SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2026
ORGANIZATION AND MANAGEMENT SERIESNO. 243

HARNESSING NEW TECHNOLOGIES TO PREVENT THE MIGRATION OF CRAFTSMEN

Katarzyna MAZUR-WŁODARCZYK[1*], Katarzyna ŁUKANISZYN-DOMASZEWSKA[2]

[1] Opole University of Technology, Faculty of Economics and Management; k.mazur-wlodarczyk@po.edu.pl, ORCID: 0000-0002-4822-9328
[2] Opole University of Technology, Faculty of Economics and Management; k.lukaniszyn-domaszewska@po.edu.pl, ORCID: 0000-0002-2165-5095
* Correspondence author

Purpose: This article combines three issues: new technologies, migration, and crafts, analyzed from the perspective of people training in craft professions in centers located in the Opole Region (Poland). It aims to find answers to the question how does the implementation of new technologies in the craft professions affect the likelihood of abandoning intentions for labor migration?
Design/methodology/approach: The article presents the results of a survey conducted among 166 students of vocational schools located in the cities of Kędzierzyn-Koźle, Opole, and Nysa. The research was conducted using a quantitative method based on a structured questionnaire that included questions concerning the respondents' vocational training profile, plans to start working in Poland, intended country of work, age, sex, and nationality.
Findings: The research reveals that although most vocational school students plan to pursue employment in Poland, limited migration interest, enduring gender-based occupational patterns, and prevailing labor market uncertainty highlight the need for enhanced vocational guidance and greater exposure to international labor opportunities. The results further indicate that while vocational school students recognize technological innovation as a driver of efficiency and the modernization of craft professions, migration intentions remain primarily shaped by economic conditions and individual motivations.
Originality/value: This article provides a comprehensive examination of the interplay between emerging technologies and migration, specifically within the context of the craft sector, thereby addressing and filling a previously identified gap in the existing body of research.
Keywords: craft, new technologies, cultural economy, migration, sustainable development, craft resilience.
Category of the paper: Research paper.

1. Introduction

New technologies refer to recently implemented innovations or observed advances. They can be improvements on existing technologies across various sectors (Cobrief, 2025). The concept of new technologies refers to technologies that were created or launched relatively recently, often associated with innovative tools, systems, or methods. Technological innovations are playing an increasingly important role in the growth dynamics of leading economies. This category is also referred to as 'emerging technologies', 'future technologies', or 'breakthrough technologies'. According to the McKinsey Technology Trends Outlook report, 13 technology trends with significant potential for business transformation can be identified. These include: Agentic AI, AI, Application-specific semiconductors, Advanced connectivity, Cloud and edge computing, Immersive reality technologies, Digital trust and cybersecurity, Quantum technologies, the Future of Robotics, the Future of Mobility, the Future of Bioengineering, the Future of Space Technologies, and the Future of Energy and Sustainability Technologies (McKinsey & Company, 2025). In migration processes, emerging technologies include: the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing, Big Data technologies, blockchain, automation, and biometric technologies (Nalbandian, Dreher, 2022), as well as virtual reality and information and communication technologies (ICT), including social media (Arya, Nardon, Riyadh, 2022). The perception of new technologies is not always clear-cut, depending on factors such as age group, place of origin/residence, and the industry represented.

Technology has always played an essential role in migration processes, in the context of movement (travel), contact with people from the home and host countries, or transferring money (Ros et al., 2007). Digital connectivity via mobile phones, in particular, is impacting every aspect of migration (Gelb, Krishnan, 2018). New technologies are transforming the labor market in various segments, including migration-related. As Barišić et al. (2024) noted, implementing new technologies can alter labor demand. Their findings, limited to the implementation of robots and based on an analysis of the literature, indicate, among other things, that the use of robots positively impacts overall employment growth. In contrast, using robots in the manufacturing sector may affect the labor market for immigrants. Generally, because workers adapt to changes in the workplace, robots do not increase the number of unemployed. Furthermore, automation and robotization do not lead to the displacement of humans in low-skilled manual work in the service sector. However, they may provide a solution to problems resulting from labor shortages.

The impact of new technologies on the labor market in the manufacturing sector involves examining the role of patents, robot adoption, digital assets (capital in computer hardware, capital in communications equipment, and capital in computer software and databases), and total factor productivity in the growth of migrants relative to the total workforce. Among

other things, it can be observed: 1) the differential impact of digital assets, 2) the impact of robots (as elements displacing people from the labor market) is greater among native workers than migrants, while 3) the impact of total factor productivity concerns migrant workers (Ghodsi, Stehrer, Barišić, 2024). These studies indicate that innovations: 1) can benefit migrant workers, 2) there is a potential complementarities between migrant work and robotization in some sectors (Barišić et al., 2024). The factors discouraging immigration include higher digital resources per employee in the target country. In comparison, the factors that attract immigration include a higher level of robots per employee in the target country (Ghodsi, Landesmann, Barišić, 2024). Research conducted in Germany, focusing on the impact of industrial robots and artificial intelligence on the labor market, indicates that the use of robots does not significantly affect migration flows. Still, it does affect wages, increasing for the native population and decreasing for the immigrant population, particularly in the manufacturing sector, where robots are most frequently used. Demand for artificial intelligence, on the other hand, favors the influx of new immigrants but negatively impacts the native population and already settled migrants (Giesing, Rude, 2022).

Martínez Torán et al. (2017) note the following trends in contemporary crafts: going glocal, focusing on sustainable intelligence, personalizing products and services, sharing experiences, engaging consumers in design and promotion, and digital craft – an area closely linked to new technologies. The evolution of craft design also reveals three main trends: 1) diversification of production to meet new needs resulting from technological progress, 2) shifting responsibility from product design to action design, and 3) blurring the boundaries between industries, disciplines, and participants (Zhou et al., 2022). The growing impact of digital technology on the skills-based economy has long been highlighted in reports on contemporary crafts. The crafts sector is constantly evolving, and this is happening in an environment of changing economic, cultural, technological, and social conditions. Online sales are increasing, and new technologies are opening up new creator opportunities (BOP, 2012). New technologies are also identified as having the potential to re-elevate the prestige of various artisan products, contributing to the preservation of traditional skills and their popularity among younger generations of artisans. These technologies can also support and increase productivity and product quality (AGNIi, 2023). In the transformation towards a knowledge-based economy, traditional, established knowledge resources retain their importance and can effectively coexist with new forms of knowledge. Crafts are a sector that can benefit from the integration of new technologies, particularly given the current democratization of: 1) design (free exchange and consumer engagement in co-creation), 2) production (the possibility of supervision, even by micro-entrepreneurs), and 3) innovation (free access to information via the Internet, software development, and the formation of online communities). Their use does not diminish the value of the final product. On the one hand, new technologies enable simplifications in manufacturing, marketing (including product presentation and establishing stakeholder relationships), sales, and product distribution, among others (CEARTE, 2017), on the other

hand, the craft-based design methodology through manufacturing with technology embodies authenticity and is relevant to the ‘culture of personalization’ in production and consumption (Bunnell, 2004).

