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THE EMPLOYEE'S COMPETENCES TOWARDS THE POTENTIAL OF AUTOMATED TECHNOLOGIES

A b s t r a c t : In recent years, there has been an increasing interest in the concept of Industry 4.0. Rapid technological progress raises society's fears of how the labour market changes in the era of the digital revolution. More and more activities are performed by machines. As a result, the role of the worker in the digital revolution era is changing and the skills that no machine is able to provide are becoming particularly valuable. The high potential of automation technology has fuelled debate and research by academics, entrepreneurs and politicians. The article presents the idea of Industry 4.0 and the concept of competences. In addition, an important aspect of this study is the notion of automation technologies and their impact on human work. The employee's key competences in the market of the future also constitute an essential element. The article uses both Polish and foreign literature. The data included in the reports presenting the realities of the Polish economy was also important.

The main purpose of the article is to identify the competences of the employee of the future. Moreover, the author attempts to answer the question what the impact of the potential of automation technology on the future labour market is, based on industry reports. The data published in the report "Shoulder to shoulder with robots. Tapping the potential of automation in Poland" created by McKinsey & Company.

K e y w o r d s : Industry 4.0; employee's competences; automation technology.

J E L C o d e: L 21, L 26

INTRODUCTION

Technological progress continues to drive the pace of society's development. It was noticed over time that the technological revolution was divided into four stages, known as the industrial revolutions. Undoubtedly, each of these stages was distinguished by a revolutionary invention [Sima, Gheorghe, Subić, Nancu, 2020, p. 1]. The first industrial revolution was the introduction

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of water and steam powered machines to support mechanical production. A characteristic feature of the latter was mass, assembly line production with the use electricity. In turn, the third revolution is distinguished by the use of IT and electronics for the automation of production [Kaufmann, 2015, p. 4]. The fourth industrial revolution, known as Industry 4.0, is currently under way and this concept mostly is characterized by the implementation of innovative technology [Bendkowski, 2015, p. 23]. The technology includes, among others: robots, big data, Internet of Things, IT systems, as well as augmented and virtual reality [Rodak, Gracel, 2020, *http*].

Moreover, in the era of Industry 4.0, the structures of activity have also changed, especially within the occupations exercised [Beretschek, 2015, p. 4]. People dealing with human resources in the company have to face the challenges of the lack of qualified staff to manage machines or the retention of existing employees in a rapidly developing work environment [Gan, Yusof, 2019, p. 620] Competences of an employee are now becoming an important factor in the labour market. The term "competence" is derived from the Latin word "competentia". This term stands for suitability, as well as compatibility [Gracel, Makowiec, 2017, p. 106]. Taking into account the area of discussion of the article in question, according to B. Gajdzik, "the employee's competences" mean "the scope of employees' eligibilities in the company (organization) to perform the tasks and functions entrusted to them" [Gajdzik, 2014, p. 25]. The reference books contain many definitions of the concept of competence. It applies both to the activities of the organization and directly to people, covering several related categories [Sojda, Lepiarska, 2019, p. 124]. Moreover, publications in the field of management distinguish competences due to innovation [Gajdzik, 2014, p. 29]. They fit perfectly into the idea of Industry 4.0 as a key element of the innovative development strategy [Bieńkowski, 2019]. Innovative competences mean "the ability of employees to behave in innovative situations, learn quickly and solve new problems, i.e. originality in thinking" [Śmid, 2000, p. 160].

Changes are becoming faster and faster, and innovations are one of the elements ensuring the company's competitive advantage [Liczmańska-Kopcewicz, 2018, p. 562]. Business owners must all the more react to challenges and take advantage of possible development opportunities [Grzybowska, Łupicka, 2017, p. 250]. In addition, the growing importance of the automation of production processes is improved by the intelligence of computers and robots. In this way, more and more activities are performed without human intervention. [Beretschek, 2015, p. 4]. This article aims to present the competences of employees of the future and determine the impact of the potential of automation technology on the labour market based on industry reports. The data published in the report "Shoulder to shoulder with robots. Tapping the potential of automation in Poland" created by McKinsey & Company was also used to present the

situation. Employment data has been broken down into ca. 800 professions, further assigned with 2,000 activities and 18 types of skills, for which the potential of work automation was estimated.

