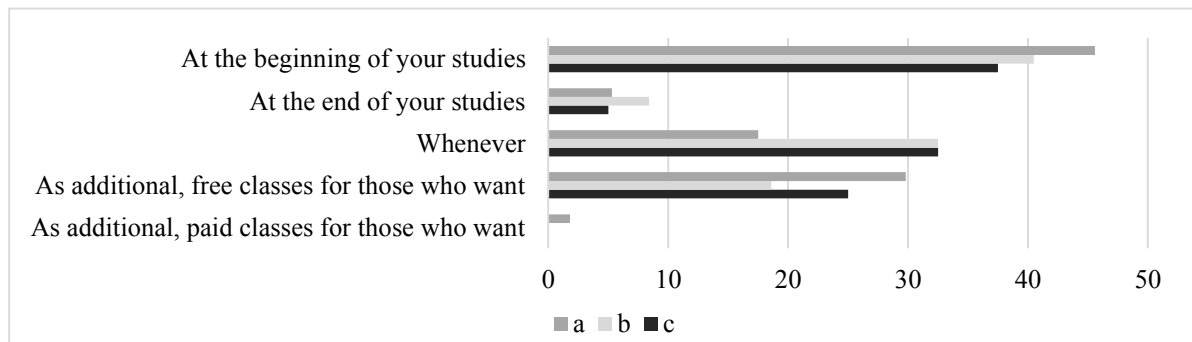
where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 11. Incorporation of courses focused on soft skills within the curriculum (%).

Source: own study.

Forty-one percent of respondents indicated that soft skills courses should occur at the beginning of their studies, 27% believed they should be scheduled at any point during the academic program, and about 18.7% suggested they should be offered in the last semester (Figure 12). Among the surveyed respondents, several asserted that these classes ought to be conducted inside the institution, albeit outside the formal curriculum (free of charge courses for

interested individuals). Responses from engineering students constituted the majority in this group, accounting for 29%. This corresponds with their convictions on the significance of soft skills in professional endeavors and in their careers post-graduation.



where: a - engineering students from University 1, b - bachelor's students from University 1, c - bachelor's students from other universities.

Figure 12. Timing for the implementation of soft skills education throughout academic study (%).

Source: own study.

5. Discussion of the results

The study's results reveal disparities in the perception and evaluation of soft skills among students from different fields and institutions, as corroborated by the academic literature. Women constituted the majority of respondents (averaging 58%), potentially impacting the results related to interpersonal skills, which are typically ranked higher by women, as noted by Mleczkowska (Mleczkowska, 2023). This study also revealed discrepancies in the self-assessment of soft skills, their recognition, and the appraisal of their significance in professional contexts. Engineering students assessed their soft skills most favorably, whilst bachelor's students from universities rated them least favorably. Psychology students held a comparably elevated perception of their abilities, asserting a superior self-evaluation in interpersonal skills (Mleczkowska, 2023). The surveyed students demonstrated familiarity with the concepts of soft and hard skills and were predominantly capable of accurately distinguishing between them. Errors in this classification may have resulted from a lack of awareness, insufficient education in this domain, or unsuitable academic curricula. Nonetheless, young people regarded these competencies as significant in both their personal and professional spheres. Creativity was the highest-ranking soft skill among all student groups, whereas empathy and communication, despite their significance in the employment market, were rated the lowest. Creativity received good ratings in the research conducted by Succi and Canovi (Succi, Canovi, 2020). The authors observed that students frequently overrate their creativity and critical thinking abilities. Noah and Abdul reported analogous findings, revealing that the graduates they examined frequently had deficiencies in critical thinking, problem-solving, English communication,

and teamwork competencies (Noah, Abdul Aziz, 2020). Subpar evaluations in empathy and communicativeness suggest that students, particularly in engineering disciplines, underestimate the importance of interpersonal skills. Robles (2012) also noted a diminished assessment of empathy as an interpersonal competency. Itani and Srour (2016) reported comparable results, indicating that students in technical disciplines are less likely to regard abilities such as conflict resolution and negotiating as crucial skills. The inadequate assessments of empathy and communication skills among engineering students may stem from academic curricula that predominantly emphasize technical competencies. This study reveals that most students advocate for the inclusion of soft skills courses in the academic program, corroborating prior findings about the educational requirements of this group. The findings demonstrating the absence of soft skills training in academic curricula align with Benek's research (2024). The author observed that Polish colleges are deficient in practical courses that cultivate abilities such as communication, conflict resolution, or negotiation. The necessity of developing soft skills during university studies has also been recognized by other researchers (Okolie, Nwosu, Mlanga, 2019; Tang, 2019). Okolie and colleagues (2019) stated that universities bear the responsibility for ensuring that graduates possess these competencies. This underscores the imperative of including soft skills training into academic curricula, particularly in technical disciplines.

6. Summary

The study provided responses to the research questions formulated. Soft skills, while significant in both personal and professional spheres and anticipated by employers, are evaluated differently by students across multiple universities and disciplines. Engineering students exhibit the highest skepticism towards them. The respondents recognized that these competencies are essential in professional settings and have to be cultivated during their education. They emphasized the imperative of incorporating subjects focused on these competencies into the curricula. An identified issue is the students' excessively inflated self-esteem, insufficient recognition of their deficiencies, and the disparity between their competencies and the demands of the employment market, highlighting the significance of education in this domain. This study's findings offer pragmatic recommendations for educational institutions. Implementing mandatory practical courses and incorporating soft skills into conventional academic curricula could greatly enhance students' readiness for employment requirements.

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PROCEDURE FOR DETERMINING A CHANGE IN LOCATION OF A CAPITAL GRUP'S SUPPORT FUNCTIONS. CASE STUDY OF AN MULTINATIONAL ENTERPRISE

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Purpose: The purpose of the study is to identify the method used by top managers to determine the location of support functions in the capital group? Around the main objective thus formulated, the following specific objectives were established: (1) to develop a procedure for determining the relocation of support functions of a capital group; (2) to identify and characterize methods for determining the location of support functions; (3) to identify the method used to determine the location of support functions for displaced functions in a subsidiary of a German capital group in the automotive components industry.

Design/methodology/approach: A case study procedure based on longitudinal empirical research was used. The ongoing changes in the subsidiary's support functions were monitored systematically (once a year). The case study procedure used the method of content analysis of organizational documents (organizational charts) and an individual interview with a list of open-ended questions. The interview was conducted with the director of the plant (who also serves as a member of the board of directors). The purpose of the conducted interviews was to deepen the issues discussed. The research was conducted from 2010 to 2024 at a subsidiary of a German automotive components company.

Findings: The experience and intuition of the plant director has the greatest influence on the selection of the final location for the displaced support functions in the subsidiary's organizational structure. A method based on benchmarking and factors is occasionally used.

Research limitations/implications: The study was limited to one subsidiary of the capital group. The opinions, rationale of only one party - the director of the subsidiary - were studied. The presented results should serve as a starting point for research on a larger research sample.

Practical implications: The information in the article can be used by other managers of subsidiaries, enterprises in different sectors to redesign the current layout of support functions. Relocating functions carries certain costs, risks and social impacts. Therefore, the final relocation of functions should be the result of a well-designed decision.

Originality/value: Development of a procedure for relocating the auxiliary functions of an AI with separate methods for determining the location of functions. Empirical verification of the applied methods in the process of relocating functions at the subsidiary level and between it and the parent company.

Keywords: Subsidiary, parent company, support functions of the company.

Category of the paper: Research paper.

1. Introduction

In modern organizations, especially business entities, the only constant is constant change. The main active areas are: changing technology, changing marketing and promotion strategies, changing forms of personnel communication, changing ways of organization or changing management models (Kiełtyka, 2016, p. 8). Making changes in various areas of an organization rests with the managers who run it. This is because, according to B. Bajcer, the success of an organization largely depends on the manager's ability to cope with a complex and rapidly changing world, especially his ability to think strategically (Bajcer, 2014, pp. 265-277). Today's managers have to make risky changes in the organization, and they have to be able to combat misunderstanding when making these changes and the reaction of their subordinates to these changes. They are referred to in the literature as the managers of tomorrow or the managers of the new era (Kiełtyka, 2016, p. 9).

The changes that are taking place in the global economy in economic, technical, social and political dimensions affect the functioning and development directions of modern capital groups. On the one hand, these changes are forcing the implementation of increasingly effective and economically rewarding organizational solutions. On the other hand, they generate a variety of problems of varying nature, scope and complexity. One of the current problems, constantly important, especially in the era of constant changes in the environment of modern capital groups, is changes in the location of support functions. This is a problem of great complexity, since they can occur with varying intensity, occur simultaneously in all or selected companies of the capital group, involve functions of strategic importance to the capital group. The problem outlined above gives rise to the need to develop a procedure for determining the change in the location of the capital group's support functions. Since any change in the organization, including the location of functions, carries certain costs, risks and social effects, it should be based on a predetermined procedure.

The research nature of the study set the following objectives: on the empirical level: (1) the development of a procedure for determining the relocation of ancillary functions of a capital group, (2) the identification and characterization of methods for determining the location of ancillary functions; on a practical level - (3) the identification of the method used to determine the location of ancillary functions for displaced functions in a subsidiary of a German capital group in the automotive components industry.

2. Theoretical assumptions

The existing arrangement of support functions and the need to optimize the functional areas of the capital group constitute a starting point for discussion about possible directions of their changes. As a result of relocation of functions, smaller or larger changes occur within the economic entity or in the entire capital group. There are changes in the structural elements of the organization (cells, departments, divisions), in interpersonal relations, in human resources (qualifications, competences), in the level of costs generated by internal units (increase, decrease), etc. We can therefore assume, following R.W. Griffin, that changing the location of a function is a significant modification of some part of the organization (Griffin, 2002, p. 393). In managerial practice, various methods can be used to solve the problem of changing the location of support functions in the structure of a capital group. The author indicates three basic methods that are an important element of a larger whole - the procedure for determining the change of location of support functions of a capital group (Figure 1).

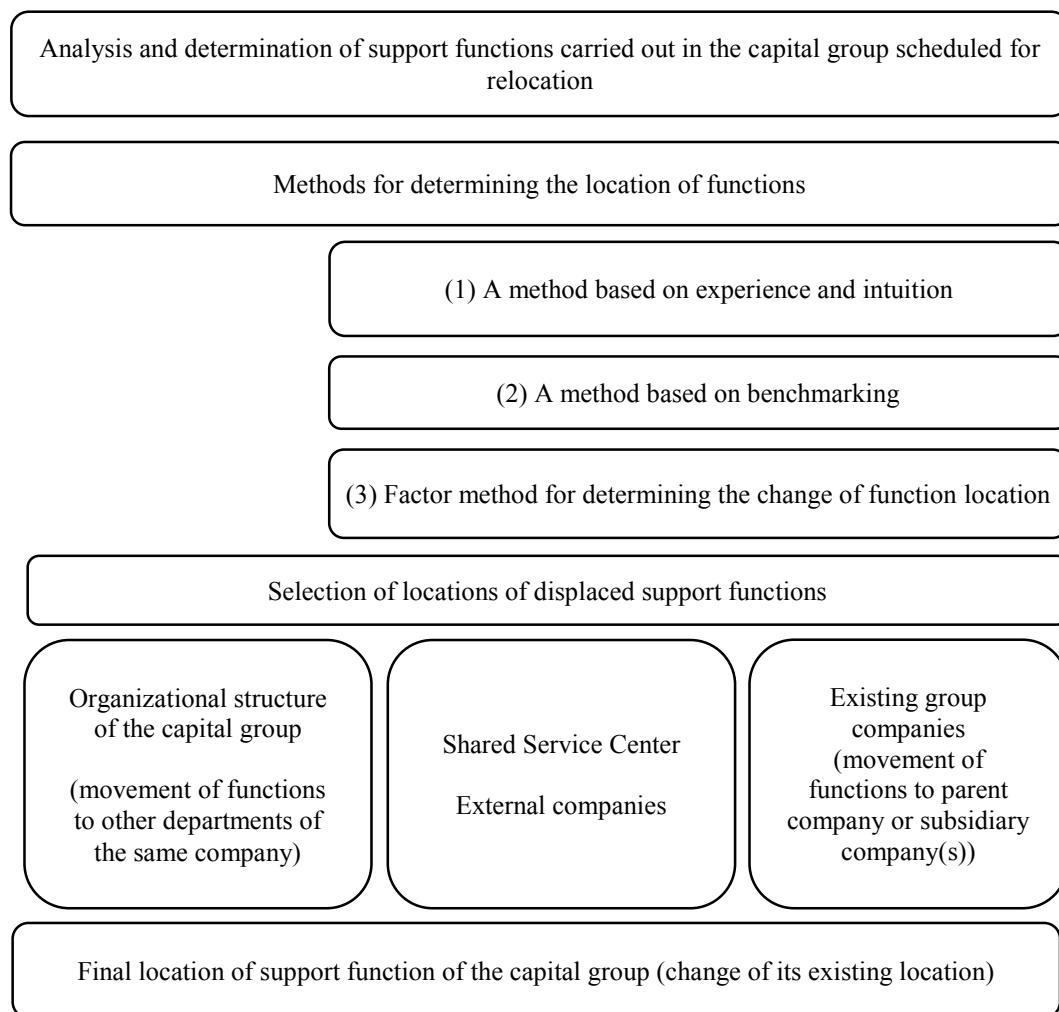


Figure 1. Procedure for determining the change of location of support functions in a subsidiary of a capital group.

Source: Own elaboration.

Under the first method, the experience of decision-makers (top managers) has a significant impact on choosing the right direction to move functions in a multi-entity organization, on reducing the risk of a wrongly chosen organizational solution. More experienced decision-makers are more likely to use an intuitive approach than an analytical one (Pretz, 2008, pp. 554-566). Ongoing research indicates that effective managers use intuition in their work when making decisions (Sadler-Smith, Shefy 2004, p. 79). Intuition is useful in the face of a crisis or emergency when new trends emerge and data is insufficient, inadequate for the problem, or missing (Williams, 2012, p. 59). According to S. Tokarski, intuition should be seen as a manager's ability that can be developed, studied and used to support decision-making (Tokarski, 2005, p. 279). Managers, using intuition, are distinguished not only by a different way of perceiving organizational situations, but also by a unique approach to decision-making problems, the ability to identify and take advantage of opportunities in the marketplace (Malewska, 2014, p. 20). The ability to identify market opportunities is not only conducive to generating additional revenue, but is also the ability to make changes in the function area to increase the efficiency of the entire organization. On the one hand, relying on this method is conducive to solving a problem in a short period of time, with the involvement of a small group of managers, but on the other hand, intuition can lead to ignoring facts (Malewska, 2014, p. 21; Serafin, 2006, p. 11), which, if functions are relocated incorrectly, can carry significant consequences, such as financial and social impacts (staff reductions).

The second method based on benchmarking provides an opportunity to implement solutions for the relocation of functions that have produced the desired results for other groups of companies, competitors, industry leaders and also entities in other industries. As a result, the solution to the problem comes down to adapting already existing solutions to the current environment. A serious barrier here can be access to data (to the latest solutions). The innovation of such a solution is low. In addition, in terms of specific functions there are established as well as dominant solutions, which are not necessarily the best in the industry or sector. But this modeling of the leader or following the dominant trend can be so "ingrained" in the management practice of managers that they implement already existing function localization solutions, treating them as the best, without looking for new, innovative ones. An example of this is, among other things, the existing tendency to centralize R&D and marketing. This trend has been going on for several decades. While the protection of the know-how generated by these functions is an appropriate phenomenon, reducing the personnel of subsidiaries to the role of mere operational implementers of these functions (to executors of top-down orders) is a far-reaching limitation of their creativity and development of human potential. On the other hand, however, imitation of already proven locations reduces the cost and time of constructing and implementing one's own solution. In addition, it is a guarantee, at least temporarily, of an effective and appropriate choice of location for the implementation of functions.

Under the third method, the factor method, a set of factors, their strength and direction of influence are determined. Each influential factor should be recognized and analyzed in detail. Selected factors of change along with their direction of influence are shown in Table 1.

Tabela 1.
Factors of change

Selected factors of change	Direction of influence
Cost reduction.	Centralization of functions
Maintaining the cohesiveness of the capital group.	
Uncertainty of the environment.	
Protection of specialized knowledge.	
Concentration on the subsidiary's core business domain.	
Restriction in access to qualified personnel in the region of the subsidiary's location.	
Function-specific factors.	
Increased involvement of local personnel in business processes.	Decentralization of functions
Orientation to talent management.	
Financial soundness of the daughter company.	
Access to qualified personnel in the region of the daughter company's location.	
Increased qualification of the daughter company's personnel.	
Legal regulations of the daughter company's location country.	
financial, material, information resources held by the daughter company.	
Function-specific factors.	Shared service center
Reduction of costs in the long term.	
Reduction of duplicated support functions.	
Stopping the proliferation of support functions in group entities.	
Elimination of duplicated support processes.	
Optimization of staffing at the administrative and "purely" executive levels.	
Conducting a common purchasing, sales, marketing, investment, renovation, etc. policy within the group.	
Gathering expertise and know-how in one place, developing it and using it outside the group structure.	
Function-specific factors.	

Source: Own elaboration.

3. Research methodology

In the research proceedings, the main problem boils down to the question: Which of the methods of determining the location of support functions has been used in economic practice? Around the main problem thus established, the following research questions were formulated:

1. Which support functions were relocated?
2. What reasons triggered the relocation of functions?
3. Where were the relocated functions located?

The following assumptions were made for the research investigation:

- the main criterion for the selection of a group subsidiary was the availability of data;
- the research was conducted in a domestic subsidiary of a German capital group, whose local management agreed to participate in the research;
- at the time the research began, there were no processes of mergers, acquisitions, demergers, divisions, divestitures of internal business entities in the capital group that could directly or indirectly affect the organizational structure of the studied entity. Thus, the essence of this assumption was to make the research results independent of the influence of various disturbing variables;
- it was a dynamic research, focusing the attention of the researchers on the processes occurring over time;
- the research lasted fourteen years and boiled down to monitoring the changes taking place in the subsidiary's support functions;
- a case study procedure was used for research purposes, based on a longitudinal empirical studies. The state of the organizational structure was monitored systematically (once a year). The case study procedure used the method of analyzing the content of organizational documents (organizational charts) and an individual interview with a list of open-ended questions;
- individual interview was conducted with the director of the plant (who also serves as a board member). The purpose of the conducted interviews was to deepen the issues discussed.