The study aims to explore the opinions of vocational school students in the Opole Region regarding the use of new technologies in crafts in the context of their migration plans. This article seeks to determine whether new technologies in crafts are perceived as a factor influencing the decision to abandon plans for economic migration.

2. New technologies in the context of migration

The issues of migration and new technologies are perceived from many perspectives, primarily in the context of the following research: 1) knowledge-based economy operating in the conditions of international competition, 2) digital labour platform, 3) the impact of migration on technological changes, 4) educational tools addressed to migrants, 5) the use of advanced digital technologies in the management of immigration and asylum systems, including migration research and border management, and 6) digital nomadism.

2.1. Knowledge-based economy

The first approach highlights aspects of the knowledge-based economy, international competition, and the consequences of highly skilled migration. These topics are examined from different perspectives: 1) negative consequences—declining economic growth in sending countries; 2) return migration of highly skilled migrants (compensating for outflows); and 3) the benefits of mobility for both sending and receiving countries (Rashidi, Pyka, 2013).

2.2. Digital labour platform

Digital labor platforms enable migrants to find work immediately upon arrival in the host country. Their use is associated with, among other things, lower entry barriers. However, offering lower-quality positions poses a different set of challenges. Research conducted by Zwysen & Piasna (2024) indicates that this type of work is not typical "migration" work. Migrants, however, are more likely to work through digital labor platforms due to the limited number of employment options available. These researchers point out, among other things, that taking up work through platforms is a symptom of labor market integration problems for migrants (Zwysen, Piasna, 2024).

2.3. The impact of migration on technological change

The third approach, explored by, among others, Andersson, Karadja and Prawitz (2022) and involving the analysis of historical data (concerning mass migration from Europe to the United States in the 19th century), indicates that emigration influences the growth of innovative activity (patent applications) and the increase in capital intensity related to new technologies (Andersson, Karadja, Prawitz, 2022). Highly skilled migrants residing in high-income countries, in particular, contribute to technological innovation and research and development. Like diasporas, migrants constitute an important channel for technology transfer, including back to the country of origin (through direct technology and knowledge transfer, investment and remittances supporting economic growth and transformation in source countries, and fostering entrepreneurship in source countries), including technology diffusion (Gelb, Krishnan, 2018). This diffusion is defined as a key factor driving productivity growth and economic progress, and migration as a process supporting the flow of knowledge to the countries of origin of migrants (CentrePiece, 2025).

2.4. Educational tools

Digital technologies enable various groups (including migrants) to access education. However, online training should be inclusive, meaning it should be tailored to the cultural specificity of a given migrant group. Furthermore, it should be designed in collaboration with migrants to ensure its practical application, based on technologies already used by migrants. It should also consider migrants' privacy and security, and include assessment and certification management (Unwin, Harindranath, Ghimire, 2021). Within this group of issues, new technologies also enable the mobilization, expression of claims and strengthening of migrants' identity (Nedelcu, Soysüren, 2022).

2.5. Managing immigration, asylum systems, and borders

The use of advanced digital technologies in immigration management is the most common research topic within migration and new technologies. Researchers emphasize the need to monitor the use of new technologies (especially AI) in international migration management (Baranowska, Szoszkiewicz, 2021). This topic covers new technologies in researching migration, e.g., using social networking sites to establish contact with migrant respondents or computer-aided research (Pötzschke, Rinken, 2022). Within border management, the dominant technologies are IoT, Big Data, automated decision-making systems, predictive analytics, drones (aerial surveillance), and biometric technologies. These are discussed from two perspectives: 1) risk to the host country (dominant approach encompassing national security aspects) and 2) to the migrant. Within the first perspective, new technologies are primarily used to track, identify, and control individuals crossing and departing from designated borders, as well as to forecast migration and capture satellite imagery. Forecasting migration flows may be related, for example, to emerging disasters or economic crises, or to incorporating migration

into epidemiological models to counteract the spread of diseases (Fournier-Tombs, Castets-Renard, 2022). International migration is considered the most difficult demographic change element to forecast (Wiśniowski, 2021). In the second perspective, innovative technologies are analyzed from the point of view of supporting migrants' experiences - protection and support tools under challenging situations, especially in the framework of migration risk analysis, accelerating identification and registration processes, improving service provision, facilitating settlement and integration (Nalbandian, Dreher, 2022). Some of these solutions speed up decision-making and reduce the risk of bias and discrimination. Still, they may also have negative aspects, including transparency, proportionality, personal data security, and respect for fundamental rights (Ozkul, 2023; Khoury, Hendow, 2025; ENNHRI, 2024; Fournier-Tombs, Castets-Renard, 2022), including encouraging the creation of e-borders (Nedelcu, Soysüren, 2022). Automated processing of massive data sets doesn't always allow for the reconstitution of the decision-making process. This is referred to as the "black box problem" in the context of the issue under analysis, which prevents investigation or questioning of the decisions made (Castelvecchi, 2016). Amnesty International (2023) emphasizes that digital technologies that facilitate rights violations at and around borders are also used to criminalize life.

2.6. Digital nomadism

The last of these topics concerns remote workers traveling the world. Generation Y primarily represents this group, educated individuals who experience uncertain economic conditions in their home countries while also having the opportunity to travel to developing countries. This lifestyle is being publicized on social media. It is fostered by the growing tourism industry, which offers long-term shared and coworking accommodations, internet cafes, and networking events (Thompson, 2024).

To sum up the above, despite the scientific community's interest in new technologies and migration, there is a clear research gap covering the group of craftsmen and people training in crafts.

3. Material and Methods

The article presents the results of the first research stage conducted among the young generation of craftsmen/ skilled tradespeople – undergoing vocational training in vocational schools of the first and second degree located in the Opole Region.

