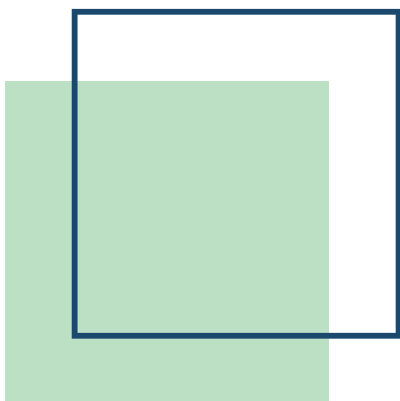
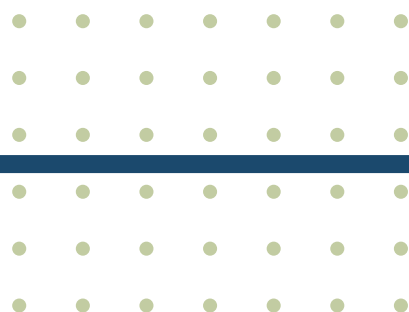


Forecasting the demand for competencies and qualifications

in selected industries in relation to changes in the economy



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Warsaw 2023

The background features abstract, light green geometric shapes. In the top left, there is a large, thick, V-shaped line. In the bottom half, there are several intersecting lines of varying thicknesses, creating a complex, star-like pattern.

Forecasting the demand for competencies and qualifications in selected industries in relation to changes in the economy



STRESZCZENIE

Głównym celem niniejszego opracowania jest diagnoza obecnego oraz przyszłego zapotrzebowania na kompetencje i kwalifikacje w wybranych sektorach gospodarki, jak również identyfikacja bieżącego oraz przyszłego zapotrzebowania pracodawców w zakresie podnoszenia oraz nabywania nowych kompetencji i kwalifikacji. W raporcie dokonano przeglądu istniejących badań i raportów z zakresie kompetencji przyszłości, wynikających z kluczowych zmian we współczesnej gospodarce. W toku przeglądu zidentyfikowano kluczowe umiejętności cyfrowe, związane między innymi z zyskującymi na znaczeniu zjawiskami pracy zdalnej, automatyzacji procesów biznesowych i robotyzacji, jak również wykorzystywania nowoczesnych technologii w pracy (w szczególności sztucznej inteligencji oraz Internetu rzeczy). Umiejętności te stanowiły przedmiot badań CAWI przeprowadzonych na potrzeby raportu. Oprócz odniesienia się do wyżej wymienionych celów w badaniach podjęto również próbę oceny wpływu aktualnych zjawisk, to jest pandemii COVID-19, wojny w Ukrainie oraz wynikającej z nich wysokiej inflacji na zapotrzebowanie pracodawców na umiejętności cyfrowe. Raport wieńczy podsumowanie wyników empirycznych oraz wynikających z nich rekomendacji dla przedsiębiorstw i polityki edukacyjnej.



ABSTRACT

The main objective of this study is to diagnose the current and future demand for competencies and qualifications in selected sectors of the economy, as well as to identify the current and future needs of employers in terms of upgrading and acquiring new competencies and qualifications. The present report reviews extant research and export reports devoted to the competencies of the future which are a result of several major changes in the contemporary economy. During the review, key digital skills were identified, including those related to the phenomena of remote work, business process automation, robotics, as well as the use of modern technologies in work (particularly Artificial Intelligence and the Internet of Things). These skills were the subject of CAWI surveys conducted for the purpose of this report. In addition to addressing the aforementioned objectives, the research also attempted to assess the impact of current phenomena such as the COVID-19 pandemic, the war in Ukraine, and the related high inflation on employers' demand for digital skills. The report concludes with a summary of empirical results and their implications for businesses and educational policy.



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AIMS AND SCOPE OF REPORT

The impact of digitalisation on the labour market does not only affect industrial and technological sectors, but also other industries. The demand from employers for programming jobs is growing half as fast as the overall labour market, and employees with skills that fit into hybrid occupations are particularly in demand (Van der Linden et al., 2019). Changes in the labour market and employers' expectations are also a result of other processes, such as automation, robotisation and the use of artificial intelligence. As technology continues to advance, workers need to acquire new skills and qualifications to adapt to changing job roles and remain competitive in the labour market. Responding to the processes in the economy, there are also emerging disruptions (resulting, for example, from the COVID-19 pandemic or the Russian aggression in Ukraine) that affect companies' development plans/strategies and employers' expectations for current and potential employees to possess and develop competencies.

The subject of this report is the employers' demand for competencies in selected industries. In this report, we focus on the analysis of the current and future demand for selected elements of competencies, attempting to capture emerging trends resulting from changes in the economy and relevant employers' expectations. The value of the study presented here are the conclusions and recommendations, which have been formed on the basis of a detailed analysis of the literature on the subject and with reference to the results of empirical research conducted in spring 2023 by the authors of this document. The empirical analysis focused on digital skills, which were identified as one of the key competence areas of the future. Today, technological competencies, particularly including digital skills, are no longer concentrated exclusively in IT departments, as they need to be embedded at all organisational levels and developed by most employees in combination with soft competencies.

The following **specific objectives** of the report were formulated:

1. identifying current and future demand for general digital competencies and qualifications;
2. identifying current and future demand for competencies and qualifications in the area of remote work;
3. identifying current and future demand for competencies and qualifications in the area of the use of modern technologies at work;
4. identifying current and future demand from employers for upgrading and acquiring new competencies and qualifications;
5. examining the impact of selected phenomena (COVID-19 pandemic, war in Ukraine, inflation in Poland) on employers' demand for digital competencies.

This report consists of two substantive parts. The first part presents the current state of knowledge on the impact of the challenges of the modern economy on the labour market and the competencies of employees, based on an analysis of available publications. Both international and national studies were taken into account. The results of the literature review were supplemented with the results of our own research, presented in the second part of the report. This part also contains a summary and main conclusions, and presents the authors' recommendations.

In the opinion of the authors of this report, the results of the research are a valuable repository of knowledge which may be used to formulate the directions of development of the labour market in Poland and, on the other hand, to develop strategies for enterprises in a dynamic environment and conditions of constant change. In particular, they can be used to develop procedures to prevent competence deficits in response to unexpected changes in the environment. Moreover, the presented conclusions may be helpful for researchers and decision-makers in identifying potential directions of labour market development in Poland in the coming years.



33%

67%





1. COMPETENCIES OF EMPLOYEES AND CHANGES IN MODERN ECONOMY – CURRENT STATE OF KNOWLEDGE



1.1 The challenges of economy 4.0 and changes in the labour market

The Fourth Industrial Revolution¹ is one of the key factors contributing to the development of Economy 4.0². However, it shows significant differences from previous industrial revolutions due to the scope and scale of changes that transcend the boundaries of individual industries, sectors and geographical areas (Iwański, Gracel, 2016). Therefore, its effects are expected to be more complex and diverse, also in terms of the functioning of the labour market and employment, which brings with it the requirement for workers to have the right competencies to interact effectively with modern production systems. Attention is drawn to the importance of the new roles and tasks of workers in industry and the emerging new ways of doing work that require humans to comply with the rules of collaboration with smart machines (Cellary, 2019; Piątek, 2017). In the robotic age, the work of humans and autonomous machines complement each other, creating a synergistic relationship (Nahavandi, 2019).

-
- 1 The fourth industrial revolution refers to changes in industry that are driven by technological advances, in particular the use of artificial intelligence, robotics, automation, big data analytics, the internet of things (IoT) and other advanced technologies.
 - 2 Economy 4.0 is a concept that refers to the application of advanced information and communication technologies (ICT) in production, logistics, marketing and other areas of the economy. In Economy 4.0, these technologies are used to optimise processes, reduce costs, increase the quality and flexibility of production and create new business models. Economy 4.0 is a broader concept than the digital economy. As defined by Śledziowska and Włoch (2021), 'the digital economy is emerging as a result of myriad, diverse, dispersed and uneven digital transformation processes that involve changing the way consumers, workers, markets, businesses and other organisations operate. This is made possible by the development and deployment of disruptive technologies for producing, collecting, processing, analysing and using data, such as connected mobile digital devices, the internet of things and the cloud, and above all artificial intelligence algorithms. (...)'

One of the outcomes of investments in advanced technologies and infrastructure, including the internet of things and artificial intelligence, is the emergence of a new model of work and employment called 'Work 4.0' (Tomaszewska, Pawlicka, 2021). Its exact definition is difficult to determine, but it is clear that the development of this model will lead to changes in employers' expectations of potential job candidates and the introduction of new training requirements for different professional groups of employees. The increased importance of certain skills or the emergence of entirely new ones is also due to changing approaches to work organisation. According to the authors of the report *The Future of Education and Skills. Education 2030*, in the 21st century workplaces are becoming flatter, more open, more flexible, and more transparent. This is reflected at the level of the functioning of entire organisations, which are based on teamwork, delegation and responsibility (OECD, 2018).

Advancing digitalisation, system interconnection and automation are leading to new ways of production, communication and management. These processes in turn trigger corresponding changes and trends in the area of employment, which relate to the nature of work and tasks performed, forms of employment and work organisation, as well as employment structure and competence profiles (Table 1).

The impact of automation processes on the labour market is usually described in terms of two effects (Acemoglu, Restrepo, 2020; Servoz, 2019):

- The displacement effect, which means that the result of automation will be the removal of employees from tasks they previously performed,
- The productivity effect, which is an increase in the demand for labour in industries or occupations that are created and developed as a result of technological progress.

A report by McKinsey experts, *Skill Shift: Automation and the future of the workforce*, analyses the impact of automation on labour markets in the United States and in Western European countries. The authors forecast a reduction in demand for skills of a physical and manual nature and core cognitive competencies in 2030 (Bughin et al., 2018). A study by the independent Bruegel *think tank* aimed to investigate the impact of industrial robots on employment and wages in six European Union countries, which together account for 85.5% of the EU industrial robot market. The authors concluded that one additional robot per 1,000 employees reduces the employment rate by between 0.16

Table 1. Changes in the labour market under the development of economy 4.0

Area of change	Characteristic phenomena and trends
Nature of work and tasks performed	<ul style="list-style-type: none"> • increased share of tasks of an intellectual nature; • increased importance of teamwork; • comprehensive nature of the tasks; • reduced share of work of a routine, repetitive nature; • automation of work and the need to work with AI-based systems (the so-called dematerialisation of work); • increased standardisation of work in certain professions.
Forms of employment and organisation of work	<ul style="list-style-type: none"> • greater worker mobility; • reduced intermediation, enhanced networking and flexibility of work; • loosened relations between employees and employers; • remote work (via online platforms, mobile applications); • work by independent contractors, freelancers; • task, project and casual engagement; • professional advancement within more than one organisation.
Employment structure and competence profiles	<ul style="list-style-type: none"> • emergence of new professions and jobs on the labour market; • requiring new skill sets within traditional jobs; • using new competencies in traditional professions; • polarisation of employment: an increase in the share of the simplest occupations and very highly skilled occupations, with a decrease in the demand for middle-skilled occupations; • increased share of self-employed workers (own-account workers).

Source: Shelest-Szumilas (2022).

and 0.20 percentage points. They also found that the displacement effect is particularly pronounced for medium-skilled workers and for younger groups of workers (Chiacchio, Petropoulos, Pichler, 2018). The observed effect indicates a significant risk of job loss affecting specific occupational groups.

PwC's team of experts predicts three waves of automation. The first one would take place by the early 2020s, the next wave will cover the later 2020s and the third wave will take place in the mid-2030s. According to a forecast by PwC and covering the outlook up to the mid-2030s, the highest share of jobs at risk of automation will be in companies operating in the transport industry (Hawksworth, Berriman, Goel, 2018). According to the report *Will robots really steal our jobs?*, in the first two waves women will be the most affected by the risk of job losses due to automation, while in later periods men will be a more at risk group. In addition, those with the lowest levels of education will be increasingly at risk of job automation over time.

Among OECD countries, the proportion of jobs at risk of automation ranges from 4% in Norway to 40% in Slovakia. Poland is among the countries with one of the highest shares of jobs at risk of automation. The minimum share of jobs at high risk of automation³ is 15%, the maximum share being 23% (Figure 1).

With the increasing automation of processes, employees need to have the right digital skills to work with and manage technology. Automation requires the use of digital tools such as software, robotics and artificial intelligence. In order to work with them effectively, employees are expected to be proficient in the use of these tools. Automation can lead to new job roles that are mostly based on digital competencies (Servoz, 2019). Developing and acquiring new digital skills will therefore be necessary to remain competitive in the labour market. A positive effect of automation may become improved work efficiency by reducing the time and effort required to perform tasks (Servoz, 2019). However, it also means that employees need to be skilled in managing and analysing data to ensure that automated processes work effectively.

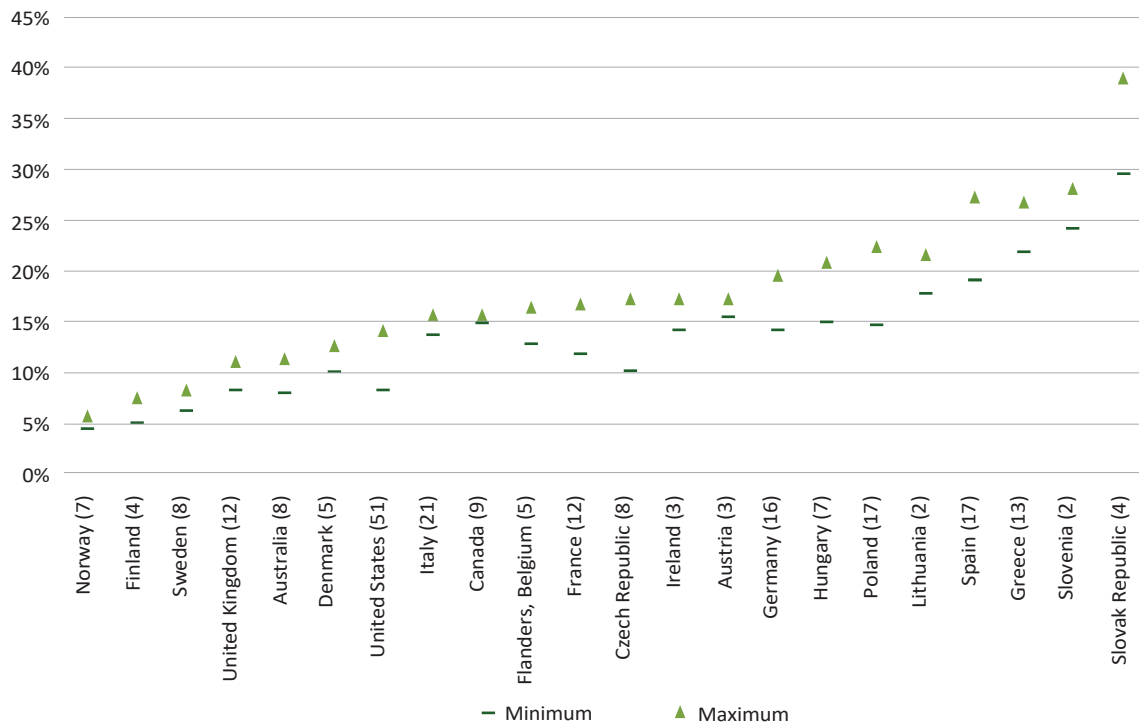
The plans of companies to implement digital technologies and tools referred to in *The Future of Jobs Report 2020* (World Economic Forum, 2020) provide a clear signal that the demand for new jobs and competence sets is expected to increase in the near future. A more detailed breakdown by selected sectors shows that certain technologies (for example, cloud computing, the Internet of Things, big data or text, image and voice processing) will be present in most sectors in the near future, while other technologies will be used in a small number of companies. This is largely due to industry/sector specificities. For example, by 2025, the use of industrial robots (eg drones or automation) is declared by as many as 90% of companies representing the mining and metallurgy sector; energy storage and generation technologies are planned to be implemented by 88% of companies in the energy services and technology sector; the use of e-commerce is declared by 90% of financial services companies; and printing and 3D and 4D modelling are planned to be implemented by 79% of companies related to the oil and gas sector.

Process automation and the development of artificial intelligence systems have gained even more momentum as a result of the shock of the COVID-19 pandemic. According to the authors of the report *The future of work after*

3 “High automation risk” refers to the percentage of employees whose work has an automation risk of 70% or higher.



Figure 1. Share of jobs at risk of automation⁴



Source: own elaborations based on OECD (2020).

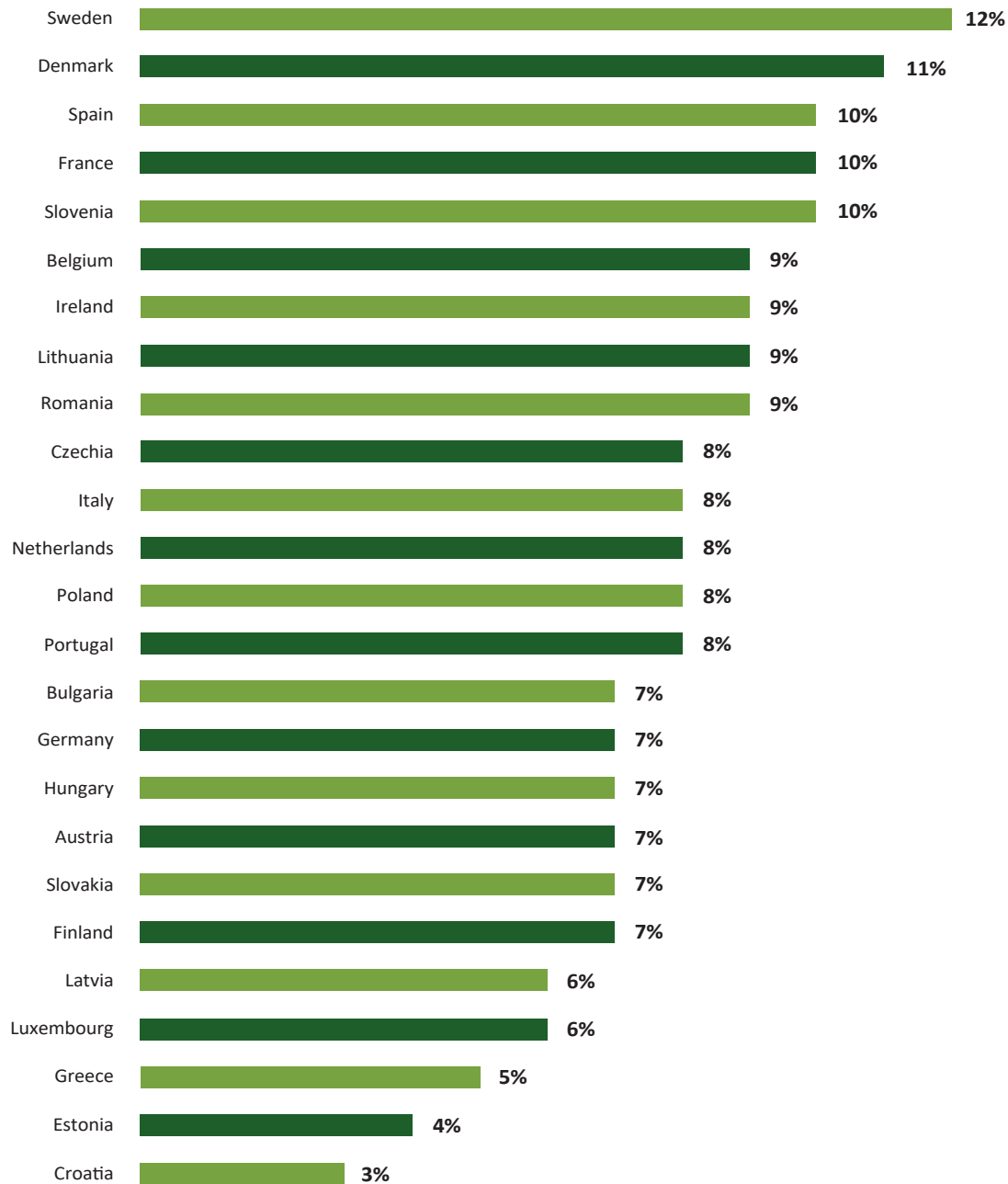
COVID-19, the further implementation of automation will be one of the most important trends determining the direction of change in the labour market after the pandemic. Among the reasons cited for accelerating automation are reducing job density, better adapting to changing demand, improving productivity and speed, and offering touchless services (McKinsey, 2021).

According to data collected by Cedefop (2023a) in Poland, only 8% of employees replied affirmatively when asked whether they had used robots in their main workplace in the month preceding the survey. This is 4 p.p. lower than in Sweden and 3 p.p. lower than in Denmark, which are leaders in terms of the implementation of robotisation processes (Figure 2).

4 Note: data for Australia are from 2016. The analysis for Austria is at NUTS1 level and for Flanders (Belgium) at NUTS2 level, as defined by Eurostat. In Hungary, the old regional classifications are used. Ceuta and Melilla (Spain), Canadian territories and Prince Edward Island are not included. For France, only metropolitan regions are included, with the exception of Corsica.



Figure 2. Use⁵ of robots in the workplace

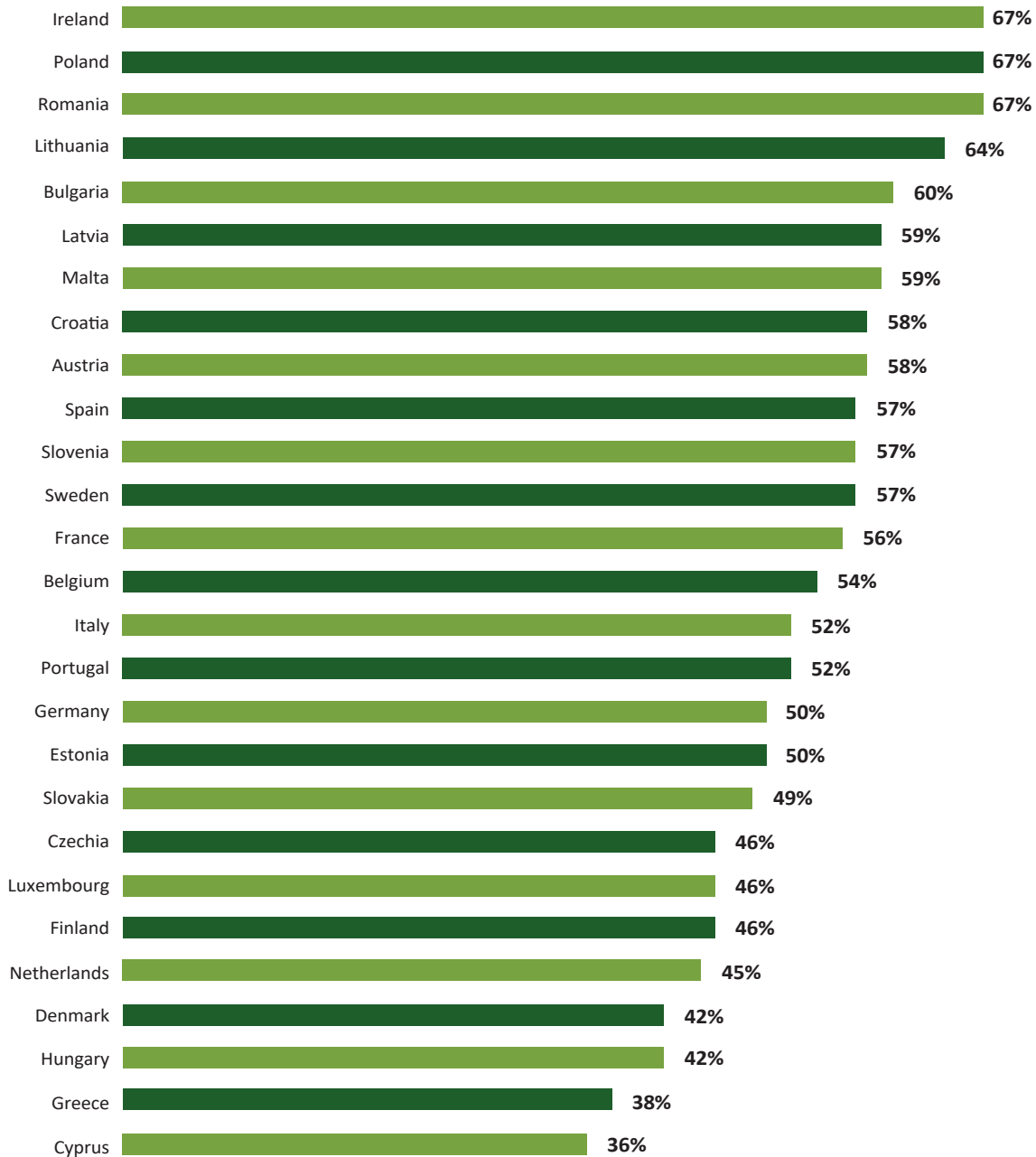


Source: own elaborations based on Cedefop (2023a).