4. Relocation of support functions in a subsidiary - research results

The first stage of the research was to determine the extent of the subsidiary's support functions. The results of the research in this regard are shown in Table 2.

Table 2.
Subsidiary functions with separate support functions

Functions of the subsidiary		Implementation of functions in subsequent years			
		2010	2014	2017	2023
Main function	Production				
Support functions of a technical nature	Research and Development				
	Pre-series production				
	Purchases				
	Logistics (internal, external)				
	Quality control				
	Maintenance				

Cont. table 2.

Support functions of an economic nature	Marketing				
	Sales				
	Personnel				
	Personnel development				
	Accounting				
	Controlling				
	IT				
	Occupational health and safety				

realization of the function

lack of realization of functions

Source: Own elaboration.

In 2010, the following organizational departments functioned in the subsidiary's structure:

- production department, in which process engineering tasks for production activities were additionally carried out,
- the paint shop department, where component painting processes took place,
- the logistics department, which handled internal and external logistics and production planning,
- the maintenance department,
- personnel department, accounting and quality control.

The first changes in the relocation of functions were recorded in 2012 (Table 3). The production department was strengthened by locating the paint shop and production planning there. A stand-alone process engineering department was created with the competence to optimize processes for the entire plant. A cell was separated in the logistics department to deal with spare parts procurement.

Table 3.
Relocation of functions in the subsidiary in 2012

Support functions	Current function location	Reason for relocation of functions	Method used	New location of the function
tasks in the production process area	varnish department	concentration of responsibility for the entire production process, including component painting, in one place	a method based on experience and intuition	production department
production planning	logistics department	conflicts between production staff and logistics staff (not fully taking into account production guidelines)	a method based on experience and intuition a method based on benchmarking	production department
tasks in the area of process engineering	production department	extension of optimization processes to the entire plant	a method based on experience and intuition	creation of a new process engineering department
spare parts purchasing	various departments of the production area	concentration of spare parts purchases in one place	a method based on experience and intuition	department logistics

Source: Own elaboration.

Further changes in support functions were noted in 2014-2016 (Table 4). A new instrument construction department was created to design and build an assembly instrument from scratch based on the product design received from the customer. Previously, these competencies belonged to the parent unit and external companies. Within the logistics department, the logistical handling of production was separated as a result of centralizing the internal logistics carried out in the three cells of the production department. Profound changes took place in the structure of the maintenance department. On the basis of the department, the technology department was separated and maintenance was transferred to the production department. Undoubtedly, this change reduced the rank of maintenance. It is worth noting that during this period the company was separating new positions in personnel development, controlling, construction and increasing employment, including engineers - constructors. This was a natural consequence of the company's development and the high demand for its products.

Table 4.
Relocation of functions in the subsidiary in 2014-2016

Support functions	Current function location	Reason for relocation of functions	Method used	New location of the function
tasks in the production process area	corporate headquarters external companies	the experience and competence of the subsidiary's engineers (personnel with passion)	factor method for determining the change of function location	creation of a new department of instrument construction
internal logistics	various organizational units of the production department	conflicts between production staff and logistics staff (not fully taking into account production guidelines)	a method based on experience and intuition a method based on benchmarking	logistics department
maintenance	maintenance department	identification of production workers with machines	a method based on experience and intuition	production department
spare parts purchasing	logistics department	relieving logistics of tasks that do not concern its competence	a method based on experience and intuition	creation of a new technology department

Source: Own elaboration.

The following changes in support functions were observed between 2017 and 2022 (Table5):

- the purchasing function was strengthened by locating it in a stand-alone department, while assigning new strategic purchasing competencies to it for the company,
- quality planning was transferred to the company's headquarters,
- a production plant directly reporting to the subsidiary was put into operation with separate functions: production, maintenance, logistics, personnel. In terms of other functions, the plant is operated by the subsidiary.

Table 5.
Relocation of functions in the subsidiary in 2017-2023

Support functions	Current function location	Reason for relocation of functions	Method used	New location of the function
perchasing	technology departament	extension of purchasing to include the purchase of strategic components	factor method for determining the relocation of functions	creation of a new administration and finance department
maintenance logistics, personnel	existing departments of subsidiaries	creation of a new production plant directly subordinate to a subsidiary	factor method for determining the relocation of functions	new production plan (transferring selected tasks from function areas)
quality planning	quality control	subsidiary's concentration on executive matters	factor method for determining the relocation of functions	company headquarters

Source: Own elaboration.

Changes in the location of ancillary functions have shaped a new arrangement of functions in the subsidiary (Figure 2).

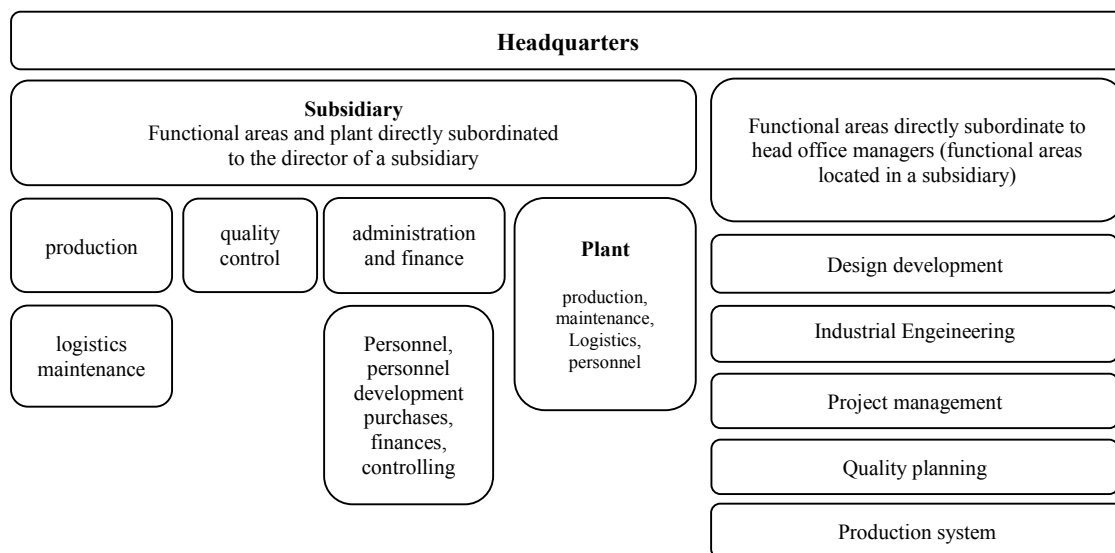


Figure 2. Functional areas of the subsidiary in 2023.

Source: Own elaboration.

The subsidiary and plant carry out support functions for the manufacture of products. The parent company, on the other hand, takes charge of functions of a planning, conceptual and design nature with the strong support of Polish managers and specialists who report directly to the functional managers of the head office.

5. Conclusion

The responsibility of managers for the future of the organisation, for its performance, innovation and development, involves solving organisational problems and making decisions about its functioning. The problems may be of different nature and complexity and their solution may be accompanied by decisions involving many managers, specialists from different organisational units of the company or outsiders. According to K. Bolesta-Kukulka, three areas (levels) of problems can be distinguished in organisational management: owner, managerial and executive (Bolesta-Kukulka, 2003, pp. 20-21). The problem of relocating ancillary functions fits into each of the above areas, as it can relate to:

- the owners' acceptance of the spin-off of a completely new function in the structure of the group company,
- determination by the manager(s) of the place of realisation of the function in the structure of the group company,
- determination by the manager(s) of the location of specific function tasks within the company structure.

The aim of relocating functions is to use human, material, financial and information resources more efficiently as before and to optimise functional areas, organisational processes, organisational structure. But also the adaptation of the company structure to changing environmental conditions. Declining demand for the company's products, staff shortages, rising media prices are influencing the reorganisation of the support functions carried out. Therefore, a change in the location of the function should be preceded by a comprehensive analysis of the places that guarantee the best quality of the function's tasks. This is because any relocation of functions carries certain costs and risks. It has greater or lesser effects at subsidiary and group level.

Analysing the changes in the location of support functions (Figure 3) in the subsidiary of the German capital group over a period of several years, it can be concluded that they were caused by internal reasons and that the dominant method of determining the location of functions was based on the experience and intuition of the plant director - the manager managing the company from its inception. Many of the changes in the area of support functions were made without interference from company headquarters. This demonstrates the trust that the company's head office placed in the local management. This trust was built up by apt decision-making at subsidiary level, which was largely based on the experience of the plant director - his many years of work for the capital group. Occasionally, a method based on benchmarking was used. This was due to the fact that the capital group lacks a company - a benchmark for comparison - and access to information from competing companies is difficult. General information gained from the market (from competitor companies) gives some picture of reality, but without access to detailed information, its use in business practice is very limited.

The method based on drivers of change has also been used sporadically. This was due to the fact that in the period of the research, centralisation, decentralisation of functions were not taking place on such a large scale. Furthermore, there is no Shared Service Centre in the Group.

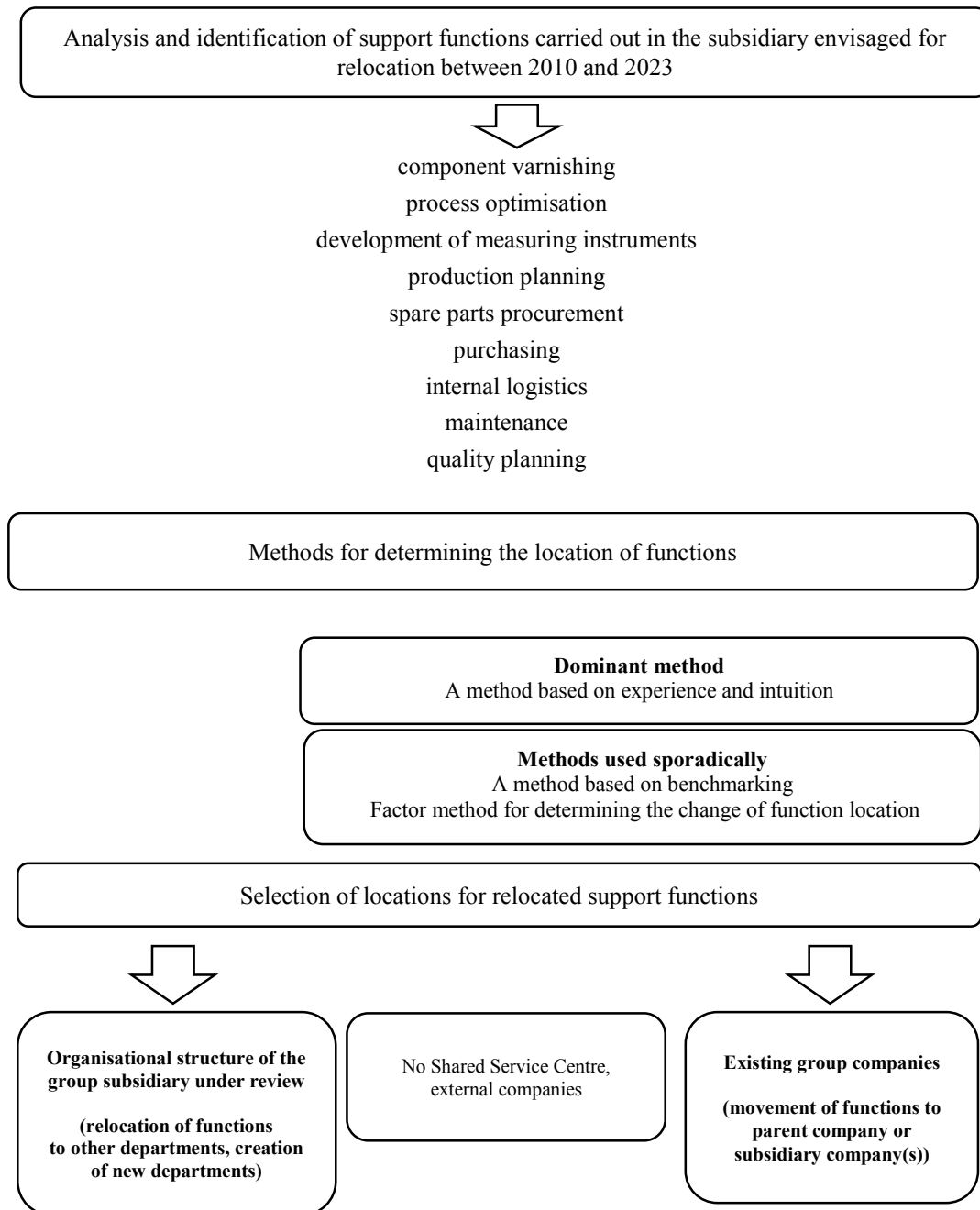


Figure 3. Procedure for determining the change of location of support functions in a subsidiary of a capital group.

Source: Own elaboration.

The research results presented in the article show the methods used in the relocation of support functions in a subsidiary of a capital group. The further direction of research should be to conduct research on a larger research sample. This would allow for the verification of the most frequently used methods of changing the location of functions and strengthening the

theoretical assumptions of the identified methods (possibly developing additional new methods).

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THE UNCERTAINTY OF REAL ESTATE MARKET VALUE AS A FOUNDATIONAL CATEGORY IN THE DECISION-MAKING PROCESS

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Purpose: The study aims to analyze real estate market value uncertainty, focusing on its impact on decision-making processes. It identifies uncertainty sources and evaluates their consequences for market participants. The hypotheses tested are: (H1) Market value lacks a single definitive level, (H2) Uncertainty is intrinsic to valuation and persists even in controlled conditions, and (H3) Its magnitude is significantly greater under real market conditions.

Design/methodology/approach: The study employed a research experiment involving two groups: (a) undergraduate students and (b) appraiser candidates. Participants estimated a commercial property's value using the income approach with simple capitalization and DCF techniques, all based on identical input data.

Findings: The study revealed significant discrepancies in value estimates, stemming from varying interpretations of inputs in the valuation model. It confirmed that valuation uncertainty is intrinsic, present even in controlled environments, and amplifies under market conditions, necessitating a revised approach to presenting results.

Research limitations/implications: The experiment was conducted under lab conditions, which limits the influence of external market factors. Future research should take into account more complex information environments. It is expected that the level of uncertainty will then be significantly higher.

Practical implications: The study emphasizes the need to revise valuation result presentations, as single-point estimates can mislead market participants. It suggests incorporating tools like numerical ranges, sensitivity analyses, and scenario analyses into reports to address inherent uncertainty and enable more informed decision-making in the real estate market.

Social implications: Transparency and standardization of valuation processes contribute to stabilizing the real estate market and more effective management. The topic of valuation uncertainty undertaken so far, mainly by very narrow specialists, has important social and practical implications and should be disseminated to decision-makers in the private and public sectors.

Originality/value: The article contributes to the literature by providing experimental evidence on the sources and extent of uncertainty in real estate valuation. The findings underscore the need for professionalization and standardization to enhance market stability and decision-making quality.

Keywords: Market value, Property valuation, Uncertainty, Decision making process.

Category of the paper: Research paper.

1. Introduction

The valuation of real estate is understood in two ways. It is (a) the process of arriving at a value, i.e. the valuation methodology, and (2) the result of this process, i.e. the value. The variety of purposes of valuation, which results from the needs expressed by market participants, causes the value of real estate to appear and continues to appear in many different forms. For example, the International Valuation Standards of the Royal Institution of Chartered Surveyors (RICS) distinguish between fair value, investment value or market value (RICS, 2020). In addition, in the EVS (European Valuation Standards), such concepts appear as insurance value, bank-mortgage value, value for expropriation and compensation (TeGoVa, 2022). A distinction between types of value has also been made on domestic grounds, e.g. in Poland, distinguishing, among others, replacement value, market value, and fair value. The most important, from the point of view of theoretical considerations and from the point of view of application, is the market value. It forms the basis of most estimates in market transactions, is also used to calculate fees and taxes, can be the basis for securing debts, and litigation is settled on its basis (Kucharska-Stasiak, 2016). Thus, it performs informational, decision-making, negotiating and advisory (Kucharska-Stasiak, 2001). It is a key concept in establishing informed price expectations while remaining a complex and controversial category¹ (Kucharska-Stasiak, Jarecki 2020).

The importance of value in the market - in particular, market value- and the complexity of the process of arriving at it - has caused the valuation of real estate to be standardized². The standardization of property valuation does not make the market value given by the appraiser become the amount that will be paid for the property. The result of the valuation process is a professional opinion of value made by a specific expert. The value is not a fact; it is an estimate, a hypothesis of the price obtainable for the property. This estimate is never

¹ This is because market value is not an intrinsic characteristic of a commodity, good or service to which it is attributed. However, the collective perceptions of market participants are formed due to the competition of subjective valuations (Mooya, 2016).

² This process began as early as the late 1970s through such professional organizations as RICS TEGoVA (The European Group of Valuer's Associations), USPAP (Uniform Standards of Professional Appraisal Practice), and later in the 1980s under the IVSC (International Valuation Standards Council, (originally IAVSC International Assets Valuation Standards Committee) (Grzesik, Żróbek, Żróbek, 2007). Valuation standards, a set of behaviours, systems, values, norms, definitions, and procedures, were developed as part of the effort. The result of standardization is the unification of definitions of the market value of real estate, as well as the development of a common interpretation (RICS, 2020; TEGOVA, 2022). Attempts at standardization have also been made in terms of methodology. However, despite the same roots in the form of economic theory, this has not been achieved (the existing state of affairs is due, among other things, to the different institutional conditions prevailing in different regions of the world) (Kucharska-Stasiak, 2016).

accurate; it carries a dose of subjectivity (Kucharska-Stasiak, 2017). This means that uncertainty is inherent in any opinion of value. It accompanies the valuation of all goods, but as Evans points out, the problem faced by the expert in estimating the market value of real estate is a much more complex problem than determining value in other markets³ (Evans, 2004). The more individualized the subject of the transaction, the less market activity, the more complex the business environment, and the more complex the objectification process. The appraiser, using observation as a research method, learns only some of the characteristics of things and the relationships that exist between them⁴. An important aspect affecting the valuation process and, consequently, property values is also the limited capacity of the human mind to process a large amount of information - heuristic thinking, as well as its interpretation (Jarecki, 2020).