Data were obtained from a survey conducted between April and June 2024. The schools selected for the study were the largest vocational education centers in the region. The schools were sent a letter requesting their consent to conduct the study. After receiving this consent,

the online survey was sent twice (Google Form). The response rate was 166 forms submitted from three centers: 1) Academy of Crafts and Entrepreneurship at the Opole University of Technology (in Polish: Akademia Rzemiosła i Przedsiębiorczości Politechniki Opolskiej), 2) Center for Vocational and Continuing Education in Nysa (Centrum Kształcenia Zawodowego i Ustawicznego), and 3) School Complex No. 1 named after the Silesian Insurgents in Kędzierzyn-Koźle (Zespół Szkół nr 1 im. Powstańców Śląskich).

The study aimed to examine the professional aspirations and employment intentions of vocational school students, with particular attention to whether they plan to work in Poland or abroad. It also sought to identify differences in intentions based on the use of new technologies in the educational process, as well as vocational profile, gender, age, and nationality.

The research was conducted using a quantitative method based on a structured questionnaire. The survey included questions concerning the respondents' vocational training profile (type of craft), plans to start working in Poland, intended country of work, age, sex, and nationality (national or ethnic identity).

Figure 1a-d summarize the key demographic characteristics of the surveyed vocational school students. The study sample consisted of 166 students attending various vocational schools. The mean age was approximately 16.44 years, while the median age was 16, indicating that half of the participants were aged 16 or younger. The youngest respondent was 14 years old, and the oldest was 19 years old. Average Age was 16.7 years. This age distribution confirms that the study focused on adolescents and young adults at the stage of early career decision-making, which is typical for vocational education settings.

In terms of gender distribution, female students accounted for 49% of the sample, and male students also made up 51%, indicating a balanced gender structure.

Regarding nationality, the vast majority of respondents (95%) identified as Polish, while a small share were of Ukrainian (4%) and German (1%) origin. This reflects the growing presence of students with migrant backgrounds in Polish vocational education, although the group remains predominantly national in composition.

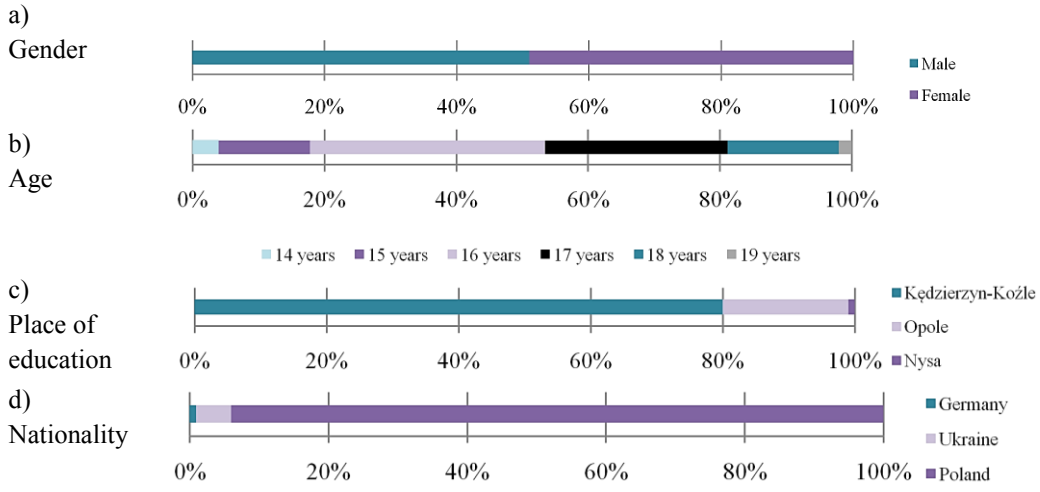

Figure 1a-d. Demographic composition of the respondents [%].

Source: own study.

Table 1 presents the distribution of the surveyed students according to their vocational training profile. The largest group consisted of automotive mechanics (23%), followed by hairdressers (20%), cooks (16%), and salespersons (15%). Together, these four professions accounted for more than three-quarters of all respondents, indicating that technical and service-oriented trades dominate among vocational students.

Smaller groups included locksmiths (6%), interior finishing workers (3%), interior finishing installers (2%), and confectioners (2%) and carpenter (2%). Several other professions, such as carpenters, hotel service workers, tailors, electricians, photographers, and IT technicians, were represented by only one or two students each, corresponding to about 1% of the total sample.

Overall, the table highlights the strong representation of practical, hands-on professions that are in high demand in both the Polish and European labour markets, especially in the automotive and personal services sectors.

Table 1.
Distribution of respondents by vocational profile

Vocational training profile	Number	%
Automotive Mechanic	39	23%
Hairdresser	34	20%
Cook	27	16%
Salesperson	25	15%
Locksmith	10	6%
Interior Finishing	5	3%
Interior Finishing Installer in Construction	4	2%
Confectioner	4	2%
Carpenter	3	2%
Logistics Warehouse Worker	2	1%
Hotel Service Worker	2	1%
Tailor	2	1%
Sanitary Installation and Network Installer	2	1%
Photographer	1	1%
Waiter	1	1%
IT Technician	1	1%
Electrical Technician	1	1%
Car Painter	1	1%
Panel Beater	1	1%
Baker	1	1%
All	166	100%

Source: own study (n = 166).

Table 2 shows the distribution of female and male students across various vocational specializations. The data reveal a clear gender-based differentiation in vocational choices. Female students were strongly represented in service-oriented and customer-focused professions, particularly hairdressing and sales. In contrast, male students dominated the technical and construction-related specializations, such as automotive mechanics, locksmithing, and carpentry, accounting for more than 90% of participants in those fields. This pattern corresponds with broader trends in vocational education, where gender still plays a significant role in determining occupational preferences and pathways.

Some professions, such as hotel service worker, tailor, and logistics warehouse worker, show almost balanced gender distribution (49% female, 51% male), suggesting that these roles attract both genders equally.

Table 2.
Gender distribution by vocational profile

Vocational training profile	Female	Male	All
Automotive Mechanic	1	38	39
Baker	0	1	1
Car Painter	0	1	1
Carpenter	0	3	3
Confectioner	4	0	4
Cook	17	10	27
Electrical Technician	1	0	1
Hairdresser	33	1	34
Hotel Service Worker	1	1	2
IT Technician	0	1	1
Interior Finishing	0	5	5
Interior Finishing Installer in Construction	0	4	4
Locksmith	1	9	10
Logistics Warehouse Worker	1	1	2
Panel Beater	0	1	1
Photographer	1	0	1
Salesperson	20	5	25
Sanitary Installation and Network Installer	0	2	2
Tailor	1	1	2
Waiter	1	0	1
All	82	84	166

Source: own study (n = 166).