- 5 The full question was: “As part of your main job, have you worked or operated any of the following computer machines in the last month?” The Figure shows the percentage of workers who answered affirmatively to the question asked, i.e. chose the option ‘Robots’.



Figure 3. Impact of digitalisation⁶ on the performance of new tasks in the workplace

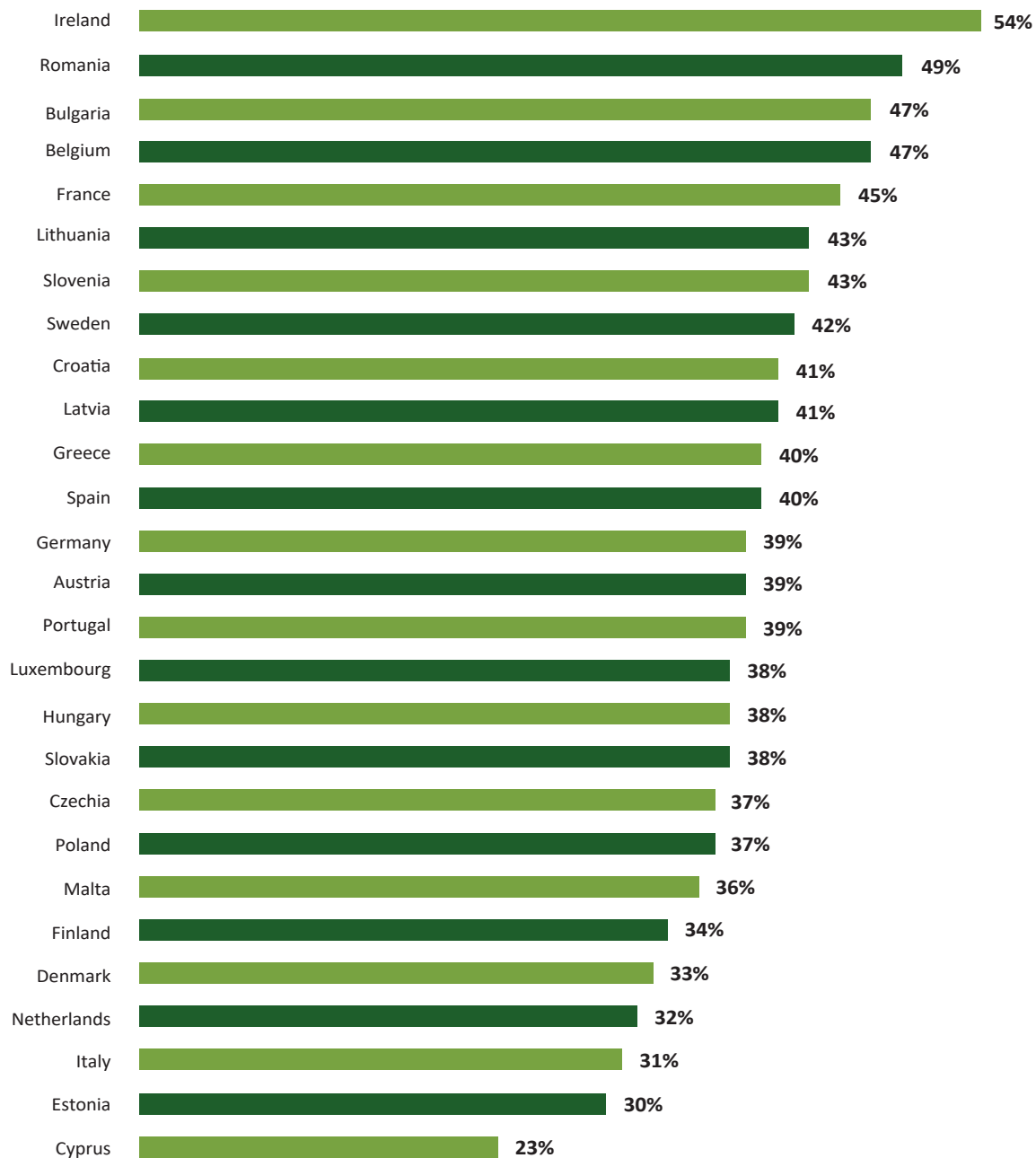


Source: own elaborations based on Cedefop (2023a)

- 6 The full question is: “As a result of new computer programmes or software/new computerised machinery that you have learned to use in your main job in the last 12 months, have your tasks changed in any of the following ways?” The Figure shows the percentage of workers who selected the option “You are now doing different or new tasks”.



Figure 4. Impact of digitalisation⁷ on automation of workplace tasks



Source: own work based on Cedefop (2023a).

- 7 The full question is: “As a result of new computer programmes or software/new computerised machinery that you have learned to use in your main job in the last 12 months, have your tasks changed in any of the following ways?” The Figure shows the percentage of workers who chose the option: “You are now not doing some of the tasks you used to do”.

The introduction of remote working in many countries (Eurofound, 2020) has highlighted the role that ICTs play in the functioning of businesses. The acceleration of workplace automation and the adoption of digital technologies, which many experts consider to be a natural outcome of the COVID-19 pandemic (Blit, 2020; Broady, Booth-Bell, Coupet, Macklin, 2021) has not only revealed barriers and challenges to the use of digital technologies (Swindells, 2021), but has also sparked debate on employment challenges and provided an opportunity to reflect on the future of work.

The impact of digitalisation on the scope of work can be seen, for example, by analysing data collected as part of the *European skills and jobs survey* (Cedefop, 2023). More than two-thirds (67%) of employees in Poland declare to have performed different or new tasks as a result of new computer programmes or software or devices in the last 12 months (Figure 3). At the same time, for more than one-third of employees (37%), the effect of digitalisation was the elimination of tasks traditionally performed in the workplace (Figure 4).

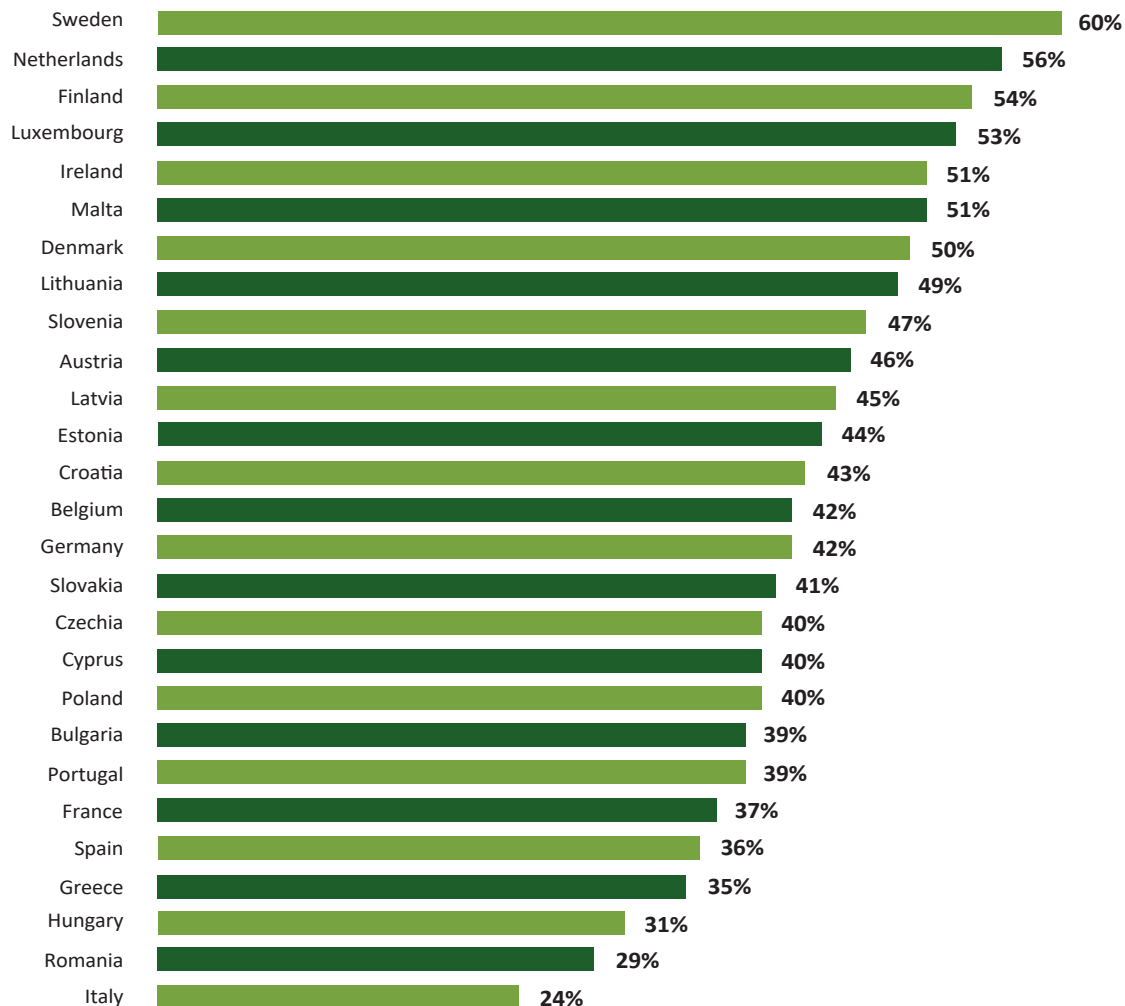
In addition to the above process automation, other trends impacting the post-pandemic employment area include remote working, travel and virtual meetings, as well as e-commerce and virtual transactions. According to McKinsey experts (2021), the potential for remote working is higher in developed economies (USA, Germany, UK, among others). It is estimated that, on average, around 20% to 25% of employees in these economies will work remotely three to five days a week. The use of various forms of remote working and virtual meetings is likely to continue, albeit with less intensity than during the pandemic⁸.

According to *The Future of Jobs Report 2020* (World Economic Forum, 2020), for the vast majority of online office workers, the future of work is already here. The research shows that as many as 84% of employers plan to rapidly digitise their work processes, including a significant expansion of remote working, which could move as many as 44% of employees into remote positions. There is also a noticeable trend towards accelerating automation processes and increasing the use of remote working. Half of the companies surveyed announced an acceleration of task automation in their organisations. Furthermore, more than 25% of employers forecast a temporary reduction in headcount, while 20% plan to cut jobs permanently.

8 The authors of the report give examples of tasks that lose effectiveness when performed remotely: business negotiations, making key business decisions, brainstorming sessions, giving sensitive feedback or inducting new employees. This also applies to the field of education.



Figure 5. Scope⁹ of remote working in EU countries



Source: own elaborations based on Cedefop (2023a).

Cedefop, on the other hand, estimates that the extent of remote working in the past 12 months ranged from 24% in Italy to 60% in Sweden (Figure 5). In Poland, 40% of employees report performing tasks as part of their primary employment at a location other than their employer's premises, with 23% of employees being exposed to this form of work on a daily basis and 33% at least once a week (Cedefop, 2023a).

9 The full question is: "In the last 12 months, have you done any work as part of your main job at a location other than your employer's premises?" The Figure shows the percentage of employees who answered "Yes" to the question.

The development of various forms of remote working has contributed to certain trends in the area of employment, in particular the ways in which work is performed. The results of the impact of the pandemic on the labour market in Poland are well illustrated by the following statistics (Cedefop, 2023a):

- 39% of employees say they are more likely to **use digital communication tools or platforms for** business **meetings** or conferences,
- 38% of employees **are using online services for learning more** for work-related purposes,
- 38% of employees are more likely to use **digital technology to perform certain tasks at work**,
- 22% of employees say they **work more time away from their** employer's premises.

The area related to e-commerce (electronic commerce) and the use of virtual transactions will grow intensively, creating an increased demand for *gig economy* work. This will be driven by an increase in the number of new users during the pandemic who have come to appreciate the convenience of digital payments, as well as their growing popularity during the pandemic (McKinsey, 2021).



1.2 What competencies will the labour market need?

1.2.1 Competencies of the future

Digital transformation has a major impact on the labour market, including the type of tasks performed, the places and ways of working, the skills required and career planning opportunities. The introduction of modern technologies requires the implementation of various solutions (not only at the individual worker level, but also at the national level) to adapt to changing working conditions. Employers, too, face the challenge in the labour market of attracting and retaining employees with the right skills who can flexibly adapt to the new reality.

This chapter provides a discussion and overview of the available theoretical frameworks and empirical studies that have appeared over the last six years (2018-2023), thus also covering the two-year period before the COVID-19 pandemic. This has allowed us to capture new challenges in the labour market and trends in the demand for workers' competencies.

Creating a comprehensive set of competencies necessary to function in a world changing under the influence of information technology and robotics is a difficult task to achieve. The reason for this is the diversity of terminology used to describe the modern economy and the new phenomena affecting its nature. As a result, the classifications and summaries proposed in the domestic and foreign literature are characterised by a varying level of detail of analysis and the time perspective adopted. Therefore, it seems justified only to indicate the most important areas of competence, which will be in greatest demand under the conditions of progressive development of economy 4.0.

Against the background of the dynamic development of ICT and digital technologies, the importance of relevant knowledge and skills for using them, ie digital competencies, is increasing. They are much more comprehensive than just being able to use the Internet or using specialised tools to create digital content¹⁰. An appropriate level of digital skills is essential not only in the working environment, but also in everyday life. In this context, mastering a minimum level of these competencies is considered one of the basic skills, as important as mathematical reasoning, reading or writing (European Commission, 2016).

There are a number of analytical studies that provide a synthetic analysis of the labour market's demand for workers' competencies. The need to develop the specific competence areas that employees should possess in the future is emphasised. Among other things, attention is drawn to the importance of interpersonal skills, which involve communication and cooperation. In addition to teamwork skills, conflict resolution, negotiation and relationship building skills are also important (McGregor et al., 2004). Furthermore, in order to function effectively in diverse groups, employees should have a high level of cultural awareness (Binkley et al., 2012; Kearns, 2001; Partnership for 21st Century Skills, National Council for Social Studies, 2008), as well as displaying ethical attitudes and social responsibility (Ananiadou, Claro, 2009).

Another important area of competence concerns thinking and the ability to learn. Within cognitive competence, the priority appears to be the willingness to learn. It is defined as the willingness and ability to develop skills that are currently required by employers and will be used in the long term (ManpowerGroup, 2018). The learning process should be continuous and adapted to changing career paths

10 The essence and role of digital competencies is presented more broadly in the next chapter.

and personal development (Deloitte, 2018). The ability to acquire new skills is particularly important in the face of labour market instability and the need to adapt to work in new conditions (Janowska, Skrzek-Lubasińska, 2019).

In the new economy, transferable knowledge plays a key role (McGregor, Tweed and Pech, 2004). In order to be effective in one's job, it is becoming necessary to self-improve professional skills, both inside and outside the organisation. Bonekamp and Sure (2015) highlight that as workplace processes become more complex, employees will be forced to undertake learning activities, beyond the level offered by the employer, on their own. This requires the promotion of a proactive attitude towards learning and a new approach to developing employee talent. It is therefore important for companies to build learning management systems and implement procedures to support learning progression and knowledge transfer within the organisation, as well as within business networks (Saniuk et al., 2021).

Another trend observed is the widespread use of mobile devices enabling easy and fast access to information, which translates into changes in expectations regarding cognitive competencies. Skills such as assessing the credibility of knowledge sources, interpreting facts (especially when faced with conflicting reports), logical thinking or the ability to concentrate when faced with multiple distractions will therefore become increasingly important (Italian, 2017).

According to Janowska and Skrzek-Lubasinska (2019), flexibility and constant change are the new paradigms in the labour market. As a consequence, job insecurity and temporariness and working for multiple employers in non-traditional forms of employment will become increasingly common (McGregor et al., 2004). It follows that employees need to demonstrate adaptability (Kearns; OECD, 2018), open-mindedness (World Bank; OECD, 2018), entrepreneurship and creativity (OECD, 2018; McKinsey & Company, 2018; Kearns, 2001) to adapt to new working conditions. The adaptability of employees is considered in several dimensions by Sony and Mekoth (2022) who refer each time to the specificity of Industry 4.0:

- 1) Adaptability through continuous learning, training and education on Industry 4.0,
- 2) Interpersonal adaptability,
- 3) Team adaptability,
- 4) Adaptability to creative problem solving,
- 5) Coping with crises and adapting to unforeseen circumstances,
- 6) Adaptability in stress management.

There have been repeated attempts to systematise current knowledge about the competencies of the future and to forecast the future situation, as reflected in a number of reports. For example, the *OECD Learning Framework 2030* (2018) identifies three categories of ‘transformative’ competencies (*transformative competencies*) that will ensure that young people can be ‘innovative, responsible and informed’ in the future. The first category relates to the creation of new value and includes the ability to collaborate with others, adaptability, creativity, curiosity and open-mindedness. The second category relates to the alleviation of tensions and resolution of dilemmas, which primarily requires the ability to think systemically. The third category of competencies focuses on taking responsibility and includes qualities such as self-control, self-sufficiency, taking responsibility, problem-solving and adaptability. The need to apply these competencies in ‘unknown and changing circumstances’ is emphasised. The concept of competence implies “the mobilisation of knowledge, skills, attitudes and values to meet complex demands” (OECD, 2018, p. 5). Among the skills desired in the future, the following are identified: cognitive and metacognitive; social and emotional; practical and physical. Employees will furthermore be required to demonstrate both specialised and general knowledge. The third component of competencies is attitudes and values at personal, local, social and global levels.

The report *Preparing tomorrow’s workforce for the Fourth Industrial Revolution* by Deloitte experts (2018) presents four competence areas of key importance in an Industry 4.0 environment: *workforce readiness; soft skills; technical skills; entrepreneurship*. The authors of the study also emphasise the growing importance of lifelong learning, which is fundamental and understood as a continuous process of acquiring new knowledge and skills as one progresses in one’s career and personal development. On the other hand, in an empirical study conducted among HR professionals of large companies in Turkey, 4 competence clusters analysed the importance of 41 competencies in the personnel selection process in the era of Industry 4.0. It turned out that 7 of them (project management, financial management, technological competence, digital competence, literacy, innovation and creativity) have a combined weight of 43%. Moreover, the 3 highest-ranked competencies fall within the technical competence cluster (Ada, Ilic and Sagnak, 2021).

A slightly different modelling approach is presented in the *OECD Skills Outlook 2019: Thriving in a Digital World*. The authors highlight the need to develop **three dimensions: skills for a digital society, learning in a digital environment and skills for a digital work environment**. In order to find their way in a digital

world, workers will need not only digital skills, but also the mastery and improvement of cognitive and socio-emotional skills (OECD, 2019a).

Also noteworthy is *The Future of Jobs Report* (World Economic Forum, 2020), in which the authors, taking a five-year time horizon, present the expected trends in jobs and the demand for workers' skills. The report's conclusions clearly indicate that a significant number of workers will need to retrain in six months or less to meet the demands of the labour market. In this context, employers expect employees to have critical and analytical thinking skills, problem-solving skills and self-management skills such as active learning, resilience, stress tolerance and flexibility. **This last identified area has emerged as a consequence of the impact of the COVID-19 pandemic on the labour market and the way many businesses operate.** In addition, more and more companies expect employees to be open to learning new skills in the workplace, which requires a high degree of flexibility and a willingness to continuously learn. The anticipated list of core competencies for 2025 includes:

- Analytical thinking and innovation,
- Active learning and learning strategies,
- Comprehensive problem solving,
- Critical thinking and analysis,
- Creativity, originality and initiative,
- Leadership and social influence,
- Technology use, monitoring and control,
- Technology design and programming,
- Resilience, stress tolerance and flexibility,
- Reasoning, problem solving and idea generation,
- Emotional intelligence,
- Problem solving and user experience design,
- Service orientation,
- Systems analysis and evaluation,
- Persuasion and negotiation.

The change in demand for competencies that is occurring as a result of process automation and the use of artificial intelligence is analysed in the report *Skill Shift: Automation and the future of the workforce* (Bughin et al., 2018). By 2030, the demand for advanced cognitive (creativity, complex information processing and interpretation), emotional and social competencies (entrepreneurship and initiative-taking, leadership and people management) is forecast to increase. According to McKinsey analysts, technological competencies will be the most

in demand in 2030. In addition, two levels of these competencies have been distinguished: advanced (understanding of advanced digital technologies, ability to develop and adapt them) and basic (ability to use digital technologies in everyday work, especially in problem solving and information retrieval).

Research by a team of specialists from the McKinsey Institute has diagnosed as many as 13 groups of competencies for the labour market of the future. They relate to one of 4 areas: cognitive, interpersonal, digital, self-leadership. The first area includes critical thinking, communication, work planning and how to perform tasks, and flexibility of mind. The second is teamwork, relationship skills, and negotiation. The third area includes understanding digital systems, digital proficiency and digital citizenship, software use and development. The fourth area, on the other hand, focuses on competencies such as self-awareness and self-management, entrepreneurship, and goal achievement (Dondi et al., 2021). According to experts, the workforce of the future should prioritise the development of those competencies **that add value beyond what automated systems and smart machines can do, enable people to function in a digital environment and continuously adapt to new ways of working and new professions.**

The Skills for smart industrial specialisation and digital transformation report refers to the concept of competencies, which is a combination of both general skills that are useful in multiple areas and specialised skills in (at least) one area. The breadth of competencies possessed by an employee reflects the individual's willingness and ability to work across industries, sectors and disciplines. The depth of an employee's industry-specific skills and knowledge is also important (Probst et al., 2018). The basis of the model presented in the report is thorough technical knowledge and deep report. These are complemented by interpersonal and leadership competencies and general problem-solving and critical thinking competencies.

The PwC team of experts, in turn, identified 6 categories of competencies whose acquisition will be key in a 4.0 economy. These are:

1. Competencies related to practical areas (technical).
2. Competencies related to quality, risk and safety aspects.
3. Competencies related to management, administration, intellectual property and finance (management and entrepreneurship).
4. Interpersonal communication competencies.

5. Competencies related to designing and creating new things (innovation).
6. The ability to manage one's own emotions and the emotions of others and to use information about emotions to guide thinking and behaviour (emotional intelligence) (PwC, 2020).

In order to monitor the current demand for competencies, the Skills-OVATE platform was launched. On the basis of observing job offers published online, information on the most desired competencies is collected. In the case of Poland, the highest demand is for skills and knowledge. The first two places among the most sought-after skills are teamwork and the use of digital tools for collaboration and productivity (Table 2).

National studies, especially those of a synthetic nature, are also a valuable source of information on the current and future demand for competencies. The report summarising the cyclical nationwide *Human Capital Balance* survey carried out in 2017-2018 analysed the competence requirements for employees of medium and large companies. Three categories of employee competencies most valued by employers were identified: self-organising (taking responsibility,

Table 2 Examples of the most desirable competencies (based on online job listings)

Specification	% of online job postings with the relevant competence
adaptation to change	40.4%
working in teams	36.9%
using digital tools for collaboration and productivity	32.9%
personal skills and development	30.9%
knowledge of languages	28.0%
computer use	27.1%
development of solutions	27.0%
management and administration	25.3%
assumption of responsibility	23.8%
communication, cooperation and creativity	23.3%
planning and scheduling of events and activities	22.2%
development and analysis of software and applications	21.4%

Notes: Colours indicate the different components of competencies (skills - blue, knowledge - green, attitudes - purple, language skills - yellow). The table uses the classification adopted by Cedefop.

Source: own elaborations based on Skills-OVATE (Cedefop, 2023b)

time management and punctuality, self-organisation of work, ability to cope with stressful situations), interpersonal (being communicative and conveying thoughts clearly, establishing contacts easily, working in a group, fluent in Polish) and cognitive (learning new things, resourcefulness, creativity, analysing information and drawing conclusions). These competencies are universal - important regardless of occupation (Czarnik et al., 2019).

Włoch and Śledziewska (2019) distinguish **future competencies as areas in which humans cannot be replaced by information systems, robots or artificial intelligence**. Within the three spheres (cognitive competencies, social competencies and technical competencies), the authors of the report *Competencies of the Future. How to shape them in a flexible educational ecosystem* listed 11 components:

- basic digital competencies,
- advanced digital competencies,
- engineering competencies,
- solving complex problems,
- creativity,
- critical thinking,
- cognitive flexibility,
- cooperation with others,
- emotional intelligence,
- people management,
- entrepreneurship.

Few attempts can be made to identify entirely new competencies useful in the context of the development of the New Economy. For example, Janowska and Skrzek-Lubasińska (2019) include sales skills for non-sales positions, adaptation to changing conditions, lifelong learning, creativity and self-initiative, personal finance skills, and entrepreneurial skills among the new skills required in Economy 4.0. In addition, the authors highlight that some traditionally less important skills are becoming absolutely essential in a 4.0 economy. These are:

- analytical skills and critical thinking,
- ability to put knowledge into practice, solve problems,
- cooperation skills,
- social skills,
- motivation and self-discipline.

