

# PEOPLE AND TECHNOLOGY – EMPLOYEE COMPETENCY PROFILE IN INDUSTRY 4.0

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## Introduction

In the organizational context, human capital includes education, experience, knowledge, and abilities that employees have and use to generate value, driving the company's success. Industry 4.0 is expected to affect markets, work environment, and changes in human capital (Ahmad et al., 2019). In addition, Industry 4.0 forces managers to change their approach not only to customers, but also to employees. New models of operation mean that personal aptitudes and organizational culture must be re-examined in the light of the requirements for new skills and the need to attract and maintain adequate human capital. This concludes that Industry 4.0 will require a significant change in employee skills, organizational structures, leadership mechanisms, and corporate culture. Most of the surveyed companies have noted the existence of a gap in the competences necessary to carry out the "digital transformation". An important barrier related to the implementation of Industry 4.0 solutions is not only the acquisition of the right technology, but – related to this – the need to change the organizational culture and acquire new competences (Nogalski et al., 2018).

The aim of the article was to identify employee competencies in the context of the requirements of Revolution 4.0. The paper poses the following research questions:

- RQ1: What changes does Industry 4.0 cause in the attitude towards human resources?
- RQ2: Is the notion of Industry 4.0 known?

- RQ3: Does technology affect how future work skills are shaped?
- RQ4: What are the competencies that Employee 4.0 needs?

The constantly changing professional environment necessitates support for the professional development of employees and equal opportunities for all. The key is diversity put to good use. It is a value both for the organisation and employees. Hence, this original research defined a competency profile of Employee 4.0 across industries, providing the added value of the paper. The authors conducted original survey research to identify the competency profile of Employee 4.0. The survey included respondents from 9 sectors of the economy.

Additionally, the authors employed the Spearman's rank correlation coefficient to determine whether the sectors required similar competencies from modern employees. The competency profile can indicate competencies worth pursuing as those appreciated on the labour market. Note that development of individuals is vital for the development of the society.

The paper consists of four parts. The first reviews the literature on human resources in Industry 4.0. In addition, Industry 4.0 was defined, and competencies were characterized. The second part contains the research methodology. The third part is a discussion of the research results,



followed by a discussion. The study closes with conclusions, which provide answers to the research questions posed<sup>1</sup>.

## Human resources in Industry 4.0 – a literature review

The notion of ‘Industry 4.0’ was coined at the German Hannover Messe Fair in 2011 and caught researchers’ attention. It was an initiative of business, politics, and academics to improve the competitive capabilities of the German economy based on technology innovation leadership. The idea of Industry 4.0 was the key point of the High-Tech 2020 strategy advocated by the German federal government. It quickly caught on as an international driver and direction for the production industry in other countries. The literature offers the term ‘Industry 4.0’ and the ‘Fourth Industrial Revolution’; the former being in common use (Bartevyan, 2015; Wan et al., 2015; Sung, 2018; Jamali, 2005; Fonseca, 2018; Ślusarczyk, 2018b).

The Fourth Industrial Revolution (Industry 4.0) originates from the First Industrial Revolution that commenced with the introduction of the power loom in 1784. It spread to other sectors and led to mechanisation of production and use of thermal and electrical energy in the industry (Cipolla, 1965). The intensive use of electrical energy led to the Second Industrial Revolution: electrification and industrialisation (Mokyr, 1999). The first programmable logic controller (PLC) in 1969 and the employment of electronics, computers, and ICT to automatize production processes announced the Third Industrial Revolution – electronic automation (Schlick et al., 2012). New technologies open broad possibilities for future development with mechanisation, automatic controls, digitalisation and networking, miniaturisation, decentralised growth, production and supply offering a perspective of changes in basic conditions to advance towards the fourth revolution (Lasi et al., 2014). The development of advanced information technology, information and communication technologies and virtualization of business models is the result of changes in existing customer preferences and expectations (Kieltyka, Charciarek, 2019).

Fourth-generation industry, Industry 4.0 or the fourth industrial revolution are related concepts that identify the

digitization and networking of production and the corresponding transformation of business models and strategies (Götz, 2018). The definition according to selected authors of revolution 4.0 has been presented in Table 1.