Overall, the data highlight a persistent pattern of gender segregation in vocational education, with women gravitating toward service and creative fields, while men dominate in technical and industrial professions. Despite this, a few mixed-gender occupations indicate a gradual diversification of vocational choices among young people. The dominance of automotive mechanics and hairdressers is clearly visible, highlighting the popularity of these professions among vocational youth. Technical trades attract a large proportion of male students, whereas service and aesthetic fields remain predominantly female. This imbalance suggests that, despite increasing gender equality in education, traditional gendered divisions of labour continue to shape vocational career choices.

The data were collected and organized in Microsoft Excel, which was also used for data cleaning, coding, and statistical analysis. Descriptive statistics were applied to calculate frequencies and percentage distributions for each categorical variable. Cross-tabulations were used to explore relationships between vocational profile and employment intentions, as well as between gender and occupational choice. These analytical procedures allowed for a structured examination of how demographic and educational characteristics influenced students' career plans and migration aspirations.

The analysis focused on identifying general patterns, gender differences, and levels of certainty in career decision-making among vocational students.

4. Results

Employment intentions were examined to assess whether vocational school students plan to start working in Poland or abroad. As presented in Figure 2, 41% of respondents expressed their intention to work in Poland, 12% declared a desire to work abroad, while 47% remained undecided. The relatively high proportion of undecided respondents indicates a degree of uncertainty in career planning typical for this age group. At this stage of life, many students are still completing their education, gaining work experience, or exploring various career paths, which makes it difficult for them to make firm employment decisions. Moreover, their choices are often influenced by factors such as family expectations, the opinions of peers, and the perceived attractiveness of working abroad compared to domestic opportunities.

The large share of undecided respondents may also reflect limited knowledge of the labour market or uncertainty about future economic conditions. Young people may not yet have sufficient information about wages, job stability, or career advancement opportunities in their chosen profession. Additionally, fluctuations in labour demand, regional differences in job availability, and the possibility of further education can also delay final career decisions.

Therefore, the high level of indecision among students should not necessarily be interpreted as a lack of ambition or interest in employment, but rather as a natural stage in the process of career orientation. Future migration and employment trends in this group are likely to depend on external conditions such as wage differentials between Poland and other EU countries, the accessibility of quality jobs locally, and the ease of international mobility.

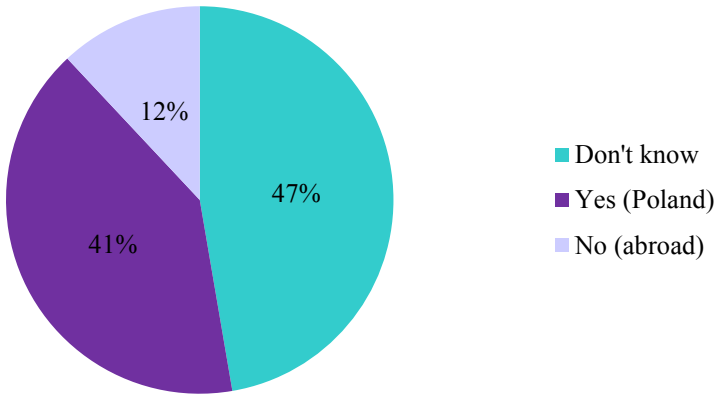

Figure 2. Employment intentions (work in Poland vs abroad).
Source: own study (n = 166).

Table 3 indicates that the majority of vocational school students declared an intention to commence employment in Poland upon completion of their vocational education. The largest proportion of affirmative responses ("yes") was observed among automotive mechanics (21 respondents), hairdressers (15 respondents), and cooks (9 respondents). These vocational profiles are likely associated with a relatively stable demand for skilled labour in the Polish labour market, particularly within the service and manufacturing sectors, where opportunities for immediate employment are more accessible and entry barriers remain comparatively low.

Nevertheless, it is noteworthy that a considerable number of respondents within these same professions expressed indecision regarding their post-graduation employment plans, specifically, 15 hairdressers and 17 cooks selected the "don't know" option. This pattern suggests the presence of a significant degree of career uncertainty among students in these vocational tracks. Such uncertainty may stem from several factors, including limited information about labour market prospects, insufficient career guidance, or perceived instability in the respective sectors. Consequently, these findings highlight the need to strengthen vocational counselling and labour market orientation within vocational education frameworks to support informed career decision-making among young professionals.

Table 3.
Plans to start working in Poland

Vocational training profile	Don't know	No	Yes	All
Automotive Mechanic	12	6	21	39
Baker	1	0	0	1
Car Painter	1	0	0	1
Carpenter	0	1	2	3
Confectioner	1	0	3	4
Cook	17	1	9	27
Electrical Technician	0	0	1	1
Hairdresser	15	4	15	34
Hotel Service Worker	1	0	1	2
IT Technician	0	0	1	1
Interior Finishing	4	0	1	5
Interior Finishing Installer in Construction	1	2	1	4
Locksmith	7	2	1	10
Logistics Warehouse Worker	2	0	0	2
Panel Beater	0	1	0	1
Photographer	0	0	1	1
Salesperson	14	3	8	25
Sanitary Installation and Network Installer	0	0	2	2
Tailor	1	0	1	2
Waiter	1	0	0	1
All	78	20	68	166

Source: own study (n = 166).

When analysing migration preferences (Figure 3), vocational school students most frequently mentioned Germany, Switzerland, Spain, Austria, the Netherlands, and Norway as their intended destinations for work abroad. These countries are well-established labour markets for Polish and Central European workers, particularly in technical and construction

professions. It should be emphasized, however, that this question differed from the previous one. In the earlier question, students were asked in general terms whether they planned to work in Poland or abroad. In that case, 41% declared an intention to work in Poland. In contrast, in the follow-up question, where respondents were asked to indicate specific countries in which they would like to work, Poland was chosen by as many as 74% of them, while 11% of respondents answered "don't know".

This discrepancy suggests that the second question was interpreted somewhat differently by the respondents. When asked to choose a country rather than to make a firm decision about their employment plans, many vocational school students selected Poland as a natural or default option, even if earlier they had been uncertain or open to working abroad. For some, choosing "Poland" in this context did not necessarily indicate a strong commitment to domestic employment but rather reflected a lack of concrete migration plans or a tendency to associate the start of their careers with their home country.