In examining the competencies of the future in the industrial enterprise sector, the Future Competence Observatory team of the *Future Industry Platform* Foundation developed a list of competencies, which were assigned to three areas: **1) cognitive (cognitive) competencies, 2) social competencies, and 3) technical competencies and in the use and management of knowledge and information.** The first area includes complex problem solving, creativity, critical thinking, analytical thinking, cognitive flexibility. The second includes cooperation with others, emotional intelligence, entrepreneurship understood as taking initiative and responsibility, and managing people. The third area included digital competencies (basic and advanced), as well as technical competencies (basic and advanced) and engineering competencies (Łapińska, Sudolska and Zinecker, 2022). Respondents assessed the importance of these competencies now and in the perspective to 2030. Within the group of cognitive (cognitive) competencies, four competencies were considered to be particularly important for the implementation of current tasks and development goals of companies. The competencies listed were: out-of-the-box thinking and creative adaptation of solutions, analytical skills with the use of technology, the ability to analyse and assess risks and responsible decision-making. According to the respondents, possession of these skills has a positive impact on work efficiency and on the development of enterprises. This indicates the relevance of the listed competencies in the context of today's business requirements. As regards the area of technical competence and the use and management of information and knowledge, the ability to manage information overload is a key competence in the companies surveyed. The ability to program and integrate robot workstations was also found to be important. In the group of social competencies, on the other hand, the ability of lifelong learning was identified as a key competence. The ability to continuously improve qualifications and further training after formal education is particularly important due to the inevitable changes in the environment. The authors of the report emphasise that the implementation of new technologies affects not only the economy, but also work, culture and the value system. In addition to lifelong learning, social intelligence and the ability to work effectively in virtual teams were also found to be important social competencies in the companies surveyed.

The New Generation in the New Economy project, undertaken by a team of researchers from the Poznań University of Economics, was dedicated to diagnosing and developing a methodology for studying the most relevant competencies of the future among schoolchildren. As part of the project, individual in-depth interviews were conducted with high-level specialists from a purposively selected sample of enterprises representing highly innovative

entities categorised as New Economy, Industry 4.0 (innovative companies, start-ups, located in technology parks) and three e-debates were organised with entrepreneurs, representatives of educational administration and secondary school teachers in the Wielkopolska region, which focused on a discussion around labour market expectations of the future in relation to employees. The main conclusions from the qualitative stage of the research are as follows. According to employers, deficits in soft competencies such as communication skills, teamwork, emotional intelligence, knowledge sharing and attitudes (flexibility, readiness for change) are the most challenging. Unlike hard competencies, which are easier to acquire, soft competencies require time and focus to develop skills. Therefore, the openness of employees to adapt and learn quickly, even from scratch, is key. It is also important to discover employees' individual predispositions and talents and to create the right conditions for realising their potential.

The conclusions presented above are to a large extent consistent with those formulated by the team carrying out the study entitled *Analysis of the demand for competencies in the economy and the labour market together with the study of the target value of the common long-term indicator POWER in the area of higher education* (Jelonek et al., 2019). Based on the analysis of employers' requirements for various jobs, it was noted that there are certain competencies that are desirable for most of them. These include the ability to collaborate effectively in a group, communication skills and the ability to convey thoughts clearly, creativity and innovative thinking, as well as easy interpersonal relations. In the case of specialised positions, employers also paid attention to having the right professional competencies, however, this does not mean that these competencies are less important. According to the report's authors, employers signalled a willingness to self-train their employees in specialist skills, while general competencies remain essential for any professional role. A valuable addition to the report is the identification of competencies whose importance will increase in the future. These are summarised in Table 3.

Based on an analysis of currently available publications and analytical studies, it can be concluded that some of this material focuses exclusively on digital competencies or ICT skills. On the other hand, other studies present a broader perspective, seeking to identify and define key competencies or skills relevant to the demands of 21st century realities. In most publications on these broadly defined *key competencies of the 21st century skills*, the area of digital competence is considered as one of their subsets.

Table 3. Competencies with increasing importance in a 10-year perspective

Area	Specification
General	<ul style="list-style-type: none"> • transferred to other roles (universal), • learning, • human/machine/computer interaction skills, • competencies that complement machine capabilities: <ul style="list-style-type: none"> – interpersonal, intercultural, social intelligence, – cognitive to allow coping with unpredictable changes, – cognitive and creative, – unconventional and adaptive thinking, – related to written expression. • use of technology, computational thinking, • use of data.
Professional	<ul style="list-style-type: none"> • specialist at expert level in middle and high-level professions, • highly specialised on the borderline between two or more fields.

Source: own elaborations based on Jelonek et al. (2019).

1.2.2 The role of digital skills in an economy 4.0

1.2.2.1 Definition of digital competence

Digital transformation, including the increasing use of automation and robotisation of processes or new applications of artificial intelligence, brings with it enormous potential for increasing labour productivity (Bejaković, Mrnjavac, 2020). The exploitation of these opportunities, however, requires, both at the stage of implementing organisational and technological changes and at the stage of further operation of enterprises, a number of new types of competencies that result from the previously mentioned technological phenomena. Digital competencies are defined in different ways in existing publications.

Thus, UNESCO presents digital competence as *“the ability to access, manage, understand, integrate, communicate, evaluate and create information securely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competencies that are variously described as computer literacy, ICT literacy, information literacy or media literacy”* (Law et al., 2018).

The European Union defines digital competence as ‘the ability to use information and communication technology (ICT) effectively to achieve work, learning and everyday life goals’. This definition comes from the European Commission’s 2017 report entitled *Digital Competence Framework 2.0: The digital competence framework for citizens with eight proficiency levels and examples of use*¹¹.

The 2018 Future of Jobs Report by the World Economic Forum, on the other hand, defines digital skills as “the ability to use digital technologies to achieve goals, solve problems and communicate with others”. The International Telecommunication Union proposes the following definition: “The competencies required to use digital technologies effectively, including the ability to access, manage, integrate, evaluate, analyse and create information and communication using digital tools: (ITU, 2018).

The definitions cited above emphasise the importance of digital literacy in different areas of life and work, such as communication, professional development or learning. Other aspects of digital competencies, such as problem solving, creativity, critical thinking or the ability to work in a team, also appear in each of these reports. Furthermore, the report *Information Society in Figures* of the Ministry of Administration and Digitalisation (2014, p. 17), points out the dual understanding of digital competencies, which can be defined as “a set of **information competencies** including the ability to search for information, understand it, and assess its reliability and usefulness, and digital **competencies consisting of the** ability to use a computer and other electronic devices, to use the Internet and to use various types of applications and software, and to create digital content”. In itself, information literacy as an object of research was originally associated with the conscious and effective use of traditional information sources and tools that facilitate access to them, including library catalogues, indexes, bibliographies, etc. (Klimczuk et al., 2015). With the development of digital technologies, information literacy is more often associated with the informed use of Internet information resources¹². Searching for information is one of the core activities carried out in the online environment, while permeating all areas of other online activities.

11 Similarly, according to the report *Digital Literacy in Higher Education, Part II: An NMC Horizon Project Strategic Brief* (2017), digital literacy is “the ability to use digital technologies to operate effectively in everyday life, work and education”.

12 However, it is worth emphasising that the conscious and effective use of all information resources and sources is contingent on an adequate level of information competence.

1.2.2.2 Digital competence typologies

The distinction between information competencies (understood as searching for, understanding, assessing the reliability and relevance of information) and digital competencies (understood as the ability to use a computer and other electronic devices, various applications and software, use the Internet and create digital content) is also evident in the Digital Competence Framework (DigComp) model, first developed in 2014 by the Institute for Prospective Technological Studies (IPTS) of the European Commission. DigComp, as a holistic model of digital and information competencies, attempts to synthesise and develop existing models, dividing the 21 key competencies into 5 areas (see Table 4).

The areas of digital competence¹³ can be summarised as follows:

- **Information and data:** identification, location, retrieval, storage, organisation and analysis of digital information, the ability to assess its value, meaning and purpose.
- **Communication and collaboration:** communicating in digital environments, sharing resources through online tools, connecting and interacting with others, collaborating through digital tools, interacting and participating in social activities and networks, intercultural awareness.
- **Digital content creation:** creating and editing new content (from text processing to images and video); integrating and reprocessing existing knowledge and content; creating new concepts, digital content and programming; understanding, respecting and applying intellectual property rights and licences.
- **Security:** personal protection, data protection, digital identity protection, security measures, safe and sustainable use.
- **Problem solving:** identifying digital needs and resources, making informed decisions about the choice of appropriate digital tools according to goals and needs, solving conceptual problems through digital means, creative use of technology, solving technical problems, updating own and others' competencies.

13 Areas 1, 2 and 3 are essentially linear, while areas 4 and 5 are more cross-cutting. This means that while Areas 1 to 3 refer to competencies that can be identified for a specific activity and application, Areas 4 and 5 refer to any type of activity carried out through digital means.

In the 2022 update of the model (*DigComp 2.2: The Digital Competence Framework for Citizens. With new examples of knowledge, skills and attitudes*), published by the Joint Research Centre (JRC) of the European Commission, the operationalisation of the general areas of the model with detailed examples of knowledge, skills and attitudes of society takes into account, among other things, the following current phenomena relevant to this report:

- **human interaction with artificial intelligence systems** (including data skills, data protection and privacy, but also ethical issues);
- **new technologies** such as the Internet of Things (IoT);
- context of the increasing use of **remote and hybrid working**.

In order for employees to make informed and safe use of new and emerging technologies, including artificial intelligence (AI)-based systems, they need to gain a basic understanding of these tools and technologies. Increased awareness can also help to improve sensitivity to potential data protection and privacy issues, ethics or gender equality issues. The DigComp 2.2 model update focuses on the topic of citizen interaction with AI systems, rather than focusing on AI knowledge itself.

Other related digital competence models are also worth noting:

- UNESCO Media and Information Literacy (MIL) model: this model was originally developed at the same time as the DigComp framework, and both models share the common goal of enabling the development of digital competencies to support professional development and employability, with a focus on information and media literacy. The UNESCO model complements DigComp by focusing on media and information literacy;
- DigCompConsumers developed by the Joint Research Centre: this model offers a frame of reference for the development of digital consumer competencies, ie the competencies that consumers need to function actively, securely and assertively in the digital marketplace. DigCompConsumers can be considered as a related model because it uses DigComp as the basis for a new digital competence framework in a narrower context.
- DigCompEdu European Framework for the Digital Competence of Educators: this model provides a general reference framework to support the development of teachers' digital competence in Europe;
- DigCompOrg: this model aims to support individuals from the education sector to develop their digital competencies. The framework can facilitate transparency and comparability of related initiatives across Europe and play a role in addressing fragmentation and uneven development across Member States.

Table 4. Areas of digital competence in the DigComp model

Area of competence	Competencies
1. Information and data	1.1 Browsing, searching and filtering data, information and digital content 1.2 Evaluation of data, information and digital content 1.3 Management of data, information and digital content
2. Communication and cooperation	2.1 Digital communication 2.2 Sharing information and resources using digital technologies 2.3 Active citizenship using digital technologies 2.4 Cooperation through digital technology 2.5 Netiquette 2.6 Digital identity management
3. Creation of digital content	3.1 Creation of digital content 3.2 Integration and processing of digital content 3.3 Observance of copyright and licences 3.4 Programming
4 Security	4.1 Protection tools 4.2 Protection of personal data and privacy 4.3 Protection of health and welfare 4.4 Environmental protection
5 Troubleshooting	5.1 Technical troubleshooting 5.2 Identification of technological needs and solutions 5.3 Creative use of digital technologies 5.4 Identifying digital competence gaps

Source: own elaborations based on DigComp 2.2 (Vuorikari, Kluzer, Punie, 2022).

As Van Laar et al. point out. (2020), in addition to the 21st century skills associated with the digitalisation megatrend, such as digital information skills, digital communication skills, digital collaboration skills or digital problem-solving skills, digital **critical thinking skills** and digital **creative skills** are also important. The latter two categories, according to the systematic literature review conducted by the above-mentioned authors, have so far received the least attention from researchers in the digital context, although it can be noted that they form part of the DigComp model presented above. Van Laar et al. (2020), on the other hand, note that in the case of digital literacy, the most

important determinants are socioeconomic, mental/motivational, demographic, psychological/personality or ICT experience variables, with material determinants related to access to ICT coming in last place. **This indicates the importance of factors on the part of the employees themselves and the potential to develop these skills.**

In addition to the above general view of digital competencies, which are cross-cutting and independent of specific technologies, the 2019 report of the European Commission and the *Executive Agency for Small and Medium-sized Enterprises* (EASME) entitled *Skills for SMEs. Supporting specialised skills development: Big Data, Internet of Things and Cybersecurity for SMEs*, in the context of the competency challenges associated with the growing importance of big data, the Internet of Things and cybersecurity in the business sector, attention was drawn to the specific digital skills associated with these technological areas. The European Commission has identified IoT, big data and cyber security as areas where European SMEs would benefit from a skills upgrade¹⁴. Both IoT and big data have great potential to maximise customer insights, optimise internal processes, renew business models and develop innovative services and solutions.

While the development of core digital competencies is already a challenge in itself, the emergence of these technologies and the need to use them in businesses is creating significant **gaps and discrepancies in specialised skills**, particularly for SMEs, which cannot compete with large enterprises in attracting and retaining scarce and valuable digital skills within the organisation. Serious digital skills gaps exist at every organisational level of SMEs, from e-leadership skills to ICT specialists to the digital skills of the users themselves.

With regard to the competencies of the workforce required to exploit the potential of technological change, the following areas were singled out, but these go beyond digital competencies in the narrow sense alone:

- **Hard skills** refer to the usual technical skills needed to work with big data, IoT and/or cyber security. These skills are often very specific and job-specific. An example is the ability to extract, structure and clean data for analysis¹⁵,

14 Artificial intelligence, quantum computing, blockchain or key chip technologies were identified as other priority areas.

15 Typical professions requiring deep technical knowledge include software engineers, programmers, data analysts, algorithm developers and security specialists.

- **Soft skills** include teamwork, leadership, creativity, collaboration, partnership skills, communication and problem solving¹⁶,
- Finally, **business expertise** refers to the set of skills needed to run a company, such as basic knowledge of financial accounts, business development and risk management skills, the ability to shape business development strategies and skills within a company, the ability to select appropriate technologies and domain knowledge (for example, understanding a specific market).

Pointing out the fact that digital competencies alone are not sufficient to transform organisations around new technologies is relevant to the understanding of future competencies in this study and coincides with the conclusions of the previous section of the report. Furthermore, particularly for smaller organisations, it is the competencies of the **workforce that are proving to be significant barriers to the implementation of the aforementioned new technologies**. In the light of the above-mentioned European Commission report, also citing available results from previous studies, there is a shortage of specialised skills related to these technologies in Europe. People with the most necessary skills for these technologies are in high demand and their employment comes at a high cost. Attracting staff with specialised skills is done in competition with large companies that offer relatively higher salaries¹⁷.

1.2.2.3 Digital competencies by industry

In the context of the above considerations, it is also important to note that the need for digital competencies may differ from one economic sector to another.

Thus, IBSA (2018) in a report on the importance of digital skills in the context of Industry 4.0 in Australia, drawing on expert teams from specific industries, identified an emerging need for three key digital skills in their industries:

- **The ability to analyse and use data provided by machines** in the workplace, relevant in particular to aviation, manufacturing and engineering, the chemical industry as well as the hydrocarbon and refining sectors;

¹⁶ They are also called transversal skills or interpersonal skills.

¹⁷ Furthermore, in the context of SMEs, the characteristics of the management team also become important. It appears that technology-familiar, younger owners or managers are more likely to adopt new technologies.

- **3D printing and manufacturing skills** relevant to manufacturing and engineering, laboratory research, the printing and graphics sector;
- **Programming and coding**, in aerospace, manufacturing and engineering, plastics, rubber processing and cable manufacturing; the printing and graphic arts sector, as well as in the clothing and footwear sector.

Konttila et al. (2019) conducted a systematic review of existing studies to identify key competencies for digitalisation in **healthcare** settings and to identify the determinants of these competencies. Key areas of competence included sufficient digital knowledge and skills needed to provide high quality ethical patient care, social and communication skills of healthcare professionals, as well as collegial and organisational support in building positive digitalisation experiences. The authors also point out that competence in digitalisation requires sound professional knowledge and skills in the first instance. Health professionals' digital competence is influenced by attitudes based on their experiences, as well as psychosocial and organisational factors.

Mazurchenko et al. (2022) in their empirical study identified the most needed digital skills for employees in the Czech **banking and insurance sector**, pointing in particular to digital problem solving, basic data entry and processing skills, advanced analytical and mathematical skills, database management skills, software development skills, digital project management skills, web development skills, development skills, digital strategy and leadership skills. In contrast, the most urgent areas for further competence development were identified as:

- Working in the cloud and using mobile technologies;
- Automation and machine learning;
- Digital communication, content sharing and performance measurement; data encryption, dataset creation and working efficiently with data;
- Problem solving using digital technologies;
- Programming in Python, Visual Basic and other languages;
- Creating effective materials using Google Workspace.

In the context of the **creative industries** in the Netherlands, van Laar et al. (2019), on the other hand, in their empirical study identified the following competencies as the most important in the opinion of the interviewed employees:

- Information management,
- Effective communication,

- Assessing the reliability of the information,
- Problem solving,
- Critical thinking,
- Capacity to cooperate,
- Developing new contacts in the digital environment.

Van Laar et al. (2022) also conducted an experimental study among workers in the **creative industries** in the Netherlands, which sheds additional light on the demand for the above competencies. A first observation regarding digital skills is that employees rarely check the information they find online thoroughly. Furthermore, when it comes to digital problem-solving skills, a relatively small percentage of employees are able to come up with more than one solution to a given problem with an explanation. These findings are problematic in that work in the modern economy is no longer defined by mere possession of technical skills, but more by the specific task or problem that the worker and his or her team are trying to solve.

1.2.2.4 Importance of qualifications in the field of digital competence

In the area of digital competencies, there are a number of ways for employees to formally verify and validate their possession. Focusing on qualifications in the area of ICT, as a number of ‘hard’ digital competencies are derived from it, a report entitled *Digital organisational frameworks and IT professionalism* produced in 2019 for the European Commission and the SME Executive Agency points out that certification or, more broadly, the validation of workers’ competencies is becoming important. The report, entitled *Digital organisational frameworks and IT professionalism*, developed for the European Commission and the SME Executive Agency in 2019, points out that certification or, more broadly, the validation of workers’ competencies is becoming important in today’s economy, when the acquisition of ICT competencies is not limited to formal education or is not the domain of specific training institutions. One can observe a progressive **decentralisation of the qualification process in the field of digital competencies in the broadest sense**, the aim of which is to award employees with recognisable and verifiable confirmations of knowledge, skills and attitudes relevant for job readiness and effective job performance. In addition to the numerous industry-specific certifications, a progressive phenomenon is the so-called open digital badging, ie the phenomenon of validation of competencies in different digital environments, in which higher education institutions, continuing education or training providers

may participate in cooperation with industry associations, aiming to develop universally accepted standards.

The above report further highlights that **qualifications in the area of digital competencies bring a number of benefits to employers**, including:

- a) Improved IT **staff productivity**, for example, deeper knowledge and understanding of technology enables time savings and higher productivity for certified staff;
- b) Improved **efficiency of IT operations**, for example, applications are delivered faster to users and customers, and users of these applications experience less unplanned downtime when certified staff are involved in their development and support;
- c) **Productivity of new employees**, for example, new employees who have been certified reach full productivity more quickly and have longer tenure on average;
- d) **Advancement of employees**, for example, employees who have received a certificate are often given more responsibility, have more opportunities for promotion and achieve higher salaries on average.
- e) **Reduction in employment costs** through more effective identification of the right competencies in the labour market.

1.2.2.5 Strategies to improve digital competencies

The availability of the necessary competencies in the face of changes in today's economy can be a significant barrier to implementing new technologies and reaping their benefits, particularly for SMEs. Regarding possible ways to improve digital competencies of employees, the 2019 publication of the European Commission and the Executive Agency for Small and Medium-sized Enterprises (EASME) entitled *Skills for SMEs. Supporting specialised skills development: Big Data, Internet of Things and Cybersecurity for SMEs*, summarises three main directions for companies to develop these competencies:

1) Upskilling of existing staff

The demand for specialist digital skills is growing as IT departments move from functions that support the operation of individual business processes within organisations to roles that are more strategically focused and more closely integrated with all areas of the business, such as the use of data in sales and

marketing. As noted in earlier sections of this report, this requires not only 'hard' IT skills, but also 'soft' business skills.

Larger companies provide training to their employees more often than SMEs, which face a number of barriers, including:

- 1) **Organisational barriers**, for example, business owners have to balance between the working time of a limited number of employees and absences due to training, potentially affecting revenue;
- 2) **Financial barriers**, ie especially micro and small companies find it difficult to allocate the financial resources needed to offer training to their employees;
- 3) **HR development policy**, ie compared to larger companies, HR processes and skills development are not to the same extent organised in a systematic way or with a long-term orientation;
- 4) **Perceptions of the urgency of training needs**, which may be related to the cultural specificities of the country or the specificities of the sector itself;
- 5) **Pooling of resources and SME collaboration** - involvement in networks, collaborations or cluster activities enables SMEs to engage more effectively in continuous training and skills development. However, robust SME networks or clusters are not yet a reality across Europe, and anchoring in such networks requires managerial capacity.

2) Reskilling of existing employees

The retraining approach for existing employees is to respond quickly to the shortage of professionals with digital competencies. These workers are encouraged to leave their current industry and re-profile towards digital competencies. In Europe, several initiatives focus on retraining the unemployed, for example Social Builder (France), The Digital Academy (Czech Republic), ICT Professionals (Spain) and Code for All (Portugal). All these initiatives are run by private organisations, but are not necessarily tailored to the skills needed in specific sectors or for companies with a specific profile in terms of size or ownership structure. The aforementioned 2019 report points out that retraining appears to be only a small part of existing initiatives and mostly concerns basic rather than advanced digital competencies. In this sense, retraining makes it possible to gain initial qualifications and strengthen one's position in the labour market.

3) Training of future employees

Formal education is the basis for skills acquisition, a long-term solution to the digital skills gap therefore requires adaptation of current education systems. Hence, it makes sense to design education programmes tailored to the needs of businesses in terms of digital competencies, starting with school education. Logical thinking, critical analysis, coding, algorithms and data literacy should be taught in schools from an early age. Coding has become part of the curriculum in some UK schools from the age of five. Initiatives such as ProgeTiger (Estonia), Coding Class (Denmark), Samsung Innovation Camp (Italy) and Codepact (Netherlands) aim to introduce children and students to coding and programming. These initiatives are often implemented in partnership with technology companies such as Samsung, Google and Accenture to provide courses to children without generating additional costs for schools. For example, the Crescere in Digitale initiative (Italy) in partnership with Google provides students with paid internships in companies. Students acquire IT-related skills during an internship in selected SMEs. They receive monthly benefits thanks to the support of the Italian government, while SMEs have the opportunity to interact with interns who can be useful to their companies from the point of view of digital marketing development, for example. In the process, companies develop a network of contacts with potential future employees with digital skills.





2. FORECAST DEMAND FOR COMPETENCIES AND QUALIFICATIONS – CONCLUSIONS FROM EMPIRICAL STUDIES

2.1 Research methodology



2.1.1 Structure of the survey instrument

The object of the empirical research was to forecast the demand for competencies and qualifications in selected industries, namely:

- Trade,
- Health/healthcare,
- Food production,
- Motoring and electromobility,
- Manufacture of metal products,
- Transport and warehousing,
- Manufacture of machinery and equipment,
- Financial advisory,
- Generation and supply of energy (including heat),
- Insurance,
- Waste management/recovery of raw materials,
- Development services,
- Information technology and telecommunications,
- Pharmaceutical industry.

In doing so, emphasis was placed on digital competencies, identified in the desk research analysis presented in the previous chapter, which are primarily associated with three areas of change affecting businesses in the modern economy, namely remote working, automation of production processes and robotisation, and the use of modern technologies based on artificial intelligence and the internet of things at work:

These competencies were assigned to three areas:

- General digital skills,
- Ability to work remotely,
- Skills in the use of modern AI/IoT tools.