Interpreting the summary shown in Table 1, it can be concluded that Industry 4.0 provides mobile computer and information technology that is used in manufacturing processes. It means fully integrated production process, flexible small batch manufacturing, automated logistics and production. Industry 4.0 is significantly changing individual economies, companies and societies. Moreover – just like previous revolutions it is influencing the labour market by creating demand for millions of new jobs, but also demand for new qualifications and skills of workers (PARP, 2020).

Industry 4.0 significantly affects politics, economics, social relations, technology, environment, and the law (Jamali 2005; Sung 2018). Its paramount effects include (Fonseca, 2018):

- the reduced development time for new products and services before they are launched, which requires greater innovative capabilities;
- increased ‘personalisation’ to meet individual customers’ needs, which determines product customisation;
- improved ‘flexibility’ thanks to quicker and more versatile processes, smaller batches of high quality and cost-efficiency;
- decentralisation by delegation of authority and responsibility to lower tiers;
- more effective use of resources;
- technology innovation and breakthroughs such as the Internet, applications, social media, networks, systems engineering, smartphones, laptops, 3D print, artificial intelligence.

It is safe to say that the Fourth Industrial Revolution continues the changes set in motion by the Third Industrial Revolution, emphasising the advantage of intellectual work over manual labour. Modernisation of the industry through the implementation of advanced production technologies can generate better standards, services, flexibility, and quality for customers, which calls for the development and implementation of new business paradigms. By analysing the Industry 4.0 studies

Table 1. Definition of Industry 4.0 according to selected authors

Author	Definition – Industry 4.0
Davies (2015)	These are changes in the planning, production, operation and service of production systems
Burrus (2022)	This is the spread of digital industrial technology
Bendel (2022)	It is a process of hybridization – it is characterized by individualization (even in serial production), combines production and services, integrates customers of business partners in business processes
Prause (2015)	Covers the entire value chain from design and research, through production, management and logistics, to the distribution of final goods
Dmowski et al. (2016)	It is based on physical and dynamic data processing systems

Source: own elaboration

published so far, it has been discovered that they mostly discuss the technical aspects but do not pay attention to managerial approaches (Mohelska, Sokolova, 2018). When referring to Industry 4.0, people most often mean technology and machinery, while the greatest potential is people with their traits and competencies. This progressing, smart transformation of production promotes digital business models and processes that have broad consequences for the workforce. It is expected to impact both the content and organisation of work to a great extent, which may change how human capital is employed as a development resource for organisations. Forecasts would have our attention directed at human creativity as a catalyst for the construction and spread of Industry 4.0 (Ahmad et al., 2019).

To implement the concept of Industry 4.0, organisations need to follow six principles: decentralisation, modularity, service-orientation, interoperability, real-time capabilities, and virtualisation (Hermann et al., 2016; Lasi et al., 2014; Schaper, 2004). The primary goal of Industry 4.0 is to increase the productivity and effectiveness of operations through automation technology (Sekhar, Patwardhan, 2015; Ślusarczyk, 2018a). The main driver of Industry 4.0 is the invention of social networks and smart devices for work (Sekhar, Patwardhan, 2015). Changes in organisations include reorganisation of business processes, human resources management, redefined employee roles, and extended job descriptions (Schaper, 2004). Today's demographic changes result in older employees and operational differences. Consequently, the transformation contributes to changes in employer expectations and the emergence of so-called future work skills. The notion of Industry 4.0 was followed by Employee 4.0, who is expected to demonstrate specific competencies (Piwowar-Sulej, 2018). With a knowledge-based economy, employee competencies gain particular importance and mean suitability and conformity to work environment requirements. They contribute to success and positive results on the organisation level. The notion of competency can be perceived as a description of an effective result of an action; one should then speak of being competent. The other meaning is a description of specific traits defined by skills that a (competent) employee has (Boyatzis, 1982; Gwarda-Gruszczyńska, Czaplą, 2011; Gracel, Makowiec, 2017).

The holistic method of human resources management in Industry 4.0 lists four necessary employee competencies: technical, methodological, social and personal (Hecklau et al., 2016).

Technological development of virtual reality, or artificial intelligence in the long run, change the employee competency model. Rigid competency models inherent to specific groups of jobs or specialisations are obsolete today. One of the key matters is believed to be the growth of competencies outside of one's field.