The presence of 11% of undecided respondents ("don't know") further confirms a general sense of uncertainty among young people regarding future employment destinations. Many of them are still in the process of career exploration and may not yet possess sufficient information about labour market conditions, job availability, or wage differentials abroad.

The observed differences between the two questions highlight the fluid and context-dependent nature of students' migration intentions. While most express attachment to Poland and see it as a likely place to begin their careers, many remain open to future mobility depending on economic conditions and professional opportunities in other European countries.

However, the "don't know" category was notably large, particularly among younger respondents aged 15-16. This uncertainty suggests that many students are still exploring their career options and may reconsider migration as they gain professional experience or encounter economic pressures.

It is worth to add, that nationality also played a role in migration preferences. While the majority of respondents identified as Polish, a small number of Ukrainian students expressed stronger intentions to work in Poland rather than return to their home country, indicating that Poland may serve as both a training and destination country for them.

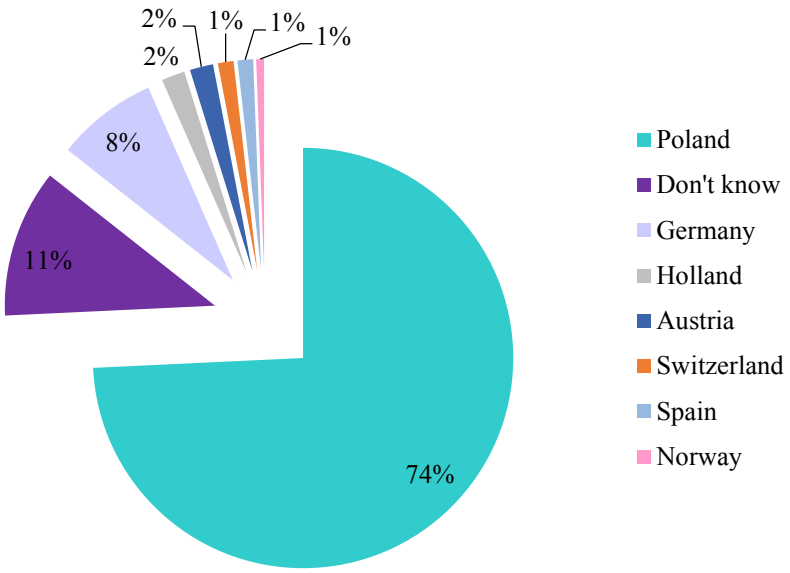

Figure 3. Migration preferences.

Source: own study (n = 166).

The cross-tabulation of vocational profiles and employment plans (Table 4) provides deeper insight into how professional orientation influences students' intentions to work in Poland or abroad. The data clearly demonstrate that the type of vocational training significantly shapes employment aspirations and potential migration decisions.

As shown in the table, vocational school students from technical fields, especially automotive mechanics, were the most determined to work in Poland, with almost two-thirds declaring such an intention (29 out of 39). This result may reflect the strong demand for skilled technical workers in the domestic labour market, where automotive and mechanical services remain stable and accessible career paths. At the same time, this group also contained the highest number of respondents considering migration, mainly to Germany and Switzerland. These two countries are traditional destinations for Polish mechanics and technicians, offering higher wages and attractive working conditions, which makes international mobility a realistic alternative rather than a distant prospect.

Among service-oriented professions, such as hairdressing and sales, the pattern was slightly different. Nearly half of these students expressed plans to work in Poland, while a comparable proportion remained undecided. For instance, eight hairdressing students and one salesperson responded "don't know," suggesting that uncertainty about labour market opportunities or plans to continue education may still influence their choices. Service professions are often more dependent on local demand, personal networks, and customer relationships, which may explain why students in these fields are less inclined to migrate immediately but remain open to future changes.

The findings also reveal that in smaller professional groups, such as cooks, confectioners, or carpenters, the overwhelming majority preferred to work in Poland. This could be due to the availability of employment opportunities in local businesses, restaurants, and small enterprises,

where such skills are directly applicable. On the other hand, a few individuals from construction-related fields (e.g., locksmiths or interior finishers) indicated plans to work abroad, reflecting the long-standing tradition of labour migration in the construction sector.

It is also worth noting that 19 respondents (11%) declared that they "don't know" yet where they would like to work. This group of undecided students represents an important segment of the population entering the labour market. Their hesitation may stem from a lack of practical experience, uncertainty about wage levels, or insufficient information about foreign labour markets. Furthermore, some students may still be considering further education before making long-term employment decisions.

However, the results presented in Table 4 highlight a dual trend among vocational students: strong local attachment combined with openness to migration. While most young people intend to start their professional careers in Poland, particularly in technical and service occupations, the appeal of working abroad, especially in Western Europe, remains significant. This suggests that future migration flows among vocational graduates will likely depend on domestic job availability, wage competitiveness, and the accessibility of international employment channels.

Table 4.
Vocational profiles and employment plans

Vocational Training Profile	Austria	Germany	Holland	Norway	Poland	Spain	Switzerland	Don't know	All
Automotive Mechanic	1	4	0	0	29	1	1	3	39
Baker	0	0	0	0	1	0	0	0	1
Car Painter	0	0	0	0	1	0	0	0	1
Carpenter	0	0	0	1	2	0	0	0	3
Confectioner	0	0	0	0	3	0	0	1	4
Cook	0	1	0	0	23	0	0	3	27
Electrical Technician	0	0	0	0	1	0	0	0	1
Hairdresser	0	2	0	0	23	1	0	8	34
Hotel Service Worker	0	0	0	0	2	0	0	0	2
IT Technician	0	0	0	0	1	0	0	0	1
Interior Finishing	0	1	0	0	3	0	0	1	5
Interior Finishing Installer in Construction	0	0	0	0	4	0	0	0	4
Locksmith	2	2	1	0	4	0	0	1	10
Logistics Warehouse Worker	0	0	0	0	2	0	0	0	2
Panel Beater	0	0	0	0	0	0	0	1	1
Photographer	0	0	0	0	1	0	0	0	1
Salesperson	0	3	2	0	18	0	1	1	25
Sanitary Installation and Network Installer	0	0	0	0	2	0	0	0	2
Tailor	0	0	0	0	2	0	0	0	2
Waiter	0	0	0	0	1	0	0	0	1
All	3	13	3	1	123	2	2	19	166

Source: own study (n = 166).

One fifth of students (21%) declared using new technologies during classes at school, while almost half (49%) during practical vocational training (Figure 4).