Thus, the market value is a hypothesis of the price possible in the market, under certain conditions, estimated by a specific expert. It is an *ex-ante* category, referring to the future. It represents an imperfect attempt to objectify the behaviour of market participants (Adamiczka, 2017). However, such a perception of the market value category is rare, as noted, among others, by N. French and L. Gabrieli. Recipients of valuation often equate value with price (French, Gabrieli, 2004). They do not perceive its uncertainty. The authors of the Mallinson report also come to a similar conclusion, claiming that even though valuation, understood in terms of the result of an estimate, represents an expert's opinion of value, recipients (individuals, companies, public entities) are inclined to treat it as if it were a fact (Mallison, French, 2000). Researchers and practitioners note that the implication of a misunderstanding among recipients of the uncertainty of the valuation may be a downgrading of its status - the legitimacy of its preparation. However, the main problems in this area relate to the effectiveness of strategic decision-making and planning processes. It is also often discussed in courts (Kucharska-Stasiak, 2016). Uncertainty in valuation, especially the unconscious, hinders decisions on the purchase, sale or modernization of real estate, especially in the long-term strategies of enterprises or public institutions.

Awareness of the uncertainty problem led to work on valuation uncertainty being undertaken by professional organizations of real estate appraisers (RICS, TeGOVA). The first studies emerged after widespread criticism of valuations that followed the real estate crash in the US in the late 1980s (Joslin, 2005). In March 1994, an RICS-appointed team led by Mallinson prepared a report outlining several initiatives that the professional community should undertake to improve the position of the real estate appraiser in the business world - one of which, recommendation No. 34, addressed the need to develop standards for expressing and measuring valuation uncertainty. Discussions on valuation uncertainty revived again after

³ Particularly in efficient markets, where price does infrequently equal value.

⁴ As psychologists point out, learning about the surrounding reality involves constructing specific images and events in the mind resulting from perceived stimulus simulation. There is no total correspondence between what is in the mind and what is in reality. There are as many realities as different mental representations of perceived objects and events (Kucharska-Stasiak, 2017).

the terrorist attack on the World Trade Center towers in 2001. The increasing pressure of the environment led to the next step, which was the commissioning by RICS of another (the first was the Mallison report) report treating the valuation of real estate, this time in the context of the requirements of real estate funds - the Carlsberg report (2002) (French, Gabrieli, 2004). The study's authors also addressed the issue of valuation uncertainty, reiterating the recommendations of an earlier study prepared by Mallinson's team on the need to disclose it in valuation reports. The 2006-2009 economic crisis revealed the need for further research on the quality of valuations. It expanded and popularized the consideration of uncertainty, particularly in global financial markets. In 2008, the Financial Stability Forum (FSF) identified five key reasons for the stagnation—one of the main concerns related directly to valuation and, more specifically, to its transparency. The 2008 crisis made the issue of uncertainty a permanent part of the specialized literature on the subject (Thorne, 2020). The events of 2019 helped to raise it again. The pandemic crisis, resulting in growing fears about the future and regulations restricting freedom of movement - lockdown - also significantly affected the practice of real estate valuation. Real estate appraisers faced the impossibility of estimating the market value of real estate as a result of the lack of market data (a drastic decrease in the number of transactions) and its obsolescence (transactions from before the pandemic period reflected a different state of the market), as well as the difficulty of performing visual inspections of real estate (restrictions). The reaction of the professional community to these events was the preparation of guidelines to assist the work of appraisers, e.g. Valuation Practice Alert - Coronavirus RICS.

Summarizing the results of the discussions held so far, practitioners of valuation have attempted to deal with the problem of uncertainty. They succeeded in leading to its definition and tried to propose a way to express it. A distinction was made between the uncertainty of a single valuation, which relates to input data and is considered typical and atypical uncertainty. Uncertainty is also understood as the difference between valuation and valuation, also referred to as valuation volatility.

Typical uncertainty is a consequence of assessing the magnitude of individual input parameters adopted in the valuation process. To objectify the market, the expert analyzes the real estate market, acquiring a range of data reflecting its participants' typical, most common behaviour. This data often needs to be completed, relates to different time horizons, and, most importantly, relates to properties similar⁵ to the subject of the valuation, not the same. From such an acquired range, the expert selects the most probable figure for a particular property, using both qualitative and quantitative methods and his own expertise. This means that each input is accompanied by uncertainty, involving the ability to assess current and future market conditions. Sources of abnormal uncertainty are found: (a) in the peculiarities of the

⁵ According to Article 4, paragraph 16 of the Law of August 21, 1997, on Real Estate Management, a similar property shall be understood as (...) a real estate that is comparable to the real estate that is the subject of the appraisal, due to its location, legal status, use, manner of use and other features affecting its value.

subject of the valuation, e.g., a huge volume or multifunctional nature of the building. These complicate the process of selecting similar properties, as well as their comparison with the object of valuation, or (b) in the market state as of the valuation date - its low activity, rapid changes in the behaviour of its participants (economic crises, pandemic).

Uncertainty, understood as the difference between valuation and valuation-valuation variability, is oriented to the output data (uncertainty of a single valuation, typical and atypical, concerns the input data). It refers to differences in valuation in the case of the valuation of the same property for the same purpose at the same time but by different appraisers. Its sources are identified: (a) in the uncertainty of a single valuation (typical and atypical), (b) the discrepancy resulting from the different assumptions made in the valuation by different appraisers.

In the case of demonstrating the uncertainty of a single valuation, the following was proposed for its expression, among others: (a) standard deviation, (b) coefficient of variation, (c) triangular probability distribution based on taking three absolute values: most likely, maximum, minimum, (d) Monte Carlo method. Studies on the demonstration of valuation volatility have pointed to, among other things, (1) the regression analysis method, where the explanatory and explanatory variable are nominated valuations prepared by two independently operating entities, (2) the variance as a measure of volatility (Kucharska-Stasiak, 2016).

Ultimately, there is no standardized approach to reporting the uncertainty inherent in property valuation (Kucharska Stasiak, 2016) Many market participants conflate the concepts of price and value, leading to investment and consumption decisions based on flawed assumptions. Presenting the market value of a property as a single figure is inherently misleading, as it fails to account for the uncertainty of the valuation estimate. In the authors' view, this situation warrants urgent change. Therefore, the aim of this study is to identify the sources of uncertainty and to assess its consequences for real estate market participants. The paper poses the following hypotheses: (H1) There is no single level of market value. (H2) Uncertainty is inherent in valuation. It will occur even in a hermetic research environment. Therefore, its level under market conditions (in business practice) will be significantly higher (H3). In order to verify this, the research experiment method was used. Determining how to express uncertainty effectively constitutes the next line of inquiry. Any proposed method must be straightforward and comprehensible for both valuation experts and their audiences. The authors suggest that this could be achieved through the use of numerical intervals or scenario analysis. Lessons could be drawn from methodologies used in the valuation of works of art, given the similarities in the characteristics of these markets (Kucharska-Stasiak, Jarecki, 2022).

2. Literature Review

The topic of uncertainty in real estate valuation has been taken up not only in the application sphere. Researchers also dealt with it⁶. Their works dealt with, among other things, preferred ways of disclosing uncertainty in valuation reports or its causes, e.g. discrepancies in uncertainty understood as valuation variability (difference between valuation and valuation). For example, A. Joslin (2005), dealing with applying the expression of valuation uncertainty, surveyed a group of 100 valuers from the UK. The researcher reached the following conclusions: (1) the respondents were aware of the uncertainty of real estate valuation; (2) the survey showed a convergence in the perception of the sources of uncertainty in valuation by the respondents relative to the conclusions of the literature (67% of the respondents said that there is no possibility of collecting market evidence that would guarantee 100% accuracy of valuation); (3) the fact that the vast majority of the surveyed real estate appraisers (83%) disclose the uncertainty of valuation in their work (however, this is informal in nature); (4) real estate appraisers are divided in their opinions regarding the need for standardization in the expression of uncertainty in valuation (50% of respondents believe it is not needed); (5) appraisers are mostly (67%) positive about the about the possibility of using a so-called tolerance interval for valuation, believing, among other things, that since valuation is an art and not a science, such a procedure would allow for the partial removal of unnecessary work pressure. It should be noted, however, that only a small proportion of respondents expressed approval of the international organizations' desire to standardize such a range. The research on valuation volatility included surveys and experiments conducted among various appraisers, who were tasked with estimating the value of the same property simultaneously for the same purpose based on the data presented or indicating selected valuation input assumptions in the questionnaire presented. A common feature of the studies was that the participating real estate appraisers were given the same set of valuation inputs. They were tasked with selecting those that matched their valuation. The researchers thus wanted to answer whether the very process of processing the information - their selection - would result in a discrepancy in the results.

For example, Hagen and Lord (2003) surveyed a group of 10 real estate appraisers tasked with estimating the value of an office property and another commercial property. The difference between the highest and lowest scores for the office building was 24%, while for the other property, it was as high as 45%. A questionnaire method study by Hutchison and MacGregor Nanthakumaran (1996) found an average difference of 10.7% for office buildings in prime locations in the UK. Brown conducted another study on valuation variability using regression

⁶ Uncertainty studies are deeply rooted in economics, aiming to determine the degree of market objectivity failure in estimating market value, especially in the real estate market context. They are crucial for the correct understanding of valuation reports, not only for real estate appraisers (due to their professional, civil and criminal liability) but also for their clients - the addressees of valuation reports, who make their decisions based on the estimated market value. To this end, several studies and experiments were conducted.

analysis. Using 26 properties valued between 1981 and 1984 by two independent appraisers, he showed that while the values obtained were not identical, the differences between them were minor - the valuations made by one appraiser accounted for about 98% of the variation in the valuations made by the other.

One of the more interesting research experiments was conducted in 2002 and presented at the ERES (European Real Estate Society) scientific conference held in Finlandia (Helsinki) in June 2003. The study's authors, William N.M Smit and Gerjan A. Vos (2003), asked themselves whether the inputs to the valuation were identical and whether the result would be so. The experiment involved several experienced real estate appraisers in good standing, who were tasked with valuing properties using the income approach⁷, simple capitalization and DCF techniques. The appraisers were given a set of identical inputs, both quantitative and qualitative, for the valuation. They were then asked to estimate the value of two properties: (a) an office building and (b) an apartment building. The results of the experiment proved surprising. In the case of the office building, a spread of 8% was observed in the simple capitalization method, while in the DCF model, this spread has already grown to 19%. The result of valuing an apartment building was a spread observed at 7% (simple capitalization) and 14% (DCF), respectively. Above, the researchers concluded with two main conclusions: (1) if the assumption is made that valuation reliability is measured as the spread between the results obtained, such that reliability increases as the spread decreases, it turns out that the simple capitalization model obtains better results than the DCF model; (2) the same set of inputs in the valuation results in different results in terms of the estimated value, the authors of the study note that when appraisers also had to specify inputs - market variables, the discrepancy would be much more significant (these were given in the task) (Kucharska-Stasiak, 2017).

3. Methodology

In this scientific article, the research experiment method⁸ was used. The subject of the study was appointed to the possibility of discrepancies in the estimation of the market value of real estate, resulting solely from the different perceptions of the same input data by students and

⁷ According to Article 153, paragraph 2 of the Law of August 21, 1997, on Real Estate Management, it consists of determining the value of a property on the assumption that its buyer will pay the price for it, the amount of which will depend on the expected income obtainable from the property.

⁸ The method of experimentation involves experimenting with deliberately and artificially created conditions, giving the possibility of any number of repetitions. In this way, by inducing a particular phenomenon and observing and measuring the changes it produces, the researcher formulates conclusions about the object of study. This method is readily used in the natural sciences and the social sciences, including increasingly in economics, which was initially considered a non-experimental science, limited to observation only. This was mainly argued by the impossibility of isolating a particular phenomenon from the whole and the researcher's subjectivity. Experimental research is now also carried out in the real estate market in the area of real estate valuation, being still not very popular (Matel, 2017).

candidates for real estate appraisers. The above accounts for (H1) the lack of a single level of market value due to the appraisal - the expert's opinion of value, and (H2) the inherent uncertainty in estimation. It will occur even in a hermetic research environment. Therefore, its level under market conditions (in business practice) will be significantly higher (H3). As part of the study, a task was prepared to value a commercial property in the income approach, using the investment method, in two variants: (a) discounting income streams and (b) the technique of simple capitalization. The valuation subject was appointed land property developed with a hypothetical office building. The task used a segmented method of data presentation.

As part of the first segment - basic information about the property, the respondents were informed about the specifics of the subject of the valuation (including the location and surroundings, the parameters of the building and its technical-utility condition, the rental area on each floor), the purpose of the valuation, the lease agreements concluded on the property (in two variants), operating expenses, non-rent income. As part of the second information segment - a fundamental analysis of the local market as of the valuation date, the appraisers were familiarized with basic data regarding the local market (where the hypothetical subject of the valuation is located), i.e. the inventory, new supply, the market range of vacancy levels and rental rates, exemptions and rent arrears⁹ - thus aligning the content with the principles of good valuation practice, capitalization rates for "prime" facilities, as well as capital market information needed for in determining the discount rate. The third and fourth segments dealt with parameters of properties similar to the subject of the valuation and transactions of similar properties in a given city. The task presented a dataset of rental rates, vacancy levels, and transactions for properties similar to those of the valuation subject. The fifth segment - an analysis of market rental rates as of the valuation date by floor, provided an alternative for choosing the market level of rental rates, approximating the rich information environment and, consequently, the need for appraisers to make decisions. The last segment, the sixth, dealt with the emergence of a new supply in the form of objects competing with the subject of valuation. Theo elicited the reaction at the stage of estimating return-his return risk generation rates.

4. Results

The experiment was conducted in June 2023 with two research groups. The first consisted of third-year Investment and Real Estate students studying at the Faculty of Economics and Sociology at the University of Lodz, several 39 people (they were asked to solve the task only

⁹ Potential gross income (PDB) - determined on the assumption that the property's potential is realized at 100%, meaning that there are no losses due to vacancies, rent waivers rent and rent arrears, with the income estimate taking into account the rules of the market and the condition of the property being valued.

in the variant of the simple capitalization technique). The second included candidates for real estate appraisers, students completing postgraduate studies in real estate valuation, and students studying at the Faculty of Economics and Sociology at the University of Lodz, with a total of 21 people. Both groups were given a task in which they were asked to estimate the value of an office property using the income approach. The task also included a flow chart for each technique. A summary of the results is provided in Table 1.

Table 1.

Summary of the results of the experiment

Group	Study group 1 (students)		Study group 2 (appraiser candidates)	
	Simple capitalization technique	The technique of discounting income streams (DCF)	Simple capitalization technique	The technique of discounting income streams (DCF)
Disparity ¹⁰	16.20%	-	14.29%	14.00%
Number of results obtained (number of subjects)	12 (39)	-	7 (21)	13 (16)
Maximum score	25 631 994 60 euro	-	25 059 653 33 euro	25 847 205 39 euro
Minimum score	21 479 702 86 euro	-	21 479 702 86 euro	22 228 716 69 euro

Source: elaborated by the authors.

Among the 39 valuations conducted by students, 12 results were recorded, with the highest value reaching 21,479,702.86 euros and the lowest at 25,631,994.60 euros, indicating a discrepancy of 16.20%. The candidates for appraisers were asked to solve the task using two approaches: the direct capitalization technique and the discounted cash flow (DCF) method. The direct capitalization technique was applied by 21 participants, while the DCF method was used by 16 participants. In the direct capitalization technique, 7 distinct results were noted among the 21 solutions. The highest value obtained was 25,059,653.33 euros, and the lowest was 21,479,702.86 euros, resulting in a discrepancy of 14.29%. In the discounted cash flow technique, 13 distinct valuation results were recorded among the 16 solutions. The highest value reached 25,847,205.39 euros, while the lowest was 22,228,716.69 euros, corresponding to a discrepancy of 14.00%. The results of the experimental study indicate that the same set of input data using the same valuation technique may result in different results due to the adoption of different assumptions. This is due to their different perceptions (regarding income, vacancy, operating expenses, and income risk) and their different combinations. There is no single level of market value. Real estate valuation is burdened with estimation uncertainty, which is not eliminated even in a hermetic research environment. It cannot be eliminated; it can only be revealed. One of its sources is the process of arriving at values. A significantly more significant discrepancy between the obtained results could be expected if a similar valuation was made in market (non-laboratory) conditions. The fewer choices there are, the more transparent the market (the more widespread access to information) and the lower the valuation uncertainty.

¹⁰ Discrepancy between maximum and minimum score.

This was also observed when comparing the valuation using the simple capitalization technique and DCF. Even though the discrepancies between the minimum and maximum results do not differ significantly, the number of results obtained varies greatly.

Thus, the research hypotheses adopted in the article have been positively verified. The results of the study also confirm the previous conclusions (contained in the literature review chapter) and confirm that the issue of uncertainty, which was mainly addressed in the 1990s, is still relevant today. The next research step is an attempt to address the identified problem, i.e. the lack of standardization in the expression of valuation uncertainty. The empirical research carried out in this paper also points to the need for greater use of experimental methods in research, rooted in new research trends such as experimental economics, economic psychology and behavioural economics. In the field of property and real estate valuation, only a few such studies have been carried out to date.

5. Conclusions

The market value of real estate, as the basis for decision-making, plays an important role in the functioning of the real estate market, influencing the activities of both private and public sector entities, including companies, financial institutions and individuals. However, as the literature on the subject and economic practice indicate, it is subject to significant uncertainty, which needs to be sufficiently highlighted in the valuation process. It results from the economic situation, the specificity of the market, the specificity of the subject, and also the valuation process itself. The study's results showed that differences in assumptions, perceptions and interpretations of the same input data may lead to significant differences in real estate value estimates (H1). This phenomenon, observed even in a hermetic research environment (H2), indicates that uncertainty is inherent in the valuation process and increases significantly in actual market conditions (H3).