Desirable employee competencies in the era of Industry 4.0 include (Chojnacka, 2017):

- logical thinking and data analysis – the latter used to be restricted to financial analysts and similar professions,

but in today's rapidly changing environment data collection and analysis are necessary for every job profile;

- ability to act quickly and make strategic decisions – important abilities include the capability of combining knowledge from many domains and flexibility, expected of the employee and employer both; when preparing for the changes, one has to keep in mind that the market now welcomes Generation Y, which prefers independence at work and flexible forms of employment just as today's employers expect non-standard work hours in an international and multicultural environment;
- project management competencies – in the dynamic modern economy project handling often makes or breaks the business;
- sales and relationship competencies – sales and relations are inherent to every aspect of our lives, both professional and private; the ability to forge relations is crucial for work in a project-based, international environment, also for engineers;
- specialisation – today, one needs to be an expert in their field, keep growing and expanding knowledge, if someone stands in place and tries to build on their university knowledge or past professional experience, they will be overtaken;
- ability to work in a multicultural and multi-generational environment;
- command of foreign languages.

Today, many job profiles overlap and competencies of one can become indispensable in another. As regards hard skills, the key ones are technical and cyber-technical competencies, but soft skills gain importance: teamwork, foreign languages, or communication competencies for sales. The progress of knowledge forces the employee to master competencies and qualification far beyond those offered by education or past professional experience. Industry 4.0 is based on modern technologies and cyberspace, forcing workers to have knowledge and skills necessary for problem-free use of this environment. Technical skills and expert knowledge for the job are important in employee review and for the efficient functioning of the organisation but are not enough. The Fourth Industrial Revolution demands that soft skills related to emotional self-control, self-organisation, social coexistence, and openness to change grow. The development of soft skills requires internal psychological changes, which means that the employee has to focus on breaking habits, fears, or psychological barriers in every-day professional life. Soft skills are a universal part of work potential necessary for every job, which is important for the growth of an individual.

The literature review allowed to conclude that Industry 4.0 causes changes in the area of management of human capital, redefines the roles of employees, and the job description is expanded. In addition, employees are required to have competences that go beyond those offered by education and professional experience. Smart manufacturing not only abolishes jobs, but also creates new ones that require new competencies, the identification of which is necessary to be able to shape them.



## Research methodology

To draft the profile of competencies of Employee 4.0, the authors conducted research with the use of a survey questionnaire consisting of a personal data section and proper questions. Word original is not necessary in this sentence. The personal data section contains questions about the industry and the function that the respondent performs in the company (employee, manager, owner).

Such information should be included at the end of the questionnaire and described at the end. There is no need to give such basic definition in a scientific article. The questions in the other section touched upon the impact of modern technologies (Industry 4.0) on employee competencies. Respondents were asked to answer yes-or-no questions and use a 5-point Likert scale for questions on specific competencies. A dichotomous yes/no scale was used for questions concerning knowledge of the following concepts: revolution 4.0, competencies of the future, use of modern technologies by the company. It was also used to determine the truth of the statement that technological progress causes changes in the competence profile of a modern employee. A 5-point scale was used for the question regarding the impact of the 4.0 revolution on the employee's competencies in terms of education, knowledge and experience. The 5-point scale was also used to identify competency requirements for employees. For this purpose, a list of 16 competencies was created, which the respondent evaluated in terms of labor market requirements.

The questionnaire thus prepared was distributed electronically to the representatives of the selected industries using CAWI techniques. The total population was 350 respondents. There was an established cooperation with 300 people, the remaining 50 respondents were new people who expressed their willingness to take part in the survey during a telephone conversation. The 300 people with whom cooperation had already been established voluntarily decided to complete the survey questionnaire after having looked into the research problem. The aim of the study was to deepen the knowledge about the impact of Industry 4.0 on the competencies of employees and changes in the labor market. For this reason, the

research was aimed at collecting opinions on this topic among people associated with companies that use modern technologies. Since the respondents did not answer the question in which specific enterprise they work, it is uncertain whether one respondent is a representative of one enterprise. Nevertheless, identification of the sectors with which the respondents were associated was made.