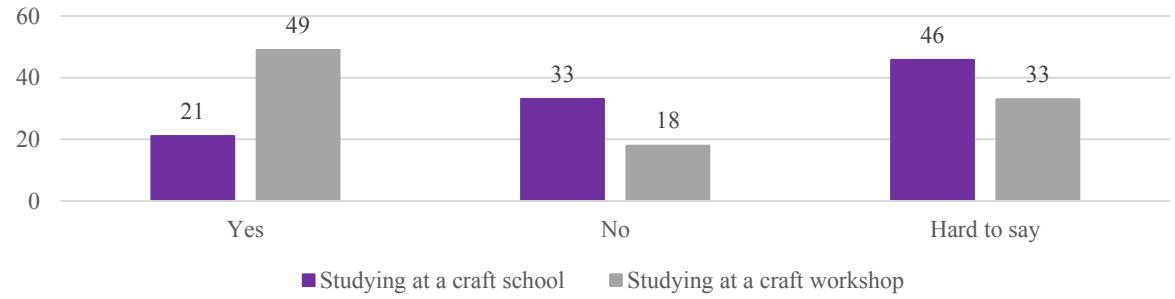

Figure 4. Using new technologies while learning a craft [%].

Source: own study (n = 166).

The analysis revealed statistically significant relationship between using new technologies while learning in craft school and students' migration intentions ($p < 0.05$), but at the same time no statistical significant relationship is shown between using new technologies while the practical process of learning a profession (during vocational training or other activities related to the practical aspects of vocational education) and students' migration intentions ($p > 0.05$). Details are shown in Table 5 and 6.

Table 5.
Using new technologies during school classes

Answer	Observed			Expected			*p-value*
	Plans to work outside Poland	Work plans in Poland	Hard to say	Plans to work outside Poland	Work plans in Poland	Hard to say	
Yes	1	23	11	4,2169	14,3373	16,4458	0,0067
No	9	22	24	6,6265	22,5301	25,8434	
Hard to say	10	23	43	9,1566	31,1325	35,7108	

Source: own study (n = 166).

Table 6.
Employing new technologies throughout vocational training and associated practical activities

Answer	Observed			Expected			*p-value*
	Plans to work outside Poland	Work plans in Poland	Hard to say	Plans to work outside Poland	Work plans in Poland	Hard to say	
Yes	10	42	29	9,7590	33,1807	38,0602	0,0634
No	4	9	17	3,61445	12,2892	14,0964	
Hard to say	6	17	32	6,6265	22,5301	25,8434	

Source: own study (n = 166).

Although 39% of respondents believe that new technologies influence young people's career choices, in a question focused on the advantages and disadvantages of new technologies in the context of crafts, none of the students noted their impact on migration plans, both in terms of pushing them into foreign markets and retaining them in the Polish market. The advantages of using new technologies included: 1) impact on productivity and efficiency, 2) more thoughtful production and management processes, 3) adaptability to the demands of modern consumers, 4) influence on the selection of less environmentally harmful materials or minimizing the use of rare materials, and 5) perception of the enterprise as modern. The disadvantages of new technologies in crafts included: 1) high implementation costs, 2) the risk of job cuts, and 3) the need to implement changes within the enterprise and the resulting reluctance of employees to change/learn new things.

Similarly, among the observed changes related to the introduction and application of new technologies in crafts (in the workplace/practice setting), no changes were identified associated with preparing, adapting, or enabling work abroad. However, the following elements were appreciated: 1) more flexibility in working hours, 2) faster performance of professional tasks, 3) easier communication within the company and with the external environment, and 4) positive impact on the natural environment.

5. Discussion

Our study focuses on a group of students of vocational schools, and it is not only oriented on the education period (preparation for a profession), but also career and migration plans after completing the education process. Other research conducted in the context of learners within the selected subject area focuses primarily on educational migration (full-time study abroad or shorter academic exchanges). Examples are presented in Table 7. It is worth emphasizing that this research does not concern the space of craftsmen or craft professions.

Table 7.
Examples of research combining the issues of new technologies and migration focused on people in education

Source	Respondents/ area	Main characteristic
Brunner, Tao (2024)	Students	Managing international students using AI and automation, among other things, to assess study permit applications. The risks of using them in this regard are related to the complex and subjective decision-making system (aspects of systemic racism and discrimination, as well as border surveillance/imperialism) and the consequences of errors, the costs of which are borne by those temporarily residing in the destination country.

Cont. table 7.

Masud (2020)	Students	The use of communication media by migrant students for higher education to maintain transnational social networks and relationships.
Collin, Karsenti (2019)	Students	International students' use of technology before and after migration in the context of integration.
Leek, Rojek (2022)	Students, teachers, researchers and administrative staff	Digital learning within international online mobility.
Podgórska (2022)	Students	Research on the use of new technologies in communication by educational migrants in the context of the use of social networks.
Kukulska-Hulme (2019)	Projects and applications designed by migrants	Innovative projects and mobile language learning applications designed for migrants that students can also use.

Source: own study.

There is a lack of scientific publications that link the topic of migration with issues related to new technologies and crafts. Available studies focus, among other things, on analyzing the impact of digital transformation on job mobility. The results of Qiao and Ao's (2024) research suggest that digitalization can facilitate increased mobility of workers from rural areas, particularly in regions with lower levels of economic development. The use of modern technologies influences the structure of labor demand, leading to transformations in the required competencies and remuneration levels of individual employee groups. Consequently, technological progress can have both positive and negative impacts on migration patterns (Barišić et al., 2024).

The results of this study provide valuable insights into the professional aspirations and migration intentions of vocational school students in Poland. The findings indicate that although international mobility remains an important consideration, the majority of respondents currently envision their professional future within the domestic labour market. This tendency likely reflects both the improving economic conditions in Poland and the growing demand for skilled workers in sectors such as automotive services, gastronomy, and retail.

The predominance of technical and service-oriented profiles among respondents demonstrates that vocational education continues to fulfil its key role in preparing young people for practical, skill-based occupations. Automotive mechanics and hairdressing remain particularly popular fields, likely due to their relatively stable employment prospects and the ease of entering the job market. However, the limited representation of emerging professions such as those related to digital technologies, logistics, or renewable energy suggests that vocational curricula may not yet fully align with structural transformations occurring in the modern economy. Updating training programs to better reflect new market realities could therefore strengthen the relevance of vocational education.