This uncertainty has far-reaching consequences for entities operating in the real estate market. In the private sector, companies and individuals must consider the potential risk associated with valuation uncertainty when planning investments or transactions. This may lead to increased safety margins, transaction costs and, in some cases, investment abandonment. In the public sector, where valuations often form the basis for public asset management, tax calculation and spatial planning, value uncertainty may affect the effectiveness of public policy implementation and resource management. The analysis of the research results indicates that the transparency of valuation processes, revealing its specificity discussed in the article, and access to complete and up-to-date market data contribute to reducing uncertainty. Standardization of procedures, development of open databases and implementation of advanced analytical tools, such as simulation models or statistical techniques, support the objectivity of

valuations and strengthen their credibility. It is equally important to include information about the level of uncertainty in valuation reports, such as tolerance ranges or sensitivity analyses, which allows recipients to understand the results and their potential deviations better.

Despite developing methodologies and tools, it is impossible to eliminate valuation uncertainty. This is due to the very nature of the real estate market - its local nature, diversity of assets and variability of market conditions. The market value remains a hypothetical price, which depends on predictions of entities' future behaviour and experts' subjective assessments. Therefore, the key task of property appraisers is not only to minimize uncertainty by applying best professional practices but also to disclose it appropriately and educate report recipients. To sum up, the uncertainty of the market value of real estate, although challenging, should be treated as an inherent element of the decision-making process. Conscious management of this phenomenon, combined with activities aimed at greater market transparency and standardization of valuations, may support entities operating in the real estate market in making more thoughtful and responsible decisions. Thus, a proper understanding of the role of uncertainty in valuation may contribute to a more effective and stable market functioning.

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ENVIRONMENTAL ASPECTS IN PUBLIC PROCUREMENT IN POLAND: A CASE STUDY OF SELECTED SUPPLY TENDERS

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Purpose: The aim of the publication is to present the results of a study on the evaluation of the extent to which the environmental aspect is applied in public contracts awarded by public entities in Poland for the supply of goods.

Design/methodology/approach: The aim was achieved by analysing 2145 public procurement notices from public entities in the Łódzkie Voivodeship in Poland, which were published from 1 January to 30 November 2024 in the Public Procurement Bulletin. The theoretical aspects covered in the publication included the issues of sustainability, the circular economy and green public procurement. The material scope of the publication includes the results of a survey of the scale of application of environmental criteria in the public procurement procedures covered by the survey.

Findings: The analysis showed that environmental aspects were included in only 34 procurement notices. Green procurement therefore represented a small proportion of the surveyed population at 1.59%. The environmental aspects in the advertisements surveyed mainly concerned environmental performance.

Research limitations/implications: A limitation of the survey was the scope and presentation of aggregate information published in the Public Procurement Bulletin. Subsequent surveys should be extended to service and works contracts, as well as to other regions of Poland and other EU countries.

Practical implications: The studies conducted should inspire public authorities to use green public procurement more widely. In addition, they indicate that legislative authorities in Poland and the European Union should introduce changes to the law obliging public entities to apply environmental criteria in every tender.

Originality/value: The publication contains original research on the extent to which environmental aspects are used in public supply procurement procedures.

Keywords: green public procurement, sustainability, circular economy, public finances.

Category of the paper: Research paper.

1. Introduction

Global economic development and increasing consumption are resulting in large environmental costs in addition to increased prosperity. To date, global economic growth has been based mainly on energy produced from non-renewable energy sources, which has simultaneously generated numerous negative consequences for the environment. This issue is discernible in numerous studies (Kozar, 2018; Kozar, Sulich, 2023; Sulich, Kozar, 2024; Suproń, Myszczyzyn, 2023). Furthermore, the very intensive unsustainable exploitation of the earth's natural resources and the environment in which we live has led to its reduction or destruction, such as in the case of the forests of the Amazon (Hariram et al., 2023). The progressive degradation of the environment as a result of uncontrolled development, the increased emissions causing an increase in carbon dioxide in the atmosphere and the associated decrease in available natural resources has forced the authorities of individual countries to take necessary action on a global scale (Mensah, 2019). The need to reduce the negative effects of economic development that does not take into account environmental protection in its production and service processes has prompted action at the international level (Hess, 2016; Kozar, Oleksiak, 2022).

As a result of public authorities becoming aware of increasing threats to the environment worldwide, the concept of sustainable development was developed and implemented by the World Commission on Environment and Development United Nations Organization. The objective of sustainable development is to implement social and economic processes in such a way that meeting the current needs of the present generation does not limit the opportunities for life and social and economic development of future generations (United Nations, 1987). Sustainable development encompasses a range of goals to be implemented in all countries of the world. The detailed definition of goals aimed at reducing the negative effects of human activities on the environment is set out in Agenda 2030, adopted in 2015, collectively by 193 United Nations countries. The main goal of Agenda 2030 is global economic development and modernisation leading to 'the eradication of poverty in all its forms, while achieving a range of economic, social and environmental objectives' (United Nations, 2015). The implementation of the 2030 Agenda includes a total of 17 Sustainable Development Goals (SDGs) relating to many areas of human life and functioning. The SDGs cover areas such as education, health care, increased productivity, implementation of zero-carbon energy, environmental protection and restoration, sustainable food production systems, sustainable lifestyles and others. The response of public authorities to the Agenda 2030 goals set and adopted for implementation is the implementation by individual countries and international organisations of their own sustainable development programmes tailored to the specifics of the country or region (Sekula et al., 2022). A very important document in this regard is the Green Deal, developed by the European Union in 2019. It assumes the transformation of the EU into

a just and prosperous society, with a modern, resource-efficient and competitive economy with no net greenhouse gas emissions in 2050 and economic growth decoupled from resource use' (European Commission, 2019). Achieving the European Union's Green Deal targets requires the implementation of sustainable development principles in most areas of social and economic activity. The pursuit of climate neutrality by 2050 requires comprehensive changes of action also by public sector actors. Individual EU states should promote and practically implement sustainability goals through their actions, if only as is being done in the area of public procurement (Pouikli, 2021).

The public sector in each country plays a significant role and is an entity participating in the market game usually on the demand side. The situation is similar in Poland, as public organisations purchase necessary goods and services on the market from economic entities operating on it. In addition, it should be remembered that public expenditure should, as a rule, be targeted, economical, effective and rational. This can be achieved, to a certain extent, using a public procurement system, which makes it possible to fulfil the requirement of rational and transparent spending of public funds. Access of commercial entities to public funds related to the offering of goods and services to public organisations should be transparent and unrestricted (Chrisidu-Budnik, 2022). Public organisations are an important part of the demand side of the market, as they fulfil their needs in the market by purchasing goods, services or works. Businesses that offer their goods and services should be able to compete for public contracts without restriction once the contracting authority meets certain criteria (Koch, 2020). The awarding of contracts by public entities is an important market area in which the principles of sustainability can be promoted. The public sector, by specifying in the legislation governing public procurement, the requirements to meet a given criterion relating to sustainability principles, can set certain rules in the market in this respect. The definition of environmental criteria in the public procurement system makes it possible to influence commercial actors and can encourage their implementation. According to current European Union regulations (European Parliament, 2014), public sector procurement in Poland should include environmental and social, i.e. sustainability, aspects in the bid evaluation criteria. When awarding a public procurement contract, Polish public sector entities may, according to the regulations, include environmental aspects in the evaluation criteria. The drive to improve and restore the state of the natural environment in Poland requires public authorities to make extensive use of environmental criteria in the public procurement system. Taking into account the environmental criterion in individual public procurement procedures is an instrument to encourage commercial entities to implement procedures and technological processes which reduce harmful effects on the environment. Such actions by public authorities can contribute to creating demand and markets for environmentally friendly products and services, thus creating incentives for the production and consumption of ecological products green products (Chiappinelli, 2022), also referred to in the literature as green products (Haba et al., 2023; Khizar et al., 2024; Padászyńska, Kozar, 2024).

The above analysis of the literature around green public procurement points to the need to pose research questions. The first question that needs to be asked is to what extent environmental aspects are practically used in public procurement in Poland? Another question that arises from the analysis of the literature is to what extent is research conducted in the area of green public procurement? Furthermore, the question should also be asked, in which types of public procurement of goods are environmental criteria used? The answer to the above questions will enable the evaluation of green public procurement in Poland in relation to the selected research sample.

2. The essence of green public procurement

The public procurement system in a democratic state is an important area for meeting the needs of public entities on the demand side of the market. Commercial entities can, through public procurement procedures, compete for orders from public entities that are financially reliable and stable recipients of goods and services. In addition, the public procurement system through tendering enables public organisations to spend their budgets more rationally, if only by choosing cheaper goods and services in a given market (Lotti et al., 2023). By implementing appropriate purchasing policies and strategies, public authorities can create a public procurement market, also in terms of promoting sustainable goods and services. By doing so, public authorities can, for example, influence companies to increase their interest in the practical implementation of the circular economy. The circular economy is nothing more than, design thinking and education for sustainability in the activities of all market participants (Arruda et al., 2021). Action on the implementation of circular economy principles is strongly promoted by the European Union institutions. Practical implementation of the circular economy concept can have a positive impact on the environment and the economy of individual Member States. In addition, the concept itself is a different solution to traditional recycling, as it relies on practical policies. This manifests itself in the fact that economic operators are oriented towards the re-use of products, components and materials and their re-manufacturing, refurbishment or repair. Furthermore, and very importantly, the circular economy relies on the extensive use of solar, wind, biomass and waste energy throughout the entire value chain of a product as part of its life cycle. Such activities contribute to better management of available goods with clear positive environmental benefits (Korhonen et al., 2018).

An important area of activity for public organisations embedded in the circular economy is well-developed procurement rules at national or international level. Public procurement that incorporates sustainability and life-cycle considerations into tenders as key criteria for evaluating bids can make a significant contribution to changing the performance of the various actors in a given supply chain in a given country (Chersan et al., 2020). Such actions should be

a strategic task for public authorities in the system of procurement of goods and services and in the incurring of public expenditure from the state budget, local government or other public entities. Increasing the number of public tenders that include environmental aspects in their criteria can be effectively supported by relevant state policies promoting the green economy.

The implementation of the public procurement system in Poland took place in 1995 through the introduction of the first legal regulations in this area. This was a result of social and economic changes in Poland in the 1990s, which made it necessary to regulate issues related to the purchase of goods and services by the public sector. Public procurement is intended to provide all economic entities with transparent and equal access to the public sector's demand for the supply of goods, services and works. Public procurement regulations have defined a catalogue of public entities obliged to purchase goods, services and works by public tender. They have also established specific amount thresholds for the value of a given contract defining a given mode of public procurement (open tender, restricted tender, negotiations with an announcement, competitive dialogue, innovative partnership, negotiations without an announcement and procurement on a sole-source basis), i.e. the resulting tender procedure (Szydłowski, 2022).

Through public procurement, the private sector has access to the state's public expenditure, which, depending on the country concerned, can represent between 12% and 30% of Gross Domestic Product (GDP). It should be emphasised that public entities satisfying their needs through the market play a significant demand-side role in the market. In addition, appropriate public authorities' spending policies on the purchase of goods and services can contribute to sustainable market demand (Mélou, 2020). The procedures for conducting tender procedures in Poland have undergone many changes, especially after accession to the European Union. In addition to the regulation of public procurement itself, steps have also been taken in Poland to introduce several European Union guidelines and recommendations on sustainable public procurement. The first actions in this area were taken because of amendments to the Public Procurement Law in 2004. As a result, elements of sustainable development principles were introduced into the Polish public procurement system for the first time (Kancelaria Sejmu RP, 2004). These changes included the introduction of social and environmental criteria into public procurement.

Poland, like any other EU Member State, is obliged to apply the public procurement rules resulting from Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement (European Parliament, 2014). It should be emphasised that the European Union strongly emphasises the importance of a public procurement system that takes environmental aspects into account in tenders. This approach is confirmed by the content of the Green Deal regulations, which emphasises that 'Public authorities, including the EU institutions, should lead by example and ensure that their procurement is green' (European Commission, 2019). It should be mentioned that the procurement process of public entities of the individual Member States must be identical to the principles of the Treaty on the

Functioning of the European Union. The principles deriving from this treaty have also been included in the Polish procurement system. These include the free movement of goods, freedom of establishment, freedom to provide services, the principle of equal treatment, the principle of non-discrimination, the principle of mutual recognition, the principle of proportionality and the principle of transparency. The European Union promotes the use of environmental considerations in public procurement.

According to a handbook developed by the EU, 'green public procurement is a very important tool for achieving environmental policy goals related to climate change, resource use and sustainable consumption and production, especially given the role of public sector spending from Member States' budgets' (Directorate-General for Environment (European Commission) & ICLEI – Local Governments for Sustainability, 2016). It should be emphasised that the EU's implementation of an effective public procurement system that includes environmental aspects contributes to the real implementation of the circular economy concept in individual economies. Furthermore, public procurement can realistically support those business models that aim to preserve the value of goods, materials and resources through the application of closed-loop circularity within the product life cycle (Lăzăroiu et al., 2020). However, as various studies and surveys indicate, green procurement in the EU is still not properly used in practice despite accounting for about 14% of EU GDP. If there is no overall strategy adopted by public authorities to implement green procurement on a large scale then its scope is limited (Sapir et al., 2022).

The issue of green procurement is addressed in numerous academic studies (Kozar et al., 2023; Kozar, Wodnicka, 2024). Green public procurement is identified by many authors as a strategic enabler for sustainable development, but there is still not enough action in this area. Many barriers to the development of green procurement are perceived, such as the reluctance of the public sector to promote it. A key factor in increasing the use of green procurement is the commitment of public authorities and a vision for green procurement in the future. In addition, there are a variety of barriers limiting the actual implementation of green procurement such as the lack of clear legislation, centralisation of purchasing, resistance from political authorities, or corruption, which is one of the key threats to the smooth and transparent functioning of the public procurement system as a whole (Ortega Carrasco et al., 2024). Practically, green public procurement is implemented by incorporating several environmental criteria into the tendering process, which derive from good practice and are included in the relevant legislation. The criteria for the evaluation of tenders are defined by the public entity awarding the contract in question and must be related to the subject matter of the contract. According to the legislation, the contracting entity may select the most advantageous offer based on quality criteria and price or cost, or price and cost. The contracting entity may use an environmental criterion as a criterion for evaluating the tender, which should be linked to certain benefits. These environmental criteria may include the saving of materials, energy in the process of manufacturing the product or service. In addition, they may include the minimisation of waste

or reduced environmental impact (Chrisidu-Budnik, 2022). An important environmental criterion used in green procurement is the aforementioned energy efficiency resulting from the regulation of the legislation in this area (Kancelaria Sejmu RP, 2016). The energy efficiency of products is covered by Regulation (EU) 2017/1369 of the European Parliament and of the Council of 4 July 2017 establishing a framework for energy labelling and repealing Directive 2010/30/EU (European Parliament, 2017). The Polish legal equivalent of this regulation is the Act of 14 September 2012 on energy labelling of energy-related products (Kancelaria Sejmu RP, 2012). It is worth noting that a public entity awarding a contract may use the information presented in the form of an energy label in the description of the subject matter of the contract, the criteria for evaluation of tenders, or the requirements related to the contractor's performance of a given supply.

In addition to energy labels, there are also eco-labels within the EU, introduced by Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel (European Parliament, 2007). The Regulation allows for the use of voluntary eco-labels by operators. The use of such an eco-label requires the operator to undergo a certification process by the relevant Ecolabel product certification body. The procedure for awarding the label covers the life cycle of the product, so that the recipient of the good is aware that the product has been produced in accordance with the principles of sustainability and respect for the environment (Iraldo et al., 2020). Public entities, as part of the award of a public contract, may specify in the criteria for evaluating the subject matter of the contract the requirement for a potential supplier to use the Ecolabel for selected products (Galarraga Gallastegui, 2002). The detailed scope of application of the Ecolabel is defined by the relevant regulations. It is worth mentioning that Polish regulations have imposed an obligation on the government administration to have, as of 1 January 2022, 10 % share of electric vehicles in the fleet of motor vehicles in use. Similar regulations also apply to the need for local government units to have electric vehicles or those powered by another environmentally friendly energy source (Urząd Zamówień Publicznych, 2022). The fulfilment of the above criterion should therefore be considered when tenders for the supply of energy-efficient vehicles are carried out. However, according to the regulations, the environmental criterion is applicable and not required.

Detailed rules for the scope of use of environmental aspects in public procurement in Poland are set out in the relevant Public Procurement Act 2019. In accordance with the provisions of the Act, several environmental criteria have been implemented that may be used by the public entity announcing the tender when determining the criteria or requirements for the evaluation of bids in each tender. These criteria include:

- the possibility of specifying environmental requirements in the description of the subject matter of the contract in accordance with the regulation of Article 101 of the Act,
- the possibility of specifying a requirement for the applicant to apply environmental management systems or standards in accordance with Article 116(1) of the Act,

- the possibility of specifying in the criteria for evaluation of tenders environmental aspects, including energy efficiency of the subject matter of the contract, as referred to in Article 242(2) of the Act,
- the possibility of specifying in the criteria for the evaluation of tenders the application of the cost criterion using life-cycle costing as referred to in Article 245 (1) of the Act,
- specifying the requirements for the performance of the contract including the environmental aspects referred to in Article 96(1) of the Act,
- the determination of the label relating to environmental aspects in accordance with Section 104 of the Act (Kancelaria Sejmu RP, 2004).

The environmental criteria outlined above, which can be used by public entities during the execution of a public contract, are only an option that can be used in a tender. Unfortunately, environmental criteria are not mandatory for use by public entities. The complexity of public procurement procedures and the existing thresholds for the value of the contract which determine the need for a specific procedure mean that the use of environmental aspects is not very easy to apply.