1. AUTOMATION TECHNOLOGY

The further development of automation is a strict approach representing the concept of Industry 4.0. [Beretschek, 2015, p. 15]. Therefore, the concept is worth taking a closer look at. The main idea of Industry 4.0 is to "use the processes of industry digitization and automation to transform existing factories into self-controlling and self-adapting social engineering systems (Smart Factories), allowing the creation of smart value chains" [Bendkowski, 2015, p. 22]. The aim primary of Industry 4.0 is to increase the effectiveness and efficiency of activities in the enterprise by the "implanting" of automation technology [Sima, Gheorghe, Subić, Nancu 2020, p. 1]. It should be emphasized that the development of this concept is not only determined by innovative technologies. This is also related to new methods of work organization. Industry 4.0 is changing the perception of the production process as well as the role of man. Due to this, employees are replaced by machines, and their role is transformed into specialists to operate a given technology [Szum, Magruk, 2019, p. 74].

An important factor in the process of technology transfer is the company's ability to assimilate it [Glabiszewski, Zastempowski, 2016, *The Ability to Assimilate...,* p. 61]. The application of innovative technology transfer is a complex and demanding task [Glabiszewski, 2017, p. 397]. The way the enterprise operates, including technology management, requires the introduction of necessary modifications to meet new market expectations [Glabiszewski, Zastempowski, 2017, *The Absorptive Capacity of...*, p. 61]. Innovative enterprises are characterized by the ability to constantly renew their product portfolio in line with changes in the environment. Moreover, they are able to efficiently implement new technologies together with organization methods, what is necessary for an innovative enterprise, due to the changing development goals [Grego-Planer D., Liczmańska-Kopcewicz K., 2015, *Innowacje Sektora MŚP...*, p. 161]. The introduction of new innovations indicates that leading companies react to changes in the environment [Grego-Planer D., Liczmańska-Kopcewicz K., 2015, *Factors, Resources, and Motivators...,* p. 190].

The role of automation is, without any doubt, of great importance for Industry 4.0. Currently, the concept of process automation is closely related to the Robotic Process Automation – RPA. In this case, RPA is "software for coordinating activities between existing applications in the enterprise without human intervention" [McKinsey&Company, 2018, p. 13]. Process automation is a radical step towards replacing the role of a human in processes as well as duplicating

human behaviour in advanced technologies. Piotr Zygmunt[1] claims that due to the still dynamically developing e-commerce industry, one can observe more and more facilities with autonomous cash registers or bots for manning hotlines. Soon, work may also be automated in repetitive activities, such as the settlement of invoices or business expenses. Such processes can be fully automated in the near future [ManpowerGroup, 2019, p. 4]. Thus, process automation can speed up tasks in finance, procurement, supply chain management, accounting, customer service and human resources [Institute for Robotic Process Automation & Artificial Intelligence, 2020]. According to the Astor report, three types of work automation can be distinguished. Each of the following methods differs in the way, nature and type of work. Table 1. presents the above situation, i.e. work automation technologies divided into process robotization, cognitive automation and social robotics.

Table 1. Technologies of work automation

	Robotization of processes	Cognitive automation	Social robotics
Types of tasks	- routine activities - large-scale spread - low complexity	- non-routine activities, - research methods - high degree of complexity - supports decisions	- routine and non-routine activities combined - collaborative technologies
Operating mode	- based on the manual - good chances for further improvement through machine learning	- machine learning - data and human coaches required for learning - hybrid artificial intelligence - deep neural networks	- learning from human interactions and data
Scope of application	- wide range - possible automation of the elements of business processes	- targeted - designed to deliver certain results - focused on specific data sets	- wide range - human productivity can be increased in a variety of activities and in many areas of expertise
Change of the definition of work	- from slight to moderate	- large	- from moderate to significant

Development based on G. Zarkadakis, R. Jesuthasan, T. Malcolm, *Trzy sposoby automatyzacji pracy, Harvard Business Review W stronę Przemysłu 4.0,* https://www.astor.com.pl/industry4/HBRP_ASTOR_w_strone_przemyslu_4_0.pdf, , 2019, p. 25 (15.07.2020).

The most "mature" type of automation is the robotization of processes. It is used in activities related to the introduction or transfer of data from one computer system to another. These activities are performed by people routinely, such as downloading files from e-mail. However, there are systems that can replace

[1] Recruitment Outsourcing Manager, Manpower Group in the report Skills Revolution 4.0.

people even in non-routine, creative and research situations. These features are characteristic of cognitive automation. Thanks to the computing power of the cloud, devices can now recognize content in huge data sets. An example of application are systems that allow the recognition of human speech, image or analysis focused on specific data sets. In turn, social robotics is primarily robots of the next generation. They are mobile and used by people for everyday routine or non-routine tasks.