The survey was conducted in August 2020 on 154 respondents from nine sectors: professional, scientific, and technical services (A); financial and insurance services (B); administrative and support services (C); accommodation and food services (D); trade (E); information and communication services (F); other services (G); manufacturing (H); transportation and storage (I).

The research verified whether these sectors required similar competencies from modern employees. The relationships were analysed using the Spearman's rank correlation coefficient. It describes the strength of correlation of two features that are measurable and qualitative when the population is small, and the features can be ordered. The measure values lie in the interval of  $<-1, +1>$  (Chilko et al., 2004). The closer it is to one, the stronger the correlation between the features (Aczel, Sounderpandian, 2018).

## Research results

The survey revealed that most of the companies (71.43%) are based on modern technologies. It was not true for 44 of the respondents or did not agree with a particular statement included in questionnaire. The structure of the responses in the sectoral cross-section on the use of modern technologies has been presented in Table 2.

An in-depth analysis across sectors demonstrated that the sector that used modern technologies the most was information and communication services followed by financial and insurance services, and manufacturing (100%, 87%, and 86% of the relevant sector respondents respectively gave an affirmative response). The sectors that used modern technologies the least were accommodation and food services and transportation and storage.

Table 2. Structure of distribution between sectors and the use of modern technologies

Sector	A	B	C	D	I	F	G	H	And
<b>Modern technologies</b>									
Modern technologies are used	15	33	1	1	12	8	35	6	1
Modern technologies are not used	4	4	1	3	10	0	16	1	3
Percentage of positive responses	79	87	50	25	54	100	69	86	25
Sum of all answers given	19	37	2	4	22	8	51	7	4

Source: own elaboration

In the next step of the research, the respondents were asked about their familiarity with the notions of 'Industry 4.0' and 'future work skills'. The results suggest that a number of the respondents have not come across the notion of 'Industry 4.0' (only 38% of them declared otherwise). It was a little different for 'future work skills'. Fifty-nine per cent of the respondents were familiar with it. The results may indicate a knowledge gap related to Industry 4.0.

The survey assessed the impact of technological progress on employee competencies. The respondents confirmed its significant impact in almost 90%. Only a few respondents believed there was no impact or a slight impact. Only two representatives of manufacturing and information and communication services chose those responses.

The respondents answering the question about competency requirements used a five-point Likert scale (1 – very much in demand, 5 – almost no demand). The respondents had 16 selected competencies to evaluate. After the responses were obtained, each competency was ranked by calculating the average value of all responses for each sector (the lowest rank was assigned to the lowest average value). Based on the results obtained,

regarding the required competencies of employees in the modern economy, a ranking list of required competencies was developed, which has been shown in Table 3.

Ranking the competencies in Table 3 allowed us to indicate which of the 16 analyzed competencies is important depending on the sector. The value for the competence – knowledge of technology – in sector A is 8, which means that it is in the eighth place in terms of importance. The most important competence in industry A is the ability to act quickly (value of 1). Analyzing the results we can state that this competence is also the most important for the industries D, E, F, G, H. Thus, we can make a conclusion, that this competence is the most important for modern employees. The next competence – logical thinking is in the second place in the sector G and H, while the ability to work in a team is the most desired in the sector B, ranked second in the sector E and I, while for the sectors A, C, D, this competence comes somewhere between the second and third. A cross-sectoral analysis found out that professional, scientific, and technical services as well as administrative and support services demanded that employees act promptly, can change, and work in a group the most. In financial and