Migration intentions reveal an interesting combination of moderate mobility and notable uncertainty. While only 12% of respondents expressed a clear desire to work abroad, almost half remained undecided. This level of ambiguity indicates that many young people are open to migration in principle but have not yet made firm decisions. Several factors may contribute to

this hesitation, including limited knowledge of foreign labour markets, language barriers, or the perception that working abroad entails greater preparation and financial risk. Similar findings have been reported in other studies of youth labour mobility, where migration intentions often remain aspirational rather than leading to concrete action.

The gender distribution confirms the persistence of traditional gender patterns in vocational education. Male students continue to dominate in technical and mechanical fields, while female students are concentrated in service-oriented and aesthetic professions. This division reflects enduring social norms and stereotypes concerning male and female occupations. Although overall gender parity has been achieved in vocational education enrolment, equality across occupational specializations remains limited. Addressing these imbalances may require targeted interventions in career counselling, mentorship, and public education to promote greater gender diversity across all vocational domains.

The considerable proportion of students who remain uncertain about their future employment plans suggests that career guidance and counselling services in vocational schools could be further developed. Early exposure to both domestic and international labour markets through internships, student exchange programs, or career fairs could help students make more informed career choices. Furthermore, initiatives that encourage entrepreneurship and self-employment may strengthen the confidence and independence of those still unsure whether to pursue careers locally or abroad.

Finally, the relatively low rate of declared migration intentions should not necessarily be interpreted as a lack of interest in mobility. Rather, it may reflect Poland's current socioeconomic stability and rising wage levels, which reduce the need for migration, particularly among low- and mid-skilled workers. Nonetheless, as European labour markets continue to evolve, future cohorts of vocational students may once again experience stronger migration pressures, especially in response to wage differentials or labour shortages abroad.

The high proportion of undecided responses is a limitation of this research. The large number of respondents who chose a neutral option or avoided expressing a clear opinion may result, for example, from limited knowledge of the issue being analysed or a low level of engagement with the topic. Therefore, some of the results obtained may reflect a lack of a clear position or uncertainty.

In conclusion, this study underscores both the strengths and challenges of vocational education in preparing young people for an increasingly dynamic labour market. While most students plan to remain in Poland, maintaining flexibility and awareness of international opportunities will be essential for their long-term employability. Promoting gender balance, modernizing vocational curricula to include emerging industries, and expanding access to career guidance can further enhance the readiness and adaptability of Poland's future vocational workforce.

6. Conclusion

The study provides an overview of the employment and migration intentions of vocational school students, revealing that most respondents plan to work in Poland while only a small proportion express definite plans to seek employment abroad. The results highlight the enduring popularity of traditional technical and service professions and the persistence of gendered occupational choices. Uncertainty among many respondents suggests the need for stronger vocational guidance and exposure to both domestic and international career pathways. Although migration is not currently a dominant goal, the openness of some students to mobility, especially toward nearby European countries, indicates potential for future international engagement.

Respondents generally recognized the importance of technological innovation for improving work efficiency and the attractiveness of craft professions. Exposure to or awareness of new technologies does not appear to have the only direct impact on students' migration decisions. This finding suggests that factors other than technological modernization, such as wage expectations, working conditions, or personal aspirations, may play a more decisive role in shaping the migration intentions of future craftspeople.

However, integrating modern tools, digital solutions, and innovative production techniques into vocational training can make local industries more attractive and competitive. By modernizing craftsmanship and aligning it with the demands of Industry 4.0, young professionals can pursue meaningful careers, professional development, and technological innovation within their home country, rather than abroad. To better prepare young people for evolving labour market demands, vocational education should focus on aligning training with emerging sectors, promoting gender balance across professions, and supporting informed decision-making about career and migration opportunities.

Acknowledgements

This work was financially supported by the Opole University of Technology as part of the DELTA projects nos. 246/23 and 247/23.

References

1. AGNIi (2023). *Innovation for Handicrafts and Handloom Clusters Technology advisory note for re-premiumization, propagation and preservation of Kashmiri crafts*. Office of the Principal Scientific Adviser to the Government of India, Directorate of Handicrafts & Handloom, Technology Advisory Note, September 2023.
2. Amnesty International (2023). *The digital border. Migration, technology & inequality*, POL 40/7772/2024. London: Amnesty International.
3. Andersson, D., Karadja, M., Prawitz, E. (2022). Mass migration and technological change. *Journal of the European Economic Association, 20(5)*, 1859-1896.
4. Arya, A., Nardon, L., Riyadh, Md. (2022). *Information and Communication Technology in Migration: A Framework for Applications, Customization, and Research.* Working Paper No. 3, April 2022. Ryerson Centre for Immigration and Settlement (RCIS), CERC in Migration and Integration.
5. Baranowska, G., Szoszkiewicz, L. (2021). New International Migration Management Technologies and Their Impact on Sustainability. In: W. Leal Filho, A. Marisa Azul, L. Brandli, A. Lange Salvia, P. Gökçin Özuyar, T. Wall (Eds.), *Reduced Inequalities. Encyclopedia of the UN Sustainable Development Goals*. Cham: Springer. https://doi.org/10.1007/978-3-319-95882-8_120
6. Barišić, A., Ghodsi, M., Landesmann, M., Sabouniha, A., Stehrer, R. (2024). *New Technologies, Migration and Labour Market Adjustment: An Intra-European Perspective, Policy Notes and Reports, 77.* The Vienna Institute for International Economic Studies.
7. BOP (2012). *Craft in an Age of Change: Summary report. Prepared for the Arts Council of Wales. Final summary report.* BOP Consulting, January 2012.
8. Brunner, L.R., Tao, W.W. (2024). Artificial intelligence and automation in the migration governance of international students: An accidental ethnography. *Journal of International Students, 14(1),* 269-288.
9. Bunnell, K. (2004). *Craft and digital technology.* World Crafts Council 40th Anniversary Conference in Metsovo, Greece. Retrieved from: https://repository.falmouth.ac.uk/537/1/craft%20and%20digital%20technology.pdf, 09.08.2025.
10. Castelvecchi, D. (2016). Can we open the black box of AI? *Nature, 538(7623)*, 20-23. https://doi.org/10.1038/538020a
11. CEARTE (2017). *Crafts 3.0. Supporting the transition of handicraft teachers and trainers to the Digital Age.* IO2: Training Modules on ICT-based teaching methods in VET for crafts sector, 2017-1-ES01-KA202-038435. Portugal: Centro de Formação Profissional do Artesanato.