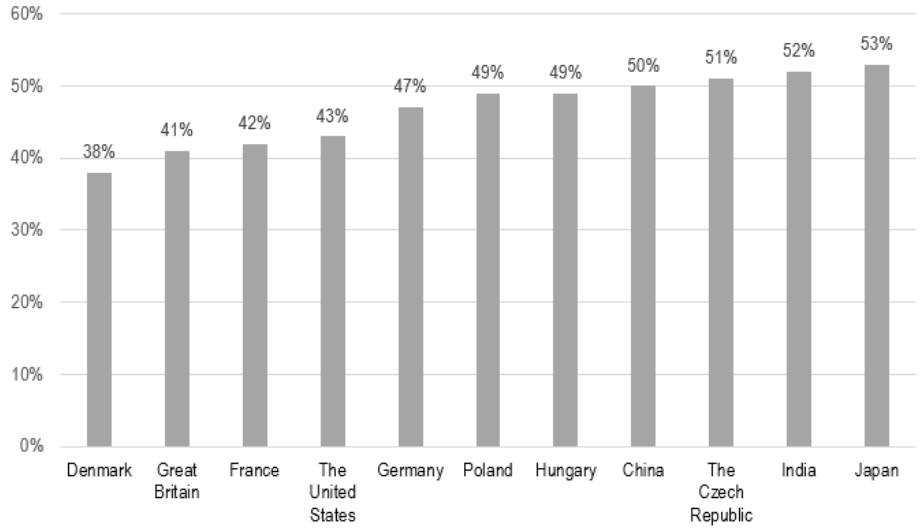
It is worth noting that innovative devices do not necessarily have to be attached to the assembly line. Importantly, these types of robots are capable of interacting with humans in many situations. An example of the use of this type of device are very commonly used, e.g. drones [Zarkadakis, Jesuthasan, Malcolm, 2019, pp. 23–24].

2. POTENTIAL OF AUTOMATION

There are still concerns in the labour market about the high potential of automation. The constant development of technology adds to the growing concern about mass unemployment, which in turn causes social inequality. Such situations have already occurred in history. The situation in the 1980s, when universal access to computers caused a number of discussions among the society may serve as an example. People began to fear the automation of work by computers in both industry and office work. Since the first industrial revolutions, politicians, scientists and businessmen have discussed technological unemployment, as well as the prognosis of job losses. In the following years, the unrest continues to grow, and further theses are presented along with the next digital transformation. Currently, many researchers claim that we are no longer at the stage of automating physical work by mechanization [McKinsey & Company, 2018, p. 8]. Moreover, for the first time the so-called cognitive activities using digital technologies, e.g. problem solving, simple tasks, inference or interaction with the environment takes place [Rachoń, 2018].

McKinsey & Company presented the potential impact of automation in the report "Shoulder to shoulder with robots". Generally, process automation is a global trend, therefore, it is worth paying attention to the potential of work automation in relation to other countries. This situation is presented in Chart 1. The potential of work automation in Poland, compared to other countries in the world, is at an average level of 49% and it is close to the global average of 50%. At this point, Poland exceeds the potential of such countries as Germany (47%) or the United States (43%). A higher level can be found in countries such as Japan (53%) or China (50%).

Chart 1. Shaping the potential of work automation in the world



Development based on the report: McKinsey & Company, *Ramię w ramie z robotem. Jak wykorzystać potencjał automatyzacji w Polsce*, https://www.mckinsey.com/pl/our-insights/ramie-w-ramie-z-robotem, 2018, p. 7 (10.07.2020).

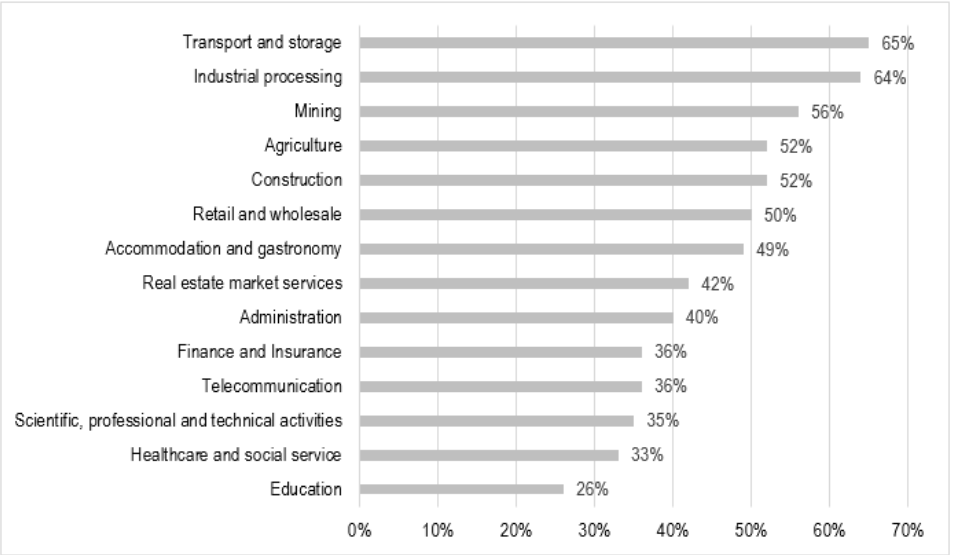
The data contained in the 2019 report shows that in Poland 49% of working time is performed by activities that can be automated by 2030, which is equivalent to 7.3 million jobs. These forecasts are not yet certain [McKinsey&Company, 2018, p. 13]. This is still due to many factors including fear of the potential of technology, security, compliance with traditional rules or sufficient knowledge about technology [Vogelsang, Packmohr, Hoppe, 2019, p. 4939]. The potential of automation is becoming increasingly important in some activities performed at work. The above situation is presented in Chart 2.