Table 3. Ranking list of competencies required from modern industries

Competency / sector	A	B	C	D	E	F	G	H	I
familiarity with technology	8.0	5.5	9.5	11.0	4.5	9.0	6.0	7.5	7.5
engineering diploma	15.5	16.0	15.0	16.0	16.0	16.0	16.0	5.0	11.5
technical secondary education	15.5	15.0	16.0	14.5	13.0	15.0	15.0	7.5	9.5
ability to act promptly	1.0	2.0	2.5	1.0	1.0	1.0	1.0	1.0	2.0
taking strategic decisions	6.5	9.0	12.0	11.0	7.0	10.0	9.0	3.0	5.0
project management skills	13.0	12.5	14.0	14.5	12.0	12.0	11.0	11.0	13.5
sales and relationship competencies	10.0	10.5	5.5	2.5	8.0	12.0	10.0	13.5	15.5
logical thinking	4.0	3.0	5.5	6.0	3.0	3.5	2.0	2.0	5.0
high level of specialisation	11.0	8.0	5.5	11.0	14.5	14.0	12.0	10.0	5.0
empathy	12.0	10.5	12.0	11.0	14.5	3.5	8.0	15.0	2.0
creativity	5.0	4.0	8.0	6.0	6.0	7.0	3.5	9.0	9.5
ability to change	2.5	5.5	1.0	6.0	4.5	7.0	3.5	4.0	7.5
ability to work in a multi-cultural environment	6.5	7.0	5.0	6.0	9.0	3.5	7.0	13.5	13.5
ability to work in a multi-generational environment	14.0	12.5	9.5	11.0	11.0	12.0	14.0	16.0	15.5
team player	2.5	1.0	2.5	2.5	2.0	3.5	5.0	6.0	2.0
trust-based relations	9.0	14.0	12.0	6.0	10.0	7.0	13.0	12.0	11.5

A – professional, scientific, and technical services; B – financial and insurance services; C – administrative and support services; D – accommodation and food services; E – trade; F – information and communication services; G – other services; H – manufacturing; I – transportation and storage

Source: own elaboration

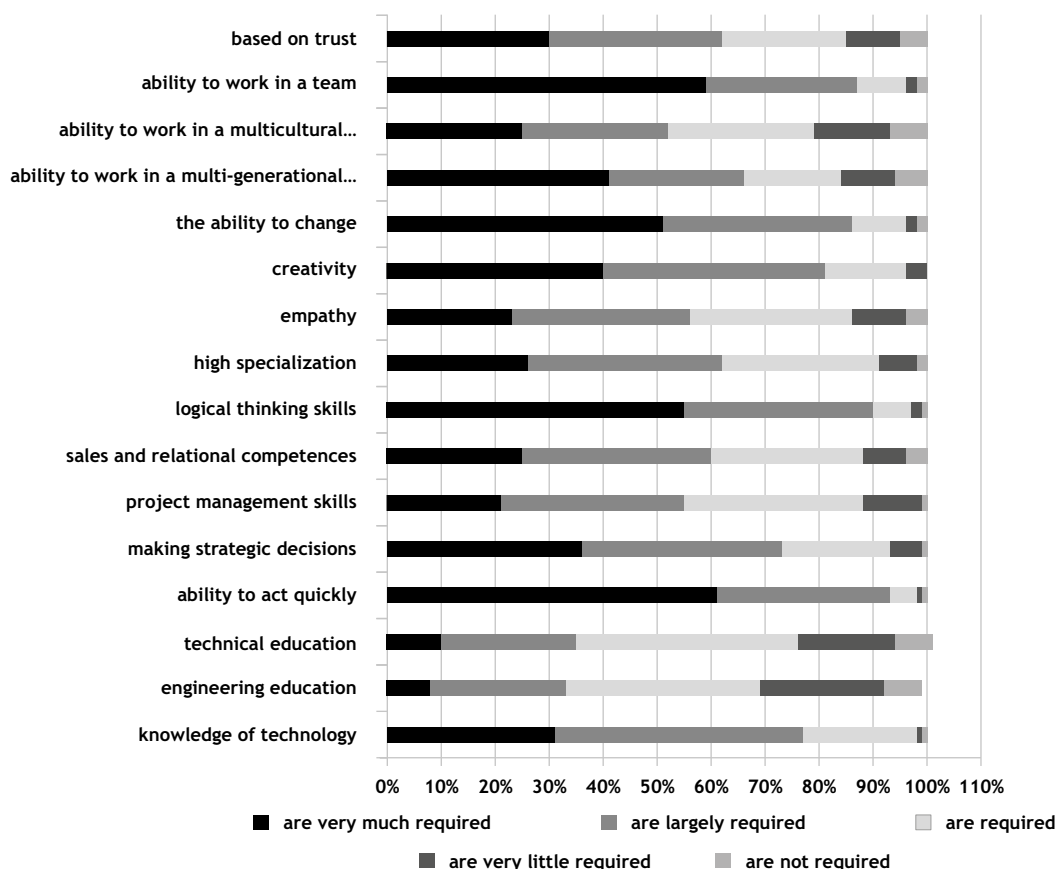


Figure 1. Competencies expected from modern employees in all sectors  
Source: own elaboration