Table 5. Typology of digital competencies used in the study

General digital skills	<ul style="list-style-type: none"> • creating and modifying texts and images in a digital environment • filtering relevant information and critically assessing its reliability • integration of data from different sources • programming • searching for data and content in digital environments • communication using digital tools • selecting the form and content of online communication according to the profile of the recipient • recognising digital risks and protecting and safeguarding data • self-learning and development of their digital skills
Remote work skills	<ul style="list-style-type: none"> • building commitment and motivating team members • creating a healthy and ergonomic workspace for remote working • collaborative, simultaneous working on files in the cloud • using file and folder repositories in the cloud • use of video conferencing platforms • use of applications that support collaborative remote working • planning and organising team and individual remote working • optimal allocation of team responsibilities • use of project management software
Skills in using modern AI/IoT tools	<ul style="list-style-type: none"> • use of AI-supported translators and spelling correction systems • integration of AI-supported content • use of AI software to increase your and your team's productivity • feeding AI systems with good quality input data and making critical inferences as to the reliability of the feedback obtained • using digital tools with voice commands

Source: own work based on desk research.

Given the stated objectives of the report, respondents were asked to assess the demand reported by companies for employees and future employees for specific competencies in each of the three skill areas in relation to two time perspectives:

- Short-term (in the 2023 perspective),
- Medium-term (over a three-year horizon, ie until 2026).

The review of existing studies shows that entrepreneurs often report the need for formal verification of digital competencies, which generates a number of benefits for companies at the stage of efficiency of acquiring human resources and implementing new employees, as well as certainty as to the level of assimilation of the competencies themselves in practice. Therefore, in order to diagnose the demand for qualifications among Polish

enterprises from the above-mentioned industries, respondents were asked about the **importance of formal confirmation of particular skills** (ie about the demand for **particular** qualifications). This way of asking the question results from the significant number of individual certificates, diplomas and other formal attestation of particular competencies and, on the other hand, the lack of available formal qualifications for all relevant competencies identified under desk research.

In view of **the need to develop particular skills**, companies were also asked how they would deal with existing or possible competency gaps in the above-mentioned areas, ranking the following action strategies in order of preference:

- Upgrading of skills by the company in current employees,
- Expecting current employees to acquire skills or qualifications themselves,
- Hiring new staff with the required level of competence,
- Hiring new staff and training them in the competencies needed.

Finally, survey participants were also asked for their opinion on the impact of selected current phenomena, namely the COVID-19 pandemic, the war in Ukraine and high inflation in Poland (as a result of the other phenomena) on the digital skills needs of employees¹⁸.

Some definitional remarks should also be made at this point. In most analytical studies, the concept of competence is usually understood more broadly than skills. *“The concept of competence implies more than the acquisition of knowledge and skills; it involves the mobilisation of knowledge, skills, attitudes and values in specific contexts to meet complex demands”* (OECD, 2018, p. 4). However, in the Polish terminology of qualifications in the labour market, it is widely accepted that all competencies are expressed through skills, which coincides with the approach proposed in the Integrated Skills Strategy 2030. According to this approach, even knowledge and social (including interpersonal) competencies are reduced to the level of skills. In such a view, skills are the key element of qualifications and competencies, with qualifications needing to be confirmed by an appropriate document. In practice, a precise distinction between the concepts of knowledge and skills is difficult, as the two components influence each other and develop in interdependence.

18 The full content of the questionnaire is presented in Annex 1.

The current empirical study therefore focuses on skills, which are understood as *“the ability to perform a certain type of activity, task or function correctly and efficiently. Correct performance is understood as the use of appropriate theoretical and practical knowledge in action and the application of social norms, in particular those relating to the type of activity in question”* (Integrated Skills Strategy 2030, p. 4). Speaking of qualifications, in turn, the authors of this report refer to skills that must be formally verified (in the course of validation) and confirmed by an appropriate document.

2.1.2 Data collection and sample design

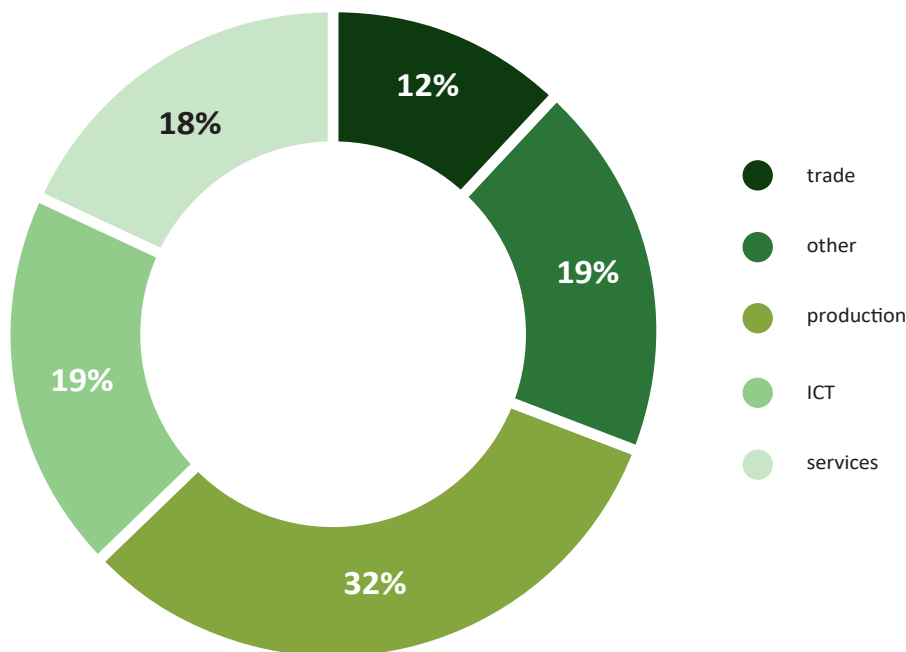
Representatives of employers operating in the above-mentioned sectors of the Polish economy were invited to participate in the empirical study. At the first stage, the invitation to participate in the survey went to enterprises belonging to the Lewiatan Confederation; at the next stage, the request for opinions went to the contact database of the Wielkopolska Agency for Enterprise Development (WARP, Wielkopolska Agencja Rozwoju Przedsiębiorczości). In the third stage, using direct contacts, representatives of selected enterprises from the above-mentioned sectors covered by the survey were asked to participate in the survey.

Responses were obtained via the Webankieta platform from 103 company representatives, including board members, HR managers or IT managers. Almost half of the respondents (49.51%) represented enterprises with more than 250 employees, almost a third (27.18%) represented medium-sized enterprises (51-249 employees). The share of micro- (1-9 employees) and small enterprises (10-50 employees) in the sample totalled 23.3%. Companies with foreign capital in their structure accounted for 46.6% of the survey sample, with the share of companies with 100% foreign capital amounting to one-third of the sample (32%). The general structure of the surveyed companies in terms of sectors is presented in Figure 6. For the purpose of presenting the results and capturing differences resulting from the profile of business activity, the following division of the sectors selected for the survey was adopted:

- **Trade;**
- **Information technology and telecommunications;**
- **Manufacturing** (*pharmaceutical sector, automotive and electromobility, machinery and equipment manufacturing, metal product manufacturing, energy generation and supply*);



Figure 6. Structure of the research sample



Source: own work based on the results of the empirical study.

- **Services** (financial advisory, waste management, transport and warehousing, insurance, development services, health and healthcare)¹⁹;
- Other²⁰.

The selection of survey participants was non-random. For this reason, it should be noted that the results presented in this study are not representative for the entire population of enterprises operating in Poland. However, they may be an important starting point for further research on the issue of the demand for competencies of the future in enterprises from various sectors of the economy. The presented results should therefore be verified in the course of further research.

19 The aggregation of sectors serves to generate comparisons and takes into account the predominant type of activity. It clearly leads to simplifications, but was justified given the size of the sample.

20 The survey addressed the companies in the sectors listed above, hence the 'other' category includes companies that wished to categorise their activities in a different way (for example, in more detail).



2.2. Results

2.2.1. Demand for general digital skills

As a first step, business representatives were asked to assess the importance of selected digital skills, taking into account current development plans and trends. The results presented can be an important source of information for the short-term forecast of skills demand. This is because they make it possible to identify which skills are most in demand by companies in the industries covered by the survey, as well as to understand trends and changes in the labour market. In this way, it is possible to identify which skills will be most needed in the near future.

In the first area of general digital skills, a total of 11 skills were listed (see Annex 1). Employers surveyed rated the importance of the following skills highest: recognising digital risks (mean score of 4.47), communicating using digital tools (mean score of 4.44) and filtering information and critically assessing its reliability (mean score of 4.42). On the other hand, survey participants declare the lowest demand in the area of skills related to the creation of digital content (text and graphics), as well as in the area of programming. Detailed results are presented in Figure 7.

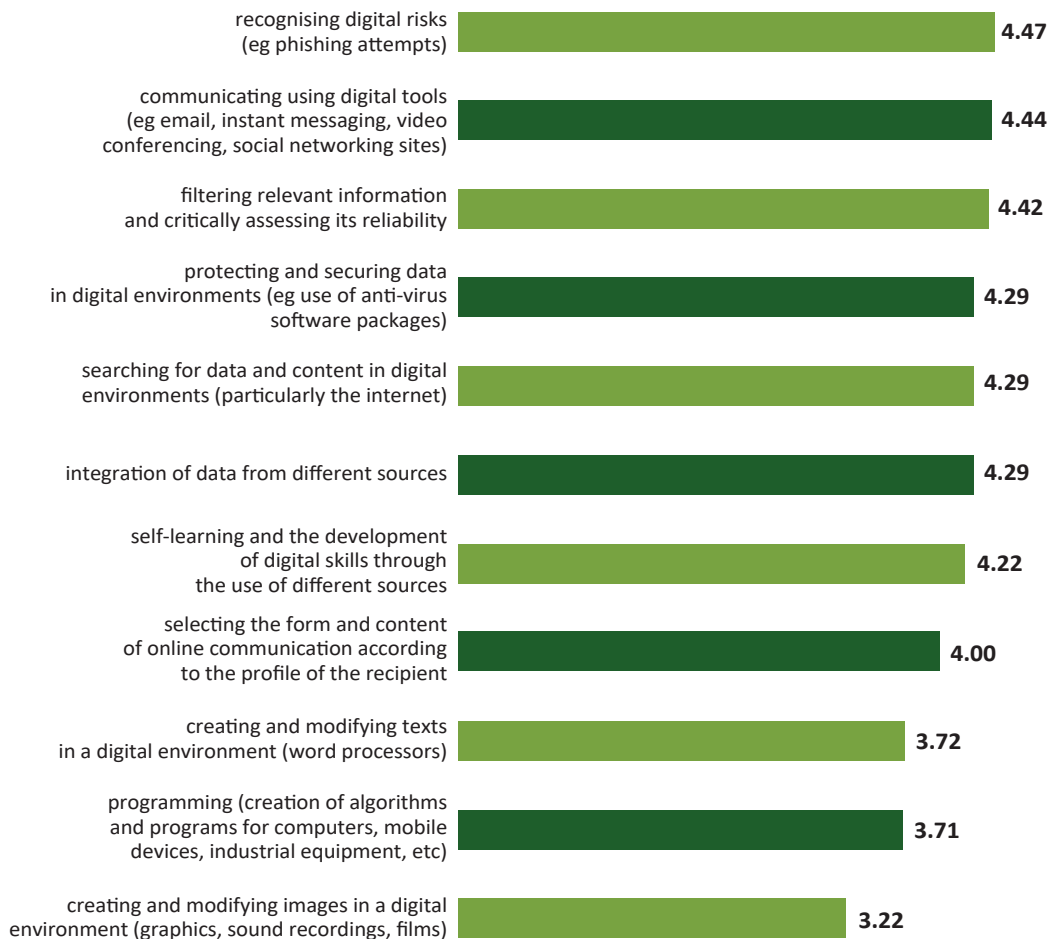
Comparing the importance of general digital skills according to the size of companies, it can be seen that for large companies (with more than 250 employees), the declared need for general digital skills is lower (average for the entire skills area 4.04) than for the group of entities including medium, small and micro enterprises (4.16). These differences are particularly apparent for skills such as (Figure 8):

- Ability to create and modify images in a digital environment - graphics, sound recordings, videos (average score of 3.0 for large companies compared to 3.5 for others);
- Ability to create and modify texts in a digital environment using word processors (average score of 3.5 for large companies compared to 3.9 for others);
- Ability to search for data and content in digital environments (average score of 4.2 for large companies compared to 4.4 for others).

In addition, it can be observed that companies with a majority of Polish capital in the short term reported a lower demand for general digital skills compared to



Figure 7. Importance of general digital skills in the short term



Source: own elaborations based on empirical results.

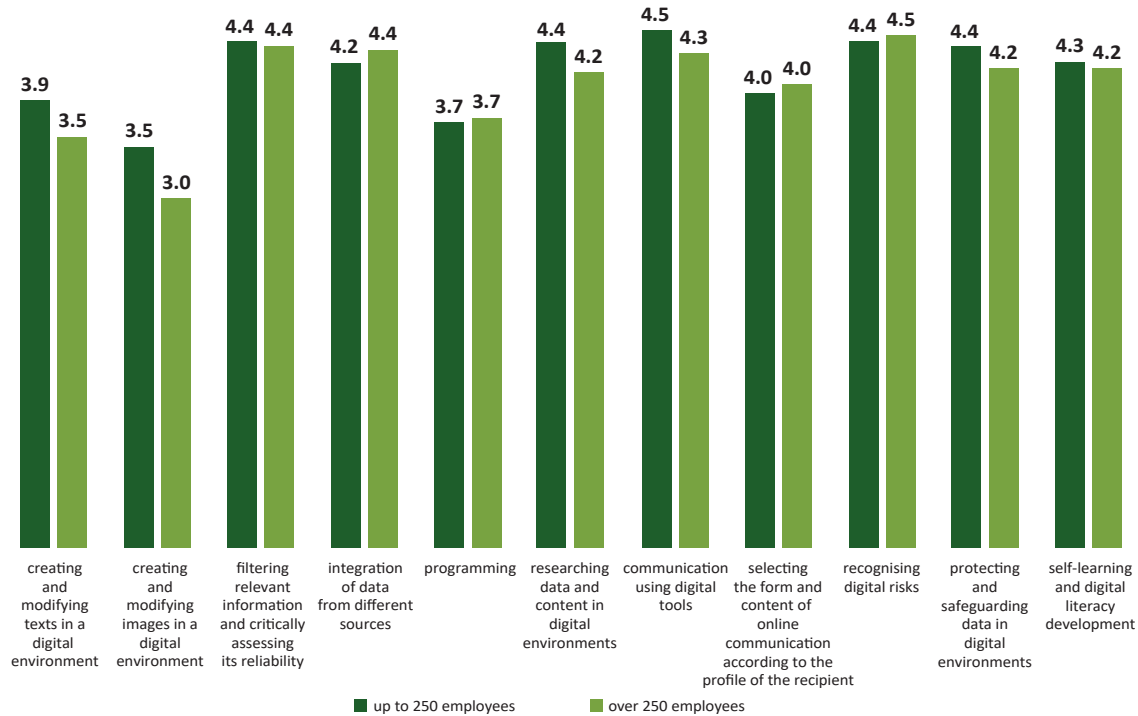
the group of employers with predominantly foreign capital (4.07 versus 4.13). In particular, the observed differences concern the following skills (Figure 9):

- Recognising digital risks,
- Integration of data from different sources,
- Selecting the form and content of communication to suit the audience profile,
- Data protection and data security.

For companies with foreign capital, the listed skills were more important than for companies with predominantly Polish capital.



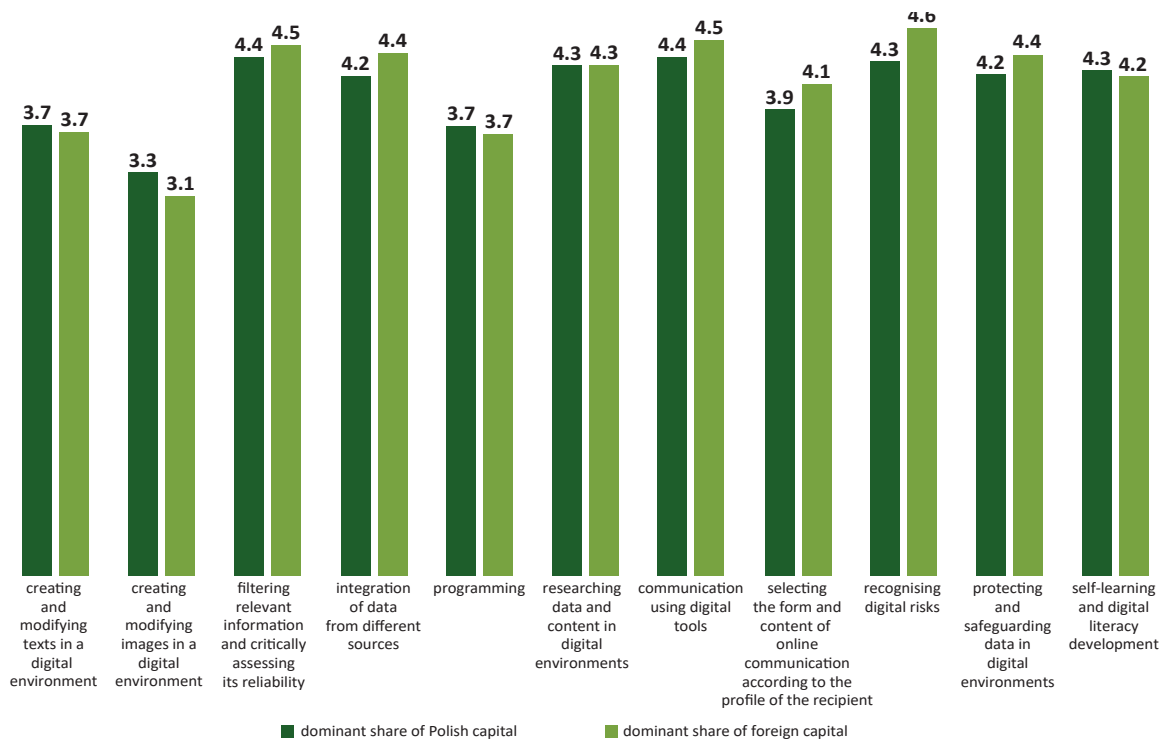
Figure 8. Importance of general digital skills by company size



Source: own elaborations based on empirical results.



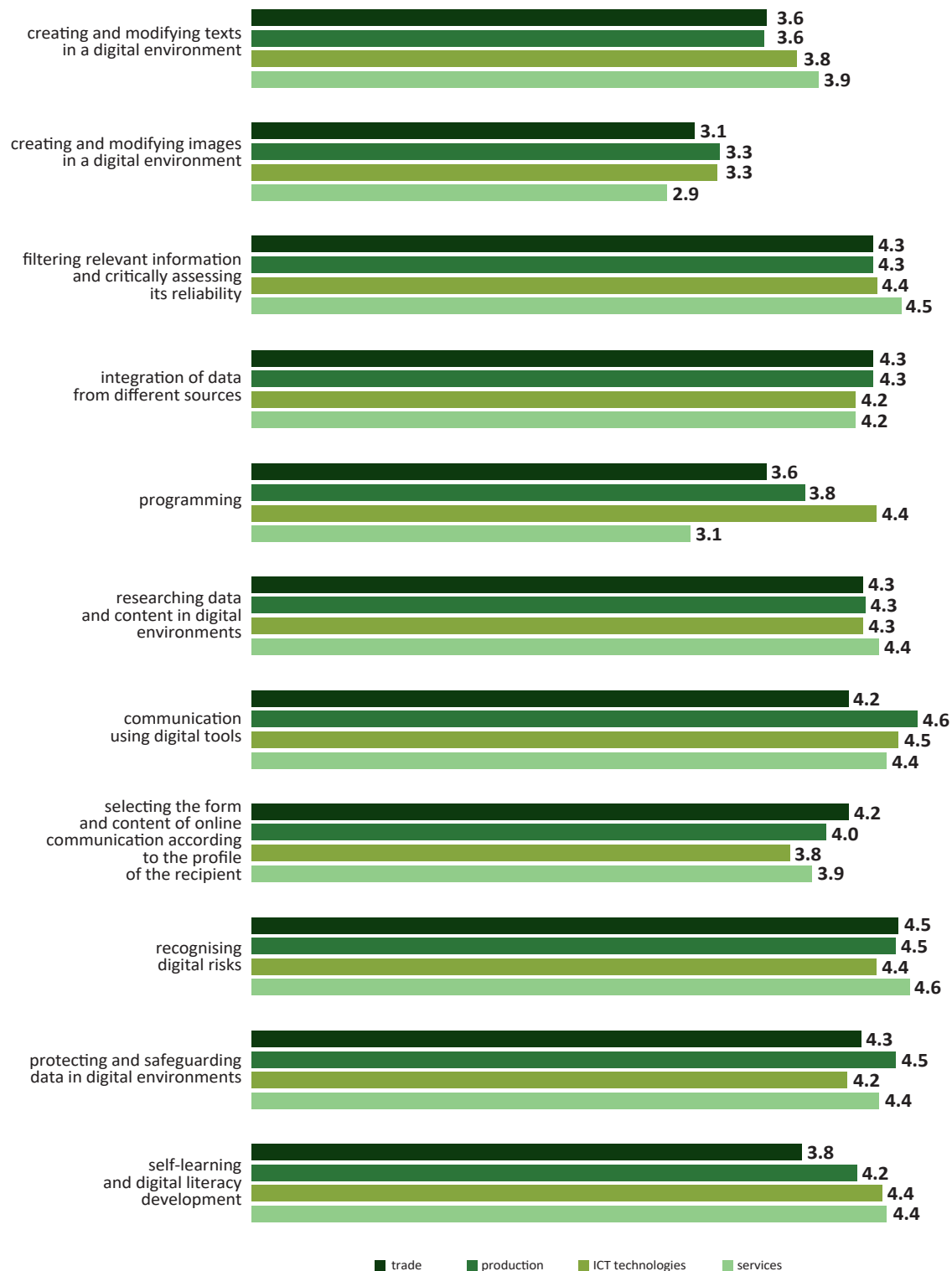
Figure 9. Importance of general digital skills by capital structure



Source: own elaborations based on empirical results.



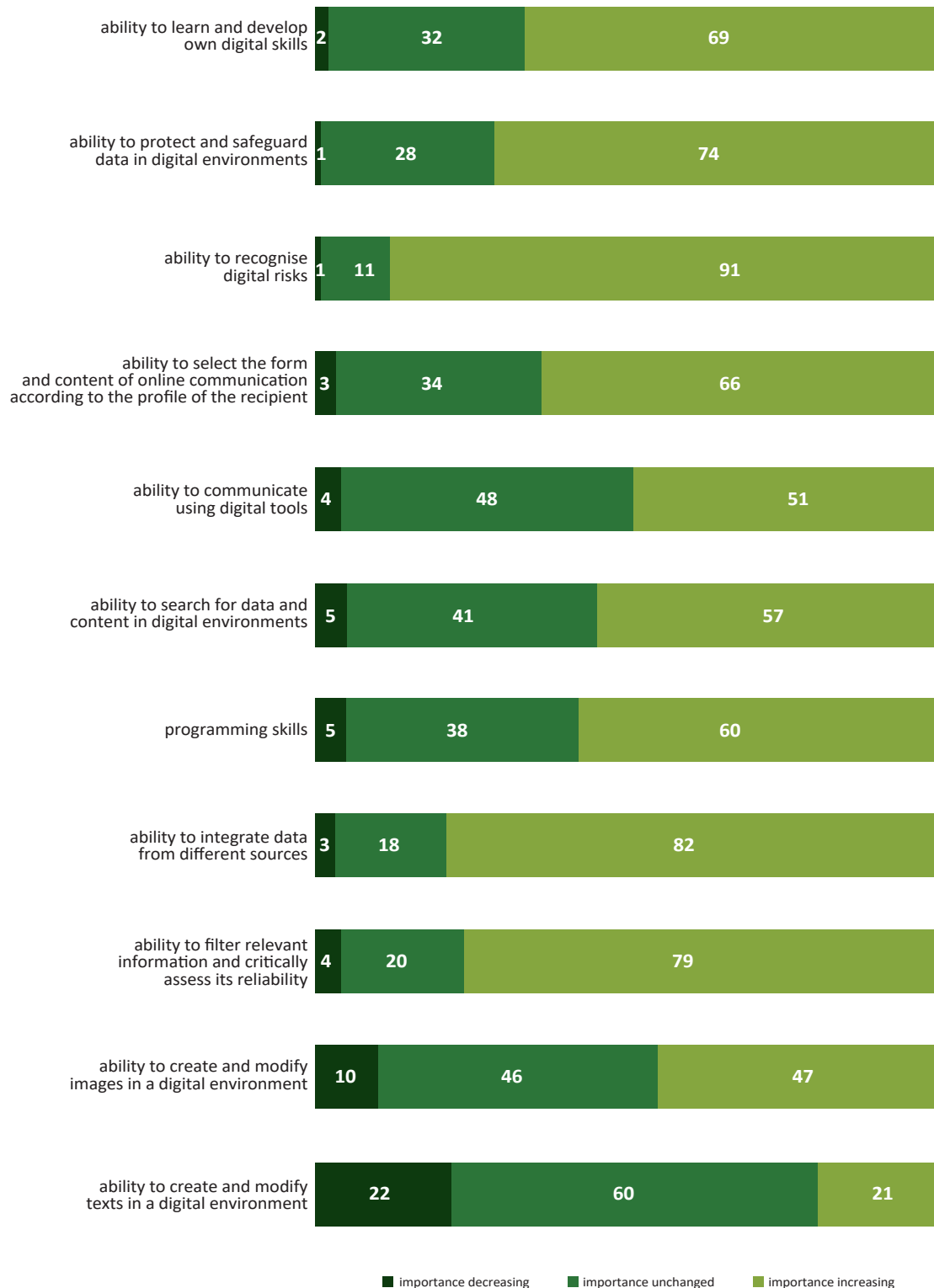
Figure 10. Importance of general digital skills by business profile



Source: own elaborations based on empirical results.