When discussing the green procurement system in Poland, it is important to mention the scale of the public procurement market as a whole and in relation to environmental procurement. According to the report of the President of the Public Procurement Office on the functioning of the public procurement system in 2023, the approximate value of the entire public procurement market in Poland in 2023 was approximately PLN 579.7 billion in total. It is worth pointing out that, for comparison, in 2022 it was a total of PLN 698.3 billion, so year-on-year the value of the public procurement market in Poland fell by 16.98% (Urząd Zamówień Publicznych, 2024). The report also contains very important data on the scale of environmental public procurement awarded by the public sector in 2023. The report shows that 693 public entities awarded a total of 4052 public contracts incorporating environmental aspects in 2023. The value of these contracts amounted to a total value of - 11925319278.12 PLN (excluding VAT). It is worth noting that, according to the report, there was an increase in green public procurement by 730 tenders in 2023 compared to 2022. However, there was also a decrease in their total value by 5247011109.53 PLN (excluding VAT). There was also an increase in the number of total green public procurement by 84 in 2023 compared to 2022. However, the data in the analysed report shows that the total share of green public procurement in Poland in the total number of public contracts awarded in 2023 was only 3%, while its value accounted for 4% of the total value of public contracts awarded (Urząd Zamówień Publicznych, 2024).

3. Description of the research method

The aim of the research presented in this article was to assess the extent to which public entities use the environmental criterion in public procurement of supplies in Poland. For the purposes of the study, the hypothesis was assumed that the scope of application of environmental criteria in supply contracts awarded by public entities in Poland is small. Verification of the research hypothesis and an assessment of the practical application of the environmental criterion in tenders was possible by verifying the content of public contract award notices, which contain detailed information in this respect. The study concerned only announcements at the stage of commencement of the public procurement procedure and not completed procedures with selection of the contractor. This was due to the aim of the study, which was to examine the scope and scale of the use of environmental criteria in tendering procedures by public entities. The study used a qualitative method and a case study relating to individual tender notices and tender documentation such as the Terms of Reference. The use of these research methods made it possible to assess the actual extent of application of the environmental criterion in public supply contracts. The research was focused exclusively on the analysis and verification of the content of individual public supply contract notices published by public entities. The source of data for the analysis was the general database of public contract award notices published on the website of the Public Procurement Bulletin (*EZamowienia*). The supervision of the public procurement system in Poland is exercised by the President of the Public Procurement Office, who, through its subordinate Public Procurement Office, performs its statutory tasks, including being responsible for the publication of tender notices. The choice of the Public Procurement Bulletin as the source of data for the analysis was based on the fact that it is the only complete and reliable database of all public contract award notices in Poland. According to the regulations, all public entities in Poland which are obliged to award public contracts must publish announcements on tenders and other information on their progress, including the award or conclusion of a contract for the execution of a given contract, in the Public Procurement Bulletin. For the purposes of the study, methodological assumptions were defined, which determined the criteria for the selection of the scope of data, i.e. announcements on the awarding of public contracts. For the study, only notices for supplies from the Łódzkie Voivodeship were selected as the type of contract to be realised for the needs of public entities. It is worth mentioning that according to Polish law, supplies are understood as 'the acquisition of products, which are movables, energy, water and property rights, if they can be the subject of trade, in particular on the basis of a sale, supply, rental, lease and leasing agreement with or without a purchase option, which may additionally include placement or installation' (Kancelaria Sejmu RP, 2004).

Another criterion for the selection of data for the study was the restriction to notices published under the national public procurement procedure. The restriction to the national procedure only is determined by the fact that, in practice, public entities in Poland carry out most supplies under this simplified procedure. This is due to the use in the EU public procurement regulations of separate amount thresholds for supplies, services and works, below which a simplified national procedure may be used in public procurement other than when these thresholds are exceeded. The simplified procedure mode is defined by the relevant provisions of the Act of 11 September 2019. Public Procurement Law (Kancelaria Sejmu RP, 2004). In accordance with the provisions of the 2019 Public Procurement Law, the President of the Public Procurement Office published a notice in 2023, which specified that in 2024 there will be 2 quota thresholds for supplies depending on the type of public entities. The first quota threshold below which simplified tendering procedures for supplies for public entities apply was €143,000, equivalent to PLN 663,105. On the other hand, for other public entities listed in the Act, the amount threshold below which simplified procedures may be applied was 221000 euro, which was the equivalent of 1024799 PLN (Prezes Urzędu Zamówień Publicznych, 2023). The established amount thresholds for public supply contracts are very occasionally exceeded each year by the ordering entities, so it was optimal to set this criterion when selecting public procurement procedures for the purposes of the study. Furthermore, for the purposes of the study, only tender notices for supply contracts of public entities from the Łódzkie Voivodeship were selected. To unify the scope of the analysed data in relation to the applicable legal regulations and the related procedure and the applicable amount thresholds, announcements from 1 January 2024 to 30 November 2024 were selected. The assumptions allowed for the unification of the results of the study and their interpretation with regard to the analysed phenomenon. According to data from the Public Procurement Bulletin, in the period under study, public entities in the Łódzkie Voivodeship published a total of 2145 announcements on the award of public supply contracts in accordance with the national procedure. It should be noted that the national procedure also for supply contracts provides for the possibility of considering sustainability criteria, including the environmental criterion.

The database of public supply contract award notices under the simplified procedure, downloaded for the purpose of the study, contained only general information about the tender along with the website address of the Public Procurement Bulletin where the specific notice was published. The downloaded database therefore did not contain the exact content of the notices but only general information, including the entity awarding the contract and the subject of the contract. In practice, this required a thorough review and analysis of each public procurement notice published on the website of the Public Procurement Bulletin during the research. In the end, the study covered a total of 2145 contract award notices of public entities from the Łódzkie Voivodeship, i.e. all notices published in the period under study (1 January - 30 November 2024). It should be emphasised that each announcement of the award of a public contract must contain a note on the fact that environmental criteria were applied with regard to

the description of the subject of the contract, the qualitative assessment of the offer made by potential suppliers and its inclusion in the projected supply contract. Also, the fact that environmental criteria have not been applied must be included in the notice in question. Thus, this research methodology enabled a precise assessment of the scope of application of the environmental criterion in public supply contract award procedures in Poland on the example of the Łódzkie region. It should be emphasised that the inclusion of a given requirement to apply environmental criteria in a public procurement notice means that at the selected stage of the tender procedure, they must be applied during the evaluation of bids submitted by potential suppliers.

The focus of the research was to establish the extent to which the environmental criterion was applied to the announcement in question separately:

- the use of the environmental criterion in the notice as a separate criterion in the description of the subject of the contract,
- the application of the environmental criterion in the announcement in the qualitative assessment criteria,
- the inclusion of an environmental criterion in the notice in the draft contract for the delivery of the public procurement contract awarded.

A thorough analysis of public procurement notices made it possible to verify the actual extent to which the above-mentioned environmental criteria were applied in the awarded public contracts. The results of the research are presented later in this publication. Furthermore, it should be emphasised that a certain limitation of the research in this case was the fact that some of the public procurement notices analysed may not have resulted in the actual award of a tender consisting in the conclusion of a supply contract. However, the study of announcements made it possible to assess the scale of the use of the environmental criterion by public entities in the Łódzkie Voivodeship in supply tender procedures.

4. The results of green procurement research

The verification of each of the 2145 notices made it possible to determine the overall share of green procurement in the total number of tender notices during the period under review. Figures on the number of public procurement notices verified, together with data on the number of tender notices with environmental aspects and their percentage share, are included in the table (Table 1).

According to the data in the table (Table 1), public entities from the Łódzkie Voivodeship in the examined period of 2024 only applied environmental criteria in 34 public procurement notices for supplies. This represented only a share of 1.59% in the total number of public procurement notices examined. This indicates that the share of green procurement in the total

number of public procurement notices issued by public entities in the Łódzkie Voivodeship in the examined period was low. It is noteworthy that the shown share of 1.59% is lower than the total share of all green public contracts in Poland awarded by public entities in the whole of 2023, when it amounted to 3% (Urząd Zamówień Publicznych, 2024). It should be noted, of course, that the data covered in this study included 11 months of 2024, and only announcements for supply tenders in one region of Poland. Despite this, the results of the analysis indicate a general trend in the share of green public procurement in Poland in total tenders. It should be mentioned that the examined announcements included procurement procedures carried out by various public entities, such as offices, universities, hospitals, scientific and research institutes and other organisational units of the public sector obliged to do so. A thorough verification of the procurement notices also made it possible to check to what extent the public entities in the sample considered particular environmental criteria or aspects in their tender notices. The results of this analysis are summarised in the table (Table 2).

Table 1.

Summary of the total number of public procurement notices examined with notices containing environmental aspects

Item	Numerical and percentage coverage of public procurement notices examined	
	Number of public procurement notices	Share of a given type of public procurement notice in %
Total number of public procurement notices examined	2145	100.00%
Public procurement notices with environmental aspects	34	1.59%

Note: The study covered a total of 2145 public procurement notices published by public procurers (central and local government offices, public universities, healthcare institutions, research institutes, higher education institutions and by other public entities obliged to do so) from Łódzkie Voivodeship in the period from 1 January to 30 November 2024 on the website of the Public Procurement Bulletin (EZamowienia). Table 1 also includes a total of 34 tender notices to be counted as green public procurement.

Source: own study based on empirical research.

According to the data in the table (Table 2), public procurers most often included environmental performance or functionality requirements in their green supply contract announcements, resulting from Article 101(1) of the PPL. In total, in 20 out of 34 notices containing environmental aspects, public entities included environmental criteria. This represented only a share of 0.93% of all notices examined. Among all 34 notices containing environmental aspects, the share of this criterion was at the level of 58.82%. Detailed analysis of the notices showed that most often the environmental aspect resulting from Article 101, paragraph 1 of the PPL was used as a criterion for evaluation of a given offer regarding energy consumption in the purchase of motor vehicles (cars, including electric cars).

In the case of purchase of vehicles, this criterion accounted for, however, only 10% in the overall evaluation criterion in addition to the price offered by the potential supplier (the criterion's ratio was 90% price to 10% energy consumption). In addition to the purchase of

cars (10 tenders), this criterion was included in the purchase of necessary infrastructure for new childcare places (4 tenders), in the purchase of agricultural equipment (3 tenders). The criterion in question was also used in tenders for the purchase of equipment for rescue or fire-fighting operations (1 tender), for the purchase of a mobile stage for the Cultural Centre (1 tender) and for the purchase of renewable energy installations (1 tender). It should be emphasised that in relation to all the 2145 public procurement notices examined for the purchase of similar goods (cars, agricultural equipment, rescue and fire-fighting equipment or photovoltaic panels), this is an almost trace proportion of the use of this environmental criterion in tenders.

Table 2.

Summary of numbers and percentages of public contract award notices containing specific environmental criteria under the provisions of the PPL

Item	Numerical and percentage coverage of the public procurement notices examined regarding the application of specific environmental criteria under the PPL		
	Number of public procurement notices containing specific environmental criteria resulting from the legal provisions of the PPL	Percentage of notices with selected environmental aspects from the PPL in the total number of notices (2145)	Share of notices with a selected environmental aspect from the PHP in the total number of green public procurement notices of public procurement notices (34)
Notices containing environmental aspects (Article 96 of the PPL)	16	0.75%	47.06%
Notices containing performance or functional requirements, including environmental requirements (Article 101(1) of the PPL)	20	0.93%	58.82%
Notices requiring the supplier to provide an environmental label (Article 104 of the PPL)	1	0.05%	2.94%
Notices requiring that the most advantageous tender be selected on the basis of quality criteria - environmental aspects (Article 242(2) of the PPL)	6	0.28%	17.65%

Note: The abbreviation PPL stands for the specific legal regulations contained in the Act of 11 September 2019. Public Procurement Law (Kancelaria Sejmu RP, 2004). The study covered a total of 2145 public procurement notices published by public contracting authorities (government and local government offices, public universities, health care facilities and self-government administration offices, public universities, healthcare institutions, research institutes, higher education institutions and by other public entities obliged to do so) from Łódzkie Voivodeship in the period from 1 January to 30 November 2024 on the website of the Public Procurement Bulletin (*EZamowienia*). The table (Table 2) includes a summary of the number and percentage of announcements that included specific environmental aspects resulting from the legal regulations governing the public procurement system in Poland. A total of 34 notices containing the environmental aspects indicated in detail in the table above were identified in the study population (Table 2). Some of the environmental criteria were collectively used several times by public sector procurers.

Source: own study based on empirical research.

The next criterion in terms of the number of times it was used by public entities in tender announcements was the environmental aspect resulting from Article 96 of the PPL. In total, the fact that this criterion was included was found in 16 green public procurement notices. This represented only a share of 0.75% of all the notices examined and a 47.06% share in all 34 notices containing environmental aspects. The environmental criterion resulting from the regulation of Article 96 of the PPL was included in the draft provisions of the contract for the execution of a given public procurement supply. This regulation was included in the case of announcements for the supply of motor vehicles (7 tenders), for the supply of octagonal reducers on existing acoustic screens (2 tenders), for the supply of number plates (1 tender), for the supply of photovoltaic panels (1 tender), for the supply of fuel oil for a social care facility (1 tender), for the supply of electrical equipment (1 tender), for the supply of a platform for the disabled (1 tender), for the supply of granite aggregate (1 tender) and for the supply of equipment for traffic stops (1 tender). Again, it should be emphasised that an analysis of all the announcements from the surveyed sample shows that in the case of similar announcements for the supply of goods, public entities did not make use of the possibility to apply the environmental criterion. This was the case with the purchase of passenger cars as well as fuel oil or number plates and other similar goods.

Another criterion in terms of the number of its application by public entities in public procurement was the requirement to select the most advantageous offer on the basis of quality criteria, i.e. environmental aspects included in Article 242(2) of the PPL. In total, the fact of including this criterion was found in 6 public procurement notices. This constituted only a 0.28% share among all the notices examined and a 17.65% share among all the 34 notices containing environmental aspects analysed. The criterion of the requirement to select the most advantageous offer on the basis of environmental aspects, mainly concerned the energy efficiency of the subject of the contract. In practice, it was used similarly to the criterion resulting from Article 101, paragraph 1 of the PPL. First of all, it was applied in the scope of offer evaluation concerning energy consumption in the purchase of motor vehicles. Both indicated criteria resulting from Article 101, paragraph 1 and Article 242, paragraph 2 of the PPL was used in total in 5 tenders. All 6 notices containing the criterion of environmental aspects resulting from Article 242, paragraph 2, concerned notices for the award of public procurement contracts for motor vehicles.

Among all the notices examined, only one was found to include a requirement for the supplier to provide an environmental label (Article 104 of the PPL). This announcement therefore accounted for a trace share of 0.05% in the total number of public procurement notices examined. Furthermore, this announcement accounted for a 2.94% share of all 34 announcements containing environmental aspects. The requirement for a supplier to use an environmental label concerned, in the case examined, the supply of lighting retrofits. The symbolic use by public entities of the requirement for a supplier to use an environmental label in the announcement may indicate a very low awareness of the importance of environmental labels and the essence of green procurement among managers of public entities.

The verification of the individual 34 green procurement notices also showed that the public entities launching the tender in question applied several environmental criteria or aspects simultaneously in a single procurement procedure. Generalizing, public entities applied 3 environmental criteria or aspects simultaneously in one announcement in only 2 announcements containing environmental aspects. The simultaneous application of 2 environmental aspects in an announcement was found in 5 announcements, while only one of the environmental criteria indicated above was applied by public entities for a total of 27 announcements.

A detailed study of 2145 public procurement notices shows that the scope for green public procurement is small. Research in this area needs to be broadened, if only to include further areas of public procurement, namely services and public works. Furthermore, it is worth extending the territorial scope of the Green Public Procurement Survey to include the entire country and the member states of the European Union. In addition, the study should focus on evaluating completed public procurement procedures with the conclusion of a contract. This would enable a thorough analysis of the extent of green public procurement. The selection of contract award notices for the study was conditioned by the need to examine the scope of green procurement in 2024, the practice of proceedings indicates that they can take a very long time, so complete data in this area is not easy to obtain in a short period of time. In addition, the selection of announcements was conditioned by the attempt to study in-depth the tenders in the scope selected for the study.

The presented results of a study on the extent to which environmental aspects were applied in public procurement announcements included actual green public procurement. The data presented may be an interesting source of information on this issue or may inspire other researchers interested in the subject. However, when analysing the results of the study, it should be borne in mind that some procurement notices may have been re-posted and their content may always have changed, for example by adding environmental aspects to the new notice. Despite some limitations, the analysed database of announcements made it possible to examine the scope of application of Green Public Procurement in tenders for the supply of goods for public entities in the selected region of Poland (Łódzkie Voivodeship).

5. Discussion

The issue of green public procurement and the extent to which it is applied in practice in European Union countries is an interesting research area for many researchers. One important research area in the field of public procurement is the assessment of the determinants of the adoption of green procurement practices at the local authority level. This issue was the subject of a survey in Sweden, which covered a total of 140 municipalities in 2018. The results of this

research indicate that, for Swedish municipalities, the most important determinant of green procurement was reliance on existing green procurement action strategies. It was also found that the propensity to use environmental criteria in public procurement decreased as the priority given to cost minimisation in the procurement process increased. The publication points out that the use of environmental criteria in public procurement is voluntary and formulated only as a suggestion to public entities. There is therefore, according to the researchers, a significant risk that environmental objectives will be given less importance in public organisations where procurement processes are centralised (Bryngemark et al., 2023). The conclusions of these studies indicate that Sweden lacks an explicit legal obligation to use an environmental criterion in tenders, which contributes to their limited use by public entities in practice. Similar conclusions can be drawn in this respect by analysing the legal regulations for the award of public contracts in Poland, as mentioned earlier in this publication.

Another example of analysing the activities of public entities in this area was a study on Malta, which is a small Member State of the European Union. The analysis of green public procurement in Malta shows that the lack of clear regulations for its use is a barrier to its practical application. As a small country, Malta is heavily dependent on imports. This is why the Circular Economy Malta (*Home - CE Malta*) programme was implemented there. This is because the Maltese public authorities have recognised that if entrepreneurs implement innovative production or service delivery systems based on closed-loop business models that include reuse and recycling in their processes they will be able to succeed. This scheme can fit well into the green public procurement system, as the public sector will be able to source goods produced in accordance with the circular economy concept. It can be considered good practice in this area (Caruana, Vassallo, 2024). So far, no such concepts promoting circular economy have been implemented in Poland within the public procurement system. It is worth mentioning that the use of environmental criteria in public procurement by the public sector can also have a very good impact on the environmental innovation of companies, as is the case in Germany, as demonstrated by research in this area (Krieger, Zipperer, 2022).