insurance services, trade, and information and communication services, logical thinking was important in addition to prompt action and teamwork. Accommodation and food services valued prompt action, sales and relationship competencies, and team-player skills the most. Other services and manufacturing exhibited some similar trends; prompt action and logical thinking were most appreciated there. In transport and storage, the most demanded features were prompt action, empathy, and team player skills.

The next step was to assess the responses in aggregate. The results have been shown in Figure 1.

As regards all the sectors, the most in-demand competencies were prompt action, logical thinking, team-player skills, and the ability to change. The least important skills were an engineering degree (apart from manufacturing), technical secondary education, project management skills, and the ability to work in a multi-generational environment.

The next research step was to investigate correlations between ranking lists of competencies expected from employees in different sectors in Industry 4.0. The objective was to verify whether the sectors required similar competencies from modern employees. The results have been summarised in Table 4.

The values of Spearman's rank correlation coefficient indicate that there was a strong or very strong correlation

between professional, scientific, and technical services, financial and insurance services, administrative and support services, accommodation and food services, trade, information and communication services, and other services (except for administrative and support services and information and communication services where a moderate correlation was found). It was different for manufacturing and transport and storage services. The relationship between these sectors and the remaining ones was moderate at best. Note that weak or very weak relationship was found in six cases. They were the relationship between a) manufacturing and administrative and support services; b) accommodation and food services and information and communication services; c) transport and storage services and administrative and support services; and d) accommodation and food services and trade. The authors assessed the significance of the Spearman's rank correlation coefficients ( $n=16$ ,  $\alpha=0.05$ ). Its precise distribution was used when testing the zero hypothesis due to the small number of observations. The zero hypothesis was rejected in favour of the alternative hypothesis for all coefficient that showed moderate, strong, and very strong relation in Table 2. This means there was a positive correlation of desirable competencies in individual sectors. If the coefficient indicated a weak or very weak relation, the zero hypothesis was accepted, meaning no correlation.

Table 4. Spearman's rank correlation coefficients for ranking lists of competencies required from modern employees in individual sectors

	A	B	C	D	E	F	G	H	I
A	1	0.902	0.806	0.815	0.904	0.79	0.91	0.545	0.521
B	-	1	0.817	0.713	0.849	0.734	0.926	0.463	0.596
C	-	-	1	0.827	0.699	0.596	0.731	0.249	0.321
D	-	-	-	1	0.768	0.729	0.704	0.184	0.259
E	-	-	-	-	1	0.676	0.849	0.554	0.383
F	-	-	-	-	-	1	0.823	0.202	0.529
G	-	-	-	-	-	-	1	0.471	0.547
H	-	-	-	-	-	-	-	1	0.568
I	-	-	-	-	-	-	-	-	1