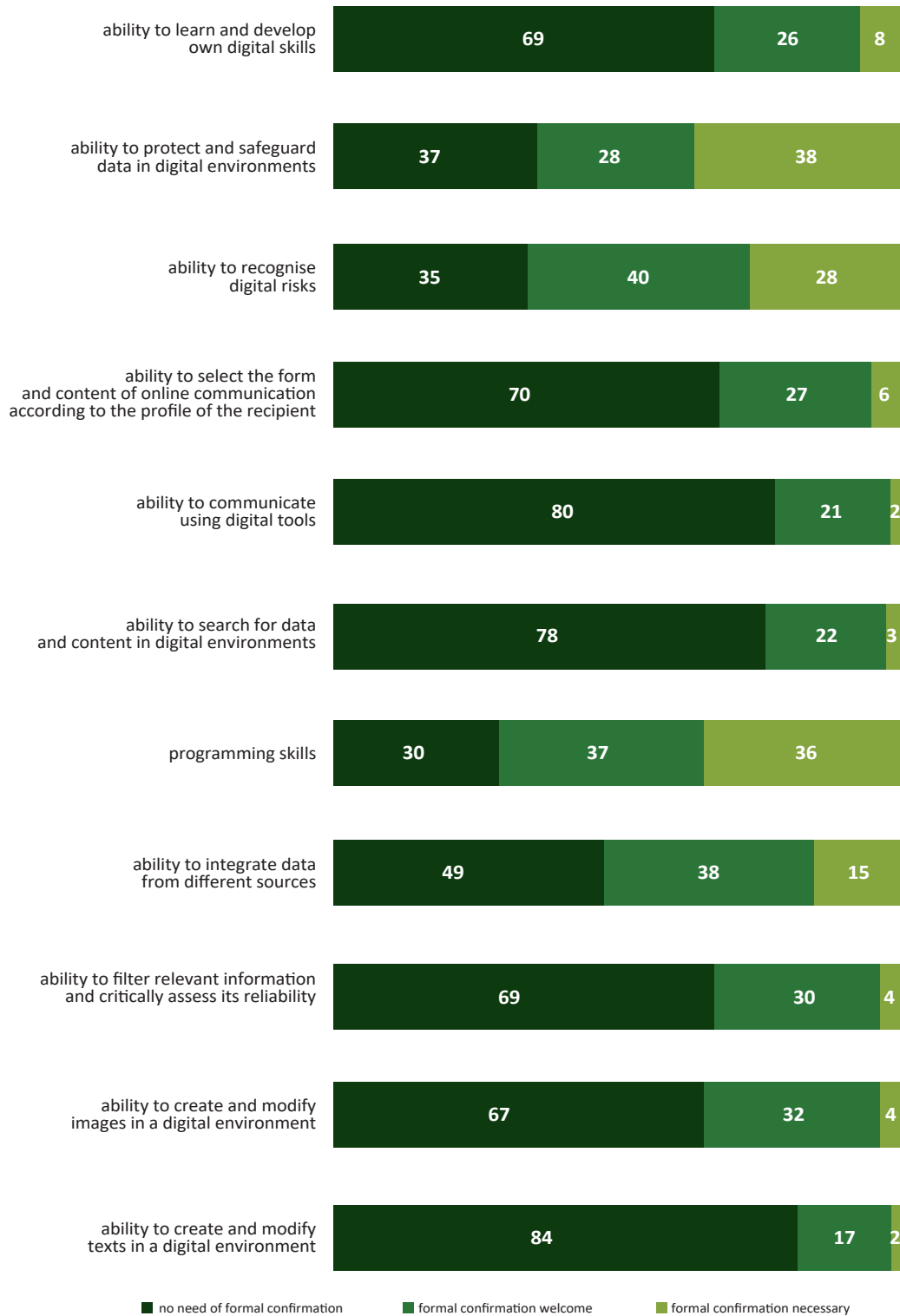
Figure 11. Change in importance of general digital skills by 2026



Source: own elaborations based on empirical results.



Figure 12. Demand for formal confirmation of general digital skills (qualifications)



Źródło: opracowanie własne na podstawie wyników badań empirycznych.

Analysing the importance of overall digital skills for companies representing different industries and business profiles (Figure 10)²¹, there are some discrepancies that can be summarised as follows:

- For **trade** employers, the greatest current need is for skills in recognising digital risks, the ability to protect and secure data, search for data, integrate information from different sources, and filter relevant information and assess its reliability,
- Similar skills are also in demand from **manufacturing** companies with digital communication being the most valued skill for this group of employers,
- Companies operating in the field of **information technology and telecommunications** expect employees to have programming skills first and foremost, but also to be able to learn independently, filter relevant information and assess its reliability, and recognise digital risks,
- Companies providing various types of **services** value skills related to recognising digital risks, filtering relevant information and assessing its reliability, in addition to communication and upskilling skills, as well as data search and data protection and security.

Analysing the data presenting the opinions of the surveyed employers on the future demand for the digital skills in question (Figure 11), it can be concluded that the greatest demand from employers in the medium term (that is, until 2026) will be for skills such as:

- Ability to **spot** digital **risks** (91)²²,
- Ability to **integrate data** from different sources (82),
- Ability to **filter relevant information and critically assess** its reliability (79),
- Skills to **protect and secure data** in digital environments (74).

In terms of employers' demand for formal confirmation of general digital skills (qualifications), this aspect mainly signalled the need for employees to have relevant level certificates (Figure 12):

- Ability to integrate data from different sources,
- Programming skills,

21 In this and subsequent summaries, the main business profiles of companies are included, omitting the "other" category due to the difficulty of interpreting the results.

22 Figures in brackets refer to the number of surveyed companies that indicated that the importance of a particular skill will increase in the run up to 2026.

- Ability to recognise digital risks,
- Skills to protect and secure data in digital environments.

For the skills listed, employers surveyed most often indicated that formal confirmation was welcome or required.

2.2.2. Skills needs in the area of remote work

Another area of digital skills assessed were those relating to remote work, which included not only the use of specialised digital tools, but also issues related to planning and organising remote work (one's own and of a team of employees) and managing people. A total of 10 skills were listed in the group (see Annex 1).

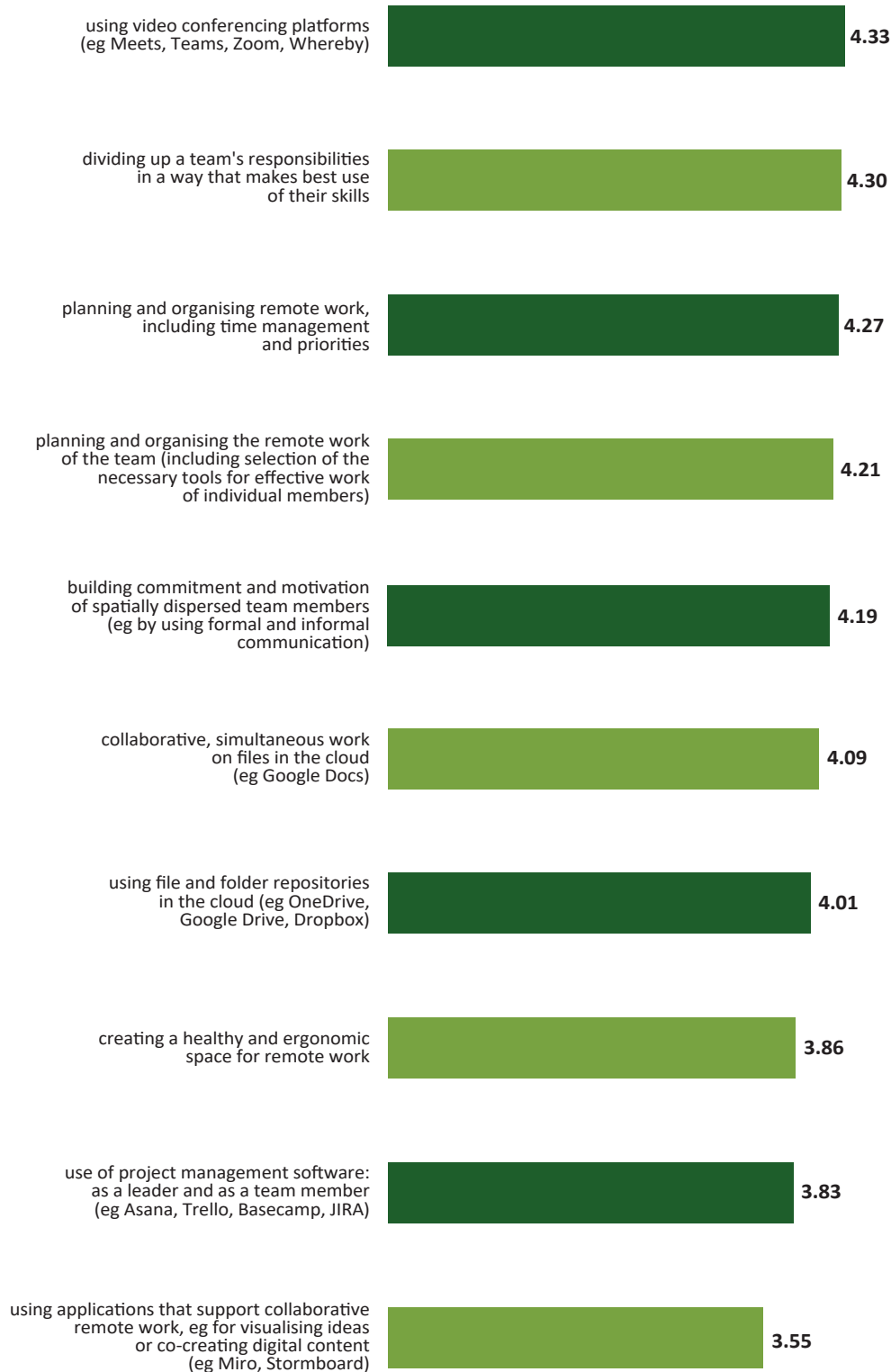
In the case of this group of skills, employers surveyed rated as most urgently needed the skills related to: using videoconferencing platforms (mean score of 4.33), dividing up a team's responsibilities in a way that makes best use of their skills (mean score of 4.3), and planning and organising their remote work and completing tasks on time (mean score of 4.27). On the other hand, survey participants declare the lowest demand for skills related to the use of applications supporting collaborative remote work, the use of project management software or creating a healthy and ergonomic space for remote work. Detailed results are presented in Figure 13.

Large companies (with more than 250 employees) declared, on average, a lower demand (score of 4.01) for digital skills in the area of remote work than medium, small and micro companies (4.12), as illustrated in detail in Figure 14. Interestingly, small and medium-sized companies, compared to large companies, indicate a greater need for digital skills in particular in the area of using project management software (mean score of 4.0 compared to 3.6), the ability to optimally distribute the responsibilities of a spatially dispersed team (mean score of 4.4 compared to 4.2), building commitment and motivating a team (mean score of 4.3 compared to 4.1) or teamworking on files in the cloud (mean score of 4.2 compared to 4.4). Only in the case of planning and organising remote work was greater importance (4.4 versus 4.2) indicated in the category of companies with more than 250 employees.

Comparing the importance of digital skills in the area of remote work depending on the capital structure, it can be observed that companies with a dominant foreign capital reported a higher demand for the type of skills in question than



Figure 13. Importance of digital skills in the area of remote work



Source: own elaborations based on empirical results.

entities with a majority Polish capital (average 4.13 against 4.01). The differences observed relate primarily to skills in: building commitment and motivating a team (mean score of 4.4 against 4.0), using video conferencing platforms (mean score of 4.5 against 4.2) and using file repositories and folders in the cloud (mean score of 4.2 against 3.9), which were more important for foreign companies. In contrast, the ability to use project management software is more valued by companies with dominant Polish capital (mean 4.0 against 3.7; see Figure 15).

When analysing the importance of digital skills in the area of remote work for employers representing different industries and business profiles (Figure 16), some discrepancies can be observed, as follows:

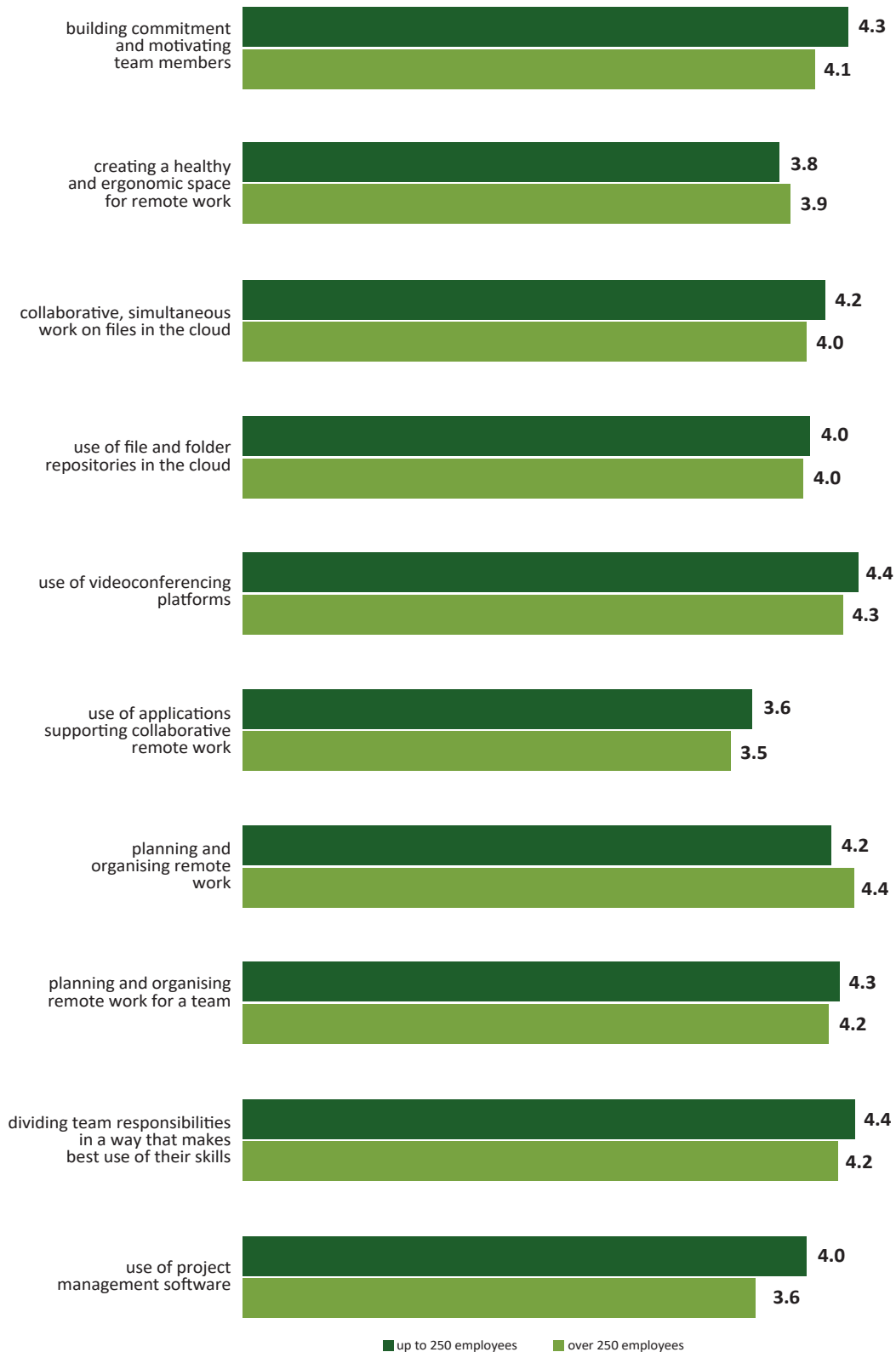
- For **trade** employers, the greatest current demand is for skills in building engagement and motivating a team, using video conferencing platforms, planning and organising their remote work and dividing responsibilities among team members;
- For companies with a **manufacturing** profile, the most important skills are those related to planning and organising their own remote work and dividing up the responsibilities of the team in a way that makes best use of employees' competencies, which is in line with the prevailing need in this sector to optimise operations, particularly in an economic crisis;
- Companies operating in the field of **information technology and telecommunications** expect employees to have the ability to use videoconferencing platforms, but also the ability to build commitment and motivate a team, share responsibilities and plan and organise their own remote work, reflecting the project-based nature of work in this sector;
- And, finally, companies providing various types of **services** most appreciate the skills of their employees in relation to the use of video conferencing platforms, as well as in the division of team responsibilities.

When analysing the data presenting the opinions of surveyed employers on the future demand for digital skills in the area of remote work (Figure 17), it should be noted that in the medium term (ie until 2026), the highest demand will be primarily for the skills of **building commitment and motivating** a team (69)²³. To a slightly lesser extent, but also relatively high, there will be a demand for the

23 Figures in brackets refer to the number of surveyed companies that indicated that the importance of a particular skill would increase.

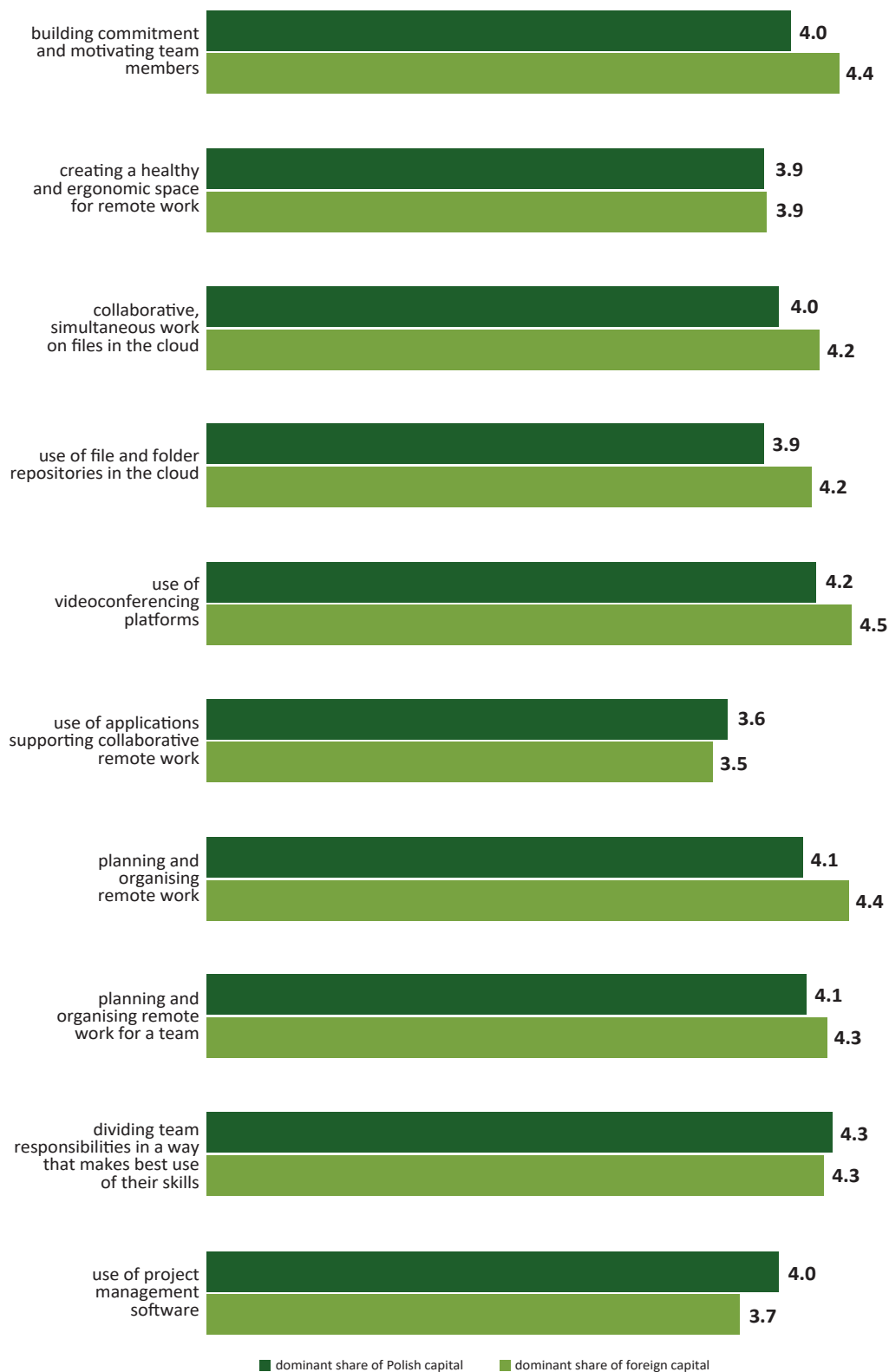


Figure 14. Importance of digital skills in the area of remote work: by company size



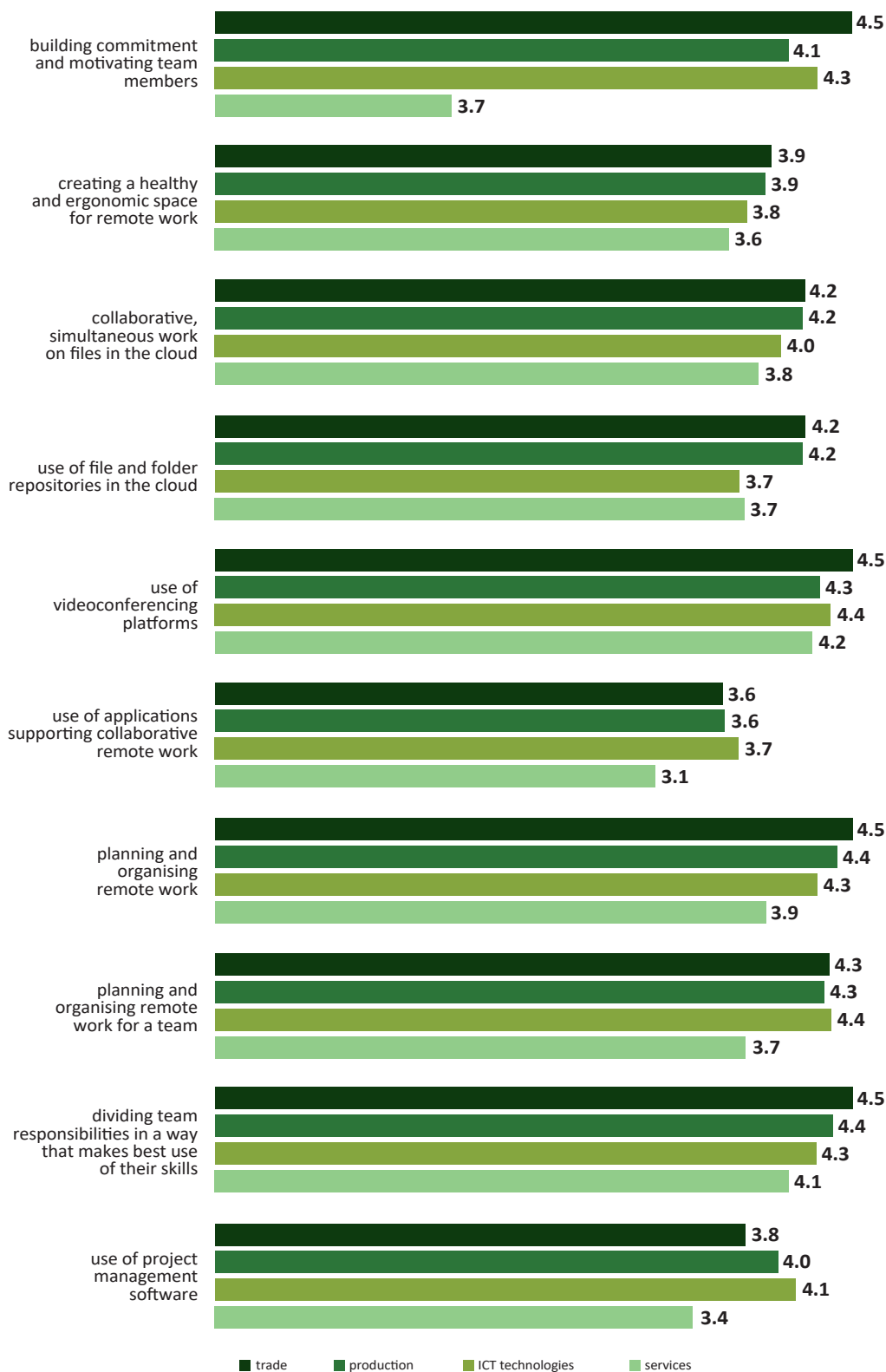
Source: own elaborations based on empirical results.