12. CentrePiece (2025). *Return innovation: how migration shapes diffusion of new technologies*. Retrieved from: https://cep.lse.ac.uk/_NEW/publications/abstract.asp?index=11637, 09.08.2025.
13. Cobrief (2025). *New technology: Overview, definition, and example*. Retrieved from: https://www.cobrief.app/resources/legal-glossary/new-technology-overview-definition-and-example/, 14.01.2025.
14. Collin, S., Karsenti, T. (2019). Between continuity and change: A comparison of technology use by pre- and post-migration international students and local students, *International Journal of Technologies in Higher Education, 16(1)*, 1-14. https://doi.org/10.18162/ritpu-2019-v16n1-01.
15. ENNHRI (2024). *Technologies, migration and human rights: the role of European NHRIs – ENNHRI scoping paper*. European Network of National Human Rights Institutions.
16. Fournier-Tombs, E., Castets-Renard, C. (2022). Protecting migrants against the risk of artificial intelligence technologies. In: *The impacts of Covid-19 on migration and migrants from a gender perspectives.* International Organization for Migration.
17. Gelb, S., Krishnan, A. (2018). *Technology, migration and the 2030 Agenda for Sustainable Development: a briefing series.* Swiss Agency for Development and Cooperation.
18. Ghodsi, M., Landesmann, M., Barišić, A. (2024). *Technological Push and Pull Factors of Bilateral Migration*, *Working Paper, 242*. The Vienna Institute for International Economic Studies.
19. Ghodsi, M., Stehrer, R., Barišić A. (2024). Which migrant jobs are linked with the adoption of novel technologies, robotisation, and digitalisation? *Technology in Society, 78*, 102647. https://doi.org/10.1016/j.techsoc.2024.102647
20. Giesing, Y., Rude, B. (2022). Robots, AI, and Immigration – A Race for Talent or of Displaced Workers, *EconPol Forum, 5(23)*, 20-23.
21. Khoury, C., Hendow, M. (2025). *Advances in Border Management: Digitalisation trends and emerging technologies*. *Working Paper*. Vienna: International Center for Migration Policy Development (ICMPD).
22. Kukulska-Hulme, A. (2019). Mobile Language Learning Innovation Inspired by Migrants. *Journal of Learning for Development, 6(2)*, 116-129.
23. Leek, J., Rojek, M. (2022). Functions of digital learning within the international mobility programme – perspectives of university students and staff from Europe. *Education and Information Technologies, 27*, 6105-6123. https://doi.org/10.1007/s10639-021-10855-y
24. Martínez Torána, M., Esteve Sendraa, C., Moreno Cuestab, R. (2017). *Scenarios for design and craft*, 12th EAD Conference Sapienza University of Rome, 12-14 April 2017.
25. Masud, M.M.H. (2020). International student migration and polymedia: The use of communication media by Bangladeshi students in Germany. *Research in Social Sciences and Technology, 5(3)*, 95-110. https://doi.org/10.46303/ressat.05.03.5

26. McKinsey & Company (2025). *McKinsey Technology Trends Outlook 2025*. Retrieved from: https://www.mckinsey.com/capabilities/tech-and-ai/our-insights/the-top-trends-in-tech, 14.01.2026.
27. Nalbandian, L., Dreher, N. (2022). *Advanced Digital Technologies in Migration Management: A Review of Emerging Literature*, *Working Paper, No. 11, October 2022*. Toronto Metropolitan Centre for Immigration and Settlement (TMCIS) and the CERC in Migration and Integration.
28. Nedelcu, M., Soysüren, I. (2022). Precarious migrants, migration regimes and digital technologies: the empowerment-control nexus. *Journal of Ethnic and Migration Studies, 48(8)*, 1821-1837. https://doi.org/10.1080/1369183X.2020.1796263
29. Ozkul, D. (2023). *Automating Immigration and Asylum: The Uses of New Technologies in Migration and Asylum Governance in Europe*. Oxford: Refugee Studies Centre, University of Oxford.
30. Podgórska, K. (2022). Technology and Transnational Habitus. Online Communication in Migration Networks of Foreign Students [Technologia i transnarodowy habitus. Komunikacja online w sieciach migracyjnych studentów zagranicznych]. *Migration Studies – Review of Polish Diaspora, 1(183).* https://doi.org/10.4467/25444972SMPP.21.025.13846.
31. Pötzschke, S., Rinken, S. (Eds.) (2022). *Migration Research in a Digitized World: Using Innovative Technology to Tackle Methodological Challenges* (IMISCOE Research Series). Cham: Springer. https://doi.org/10.1007/978-3-031-01319-5
32. Qiao, Y.X., Ao, X.G. (2024). Digital transformation and rural labour force occupational mobility. *International Review of Economics & Finance*, *93*, pp. 42-50. https://doi.org/10.1016/j.iref.2024.04.007
33. Rashidi, S., Pyka, A. (2013). Migration and innovation: A survey. *FZID Discussion Paper, No. 77-2013*. Stuttgart: Universität Hohenheim, Forschungszentrum Innovation und Dienstleistung (FZID).
34. Ros, A., González, E., Marín, A., Sow, P. (2007). Migration and information flows A new lens for the study of contemporary international migration. *Working Paper Series, WP07-002*. UOC.
35. Thompson, B.Y. (2024). Digital Nomads, Social Media, and the Individualistic Solution of Long-Term Travelto Address General Downward Mobility. In: F. Hillmann (Ed.), *Interdisciplinary Migration Research With a Focus on New Technologies and Multiple Crises: Relating Birds of Passage to Social Policies* (pp. 36-54). Berlin: Berlin Universities Publishing.
36. Unwin, T., Harindranath, G.H., Ghimire, A. (2021). Migrants and digital technologies for learning and education: recommendations for governments. *UNESCO Chair in ICT4D Policy Briefs, 1/2024*.

37. Wiśniowski, A. (2021). Migration forecasting using new technology and methods. In: M. McAuliffe (Ed.), *Research Handbook on International Migration and Digital Technology* (pp. 373-389). Edward Elgar. https://doi.org/10.4337/9781839100611.00039
38. Zhou, M., Liang, S., Yao, P.A., Follesa, S. (2022). *New Craft Design in the Digital Age, Applied Human Factors and Ergonomics International*. Intelligent Human Systems Integration (IHSI 2022): Integrating People and Intelligent Systems.
39. Zwysen, W., Piasna, A. (2024). Digital labour platforms and migrant workers: analysing migrants' working conditions and (over)representation in platform work in Europe. *Working Paper, 2024.06.* ETUI.