Source: own elaboration

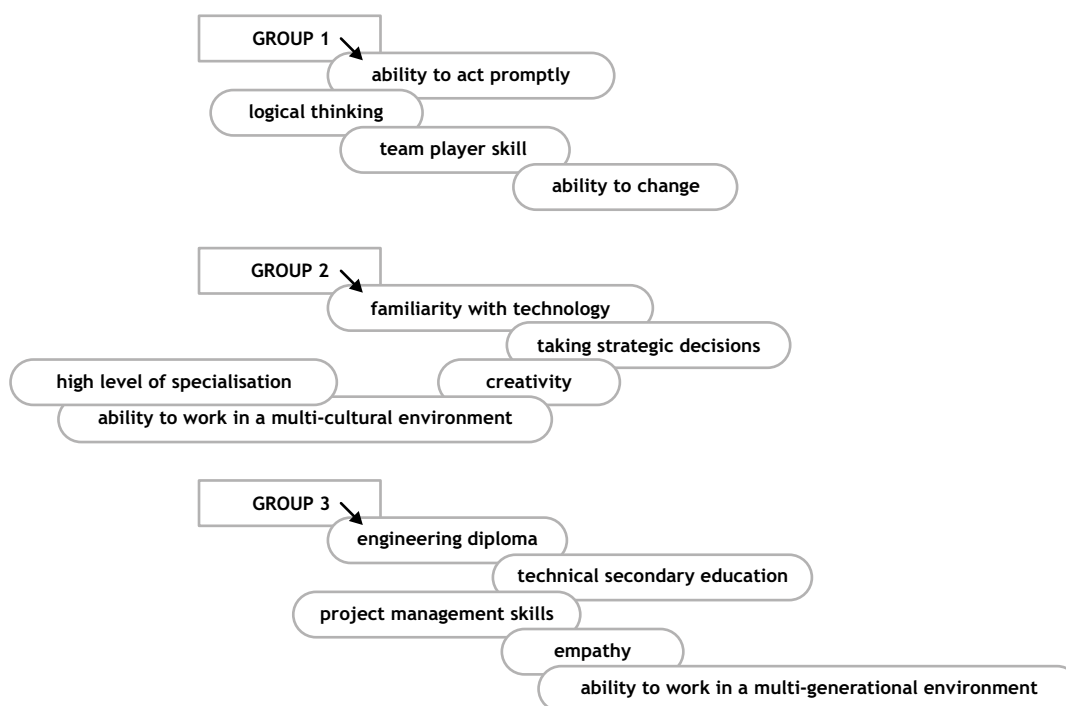


Figure 2. Classification of competences for a modern Employee 4.0  
Source: own elaboration

The next step of the survey was to answer the question whether or not the progress of technology affects the competency profile of the modern employee.

The survey demonstrated that the respondents emphasised the significant impact of the technological progress on changes in the competency profile of the modern employee. As many as 97% of the responses were affirmative. Only five people believed there was no such relation; one from each professional, scientific, and technical services, information and communication services, manufacturing, and two from other services.

The knowledge society and continuous technological evolution result in the necessity to acquire new competencies to be successful and grow. They are called the 21<sup>st</sup> century skills that are believed to require high competencies: higher-order thinking and collaboration together with ICT competencies in technology, teaching, and ethics (Almerich et al., 2020). The analyses suggest insufficient knowledge of the basic notions related to Industry 4.0. It is, therefore, justified to intensify the educational effort in this regard. It is consistent with findings by Hirschi (2018), who believed that digitalisation and



automation of work referred to as the Fourth Industrial Revolution had a tremendous impact on the professional experience of individuals. Surprisingly, the literature does not offer much on the trend.

The present research leads to the conclusion that the most in-demand competencies in the modern economy were prompt action, logical thinking, team player skills, and ability to change. At the same time, engineering diploma and technical education, project management skills, and ability to work in a multi-generational environment have lost their importance. It has been demonstrated that most sectors preferred similar competencies. The only exception is manufacturing and transportation and storage services. The technological progress significantly affects changes in the competency profile of the modern employee in all the sectors. Based on this observation, the authors have built a classification of competences for a modern employee, which has been presented in Figure 2.

The model presented in Figure 2 shows three groups of basic competencies that were identified as desirable in Employee 4.0. The first group contains the most in-demand competencies. The second group includes competencies that are required less than those in the first one. The third group includes competencies the respondents considered required, required to a small extent, or not required. The research suggests that logical thinking, prompt action, collaboration, and ability to change play a very important role in the modern, dynamic labour market. It is, therefore, justified to make an effort to develop these features from the early stages of education.

## Discussion

**W**hen talking about Revolution 4.0, one usually has in mind technologies and machines. In fact, however, the greatest potential lies in people, their qualities and their competencies. This intelligent, progressive transformation of manufacturing is promoting digital business models and processes with widespread implications for employees. It is projected to have a profound impact on both the content of work and the organization of work, which could change the way human capital is used as a growth resource for organizations. Attention is projected to be directed to human creativity as the capital that catalyzes the emergence and spread of Industry 4.0 (Ahmad et al., 2019).