An analysis of Spain's green procurement implementation process, covering thousands of public procurement processes awarded between 2012 and 2019, showed that Spain's implementation of Directive 2014/24/EU on public procurement has had a positive effect on increasing its use by local public entities. The most pronounced effect of the increase in green procurement in Spain was found among the more bureaucratic, less flexible public administrations. Overall, based on the results of the study of green public procurement in Spain, it should be concluded that public administrations can effectively use public procurement as a strategic tool to achieve sustainable results (Rosell, 2023). When comparing green procurement data between Poland (Urząd Zamówień Publicznych, 2024) and Spain, it is clear that public entities in Poland make less use of environmental aspects in public procurement (Piotrowska, Przygodzki, 2024). The findings in Spain are significant in that the country is often comparable in its population and economic potential to Poland within the European Union

countries. Interesting findings on green procurement emerge from a publication containing the results of research in Romania. An analysis of the implementation of green procurement by public entities in Romania, shows that the level of application of environmental aspects was as low as in Poland (Urząd Zamówień Publicznych, 2024). A key barrier to increasing the scope of green public procurement in Romania is, as in Poland, the lack of mandatory legal requirements and clear performance targets in this area. In addition, in Romania, a barrier to the development of green procurement has been the lack of training, little awareness of existing tools in this field and insufficient knowledge and skills necessary to properly prepare and conduct tenders that include environmental considerations in the evaluation criteria. The similarities between Romania and Poland (Urząd Zamówień Publicznych, 2024) in the area of public procurement based on this research are very clear (Bilan, 2023).

The results of the research clearly show the benefits of green public procurement. A perceived barrier in this area by many researchers is the lack of legal regulations that would explicitly require the public sector to use environmental criteria in public procurement. It is important to remember, however, that green public procurement can make a significant contribution to reducing carbon emissions and improving the environment. Research carried out in Germany on the impact of green public procurement on decarbonisation policies indicates that it can also play a positive role in this area. Indeed, by selecting environmentally friendly goods and services in areas where public authorities are important buyers, public organisations can have both a direct and indirect impact on the direction of sustainable development in a country (Chiappinelli, Zipperer, 2017).

Summarising the analysis of research on the use of green public procurement in various exemplary European Union countries, it is worth highlighting research on the use of environmental criteria by EU institutions. The results of a study in this area covering tenders for the period 2009-2019 showed that, in fact, the local public sector in EU countries led the way in implementing environmental aspects in public procurement (8.7%), while EU institutions achieved a rate of (3.1%) compared to national governments (5.4%) and regions (6.2%). These studies clearly indicate that there is still a lot of work to be done across the European Union to increase the practical application of environmental criteria in public procurement (Badell, Rosell, 2021).

Conclusions

A study of the extent to which green public procurement is used has revealed very little use of the environmental criterion by Polish public entities. Out of a total of 2145 public supply contract award notices examined, the fact that an environmental criterion was applied was found in 34 tender notices. This represented only a 1.59% share of notices with environmental criteria

in the total population examined (2145 notices). A thorough analysis of all public supply contract notices revealed that public entities in Poland make sporadic use of environmental criteria. The study made it possible to confirm the research hypothesis that the extent of use of environmental aspects in the awarding of public contracts in Poland is low.

Among the advertisements examined, none with an environmental criterion were found to be published by universities, medical care facilities (including hospitals) or scientific and research centres. The advertisements of these entities concerned, among other things, the purchase of very different computer equipment, medical equipment, household appliances, cars and other goods, the manufacture and decommissioning of which affect the environment. The fact that the above-mentioned public entities did not use the criterion of energy consumption or the use of environmental labels in their advertisements shows that issues of sustainable development, including environmental aspects, have so far had little practical application. This is all the more surprising in the case of these entities, as most of the universities that have awarded public supply contracts have conducted extensive research into the nature and principles of sustainable development. This therefore calls for a broader implementation of scientific findings into the practical organisational activities of the university or research institute concerned.

The negligible use of environmental criteria by public entities in public procurement when evaluating bids was probably due to the regulations in force. Tenders carried out under national public supply procurement procedures do not contain an obligatory requirement to apply an environmental criterion. The application of the environmental criteria in question is only a recommendation, the non-implementation of which does not result in any sanctions for the public entity. The application of environmental aspects in a tender may, in practice, cause considerable organisational and formal problems for the awarding entity. This is because the need for a good definition of environmental requirements in the tender documentation requires staff with the relevant qualifications or training in this area. In addition, the inclusion of an environmental criterion in the formal requirements for evaluation of an offer means that the entity ordering the products in question has a limited number of entities that will be able to meet these requirements and deliver a good one. In practical terms, this means a reduction in the potential number of bidders willing to deliver a given supply that complies with environmental aspects. Thus, the lack of explicitly stated mandatory requirements in the legislation for the use of environmental criteria in tenders makes their use sporadic. This is also confirmed by the research results discussed in the publication and data from the report of the President of the Public Procurement Office on the implementation of public procurement in Poland in 2023, where it was indicated that the share of green procurement in all completed tenders was only 3% (Urząd Zamówień Publicznych, 2024).

A possible solution for increasing the scope of application of environmental aspects in public procurement is to change the legal regulations in this regard. Changes in legal regulations should be aimed at a clear determination of the obligation to apply environmental criteria each

time. This obligation, at least at the beginning of changes in legal regulations, could concern the necessity to apply the environmental criterion when making purchases of specific groups of goods, e.g. cars, computer equipment, household appliances, whose production process and operation are very energy-consuming and harmful to the environment. In subsequent stages, the range of mandatory goods or product categories for the purchase of which the public sector must apply environmental criteria in every case could be increased.

It is also worth mentioning that the implementation of such mandatory requirements for the use of environmental criteria in tenders should be regulated at EU-wide level, if only in the relevant EU Directive. This would be a practical implementation across the EU of a number of 'Green Deal' principles for the award of public procurement containing environmental aspects. Currently, the only available possibility of increasing the scope of green public procurement in Poland is to promote and encourage the use of environmental aspects in individual tenders of the management of public entities.

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NEW REQUIREMENTS FOR PACKAGING WASTE MANAGEMENT IN POLAND AS A WAY TO REALIZING THE GOALS OF A CIRCULAR ECONOMY

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Purpose: The aim of the article is to present the legal changes in the field of packaging and packaging waste in Poland over several years. These changes also concern various institutions adapting to the amendment to the law by, for example, introducing a deposit system or purchasing bottle dispensers. The authors want to show what the deposit system in Poland will look like in principle. It is intended to reduce the waste of secondary raw materials and accelerate the implementation of circular economy (CE) and sustainable development goals.

Design/methodology/approach: The aim of the article will be achieved by analyzing the proposed changes to the Act on packaging and packaging waste management and comparing them to economic realities. A review of scientific articles, the authors' participation in online debates on changes in the deposit system and a review of websites will allow for a comparison of the work/changes made so far by various institutions (cities, shops) in this area. This will also allow you to formulate the benefits and difficulties that may arise when implementing the system.

Findings: Based on the analysis of documents and implemented investments, ecological, economic and social benefits for the country were identified in the implementation of the deposit system (affecting the implementation of CE objectives).

Research limitations/implications: The research conducted by the authors is based on the previous initiatives of the organizations described. The real benefits of implementing the deposit system will be visible at least after a year or two of its operation. Currently, these are guesses based on other countries. In their research, the authors intend to monitor the results and benefits of the deposit system in Poland in the coming years.

Practical implications: The article has a synthetic application for retail chains that can observe the activities of competitors. Moreover, it constitutes source material for future comparisons and research in this area.

Social implications: The implementation of the deposit system from January 1, 2025 in Poland will have a positive impact on increasing the recovery of packaging waste. This has a direct impact on environmental protection, saving raw materials and energy, increasing the responsibility of packaging producers and society for the implementation of packaging waste management and CE.

Originality/value: The article presents current achievements in the implementation of the deposit system in Poland as a result of new legal regulations.

Keywords: deposit system, bottle dispensers, waste packaging management, circular economy, SUP - Single Use Plastics.

Category of the paper: research work, case study.

1. Introduction

The aim of introducing circular economy (CE) is to change the farming system from linear to circular. This goal is to be achieved by introducing high-quality and durable products to the market that can be: borrowed, reused, repaired, refurbished and recycled for as long as possible. In this way, the life cycle of existing products operating on the market will be extended (COM 98/2020; COM (2014) 398; Smol, Kulczycka, Avdiushchenko, 2017, pp. 669-678; Zarębska, 2017, pp. 286-295). Packaging is a perfect example here. Packaging is perfect for recovery and recycling. For example, beer bottles, barrels, wooden and plastic crates are suitable for multiple use; for material recycling - plastic bottles, juice cartons, linen or cotton bags; for thermal recycling - mixed and contaminated plastic packaging. In addition to reusable packaging, there is a large amount of disposable packaging on the market, which quickly becomes waste for example: disposable bags, juice and mineral water bottles, beverage cans, milk cartons, disposable food packaging (Plastics Europe, 2023; Szczepański, Waszczyko-Miłkowska, Kamińska-Borak, 2022; Zarębska et al., 2018; Zarębska, 2019).

According to data from the European Commission (Eurostat, 2024), over 2.2 billion tons of waste are produced annually in the European Union (EU), of which 27% (594 million tons) of all waste is municipal waste. In 2021, 84.3 million tonnes of packaging waste was generated in the EU, which corresponds to almost 189 kg per inhabitant. Of this packaging waste generated, approximately 80% was recovered, but only approximately 64% was recycled. Between 2010 and 2020, the amount of plastic packaging waste generated per capita in the EU alone increased by 23% (Eurostat, 2024). As you can see, packaging waste including plastic is a big problem to solve in terms of its management. This problem is very important because, as the EU forecasts, the amount of packaging waste produced will continue to increase.

By implementing a deposit system, EU countries intend to increase the recovery and recycling of packaging waste and thus minimize the amount of packaging waste deposited in landfills or incinerated (Directive 2019/904; Directive 2018/852; Lewicka et al., 2023; Zarębska, 2019). In the 16 European countries that have already introduced a deposit system, the best results are achieved by: Croatia - the average collection rate for all packaging is approximately 90%; Finland - collection rate for glass - 88%, for PET (Polyethylene Terephthalate) - 92%, for metal - 96% (Deloitte 2019). Such effectiveness of the deposit system convinces other countries, including Poland, to implement it.

Packaging and packaging waste solutions applicable in the European Union must also apply in Poland. The deposit system in Poland is to be introduced from January 1, 2025. However, preparations for its implementation have been ongoing for several years. Therefore, in order to adapt Polish law to EU requirements, the Council of Ministers adopted an amendment to the Act of June 3, 2013 on packaging and packaging waste management (consolidated text: Journal of Laws 2023, item 1658; item 1852). According to the 2023 Act, from January 1, 2025, for a plastic, glass bottle or metal can returned to the store, the consumer will receive a refund of the specified amount that he previously paid for it. In Poland, there are two names used to describe the additional fee for packaging: 1) deposit for reusable packaging and 2) deposit for disposable packaging.

The article will discuss the current work of the Ministry of Climate and Environment (in Polish: Ministerstwo Klimatu i Środowiska) in the field of changes to legal acts and the results of conversations and consultations with entrepreneurs, recovery organizations and representatives of municipalities in the implementation of the deposit system. The above data, characteristics of current legislative work, a review of the literature and work on infrastructure in Poland will allow the authors to compare the barriers and benefits of the deposit system. The main objective of this article is to compare the barriers and benefits of the deposit-refund system. The authors also want to answer the question whether the deadline of January 1, 2025 is realistic in the event of introducing a deposit system in Poland? This deadline has already been postponed many times and currently, among entrepreneurs, there are many supporters of another postponement of the deadline to 2026. This topic is particularly important and current because its results may be useful for stakeholders (enterprises, municipalities, non-governmental organizations) to create and implement appropriate initiatives, strategies within public policies and waste management.

2. Materials and methods

The subject of the article is the implementation of broadly understood packaging waste management and the packaging deposit system in Poland. In their research, the authors analyze EU and national legal acts, website databases (Eurostat, EEA - European Environment Agency; Central Statistical Office - in Polish: GUS; Ministry of Climate and Environment) and reports of non-governmental organizations (Deloitte, 2019, Togetair, 2024; Plastics Europe, 2023). The implementation of the deposit system in Poland is widely discussed on online forums, in the media, and in domestic and foreign publications (Lewicka et al., 2023; Teraz Środowisko, 2023; Malowaniec, 2022; Szczepański, Waszczyko-Miłkowska, Kamińska-Borak, 2022; System kaucyjny..., 2024). This topic raises many doubts and controversies, as it requires not only legal changes, reconstruction of waste management infrastructure, but also expansion of

business responsibility. The authors, at least partially, want to answer the following questions in this publication:

- Is January 1, 2025 for the implementation of the deposit system a realistic deadline?
- What estimated benefits can be expected after implementing the system in Poland?
- Are Polish prepared to implement a deposit system?

In response to the questions, hypotheses were formulated:

- H1. The date of January 1, 2025 is realistic for the implementation of the deposit system in Poland, but only partial.
- H2. Polish residents want to introduce a deposit system, seeing the financial benefits from the recovered deposit and the environmental benefits.

The research carried out consisted of two parts. The first part of the research consisted of: analysis of the literature on the subject, EU directives and Polish legislation in the field packaging waste management and the deposit system. The second part consisted of a comparison of the stores' activities to date and the projected barriers and benefits of the system, divided into three pillars of sustainable development. To sum up, in order to effectively achieve the assumed research goals, several research methods were used in the publication:

- analysis of the subject literature,
- tabular and descriptive charts,
- deductive method,
- analysis of source documents.

The national activities undertaken so far are intended to check society's readiness to implement the deposit system and the effectiveness of its operation. The analysis of documents and national activities allows us to compare the barriers and benefits of the system in which not only enterprises, but also Polish residents themselves must be involved.

3. New legal regulations regarding the management of packaging and packaging waste

The EU rules on packaging and packaging waste cover both packaging design and waste management. Their aim is to harmonize national regulations, prevent waste generation and increase packaging reuse, recovery and recycling. They also define minimum requirements for packaging recycling on the EU market. The regulations are constantly changing and modified depending on the needs of the changing market situation and political pressure (Zarębska et al., 2018; Zarębska, 2019; Zarębska, Lewicka, 2020; Raftowicz, Ochman, 2024).

The implementation of CE and sustainable development goals varies and depends on the country. Not all EU member states are able to achieve the assumed recovery or recycling targets for municipal waste or packaging waste by 2025 and 2030 (Lewicka et al., 2023). Poland also

has problems with achieving such high levels of recycling (in 2021, the average recycling rate of packaging waste for the EU was 64%; Poland – 56.7%) (Eurostat, 2024). It should also be mentioned that failure to meet the deadlines for Poland to achieve the objectives of Directive 94/62/EC on packaging and packaging waste may result in the Commission initiating infringement proceedings. According to the Ministry of Climate and Environment, the introduction of the deposit system will contribute to a reduction in Poland's contributions to the common EU budget for non-recycled plastic packaging waste. In 2023, Poland paid approximately PLN 2.4 billion for not recycling plastic packaging waste (Ministerstwo Klimatu i Środowiska..., 2024b).

The EU regulations have recently amended:

- the waste framework directive (Directive 2008/98/EC),
- the packaging waste directive (Directive (EU) 2018/852),
- the directive on reducing the impact of certain plastic products on the environment - the so-called SUP (Single Use Plastics) (Directive (EU) 2019/904).

These provisions impose specific obligations on Poland:

- in 2020 – 50%, and in 2035 – 65% of waste should be recycled,
- by 2025 we must collect at least 77% of PET plastic bottles, and by 2030 as much as 90%,
- each PET bottle must contain 25% recycled materials by 2025 and 30% by 2030,
- by 2030, all plastic packaging should be recyclable or reusable,
- packaging waste recycling targets by 2025 and 2030 are for: plastic 50%/55%, respectively; aluminum 50%/60%; steel 70%/80%; glass 70%/75%; paper and cardboard 75%/85%.

Targets for recycling municipal waste and packaging waste are presented in Table 1.

Table 1.

Targets for recycling municipal waste and packaging waste

Specification	Waste recycling targets (%)					
	According to Directive 2018/851 amending 2008/98/EC			According to: Dz. U. 2020 poz.1114; Dz.U. 2021 poz. 2375; Dz.U.2023.poz. 2550.		
	years					
	2025	2030	2035	2025	2030	2035
municipal waste	55	60	65	55	60	65
packaging waste (total), including:	65	70		65	70	
plastics,	50	55		50	55	
aluminum	50	60		50	60	
steel	70	80		70	80	
glass	70	75		70	75	
paper and cardboard	75	85		75	85	
wood				25	30	
multi-material				65	70	

Source: own work.

National targets for recycling municipal waste and packaging waste are aligned/consistent with EU targets. Table 1 additionally presents recycling levels for wooden packaging and multi-material packaging (excluding hazardous packaging), which are also listed in national legislation. In the future, it is also planned to apply a deposit system to these packaging.

The national act implementing the SUP (Single Use Plastics) directive is the Act of April 14, 2023 amending the Act on the obligations of entrepreneurs regarding the management of certain waste and on the product fee and certain other acts, including on the management of certain waste and on product fee (Dz.U. 2023, poz. 877). It introduces systemic solutions aimed at reducing the impact of plastic waste on the natural environment, in particular the water environment, as well as on human health. The new obligations include a ban on placing certain types of plastic packaging on the market (from May 2023) and charging entrepreneurs fees for single-use plastic products (from January 1, 2024) and ensuring the availability of alternative packaging (from January 1, July 2024).

Changes in the laws also apply to packaging manufacturers, especially Extended Directive SUP (Single Use Plastics) Producer Responsibility (in Polish: ROP – Rozszerzona Odpowiedzialność Producenta). ROP makes packaging producers responsible for the entire packaging life cycle, from production to disposal. The manufacturer must cover the costs of collection, recycling and disposal of packaging waste. A strategy and regulations requiring the manufacturer to include all environmental costs in the price of the product, covering its entire "life" cycle - from its production, through use, to disposal after use. ROP may be introduced in the form of a simple fee depending on the type of product and material, or the obligation to organize a full system for its collection and management. So far, ROP has been introduced, among others, for packaging waste, waste electrical and electronic equipment, batteries and accumulators, oils, end-of-life vehicles.