Figure 15. Importance of digital skills in the area of remote work: by capital structure



Źródło: opracowanie własne na podstawie wyników badań empirycznych.

Figure 16. Importance of digital skills in the area of remote work: by business profile



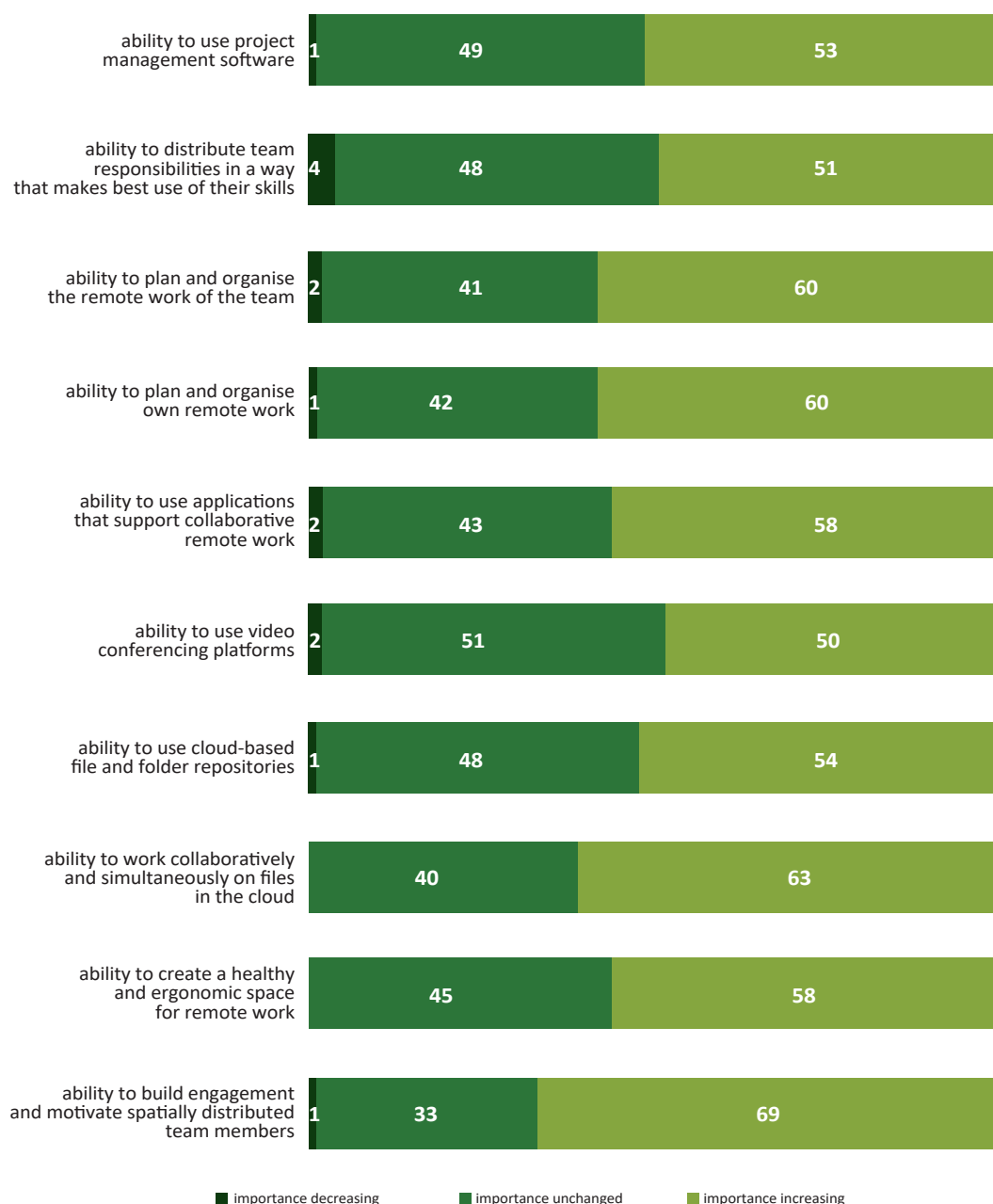
Źródło: opracowanie własne na podstawie wyników badań empirycznych.

skills of team work in the cloud (63), planning and organising individual remote work (60), and planning and organising team remote work (60).

Interestingly, the results suggest that general digital skills will, however, be more important to employers over the next three years than those related to remote



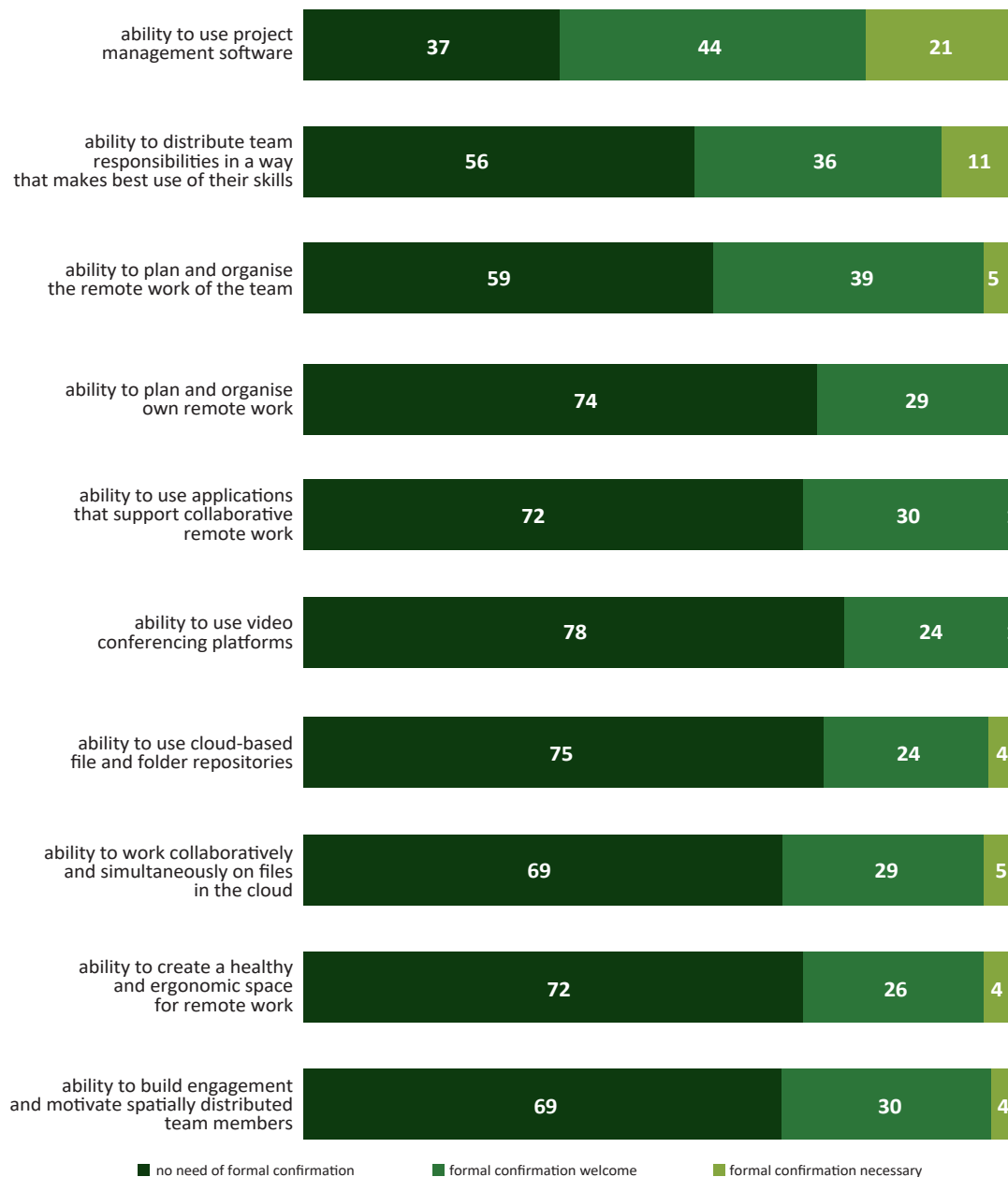
Figure 17. Change in importance of digital skills in the area of remote work by 2026



Source: own elaborations based on empirical results.



Figure 18. Demand for formal validation of digital skills in the area of remote work (qualifications)



Source: own elaborations based on empirical results.

work. This may be due to the fact that Polish employers plan to implement various forms of remote work to a lesser extent. In addition, digital skills of a general nature are universal, meaning that they can be applied in different fields and industries. As a result, employees with such skills are more flexible and can more easily adapt to the changing requirements and needs of the company.

Hiring employees with general digital skills also brings benefits for employers, such as increased efficiency and productivity, greater flexibility at work and the ability to carry out digital transformation processes more quickly and efficiently. In addition, the lower variability in the demand for remote work skills can be linked to the fact that they are more 'supportive' in nature and serve to organise and facilitate collaboration in the digital environment. Although the issue of remote work gained prominence during the COVID-19 pandemic, in 2022, according to existing research, less than half of companies in Poland provide their employees with the opportunity to work remotely (25%) or hybrid (18%) (see, for example, Talent Place's report entitled *Current work model in companies vs. work-life fit*, 2022).

Regarding the need for formal confirmation of digital skills in the area of remote work, surveyed employers declared, in particular, the need for skills in the use of project management software, planning and organising remote team work, as well as the division of responsibilities among team members (Figure 18). For other skills, the majority of surveyed companies do not require formal confirmation from employees.

2.2.3. Skills needs in the area of using modern tools based on AI and IoT

The next digital skills area assessed included aspects related to the use of modern technology at work. A total of six skills were listed in this group (see Annex 1). As can be seen from the summary data presented in Figure 19, employers currently value having the ability to use translators and language correction systems (3.37) and to feed AI systems with good quality data and make critical inferences based on the results obtained (3.25). Comparing the data with the results obtained for the two previous categories analysed (general skills and in the area of remote work), it should be concluded that the demand for skills in using **modern AI and IoT-based tools** will be the lowest in the short term.

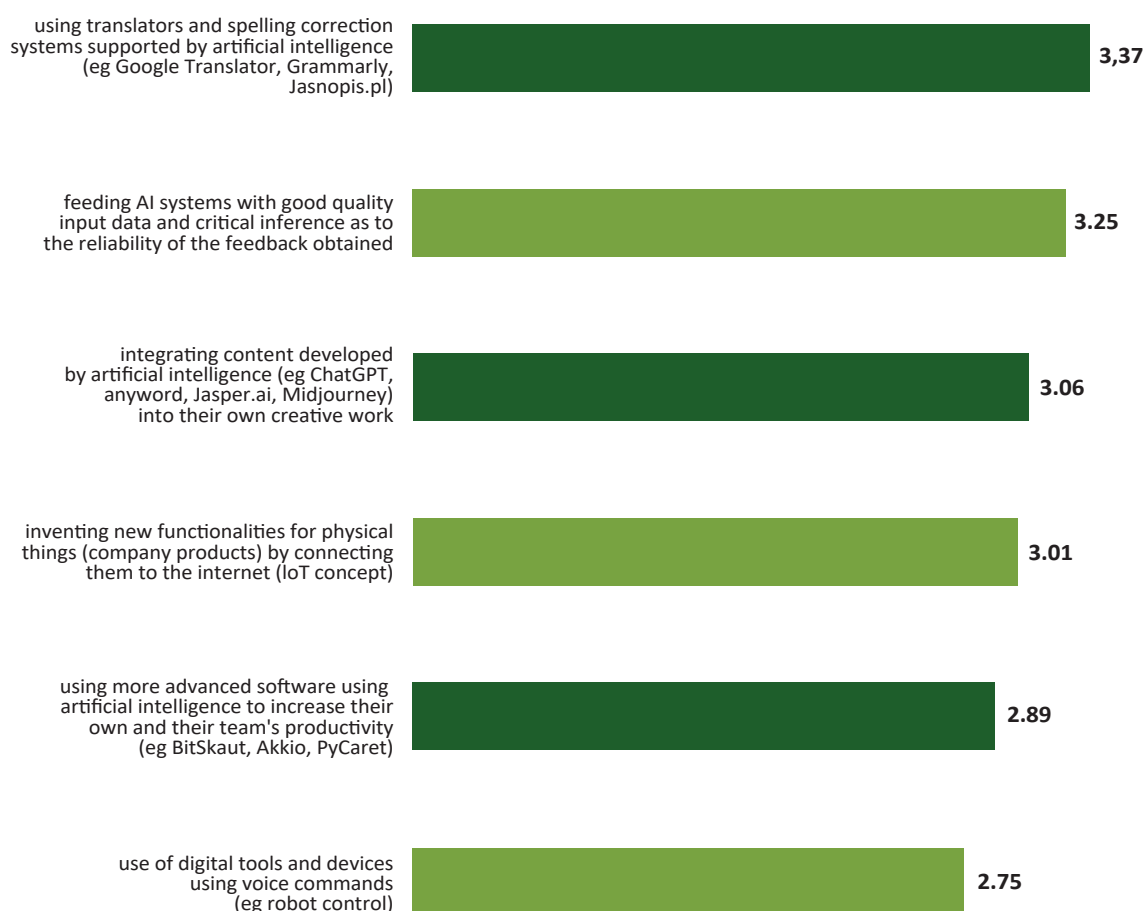
The largest employers (those with more than 250 employees) report less need for skills in the use of **modern AI and IoT-based tools** at work (average score of 2.76 compared to smaller companies with an average score of 3.06). These differences are particularly apparent in the use of AI-based software to increase productivity at work (mean score of 3.2 for small and medium-sized companies and 2.6 for large companies); the incorporation of content developed by artificial

intelligence (3.3 and 2.8 respectively) or the creation of new functionalities using IoT concepts (3.2 and 2.8 respectively) (Figure 20). These differences may be due not only to the sheer 'agility' of smaller companies, but also to industry specifics: many service or IoT-related companies are also companies with smaller workforces.

Interestingly, in contrast to the previous areas of competence, companies with majority Polish capital are more interested in having on board employees with skills in using modern technologies at work than those with dominant foreign capital (average score of 3.08 for companies with dominant Polish capital versus 2.72 for companies with dominant foreign capital). These differences are particularly evident when it comes to integrating AI-developed content into one's work and using AI-based software to increase labour productivity



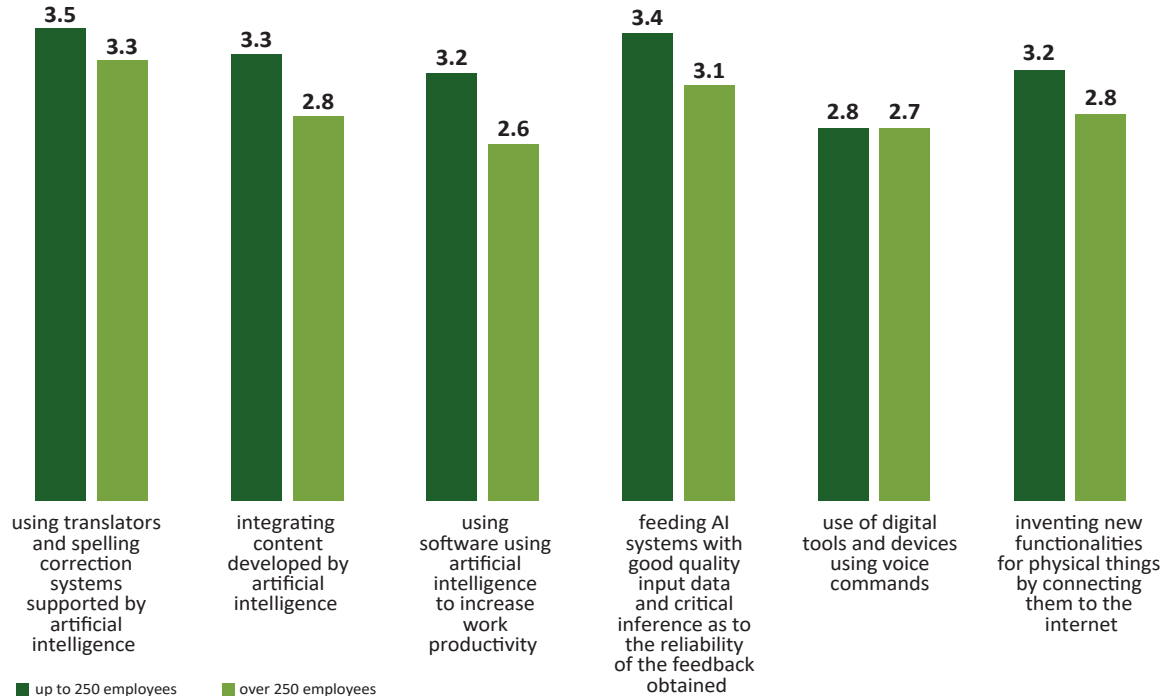
Figure 19. Importance of digital skills in the area of using modern tools based on AI and IoT



Source: own elaborations based on empirical results.



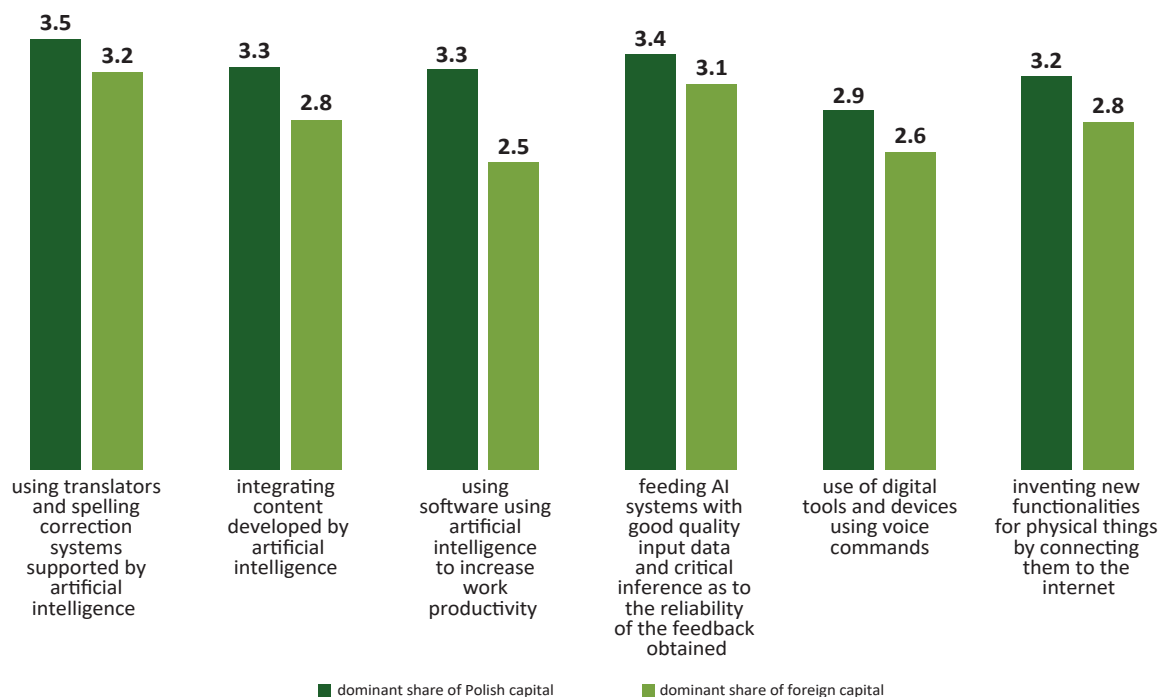
Figure 20. Importance of digital skills in the area of using modern AI and IoT based tools: by company size



Source: own elaborations based on empirical results.

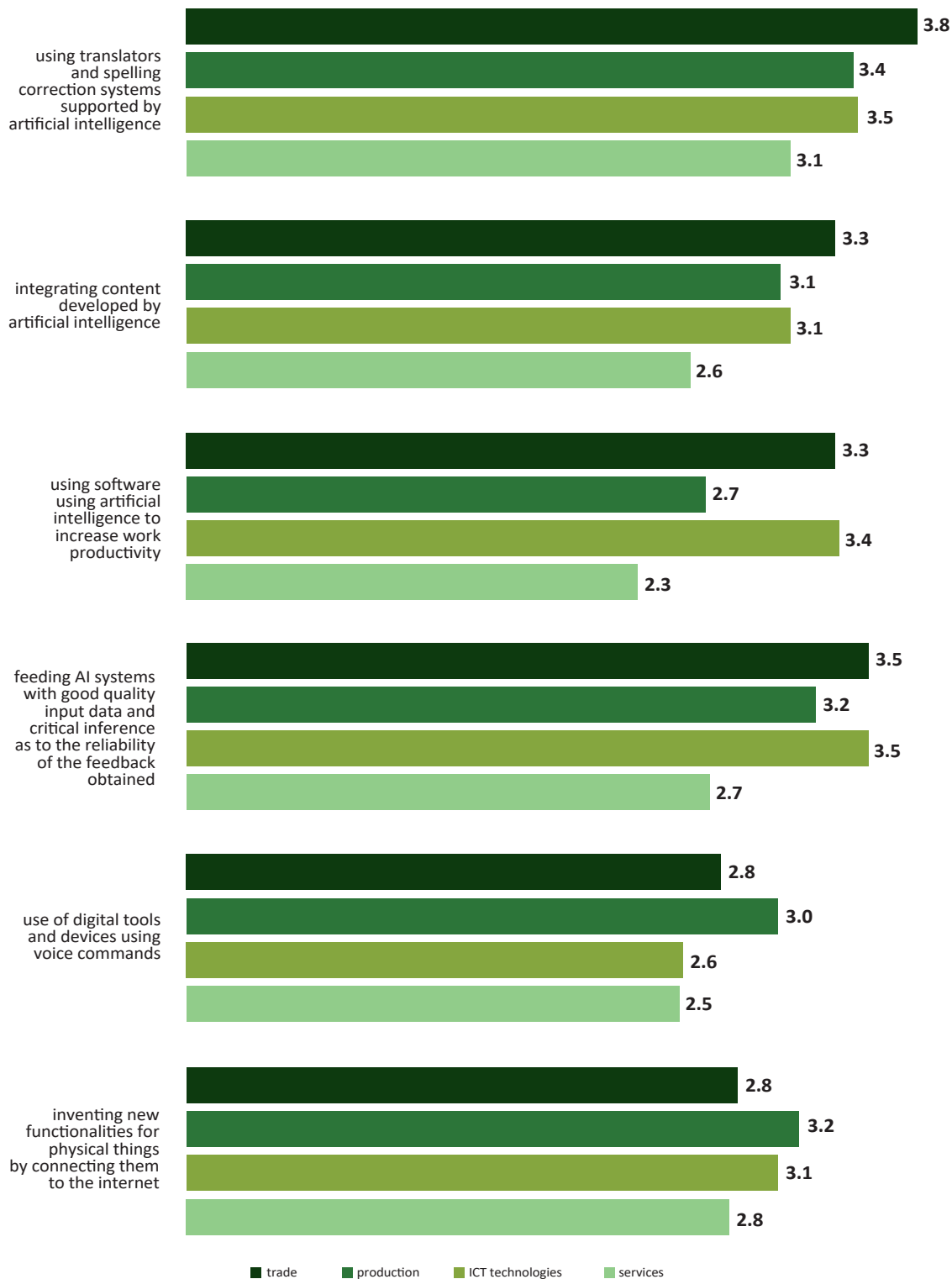


Figure 21. Importance of digital skills in the area of using modern AI and IoT based tools: by capital structure



Source: own elaborations based on empirical results.

Figure 22. Importance of digital skills in the area of using modern technologies at work: by business profile



Source: own elaborations based on empirical results.