In Poland, as one of the fastest digitalizing economies in Europe, the impact of the digitalization of the economy, state and workforce should strongly influence the character of competences desired on the labor market. Therefore, digital competences gain particular importance. This notion should be understood as a broad set of knowledge, skills and attitudes conditioning efficient and conscious use of new technologies and active participation in the information society. Gudanowska and Kononiuk (2020) indicate that competencies will be important in the digital economy: in the area of information

processing (reviewing, searching, filtering, evaluating, and managing data, information, and digital content); in the area of communication and collaboration (interacting and sharing through digital technologies, engaging in social life through digital technologies, managing digital identity); in the area of content creation (developing and integrating digital content, creating copyright and license content, programming); in the area of security (protection of devices, personal data and privacy, health and well-being, environment); and in the area of problem solving (identifying and solving technical problems, identifying needs for technology use, creative use of digital technologies, identifying digital competency gaps). The conducted research confirms these reports. Additionally, the considerations were enriched with group 1 containing a set of soft competences, which are becoming more and more important. The need to form „Soft” competencies is indicated by Gorustowicz (2019), emphasizing that they are an integral value of an employee.

The research conducted shows that nearly 60% of the respondents do not know the term Revolution 4.0. In connection with the above, recommendations developed by Gudanowska and Kononiuk (2020), which indicate, among others, the need to organize events to increase digital awareness of decision makers, to develop and organize training and incentive system aimed at bridging the digital barriers of different professional groups; to conduct training on basic digital competencies for the elderly and other social groups at risk of digital exclusion, are extremely important for shaping the competence of employees.

## Conclusions

**T**he assumed research goal has been achieved in the work. The impact of Revolution 4.0 on employee competences and the labour market has been analyzed. Answering the first research question, it was found that the transformation contributes to changes in the expectations of employers and the so-called future professional skills. Immediately after the appearance of the concept of Industry 4.0, another term was created – Employee 4.0, who is expected to have specific competencies. In the knowledge-based economy, the competencies of employees gain special importance and mean its usefulness and compliance with the requirements of the working environment. They contribute to successful and positive outcomes at the organizational level. The concept of competence can be seen as a description of an effective result of an action; then one should talk about being competent. The second meaning is the description of specific features defined by the skills that a (competent) employee possesses. In answer to the second research question, the respondents indicated that they do not know the concept of Industry 4.0, while the concept of „future professional competences” is familiar to them. Answering the third research question, it was established that technology



influences the formation of future professional skills. The conducted research made it possible to answer the fourth research question posed, regarding the identification of competencies of Employee 4.0. The most desirable competencies in the modern economy are: quick action, logical thinking, the ability to work in a team and the ability to change. In addition, an engineering degree and technical education, project management skills and the ability to work in a multi-generational environment are also important, but have lost some importance.

A limitation of the research is that a group of random enterprises represented by agents of selected industries has been studied. The results confirmed the findings in other articles and statistical reports, but do not facilitate general conclusions. However, they form the basis for in-depth research on the changes in the labour market caused by Industry 4.0 across the industry.

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## Ludzie i technologia – profil kompetencyjny pracowników Przemysłu 4.0

### Streszczenie

Celem artykułu jest analiza wpływu Przemysłu 4.0 na kompetencje pracowników i zmiany na rynku pracy. Jest on realizowany z hipotezą badawczą, że Przemysł 4.0 wpływa na to, jak kształtują się dziś kompetencje pracowników. Pierwotne badania opierały się na literaturze eksperckiej i analizie statystycznej pozyskanych danych. W badaniu wzięło udział 154 przedstawicieli dziewięciu sektorów. Kwestionariusz przeznaczony był głównie dla firm, które wykorzystują nowoczesne technologie. Relacje zostały przeanalizowane przy użyciu współczynnika korelacji rang Spearmana. Badania prowadzą do wniosku, że najbardziej pożądanymi kompetencjami we współczesnej gospodarce są: szybkie działanie, logiczne myślenie, umiejętności pracy w zespole i zdolność do zmiany. Jednocześnie dyplom inżyniera i wykształcenie techniczne, umiejętności zarządzania projektami i umiejętność pracy w środowisku wielopokoleniowym straciły na znaczeniu. Wykazano, że w większości sektorów przywiązywano wagę do podobnych kompetencji.

### Słowa kluczowe

kompetencje przyszłości, kapitał ludzki, samorozwój, Pracownik 4.0