According to the Togetair report, in 2018 the recycling rate achieved by Poland was supposed to be 30%, but approximately 300 municipalities failed to achieve this rate. Many experts emphasize, however, that even the 30% figure is overstated, because real recycling (not the one declared on paper) is around a dozen or so percent. Despite mandatory segregation, the vast majority (63-73%) of waste still goes to sorting plants as mixed waste, from which it is impossible to effectively sort out more than a few or a dozen percent of valuable raw materials suitable for processing (Togetair, 2024).

In 2020, packaging recovery organizations identified in the Waste Database (in Polish: BDO - Baza Danych o Odpadach) showed that 3954.44 thousand tons were produced in Poland Mg of packaging, of which: 964 thousand Mg of plastic packaging, 935.6 thousand Mg of glass packaging, 7157.8 Mg of aluminum packaging, 56,788 thousand Mg of steel packaging, 1366.3 thousand Mg of paper and cardboard packaging (P/T), 385 thousand Mg of wood packaging, 239.7 thousand Mg of other packaging, including multi-material packaging. Over 90% of packaging produced in the country is disposable packaging. In 2020, 1200.6 thousand were imported to Poland. Mg of total packaging. In the same period, almost 6 times

more packaging was exported from Poland, i.e. 6496.1 thousand. Mg of total packaging (Szczepański et al., 2022, pp. 33-40; GUS, 2023).

Packaging recovery organisations provide information in their annual reports, packaging recovery organizations provide information on the amounts and types of packaging waste recovered in the country and abroad. The information concerns specific types of packaging waste subjected to material recycling, another recycling method, thermal transformation and another recovery process. The total amount of packaging waste recovered in the country was 2731.6 thousand. Mg, outside the country 1243.2 thousand. Mg. The total amount of packaging waste recovered in the country and outside the country was 3974.8 thousand. Mg. Material recycling in Poland accounted for 90.8% of all packaging waste recovered in the country. An 8.2% share of thermal transformation processes was recorded, of which 4.7% were processes in waste co-incineration plants and 3.5% in waste incineration plants. Other recovery and recycling processes accounted for a total of 1% of the weight of packaging waste recovered in the country (Szczepański et al., 2022, pp. 80-81). In 2020, a total of 83.54 thousand were thermally transformed. Mg, waste code: 15 01 01, 15 01 02, 19 12 04, 20 01 01, 20 01 38. The waste was thermally transformed with energy recovery. Most packaging was thermally transformed from plastic. The largest amounts of packaging waste, 223.95 thousand Mg, were subjected to thermal transformation processes, including 127.7 thousand in co-incineration plants. Mg. and in incineration plants 96.2 thousand Mg (Szczepański et al., 2022, pp. 86-87).

The creation of a deposit system in Poland is intended to help achieve the goal of selective collection of beverage packaging made of plastic, aluminum and glass (and in the future also packaging made of steel and multi-material plastics - juice and milk cartons). In the Act of July 13, 2023 amending the Act on management of packaging and packaging waste and certain other acts (Dz.U. 2023, poz. 1852) defined the deposit system as "a system in which, when selling products in single-use or reusable beverage packaging referred to in Annex No. 1a to the Act (Table 2), which are beverages, a deposit is collected, which is returned to the end user in upon the return of packaging covered by the deposit-refund system or packaging waste generated from packaging covered by the deposit-refund system", respectively. It was also proposed that the system would be universal, non-discriminatory and that there would be no obligation to have a receipt in order to recover the deposit. The proposed regulations oblige every store with a sales area of more than 200 m² to collect empty packaging and packaging waste resulting from packaging covered by the deposit system and to return the deposit.

Table 2.

Minimum levels of separate collection of packaging and packaging waste

Types of packaging	Level of selective collection of packaging and packaging waste in % per year				
	2025	2026	2027	2028	2029 and following years
Single-use plastic beverage bottles of a capacity of up to 3 liters, including their plastic caps and lids, excluding glass or metal beverage bottles with plastic caps and lids.	77	81	84	87	90
Metal cans with a capacity of up to 1 liter.	77	81	84	87	90
Reusable glass bottles with a capacity of up to 1,5 liters.	77	81	84	87	90

Source: Act of July 13, 2023 amending the Act on packaging and packaging waste management and certain other acts (Dz.U. z 2023 r., poz. 1852).

The Act of 13 July 2023 amending the Act on packaging and packaging waste management and certain other acts (Dz.U. z 2023 r., poz. 1852; hereinafter referred to as the Deposit Act) introduces a deposit system into the Polish legal order. This Act amends the Act of June 3, 2013 on packaging and packaging waste management (consolidated text: Dz.U. z 2023 r. poz. 1658; latest amendments: Dz.U. z 2023 r., poz. 1852; hereinafter referred to as the Act on packaging management). However, the new deposit system is to start operating only from January 1, 2025 (Figure 1). Only from this date, for a plastic, glass bottle or metal can returned to the store, the consumer will receive a refund of the specified amount that he previously paid for it.

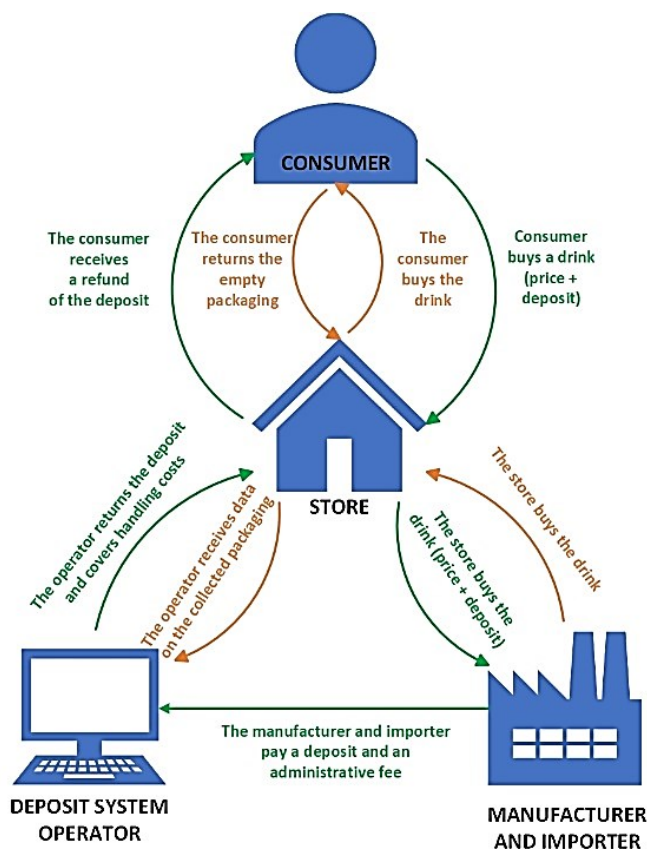


Figure 1. Simplified diagram of the deposit and packaging collection system.

Source: own work.

The proposed regulations will cover all market participants, both beverage producers, as well as modern and traditional trade stores, franchise outlets, wholesalers, bars and restaurants, as well as many other outlets offering drinks in plastic and aluminum packaging.

The main goals of implementing the deposit/refund system are: promoting environmentally friendly packaging, improving recycling, ensuring access to good quality and locally produced secondary raw materials and reducing the amount of waste that ends up in landfills. The idea is to ensure that the streams of returned packaging are homogeneous, without contamination from other fractions (e.g. food remains, sand, metals from caps), which would make them a valuable raw material for which relatively high prices can be achieved (Togetair, 2024).

The Ministry of Climate and Environment announced the introduction of the following changes to the deposit system (System kaucyjny od 2025..., 2024):

- VAT deposit exemption (for disposable and reusable packaging),
- collecting a deposit at every stage of sale,
- increasing the deposit to PLN 1 for reusable glass bottles,
- maintaining a low product fee for failure to meet the required collection levels in the first year of operation of the deposit system (in 2025 it is 77%),
- ability to return reusable glass packaging wherever they are sold,
- postponing the collection of milk and dairy product packaging under the deposit system to 2026,
- keeping disposable glass packaging outside the system (including "monkeys", juices, alcohol),
- inclusion of standard glass packaging (various types of bottles and jars) in the refund system gradually from 2026,
- minimum 1 collection point in each commune.

All the above changes and amendments to acts are intended to lead to the achievement of the goals set by the European Commission. Their implementation will prove useful in the near future. Today, however, some cities and organizations are trying to implement future-proof solutions related to the deposit system and others on their own initiative.

4. Current activities in the implementation of the deposit system in Poland (barriers and benefits of its implementation)

Circular economy (CE) is an economic model that aims to minimize waste and maximize the reuse of resources. In the Polish context, the introduction of new legal regulations regarding packaging waste management (in line with EU requirements) is a key element in achieving CE goals. However, this is only the initial element of the pursuit of CE (Zarębska, 2017, 2019). Poland faces many challenges and obstacles to overcome, building an entire deposit system and

infrastructure to introduce the deposit system into everyday life in every commune, in every city. The proposed regulations oblige every store with a sales area of over 200 m² to collect empty packaging and packaging waste resulting from packaging covered by the deposit system and to return the deposit (Dz.U. 2023, poz. 1852, art. 44.1).

The first mentions of building a deposit system in Poland appeared a long time ago (in 2019, the first machine was installed in Krakow), but the system itself was to be introduced initially from January 1, 2023, then from January 1, 2024, and the current proposal is January 1, 2025 (Lewicka et al., 2023; Plastics Europe, 2023; Ministerstwo Klimatu i Środowiska, 2024a). Legislative work and public debates led to the implementation of own initiatives at the level of cities or some store chains. City initiatives regarding the installation of bottle dispensers were created in cities such as Warsaw, Kraków, Toruń, Wrocław. Bottle dispensers in Warsaw are publicly available. Their operation is similar to that of loyalty programs. Bottle machines are integrated with a phone application that grants the so-called Eco-points. For each item uploaded, we receive points to an account created in the EcoTech system. These points can be exchanged for various types of bonuses: discounts on cinema tickets, coffee or shopping discounts (<https://butelkomaty.pl/lokalistyczny/warszawa/>).

The first packaging machines were installed in 2019 (most often accepting PET bottles and aluminum beverage cans). The machines were installed by store chains such as: Kaufland, Żabka, Lidl, Biedronka, Spar, Carrefour and PSH Lewiatan. Work on installing vending machines took place in large cities such as Warsaw, Kraków, Wrocław, Olsztyn. Table 3 lists the initiatives of stores in the field of installing packaging machines, divided into: name of the store chain, type of collection, form of identification of the return of deposits for empty packaging (vouchers, money) and the type of packaging accepted.

Table 3.

Shop initiatives to install bottle dispensers before the Act enters into force

Name of the store chain	Type of collection	Form of identification of the refund of the deposit for empty packaging	A kind of package
Biedronka	automatic	vouchers	- PET bottles with a capacity of up to 3 liters; - aluminum cans with a capacity of up to 1 liter
Carrefour	manual collection of packaging	payment vouchers	- glass bottles;
	automatic; PET for machines	e-vouchers (15 pennies for packaging)	- PET bottles; - aluminum cans
Żabka	automatic; EKOMat	Żapps (50 Żapps for one bottle/can that meets the conditions)	- PET bottles; - metal beverage cans
Lidl	automatic	5 pennies	- PET bottles
Kaufland	automatic	a voucher with a value corresponding to the deposit amount	- returnable glass bottles

Cont. Table 3.

PSH Lewiatan	automatic; bottle machine;	payment vouchers	- PET bottles
Chorten (Olsztyn)	automatic; Ekomat	payment vouchers (15 pennies for packaging)	- PET bottles; - aluminum cans
Spar (Wrocław)	automatic	Donating 50 pennies to the Kociarnia Foundation	- PET bottles; - aluminum cans

Source: own research.

The legislative work to date and the actions of local governments (cities) and shops confirm hypothesis 1 (H1) - The date of January 1, 2025 is realistic for the implementation of the deposit system in Poland, but only partial.

It is expected that 36.5 thousand jobs may be created under the deposit system in Poland: collection points for bottles and cans – 22.5 thousand manual and 14 thousand automatic (currently there are approximately 135,000 packaging collection points in Germany). In the case of automatic collection, the packaging machine (bottles, cans) will do the work for the store employee - it will scan the product, compress it and place it in the internal bin. Such a machine can also be a kind of warehouse for packages received as part of a deposit (Togetair, 2024).

The Polish Chamber of Waste Management (in Polish: PIGO - Polska Izba Gospodarki Odpadami) estimates that the introduction of the deposit system in Poland alone will cost the economy between PLN 19 and 23 billion, and the annual cost of operating the deposit system in Poland may amount to approximately PLN 3 billion. According to PIGO, the deposit system will only slightly increase the level of waste recycling (it is estimated that PET bottles will account for 200,000 tons of waste, i.e. only 1.5% of the total waste mass; metal cans - about 80,000 tons). The Chamber believes that the deposit system in Poland should be postponed until at least 2026 (Szczepański et al., 2022; System kaucyjny..., 2024).

Table 4 summarizes the barriers and expected benefits for the planned implementation of the deposit system that can be noticed in media discussions (representatives of the waste industry, recovery organizations and representatives of municipalities).

Table 4.

Selected² barriers and benefits of implementing the deposit system in Poland

Area of influence ¹	Deposit system in Poland	
	barriers	benefits
Environment	<ul style="list-style-type: none"> - Water, energy and chemicals are still used in packaging recycling. - Energy consumption (in Poland in 2023, 73% of electricity production came from non-renewable sources) for cleaning and processing recycle (glass cullet from packaging, aluminium, plastic). 	<ul style="list-style-type: none"> - Saving primary raw materials, especially non-renewable ones. - Reducing water and energy consumption for production. - Less polluted streets and cities. - Less waste means less pollution and more space in landfills (extending their functionality). - Less plastic in the seas, oceans and our bodies (microplastics). - Eliminating the burning of plastic bottles in home stoves.

Cont. Table 4.

Economy	<ul style="list-style-type: none"> - High investment costs of the deposit system. - High transformation costs. - High operating costs in relation to profits (low efficiency). - There is a need for innovative, less energy-intensive technologies for processing and treating packaging for reuse. - Problems with municipalities achieving appropriate levels of recovery and recycling of packaging waste (fines). - Investments in new recycling technologies. - Additional investments in eco-design of packaging. 	<ul style="list-style-type: none"> - Supporting research and innovation for: <ul style="list-style-type: none"> (a) recycling processes and technologies; (b) resource efficiency of industrial processes; (c) innovative and sustainable materials, products, processes, technologies and services, as well as their industrial expansion; (d) bioeconomy; e) monitoring and evaluation of the exploitation of primary raw materials. - Implementing eco-innovations in production means less pollution. - Greater recycling of raw materials means lower production costs. - Better quality of packaging = longer life cycle and possibility of rotation. - Recycling raw materials on-site (in Poland). - Beverage sellers may also receive additional revenues from a handling fee related to the operation of devices (bottle dispensers) or the sale of packaging waste.
Society	<ul style="list-style-type: none"> - Reluctance to change. - Appropriately trained employees. - There is a need for greater cooperation between system stakeholders. - Lack of employee motivation and reward in relation to employers' requirements. 	<ul style="list-style-type: none"> - Creating new jobs. - The right to decide whether to join the deposit system for customers. - Possibility to recover money from the deposit. - Possibility for children and teenagers to earn extra pocket money. - Convenience of recovering your deposit when shopping in the store. - A cleaner environment for rest and recreation. - Protecting biodiversity for future generations. - Less microplastics in the environment and in human bodies.

Note.

¹ the division of areas of influence is conventional because in fact they all interpenetrate and influence each other, in accordance with the pillars of sustainable development.

² The authors of the study, due to the breadth of the issue discussed and its multi-threadedness, made major simplifications for the purpose of compilation.

Source: own research.

There is still some time left until January 1, 2025 to solve the problems and eliminate the barriers that the implementation of the deposit deposit system will cause. Is January 1, 2025 for the implementation of the deposit system a realistic deadline? It seems so, but it will not be a fully functioning system immediately. The authors of the study believe that this system will be improved over the next two to three years. Additional obstacles will probably appear during its operation, but they will also be solved over time. In the case of introducing a deposit-refund system in Poland, the benefits include an increase in packaging recycling and thus savings in primary (non-renewable) raw materials, reduced littering of streets and landfills with packaging waste, clear and transparent rules of the deposit-refund system, which will be uniform throughout the country and a reduction consumption of primary raw materials.

A simulation of the possible increase in recycling levels in Poland was carried out for plastic packaging (PET bottles), household glass and multi-material packaging after the introduction of the deposit system. Simulation results indicate that introducing the system could

bring benefits in the area of improving recycling levels, for plastic packaging by 11.1%, for household glass by 13.8%, and for multi-material packaging by 65%. Thanks to the opening of borders, Poles are traveling more and more, seeing the bottle dispensers and the involvement of the society of other countries, they are also supporters of this system and are waiting for its introduction. From research (Deloitte Polska 2019; Plastics Europe, 2023) shows that over 81% of Poles want to introduce a deposit system and place bottle dispensers in stores.

The current preparation of the deposit system indicates confirmation of hypothesis H2. Both entrepreneurs and consumers in Poland speak positively about the implementation of the deposit system and want it to be introduced, seeing the great benefits.

5. Summary

Annually, Poland consumes a total of 613.4 million tons of materials, of which primary raw materials constitute 517.9 million tons, or 13.8 tons per person per year. Moreover, Poland's national resource extraction of 16.7 tonnes per capita per year is well above the EU average (10.3 tonnes per capita) (The Circularity Gap Report Poland, 2022).

The introduction of new requirements for packaging waste management in Poland is a key step towards achieving CE goals. These changes include legal, technological, educational and systemic aspects. Effective implementation of these requirements will contribute to sustainable development, environmental protection and increased efficiency of primary raw materials management. It may be a small success (according to PIGO), but it is always the first step towards recycling and reducing the consumption of primary raw materials.