(Figure 21). These are divergent results from those obtained for the two previously discussed skill areas. This may suggest a greater motivation to implement modern technologies in a group of companies with a dominant Polish capital as part of building their competitiveness.

When analysing the importance of digital skills in the use of modern technologies at work for employers representing different industries and business profiles (Figure 22), some divergence can be observed, presented as follows:

- For employers in the **trade** area, the greatest current need is for skills in using translators and language correction systems, and in feeding artificial intelligence systems with data and drawing conclusions from it,
- Similar skills are important for employers in the **manufacturing** sector, in addition, there is a demand in this group of actors for the ability to invent new functionalities of things through their connection to the internet (IoT),
- Companies in the **information technology and telecommunications** sector, in addition to being able to use translators and language correction systems, as well as supplying artificial intelligence systems with data and drawing conclusions based on this, also value having the ability to use more advanced AI-based software,
- Finally, companies providing various types of **services** most appreciate the skills of their employees in using translators and language correction systems.

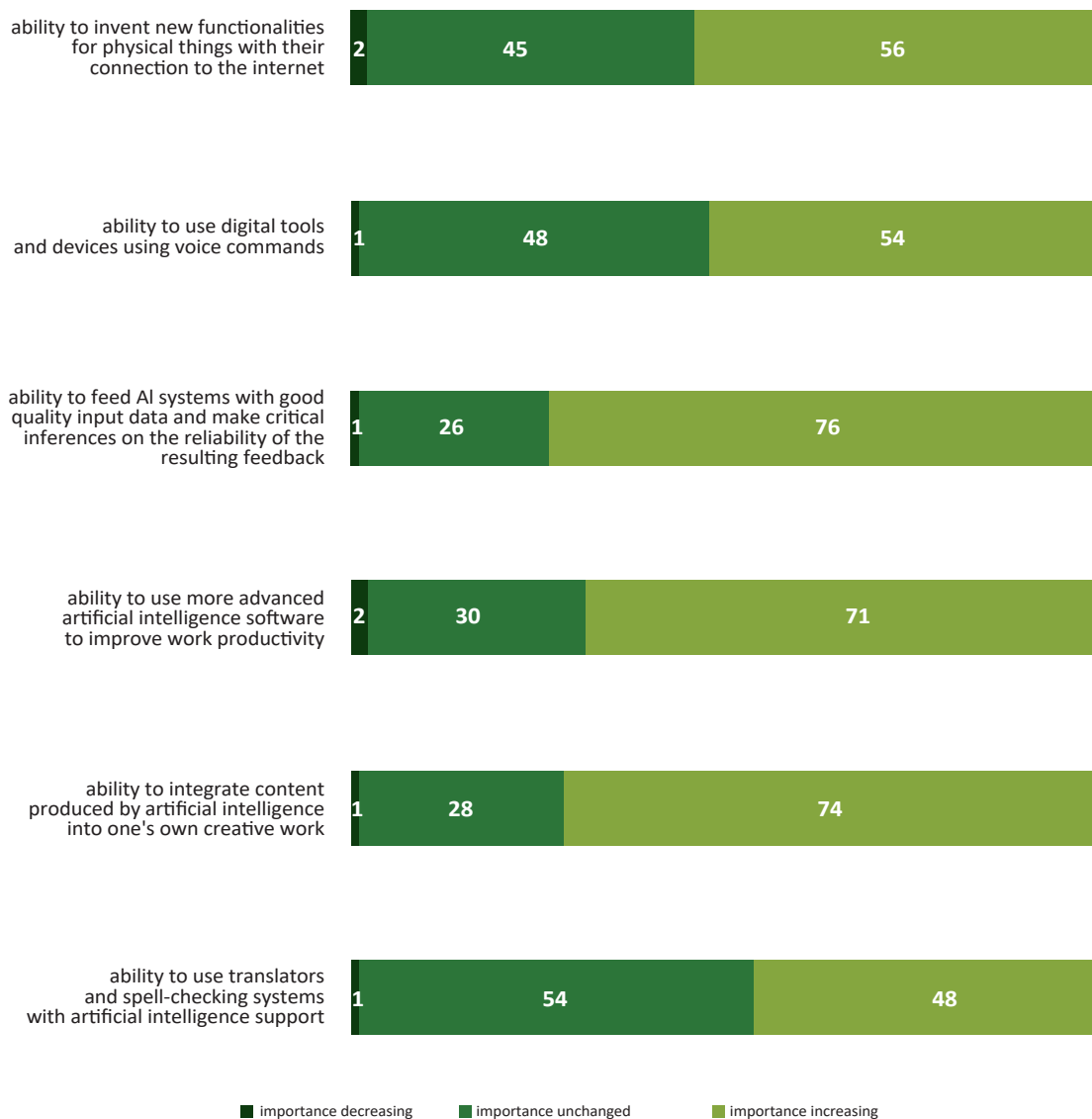
When analysing the data presenting the opinions of the surveyed employers on the future demand for digital skills in the area of using modern technologies at work (Figure 23), it should be concluded that in the medium term (that is, until 2026) the following skills will be in greatest demand:

- Ability to integrate content developed by artificial intelligence into one's own creative work (74)²⁴,
- Ability to feed AI systems with good quality input data and to make critical inferences about the reliability of the resulting feedback (76),
- Ability to use more advanced software using AI to increase their productivity (71).

24 Figures in brackets refer to the number of surveyed companies that indicated that the importance of a particular skill would increase.



Figure 23. Change in importance of digital skills in the area of using modern technology at work by 2026

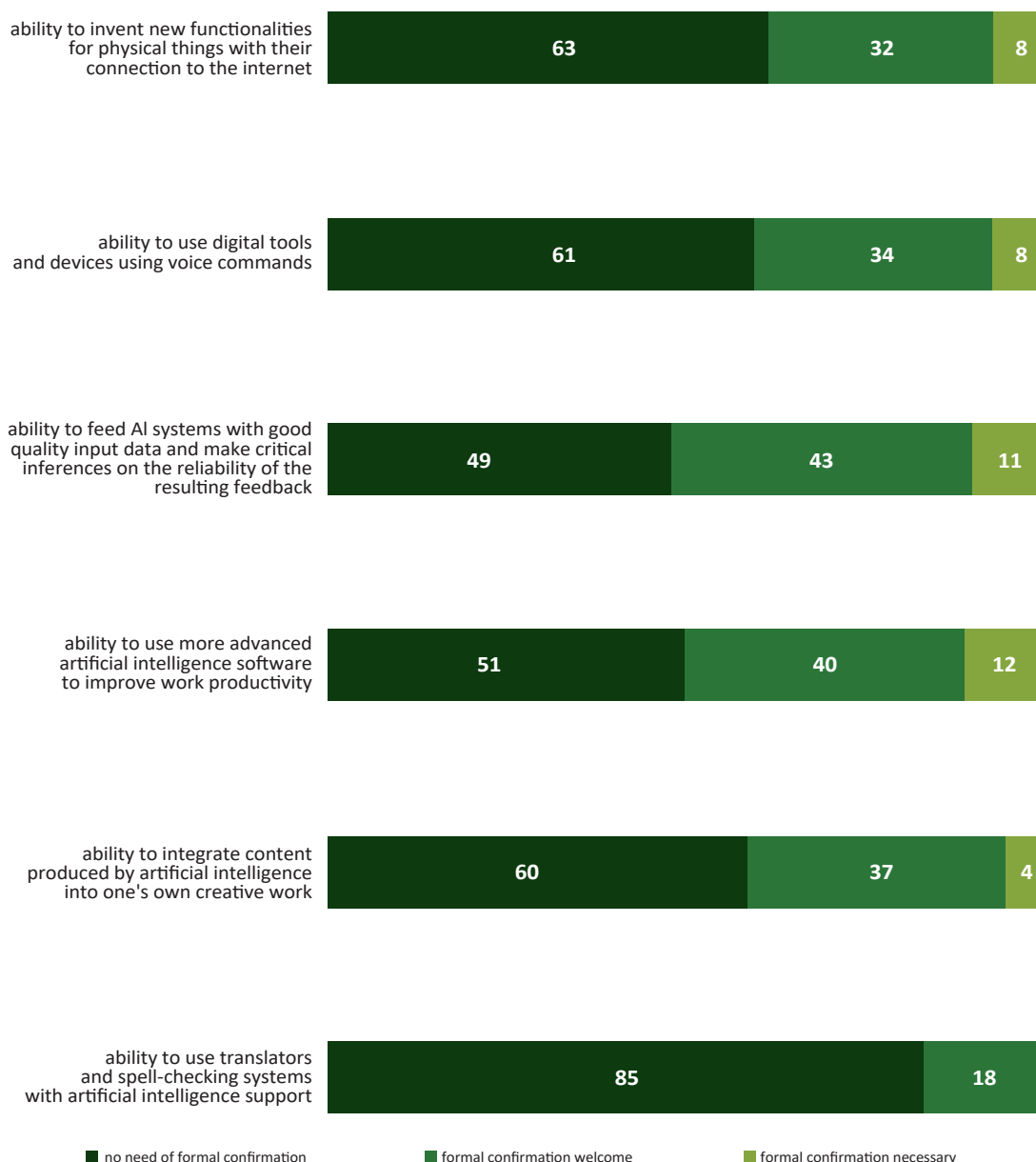


Source: own elaborations based on empirical results.

With regard to the need for formal validation of digital skills in the area of using modern technologies at work, surveyed employers reported a need for skills in feeding AI systems with good quality input data and making critical inferences about the reliability of the feedback results, as well as using more advanced AI-based software to increase their productivity (Figure 24).



Figure 24. Demand for formal confirmation of digital skills in the area of using modern technologies at work (qualifications)



Source: own elaborations based on empirical results.

2.2.4. Employers' demand for the acquisition and improvement of workers' skills

In addition to the short- and medium-term diagnosis of the demand for individual competencies and qualifications in the selected industries, the aim

of this expert study was also to analyse the demand of these industries for the acquisition and improvement of employee competencies in the areas identified earlier.

Starting to present the results of the empirical study with general digital skills, it is important to point out that **the dominant strategy for dealing with existing or anticipated shortages of these skills is upskilling current employees** (see Figure 25). For 71 of the 103 companies surveyed, this ranked first or second among the preferred actions. When it came to employers' expectation of employees acquiring new skills in this area themselves, this strategy was given first or second priority by 55% of companies. Thus, a greater willingness of enterprises to take the initiative to train existing employees in competence areas considered important than the desk research shows. On the other hand, the still high preference for transferring responsibility for upskilling to employees indicates a willingness of companies to increase the efficiency (cost and time) of the process of developing new competencies within the company.

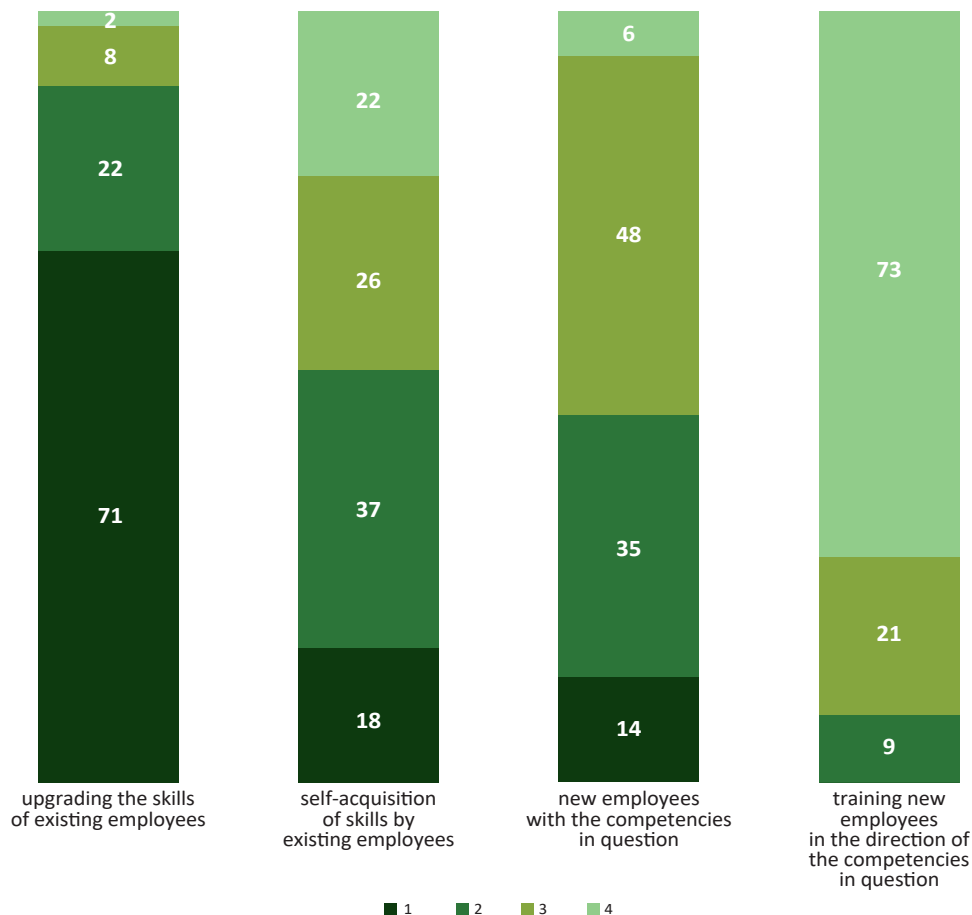
Hiring new employees with general digital skills was considered by 49 companies as a first or second preference, but for 48 it was a third preference (against 26 for upskilling employees themselves). These results therefore suggest that, in addition to upskilling employees, hiring new employees with a profile that matches the companies' needs is also a seriously considered strategy, to a greater extent than a review of existing studies would suggest. An interesting direction for future in-depth research, on the other hand, may be to capture more specific variables on the part of companies that influence the choice of particular approaches to developing forward-looking competencies.

The companies surveyed attributed the least importance to so-called reskilling, ie hiring and training new employees towards general digital competence. This was not the dominant strategy for any of the survey participants, and for as many as 73 of them it was of least importance. Comparing this result with the willingness to hire employees who already have the competencies that companies show a need for, there is less willingness to invest in reskilling new employees, as it is more time- and cost-efficient to acquire the right competencies from the market.

A similar picture emerges in terms of remote work skills. Upskilling current employees is the preferred approach for 81 companies surveyed (see Figure 26). For 67 companies, the first or second preferred strategy was to expect existing employees to acquire new skills. In contrast to the area of general digital



Figure 25. Employers' preferences for acquiring and improving general digital skills



* 1 being the most and 4 the least preferred strategy to develop or acquire competencies

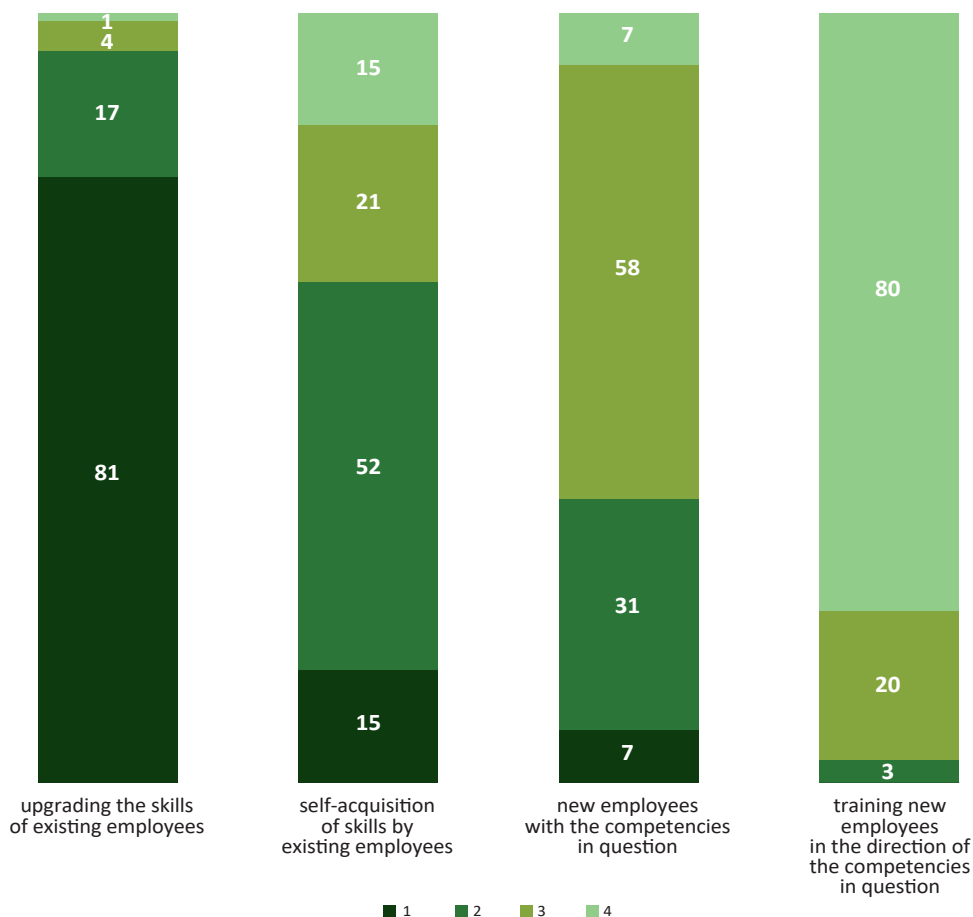
Source: own elaborations based on empirical results.

skills, hiring new employees ranked third after upskilling existing employees (employer-provided and self-provided), while reskilling new employees was rated by survey participants as the least important approach.

Finally, when it comes to acquiring and improving skills related to the use of new technologies, also the predominant preference appears to be for companies to develop the competencies of existing employees (see Figure 27). It is worth noting, however, that since competencies in this area are of the most specialised nature and are related to the application of technological solutions that many employees may be less familiar with, for 53 out of the 103 companies surveyed, hiring new employees with these competencies is the first or second preference. This result may suggest that for the skills that are perceived to be furthest removed from the existing experience and competency profile of a given



Figure 26. Employers' preferences for acquiring and improving skills in the area of remote work



* 1 being the most and 4 the least preferred strategy to develop or acquire competencies

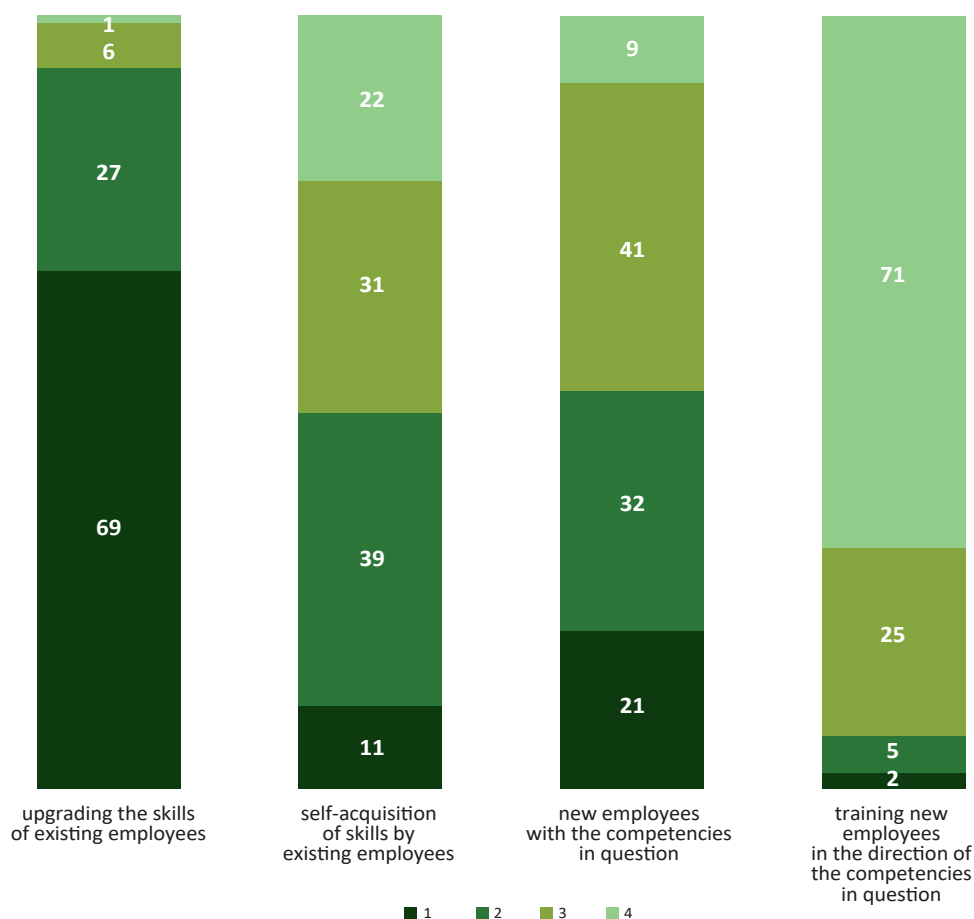
Source: own elaborations based on empirical results.

company, the need to acquire them by hiring employees with a specific skill set seems to be the most reasonable approach. In contrast, particularly for the most specific skills, training newly recruited employees was rated as the least preferred approach to dealing with competency gaps.

All in all, an overall assessment of employers' preferences for the development and acquisition of digital competencies indicates that companies prefer a mixed model with a strong emphasis on company-initiated activities, while expecting an attitude of openness and a desire for self-improvement on the part of employees. The search for new employees with the required competencies is an alternative to the preferred model. The cost rationalisation associated with competence development can be seen in the evaluation of, among other things, the last category, ie the hiring of new employees and their training. This area of



Figure 27. Employers' preferences for acquiring and improving skills in the use of modern technology



* 1 being the most and 4 the least preferred strategy to develop or acquire competencies

Source: own elaborations based on empirical results.

assessment can be a valuable indication not only for young people who are just entering the labour market, but de facto for every person of work age, intending to change or looking for a job. It is worth adding here that only very specialised skills have, in the opinion of the respondents, the rigour of being confirmed in the form of a certificate.

2.2.5. Impact of current developments on skills needs

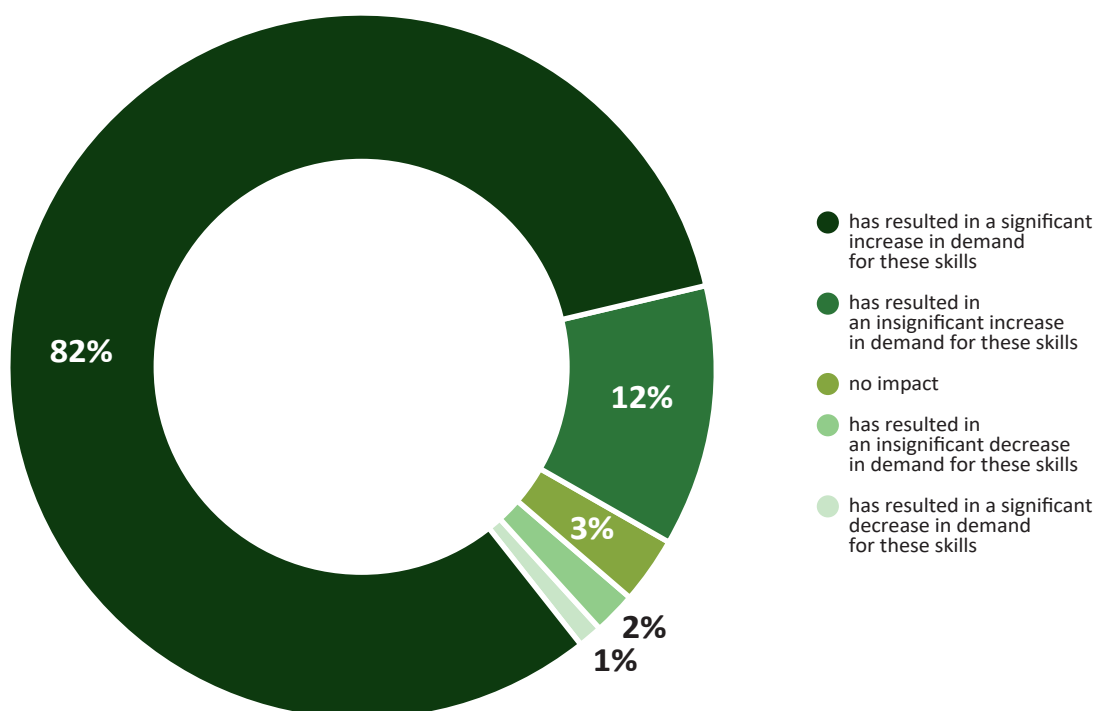
Finally, the surveyed companies were asked to assess the impact of the COVID-19 pandemic, the war in Ukraine and the associated high inflation on the demand for digital skills of employees. Regarding the impact of the COVID-19 pandemic, 94% of survey participants indicated that it had contributed to a significant increase in

the demand for the digital skills considered in the survey (see Figure 28). For only 5% of respondents, the pandemic brought a decrease in the importance of digital skills or had no impact at all. The above results are in line with previous knowledge on the impact of the COVID-19 pandemic on the acceleration of digitalisation processes in many sectors, in terms of remote work or more intensive use of online technologies in areas such as sales and marketing.


The assessment of the impact of the war in Ukraine on the demand for digital skills is diametrically opposed to the COVID-19 pandemic (see Figure 29). For as many as 65% of the surveyed companies, the war in Ukraine did not change the situation related to the demand for digital skills, and for only 31% it caused an increase. The reasons for these results can be seen in the fact that the extent of the impact of the war in Ukraine on companies varies according to their level of dependence on foreign sales or purchases and the resulting possible strategic reorientation due to the risk of operating in eastern markets. In this context, the increased use of digital technologies may contribute to the resilience of companies to this type of international turmoil, which at the same time implies an increased need for relevant skills.

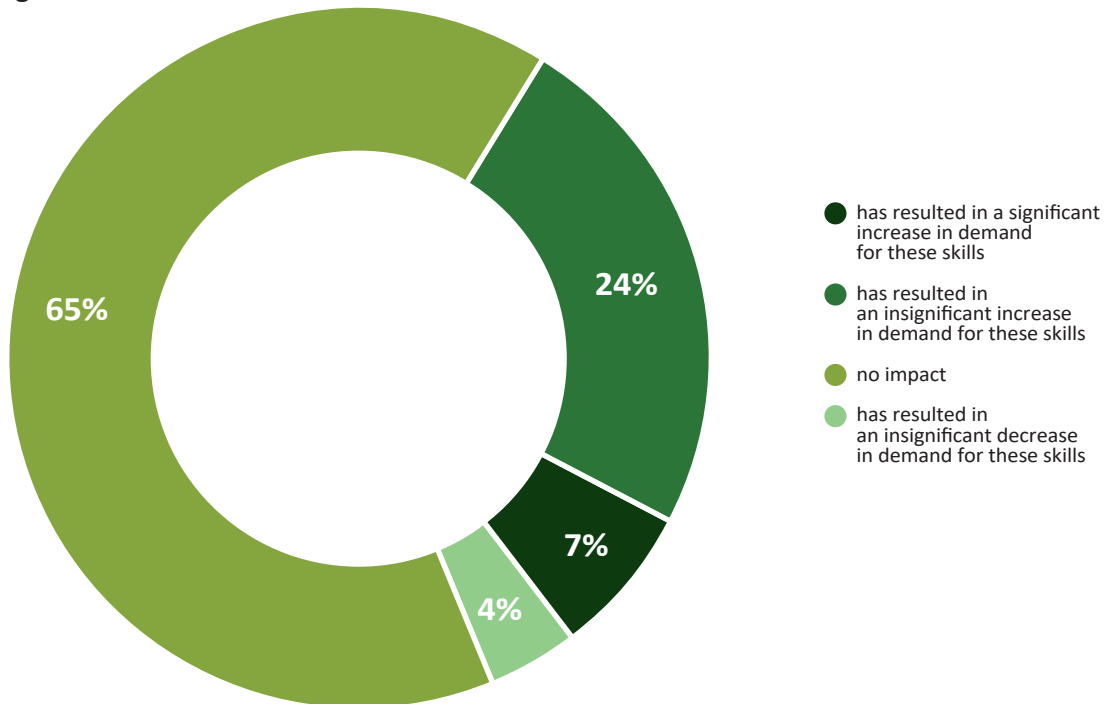


Figure 28. Assessing the impact of the COVID-19 pandemic on employers' digital skills needs




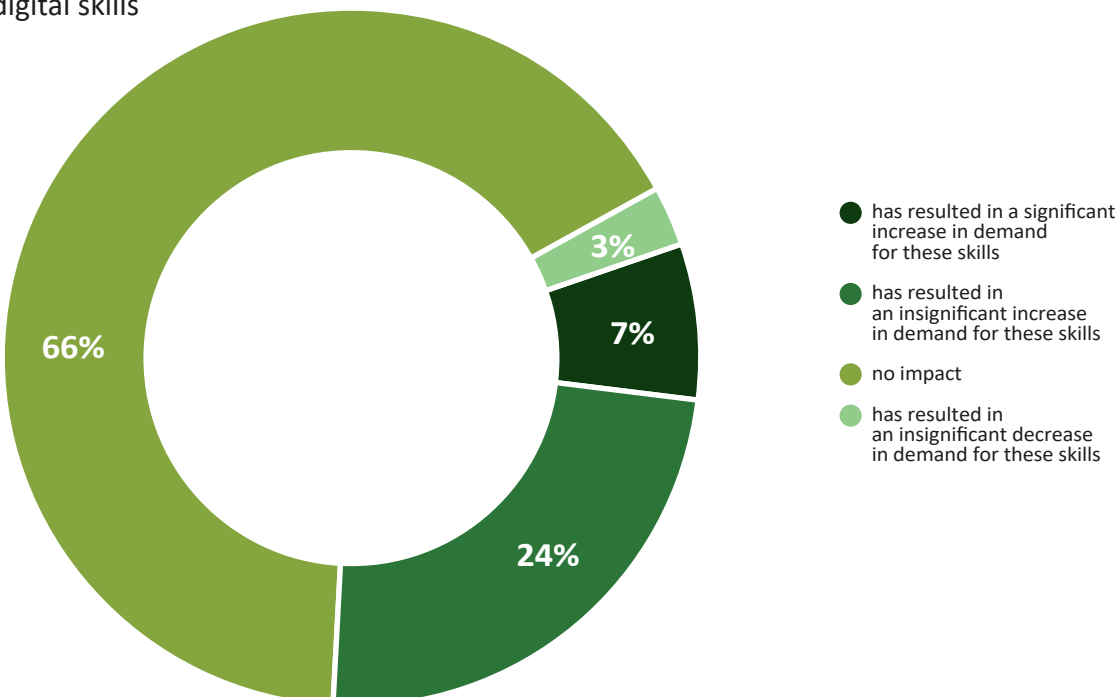
Source: own elaborations based on empirical results.

 **Figure 29.** Assessment of the impact of the war in Ukraine on employers' demand for digital skills



Source: own elaborations based on empirical results.

 **Figure 30.** Assessment of the impact of inflation in Poland on employers' demand for digital skills



Source: own elaborations based on empirical results.

Finally, in the context of inflation in Poland, which has been unprecedented since the 1990s, a similar picture emerges of the assessment of its impact on the demand for digital skills as in the case of the war in Ukraine (see Figure 30). For 66% of the companies surveyed, it had no impact at all, while for 31% it caused a significant or slight increase in the demand for digital skills. The use of digital technologies in different areas of a company's operations can lead to cost optimisation, from the area of production automation to the digitalisation of sales. In an economic crisis, cost pressures on the one hand and the need to increase one's innovation and competitiveness in the market on the other are generally increasing, which may justify the low percentage of responses related to a decrease in the need for digital skills.



2.3 Summary, main conclusions and recommendations

The contemporary transformation of the economy towards the development of 'Industry 4.0' has complex implications for the sphere of employment and the labour market, especially in the context of the human dimension and competencies. The evolution of industrial technologies and the increasing role of digitalisation are triggering changes in the expectations of workers' competencies in the new economy. This phenomenon is referred to as the competence revolution, the essence of which is the transformation of the competence profiles required by employers. On the one hand, technological and digital competencies are becoming more and more prominent, which are essential in a 4.0 economy. The empirical research conducted for this expert report focused on digital skills, relying on desk research. On the other hand, competencies resistant to automation and robotisation, including soft competencies (emotional and social) and advanced cognitive competencies, are particularly valuable. Most of these competencies are transferable²⁵, meaning that they are useful in different areas of life, not only in the work environment.

25 As Nägele and Stalder (2017) and Yate (2018) emphasise, transferable competencies are closely interrelated and universal in nature. This means that they are indispensable in the labour market regardless of the company's sector, occupation or job position. Mastering these competencies can significantly increase the employability of employees, enabling flexible adaptation to changing labour market conditions. As a consequence, career paths will no longer be characterised by linearity and predictability (Śledziwska and Włoch, 2019).

Hence, the typology of competencies used in this research, while focusing on skills related to the use of new technologies at work and remote work, also takes into account a range of skills that are soft in nature (for example, communication, collaboration, etc). The mere knowledge of various modern tools and the ability to use them at work is a prerequisite for responding to the changes in the economy presented in this report and the resulting transformation of the business sector. On the other hand, however, the aforementioned tools are used by employees to perform tasks where there are interactions between team members, often collaborating remotely, as well as between humans and artificial intelligence. Most of the 'classic' skills therefore do not lose their relevance in the digital environment either.

The main findings of the empirical study, as well as their implications for competence development policy and support for the business sector, can be summarised according to the following areas related to the objectives of this report.

I. Skills needs in the short term

It is possible to identify a group of digital skills that are already key for most companies. **In the area of general digital skills**, the five skills identified as key are:

- Ability to recognise digital risks (for example, phishing attempts),
- Ability to communicate using digital tools (for example email, instant messaging, video conferencing, social networking),
- Ability to filter relevant information and critically assess its reliability,
- Ability to protect and secure data in digital environments (for example, use of anti-virus software packages, encryption of company drives),
- Ability to search for data and content in digital environments (especially the internet).

It is to be expected that these skills will be more important in the short term than the more basic and strictly technical skills, such as the use of word processing or graphics programs in a digital environment, which are commonly offered by the training market. A possible explanation for this is that the employees of the companies surveyed have already reached a satisfactory level of skills in the area in question, or the assessment may depend on the specific industry or nature of the job.

On the other hand, a relatively lower average indicating the level of demand for a particular digital competence does not automatically imply a low actual demand for the competence as such. Due to the scale of employment and the nature of the services or production activities provided, some digital skills will be required of relatively fewer employees.

Thus, in the near future, greater demand for digital skills is reported by medium, small and micro companies (with less than 250 employees), which indicates - according to the state of knowledge emerging from the research presented in the desk research - a greater competence gap for SMEs. It can also be expected that the lower declared demand from large companies is sometimes related to a different employment structure, in which some full-time positions do not require the competencies discussed here, as also indicated by comments provided by some research participants. Large companies may also be more advanced in terms of digitalisation, while small and medium-sized companies, with more limited investment resources, are just starting to adapt to market changes, reporting a higher demand for digital competencies in the near term.

In addition, **greater demand for digital competence is declared by companies with dominant foreign capital**. This may be due to the fact that foreign companies are undergoing digital transformation processes faster. They also operate in a more dynamic and competitive international environment, which is reflected in the demand for relevant employee skills. In addition, employees of these companies from branches located outside Poland are characterised by a higher level of digital competencies and expect a corresponding adaptation of employees operating on the Polish market.

In terms of specific industries, the demand for programming skills is shown more by technology companies, and the least likely to be sought in the near future by sales and service companies. It seems that the limited demand in these industries is an expression of the still relatively low degree of digitalisation and the lack of realisation that the increase in the importance and implementation of robotisation and automation discussed in this report will force programming skills on the employees operating these technologies in companies. On the other hand, it is possible to envisage an alternative scenario for some companies, in which, by design, this area of competence will be carried out by specialised external service providers, which on the one hand will create a new market for services (and therein also a demand for these competencies), but on the other hand may lead to higher operating costs for companies.

In the area of remote work skills, the total importance of which was rated at a similar level to general skills, the five skills identified as key were:

- Ability to use videoconferencing platforms: using apps, arranging meetings, including participants, managing access (for example Meets, Teams, Zoom, Whereby),
- Ability to distribute the team's responsibilities in a way that makes the best use of their skills (for example, analytical or communication skills),
- Ability to plan and organise his or her remote work, including time management and prioritisation, and to complete tasks on schedule,
- Ability to build commitment and motivate spatially dispersed team members (for example, by using formal and informal communication).

Short-term demand for these competencies is higher than for basic skills related to the use of teamwork tools or project management alone. As with general digital skills, remote work skills are also in greater demand by large and foreign-dominated companies.

By industry, commerce reports the highest demand for differentiated remote work competencies, while technology companies, compared to other industries, report a higher demand for the ability to motivate teams, plan and organise team work or the ability to use applications that support remote work or team management software. The trade and information technology sectors also report lower current demand for skills related to working in the cloud (cloud file and folder repositories). Potential reasons for the lower demand include a limited propensity to use cloud solutions (due to data security concerns or GDPR restrictions), due to the specificities of each of these industries. Another explanation could be, as indicated earlier in the case of general digital competencies, that the required level of demand has been reached, hence a lower demand for this type of competence is reported.

Interestingly, the group of **skills for using modern AI/IoT tools was rated as far less important for companies in the short term**. In this area, the two skills considered important were the ability to use AI-supported translators and spelling correction systems, and the ability to feed AI systems with good quality input data and to make critical inferences about the reliability of the feedback results obtained.

It seems, however, that the lower declared demand for competencies in this area results from the current state of development of companies in this respect,

and not from their unawareness, as companies indicated that the importance of this category of skills will increase in the medium term. Interestingly, while a greater demand for these competencies was declared more often by the surveyed SMEs than by large companies, unlike in the case of general skills and those related to remote work, companies with dominant Polish capital report a greater demand for skills in using new types of tools.

Taking into account the industry differentiation, the trade sector declares the highest demand in the survey conducted, expressed by the number of competencies sought and the average rating of their importance. The IT sector reports a demand for competencies related to the use of AI for productivity improvement and data evaluation, as well as the creation of new concepts/products. In the latter category, it shares a similar level of need with the manufacturing sector, which additionally indicates a future demand for competencies linked to the more intensive use of voice-controlled tools and devices.

When analysing the three selected phenomena affecting the economy and the labour market most, namely the COVID-19 pandemic, the war in Ukraine and inflation (unprecedentedly high since the political transition), it was observed that only the COVID-19 pandemic had, in the opinion of employers, a significant impact on the demand for the digital skills discussed here.

II. Medium-term competence needs

Based on employer feedback, it is possible to identify a group of digital skills that will increase in importance by 2026. These are:

- In the general area: the ability to recognise digital risks and to protect data in the digital environment²⁶, to integrate data from different sources and to filter information and critically assess its reliability (more than 75 out of 103 companies);
- In the general area: the ability to build commitment and motivate team members, the ability to work simultaneously on files in the cloud, the ability

26 This result shows that with the automation of more and more processes, cyber security is becoming a serious issue. Employees need to be aware of cyber security risks and know how to protect company data and systems from potential breaches.

to plan and organise the team's remote work as well as their own (more than 60 out of 103 companies);

- In the area of the use of new AI/IoT-based tools: the ability to feed AI systems with good input data, the ability to incorporate AI-generated content into one's own creative work and the ability to use AI to improve work efficiency (more than 70 out of 103 companies).

It is worth noting here that the projections of the demand for remote work competencies in the run up to 2026 confirm the currently observed concerns of employers regarding the decline in employee productivity, which is reflected in the range of preferred competencies, such as building commitment and motivation, parallel work of team members or the ability to plan and manage remote work, including teams of people working in this way.

In order to meet these expectations, the system for the development of digital competencies and qualifications must be properly adapted to the growing needs of the labour market. To this end, new ways of teaching and greater universality of digital skills training programmes are needed, in the short term at the tertiary level, but in the long term also at the lower level. In this context, it is worth recognising the existing mismatch between the basic education system and the challenges of the modern world, including in the areas of learning to code from primary school onwards, more team and project work, or learning to search data and think critically instead of the existing system based on memory-based mastery of content.

III. Qualification needs

Analysis of the 27 digital skills, categorised into three areas, showed that only seven would require formal confirmation from candidates to meet employers' expectations. For the digital skills for which the combined responses of 'formal confirmation welcome' and 'formal confirmation required' exceeded the 50% threshold were:

- Ability to recognise digital risks,
- Ability to protect and secure data in digital environments,
- Programming skills,
- Ability to use project management software as a leader and team member,
- Ability to feed AI systems with good quality input data and to make critical inferences about the reliability of the feedback results obtained.

The results of the survey suggest that there is a consensus in the perception of competencies related to communication and basic skills that, according to the respondents, do not require certification, which may also be due to the lack of awareness of the existence or lack of actual existence of qualifications for all the competencies indicated. On the other hand, for more advanced issues such as digital security, support of artificial intelligence with specific software, 'hard' programming skills and managing teams, there is a perception that having a relevant certificate or other form of proof of skills is important.

IV. Demand for competence development

From the point of view of systemic solutions to improve the digital competencies of employees and prevent competence deficits, the importance of activities that enhance the skills of employees within an organisation's existing human resources should be particularly emphasised. The survey showed that companies **prefer skill enhancement activities in current employees** to compensate for competency gaps. This is the preferred strategy for all three digital skills areas assessed, while to a lesser extent employers expect employees to acquire digital competencies themselves. Across the sample, the third most preferred strategy for closing competency gaps is to hire new employees with the right competency profile that fits the needs of the company in question. Re-skilling new employees in terms of digital competencies was indicated as the least preferred action.

New professional challenges are a consequence of the increasing volatility in the labour market. Meeting these challenges will require companies to combine and use diverse sets of competencies that complement each other and allow them to perform their tasks effectively. The right match between the competencies of people in new jobs will be crucial for effective job performance. Among other things, it will be necessary to bring together people with different skills and knowledge, who, when successfully combined, will be able to succeed in their new tasks. It also seems important to create opportunities for knowledge sharing (for example, combining more competent staff and less experienced staff in the same team).

In order to prevent digital competence deficits, it seems reasonable to take the following measures:

- **At company level:**
 - a. Keeping job descriptions and vacancies up to date, taking into account changes in expectations of staff competence;

- b. Building and developing an internal culture of learning and continuous competence development;
 - c. Offer training tailored to changing trends. Training should be up-to-date and cover the latest technologies, tools and working methods (including using AI). They should be led by experienced professionals who have hands-on experience in their field;
 - d. Closer cooperation with universities in the development of study programmes. Companies should establish cooperation with universities to introduce new technologies and tools into study programmes that respond to current labour market needs. This cooperation should be two-way, to the benefit of both parties;
 - e. Collecting and aggregating data on the demand for specific competencies in order to analyse the dynamically changing labour market situation. Companies should collect data on trends and requirements in their industry, as well as forecasts of future needs. In this way, they will be able to adapt their training and employee development programmes to the requirements of the labour market;
 - f. The use of data within data science to analyse the specific needs of a particular company. Analysing the data makes it possible to accurately determine the needs of employers and identify areas where specific skills are required. This makes it possible to adapt training and employee development programmes more effectively to the requirements of the labour market and avoid competency deficits;
 - g. Upskilling employees is only part of the solution to digital competence deficits. Companies should be open to employing people from different social groups and introduce appropriate inclusive programmes to harness the potential of all employees.
- At the level of education policy:
 - a. Raising employees' awareness of the need to continuously improve their competencies and acquire new ones;
 - b. Promoting a positive attitude and readiness for lifelong learning and providing opportunities to satisfy cognitive curiosity;
 - c. Developing lifelong learning skills. It is necessary to develop a comprehensive education policy and ensure cooperation between the public, private and NGO sectors. It is also necessary to promote the idea in different environments and among different groups of workers and to ensure easier access to education for all people;
 - d. Use of modern technology in non-format study curricula to prepare future employees to effectively use 4.0 tools in business practice;

- e. Introducing cooperation with the business community to organise practical classes on the premises of enterprises 4.0. This can contribute to more effective preparation of students for the profession;
- f. Due to the ubiquitous use of modern technology, implementing elements of Tool 4.0 education into the educational programmes of secondary and vocational schools is becoming essential in order to prepare future employees for the demands of the labour market.



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A2-Tp	89634
M1-Tp	73430
C4-Tp	18400

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ANNEX 1: QUESTIONNAIRE SURVEY

Demand for digital competencies and qualifications in selected industries

Dear Sirs,

We would like to invite you to participate in a study on the demand for digital competencies and qualifications in selected industries, carried out by the Lewiatan Confederation and the Poznań University of Economics.

We ask about the digital competencies required, taking into account three areas: remote working, process automation and robotisation, and the use of modern technology at work. We tried to formulate the questions in an intuitive and interesting way so that answering them would not be time-consuming and burdensome.

Your responses will be used to prepare a short- and medium-term forecast of industry demand for the acquisition and improvement of digital skills in the workforce, to which we will add our own proposals for effective training solutions.

UEP Research Team

INTRODUCTION:

Please look at all of the following questions about digital skills and how to improve the competencies of your employees from the perspective of **your company** and taking into account **current development trends in your industry**.

1. For the GENERAL DIGITAL SKILLS group, rate 3 aspects:

A. Perceived current importance of the skill (scale of 1 to 5)

B. Anticipated change in importance of the skill by 2026 (scale of 1 to 3)

C. Need for formal confirmation of the relevant skill by a diploma/certificate (scale 1 to 3)

NOTE: For each skill assessed, enter answers in line 3 = **one** for each perceived importance of the skill today (A), the anticipated change in importance in the future (B) and the need for formal confirmation (C).

[illegible]

[illegible]

[illegible]

1b. In the event of a shortage of the above competencies in your company (GENERAL DIGITAL SKILLS), which strategy of action is/would be preferred by your company?

Rank the following list from most (1) to least preferred strategy (4).

1. The company's upgrading of skills in current employees.
2. Expecting current employees to acquire skills or qualifications themselves.
3. Hiring new staff with the required level of competence.
4. Hiring new staff and training them in the competencies needed.

2. For the REMOTE WORK SKILLS group, evaluate 3 aspects:

A. Perceived current importance of the skill (scale of 1 to 5)

B. Anticipated change in importance of the skill by 2026 (scale of 1 to 3)

C. Need for formal confirmation of the skill in question by a diploma/certificate (scale 1 to 3)

NOTE: For each skill assessed, enter answers in line 3 = one for each perceived importance of the skill today (A), the anticipated change in importance in the future (B) and the need for formal confirmation (C).

[illegible]

2b. In the event of a shortage of the above-mentioned competencies in the company (REMOTE WORK SKILLS), which strategy of action is/would be preferred by your company?

Rank the following list from most (1) to least preferred strategy (4).

1. Company's upgrading of skills in current employees.
2. Expecting current employees to acquire skills or qualifications themselves.
3. Hiring new staff with the required level of competence.
4. Hiring new staff and training them in the competencies needed.

3. For the group of SKILLS OF USING MODERN AI/IoT TOOLS, assess 3 aspects:

A. Perceived current importance of the skill (scale of 1 to 5)

B. Anticipated change in importance of the skill by 2026 (scale of 1 to 3)

C. Need for formal confirmation of the skill in question by a diploma/certificate (scale 1 to 3)

NOTE: For each skill assessed, enter answers in line 3 = **one** for each perceived importance of the skill today (A), the anticipated change in importance in the future (B) and the need for formal confirmation (C).

[illegible]

ability to use digital tools and devices using voice commands (for example, controlling a robot)											
the ability to invent new functionalities for physical things (the company's products) by connecting them to the internet (IoT concept)											

3b. In the situation of a shortage of the above-mentioned competencies in the company (SKILLS OF USING MODERN AI/IoT TOOLS), which strategy of action is/would be preferred by your company?

Rank the following list from most (1) to least preferred strategy (4).

1. Company's upgrading of skills in current employees.
2. Expecting current employees to acquire skills or qualifications themselves.
3. Hiring new staff with the required level of competence.
4. Hiring new staff and training them in the competencies needed.

4. You have rated the importance of the various digital skills of your employees, broken down into three sets. Was any employee digital skill important to the company/industry missing from the list? (open question)

5. How would you rate the impact of the following over the last 12 months on the demand for digital skills in the workforce:

	has resulted in a significant increase in demand for these skills	has resulted in a slight increase in demand for these skills	lack of impact	has resulted in a slight decrease in demand for these skills	has resulted in a significant decrease in demand for these skills
COVID-19 pandemic					
War in Ukraine					
High inflation in Poland					

Finally, four short metric questions (very important for the accuracy of the inference):

Check the sector in which your company currently operates:

(if more than one, check the leading industry in terms of revenue generated in 2022)

trading	health / health care
food production	motorisation and electromobility
manufacture of metal products	transport and storage
manufacture of machinery and equipment	financial consultancy
generation and supply of energy (including heat)	insurance
waste management/recovery of raw materials	development services
information technology and telecommunications	other
pharmaceutical sector	

Specify the ownership structure of the company:

Companies with 100% Polish capital
Company with majority Polish capital
Company with majority foreign capital
Company with 100% foreign capital

Specify the number of employees employed in Poland:

1 to 9	10 to 50	51 to 249	250+
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Specify the department of the company you represent:

HR Department	IT Department	Sales/marketing department	Management	other (which?)
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