Polish companies are constantly investing in new recycling technologies that allow for more effective processing of packaging waste. An example is chemical recycling, which enables the transformation of plastic waste into primary raw materials. Next is the promotion of eco-design, which involves creating products with their subsequent recycling in mind. Conducting educational campaigns aimed at increasing public awareness of the importance of waste segregation and recycling. Cooperation with local governments and non-governmental organizations to promote activities for CE and the deposit system in each commune - these are further initiatives that contribute to the promotion and effective implementation of the system from 2025.

Polish residents want to introduce a deposit system, seeing the financial benefits from the recovered deposit and the environmental benefits. Our neighbours boast of the high effectiveness of the deposit system (even about 80-90%), and this success is also achievable in our country, we just have to wait for its real implementation. Assuming that packaging recovery in Poland is 80% and that approximately 900,000 tons of packaging are introduced to the Polish market, the system will allow for the recovery of approximately 720,000 tons of packaging

waste per year. This amount of recovered waste will reduce the pollution of public spaces and the degree of use of primary raw materials.

The authors of the publication are aware of the imperfections of their research. In the future, they plan to check how the implementation of the system will look like in the coming years. Comparing the current research results and preparation for the implementation of the system in Poland, the authors believe that the system will require continuous expansion and improvement of the infrastructure. As scientists, they want to follow this process, its progress and examine the benefits that it will bring (Zarębski, Zarębska, Marosek, 2024, p. 5489).

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STUDENTS EDUCATION IN TERMS OF USING THE VIRTUAL VERSION OF INTEGRATED MANAGEMENT SYSTEM

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Purpose: The aim of the study has been to get to learn the opinions of the students in terms of the functionality of the virtual version of integrated management system.

Design/methodology/approach: Taking into account the literature on the subject and our own experience supported by the results of a preliminary (pilot) survey conducted among students, the need to use a virtual version of an integrated management system in conducting didactic classes in public higher education institutions was justified.

Findings: The results of the study justify the use of the virtual version of integrated management system in the process of education in management, management and production engineering (the first- and the second-degree programmes).

Research limitations/implications: The considerations included in this study determine further directions of theoretical and practical research. Interesting research problems include, for example, the benefits resulting from the use of the virtual version of integrated management system, the improvement of management systems and reporting of achievements.

Originality/value: Virtual Desktop Infrastructure delivers virtual desktops hosted on centralized servers, enabling remote access via various devices. VDI enhances flexibility, strengthens data security, and simplifies IT management. Its innovative approach modernizes work environments, enabling efficient resource allocation and seamless user experiences in diverse organizational settings.

Keywords: ERP systems, integrated management system, higher education.

Category of the paper: Research paper.

1. Introduction

Higher education institutions are increasingly recognizing the necessity for their integrated management systems to reflect the realities of contemporary educational demands. By aligning curricula with the skills and experiences sought by employers, these systems enhance students

employability, enabling them to compete successfully in the job market - even against individuals with several years of professional experience. A key driver of entrepreneurial growth is an education system designed to develop not only technical competencies but also the personal attributes essential for future entrepreneurs. To this end, higher education institutions are actively seeking innovative approaches that extend beyond traditional academic instruction, aiming to prepare graduates comprehensively for their professional careers. Such initiatives often incorporate practical elements, such as information technology education, which are tailored to meet the dynamic needs of the job market.

Effective instruction in enterprise resource planning systems (ERP), requires a well-structured teaching process. ERP systems are integral to the operations of medium- and large-scale enterprises, and equipping students with these skills ensures they are well-prepared to navigate professional challenges (Grochowski, 2022; Żółtowski, 2021). The delivery of ERP training, especially in computer laboratory settings, demands additional effort from educators. Despite this, such methods are highly beneficial. Hands-on instruction enhances not only the depth of students understanding but also their ability to apply this knowledge in real-world contexts. To support this process, Higher education institutions increasingly utilize advanced technical teaching aids, which enable them to adapt their educational offerings rapidly to meet the evolving demands of the external environment. These tools not only extend the scope of academic programs but also provide varied educational formats that cater to the needs of a diverse academic audience (Januszewski, Grochowski, 2016; Maditinos et al., 2012; Noamana, Ahmed, 2015).

The Faculty of Management at Bydgoszcz University of Science and Technology provides a compelling example of the integration of ERP education into higher education curricula. Within its programs in finance and accounting, management, and management and production engineering, the faculty includes dedicated computer laboratory classes focused on ERP systems (Januszewski, 2014). These courses utilize platforms such as Comarch ERP Optima and Work Manager ERP to provide students with practical training (Zwierzchowski, Graul, 2016). Depending on the specific major and degree program, students participate in ERP-related training across four courses, designed as hands-on tutorials in laboratory settings. This approach emphasizes experiential learning, bridging theoretical knowledge with practical application, and ensuring that students graduate with a comprehensive understanding of ERP system functionalities and their use in organizational contexts.

Higher education institutions are progressively offering courses that not only familiarize students with the conceptual foundations of integrated management systems but also equip them with the practical skills needed to use these tools effectively. Such courses address a critical need to align academic instruction with the technological advancements and operational requirements of contemporary business environments. By incorporating ERP education into their curricula, higher education institutions ensure that graduates are not only knowledgeable but also proficient in utilizing integrated management systems.

The study described in this article investigates students perceptions of the functionality and usability of virtual versions of integrated management systems. Understanding these perspectives provides valuable insights into the effectiveness of current teaching practices, offering guidance for the refinement of curricula. Students feedback is particularly critical, as it highlights the real-world applicability and potential shortcomings of the tools and methodologies employed in ERP instruction.

The integration of ERP training into higher education programs exemplifies a broader trend toward bridging the gap between academic knowledge and professional practice. By providing students with hands-on experience and technical competencies, higher education institutions equip them with the tools necessary to succeed in complex, dynamic organizational environments. The use of innovative teaching methodologies, supported by technical aids, further reinforces this objective, ensuring that graduates are not only prepared for the current job market but also capable of adapting to its future evolution. By continually aligning educational offerings with the demands of the external environment, Higher education institutions reaffirm their role as pivotal contributors to individual and societal progress in an increasingly competitive global economy.

2. E-learning in higher education

E-learning has emerged as one of the most versatile forms of distance education, encompassing a wide range of teaching and learning processes facilitated by modern information technologies. While often associated with online education, the term extends beyond mere Internet-based learning. E-learning includes any educational activity supported by diverse telecommunication technologies, offering dynamic and flexible solutions for learners. As Internet accessibility expands and time constraints intensify, the demand for remote learning solutions grows. E-learning has proven effective as both a complementary and alternative approach to traditional teaching methods (Bascis, 2005; Chrabąszcz, 2011; Sołtysiak, 2016). The benefits of e-learning are substantial and cater to diverse educational needs. Some of the key advantages include (Chrabąszcz, 2011):

- personalized learning pace: students can tailor their study schedules and learning speed to suit their individual needs and lifestyles,
- reduced anxiety and shyness: for students who may feel apprehensive about direct interactions with instructors in traditional settings, e-learning offers a less intimidating environment,
- multimodal content delivery: e-learning leverages various formats (text-based materials, presentations, and videos) enhancing engagement and catering to different learning preferences,

- accessibility for remote learners: for individuals facing geographic, financial, or other barriers, e-learning provides an opportunity to pursue education without the logistical challenges of attending on-site classes,
- accuracy of materials: digital resources are often rigorously reviewed and updated, reducing errors and ensuring quality,
- continuous system improvement: e-learning platforms evolve to remain engaging, incorporating innovative features and up-to-date content,
- support for learners with disabilities: e-learning systems are adaptable, enabling inclusive access for students with various disabilities,
- cost efficiency: compared to traditional classroom-based education, e-learning offers a cost-effective model for both institutions and students.

Despite its many benefits, e-learning also poses several challenges (Chrabąszcz, 2011):

- lack of direct interaction: the absence of face-to-face communication with instructors and peers can hinder the social and interactive aspects of learning,
- motivational barriers: self-discipline and intrinsic motivation are critical for success in e-learning, but not all students possess these traits,
- technical proficiency requirements: students must be comfortable using digital tools, which can be a barrier for some individuals.

Blended learning, which combines traditional classroom instruction with e-learning, is gaining widespread recognition as a balanced educational approach. This hybrid model allows students to benefit from direct engagement with instructors and peers while enjoying the flexibility and accessibility of online resources. Students can participate in discussions, collaborate on projects, and access materials at their convenience, creating a well-rounded learning experience. For higher education institutions striving to remain competitive and relevant, investing in e-learning and blended learning systems is imperative. However, this evolution must not come at the expense of direct interpersonal engagement, which remains a cornerstone of effective education. By integrating traditional and digital methods, universities can offer a modern, inclusive, and effective learning environment that meets the demands of today's diverse student body (Bubenets, 2023; Komańda, 2014).

The Faculty of Management at the Bydgoszcz University of Technology employs Virtual Desktop Infrastructure (VDI) as a key e-learning tool. This platform supports selected courses, providing students with access to virtual desktops and specialized software. In the initial phase of VDI implementation, students' motivation plays a crucial role in ensuring success. Comprehensive training sessions designed to overcome technical and psychological barriers are essential. Each institution should develop a tailored training system for platform usage. A recommended practice is mandatory training for first-year students, ensuring they are equipped to navigate e-learning tools effectively (Calle-Romero et al., 2020; Graul, 2016; Graul, Januszewski, 2015).

3. Using the virtual version of the ERP class systems; the opinion of the students

The classes aim at the students acquiring the knowledge of the principles of management in the contemporary enterprise when using the integrated management system. The students have a chance to develop their knowledge of the functional and structural properties of such systems further.

Depending on the major and the programme degree, the students surveyed were getting to know the integrated management systems in one of the following courses: information technology for management (Management - B.Sc. programmes), management information systems (Management - M.Sc. programmes) and integrated management systems (Management and production engineering - M.Sc. programmes). The classes were provided in a form of lectures and practical tutorials in computer labs.

The development of the article was preceded by empirical studies. In June 2024 a pilot survey was carried out among 127 students majoring in Management as well as Management and production engineering (a regular programme). An e-survey created in Google Forms has been used as a research tool. The survey questionnaire was addressed to 3 groups of students following the applicable courses in the 2023/2024 academic year (Table 1).

Table 1.
Characteristics of the respondents

Major	Management	Management	Management and production engineering
Level of studies	the first-degree programmes (B.Sc.)	the second-degree programmes (M.Sc.)	the second-degree programmes (M.Sc.)
Course	Information Systems for Management	Computer Science in Management	Integrated Management Systems
Profile of the studies	general academic	general academic	general academic and practical

Source: authors' own study.

The questionnaire included detailed questions to learn the opinions of the students in terms of the functionality of the virtual version of integrated management systems. For each question at least one answer had to be ticked as applicable. The results presenting the answers to the questions in the survey questionnaire to get to know the opinion of the students are discussed and presented in a graphic form.

With the students' evaluation of the class level, it can be noted that 70% of the respondents provided positive feedback on the class quality (Figure 1). Classes at the Faculty of Management were performed in a way as to present in detail, at the start, all the information related to the course to the class participants. An example can be provided by an virtual version of the integrated management systems available to the students. It is often the case that the students for the first time deal with virtual version (it mostly refers to the students of the first-degree programme and, less considerably, to the second-degree programme).

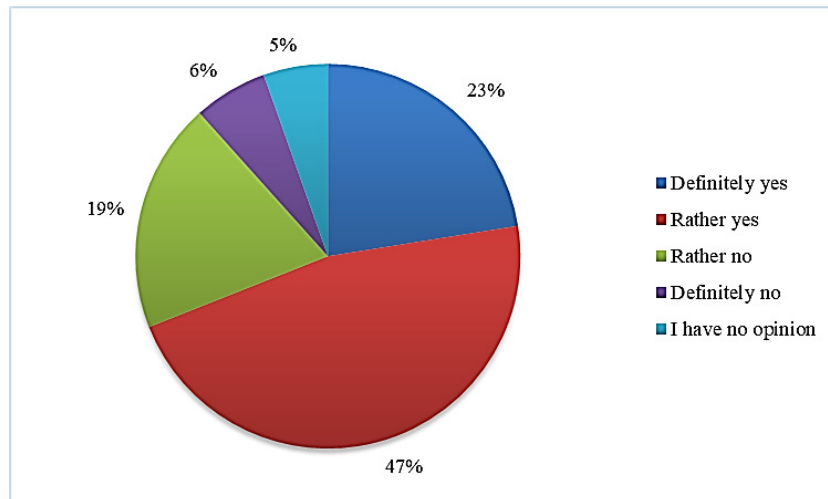


Figure 1. Question: How do you evaluate the level of the classes provided with virtual version of the integrated management systems?

Source: authors' own study.

The study concerned e.g. the functionality of the virtual version of the integrated management systems offered (Figure 2). The analysis of the results confirmed the justifiability of sharing and providing a full functionality of the ERP class systems with students. As many as 79% of the respondents consider it justified to deliver classes with a full system version in computer labs. The students are aware of the necessity of getting to know a full functionality of the integrated management systems.

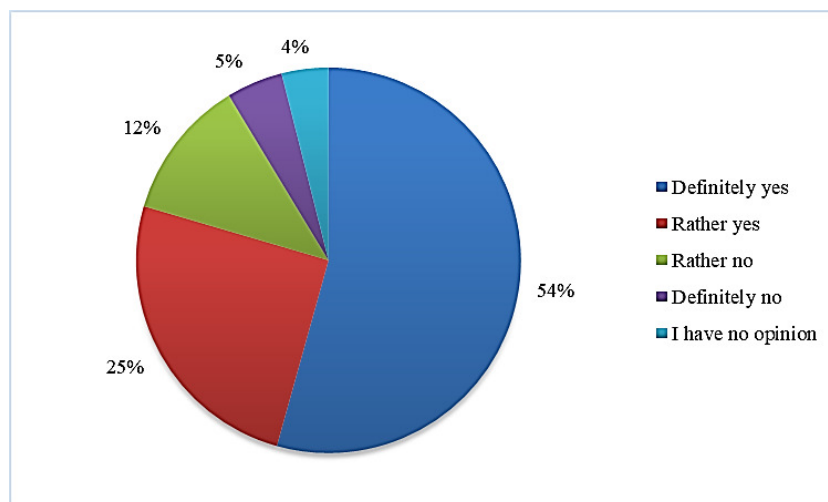


Figure 2. Question: Should the virtual version of the integrated management systems provide a full functionality?

Source: authors' own study.

The last question concerned the availability of the integrated management systems in the virtual version for students (Figure 3). As many as 71% of the students indicated the need of having access to the ERP class system at home. That result must have been due to the fact that the students in the future can verify the functionality of the integrated system even after completing classes in a given course.

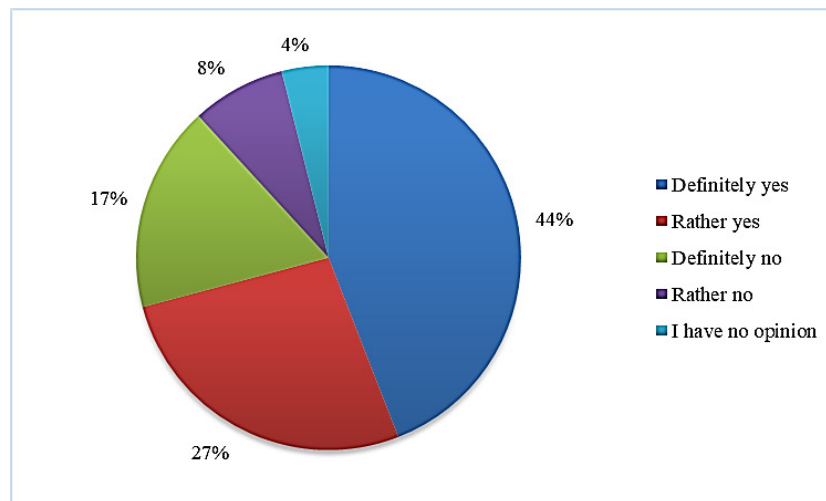


Figure 3. Question: Should the students have access to the virtual version of the integrated management system outside the higher education provider's computer lab?

Source: authors' own study.

4. Conclusions

Integrated management systems have become a standard for enhancing the efficiency and effectiveness of enterprises, offering a structured approach to managing resources, operations, and decision-making. Familiarity with these systems provides significant advantages for students, equipping them with in-demand skills that enhance their employability in a competitive job market (Chaudhry et al., 2021; Zwierzchowski, 2023). Recognizing the value of integrated management systems knowledge, higher education institutions are increasingly integrating these tools into their curricula. Moreover, partnerships between higher education institutions and information systems providers play a pivotal role in advancing these educational efforts. When providers identify high potential in students skills, they are more inclined to invest in developing educational offerings, creating a mutually beneficial relationship.

The academic phase of a students life is crucial for skill acquisition. During this time, students can gain hands-on experience with integrated management systems. These systems simulate real-world business processes, offering students the opportunity to understand and apply complex operational frameworks in a controlled environment. Such practical exposure is invaluable as it aligns with industry demands for graduates who bring both theoretical knowledge and practical expertise to their roles (Abugabah et al., 2015). Graduates who can demonstrate additional competencies, particularly in utilizing advanced technological tools like ERP systems, stand out to employers. As a result, higher education institutions must prioritize the inclusion of these systems in their academic programs. This approach ensures that students

are well-prepared to transition seamlessly into professional settings, contributing effectively from the outset of their careers.

Empirical evidence supports the integration of ERP systems into the academic curricula of economics and management programs. At the Faculty of Management at Bydgoszcz University of Science and Technology, for instance, students in majors such as finance and accounting, management, and management and production engineering have benefited from the inclusion of ERP tools in their courses. Pilot surveys conducted among these students reveal positive feedback, highlighting the relevance and effectiveness of ERP systems in enhancing their educational experience.

The survey results justify the application of ERP systems in higher education as a means to bridge the gap between theoretical knowledge and practical application. These systems enable students to develop a comprehensive understanding of integrated management, preparing them to meet the expectations of modern employers. Furthermore, the analysis underscores the importance of providing students with access to educational versions of integrated management systems, ensuring affordability and broad accessibility.

The integration of ERP systems, into academic programs represents a critical step in preparing students for the demands of the modern workforce. By fostering collaborations with system providers and continuously adapting curricula to industry standards, higher education institutions enhance students employability and contribute to the development of a technologically adept and competitive workforce.

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