According to Chart 2, automation is primarily intended to apply to jobs that perform repetitive activities in a predictable physical and mental environment. Examples of routine activities are welding, packing and invoicing. According to research carried out by McKinsey & Company, jobs with high automation potential are mostly performed by employees with lower education. What is more, they are largely performed by men than women [McKinsey & Company, 2018, p. 4]. There are also activities where advanced technology is not able to fully replace humans. This applies especially to activities in an unpredictable environment, as well as to work that requires knowledge, experience and interaction with other people. In addition, activities in managerial positions are the least potential for automation [Rachoń, 2018]. Furthermore, it is worth seeing how the automation potential is shaped by industry sectors. This situation is presented in Chart 3.

Chart 2. The potential of automation by activities performed at work

Development based on the report: McKinsey&Company (2018), *Ramię w ramie z robotem. Jak wykorzystać potencjał automatyzacji w Polsce*, https://www.mckinsey.com/pl/our-insights/ramie-w-ramie-z-robotem, p. 14 (10.07.2020).

Chart 3. Automation potential by industry sectors



Own development based on: McKinsey&Company, *Shoulder to shoulder with robots. Tapping the potential of automation in Poland*, https://www.mckinsey.com/pl/our-insights/ramie-w-ramie-z-robotem, 2018, p. 14 (10.07.2020).

Chart 3 shows that the significant importance of the automation potential is found in the transport and storage sector (65%), and in manufacturing (64%). Such a percentage distribution means that so much working time is spent on activities that in these sectors are currently performed by employees and in the future may be automated. These include tasks such as: stacking and packing goods on shelves or in transport by autonomous vehicles. In turn, in industries such as mining, agriculture, trade and administration, the automation potential ranges from 40% to 56%. This is due to the still large number of employees employed in these sectors. On the other hand, the lowest automation potential occurs in business services, research, medicine, and education. It is in these industries that direct contact with the client, patient or student takes place. These aspects make automation exceedingly difficult [McKinsey&Company, 2018, p. 16]. It should be noted that in interpersonal relations man has an advantage over machines [Rachoń, 2018].

3. KEY EMPLOYEE SKILLS IN THE FUTURE MARKET

At the Hannover Messe Industrie in 2011, the first concepts for Industry 4.0 were presented. Back then, these solutions were mainly sought in technology. It is worth noting that humans play an equally important role in this process. They are referred to as co-creators and coordinators, as users and innovators [Beretschek I. 2015, p. 11]. The competences of the future should also be considered in terms of how technology interferes with human work and what their relationships are. The breakdown of the technology-human relationship was presented in the McKinsey report, Shoulder to shoulder with robots. These include activities in which [McKinsey&Company, 2018, p. 25]:

- Technology can replace human labour,
- Technology is not a threat to humans,
- The technology is complementary, e.g. advanced data analytics.

Currently, the continuous development of automation technology causes constant changes in various industries. The growing importance of technology makes employers pay attention to certain skills among employees. The key importance are those competences for which automation technologies have no impact on human work. This means that the employee's skills will be difficult to replace by innovative technologies. Such a measure determines the competences of the future [DELab UW, 2018, p. 14].

In that case, it is worth considering what competences of the future will be desirable in the market of the future. The McKinsey Global Institute Report on Automation and Artificial Intelligence outlines a model of skill change up to 2030. This shows an increase in changes in technological skills. The impact on social and emotional skills will also particularly increase. Then, less importance for cognitive skills is predicted [McKinsey Global Institute, 2018]. Table 2 presents the most significant competences of an employee on the future market.

The report on competences of the future, prepared by the University of Warsaw, divides them into three groups, such as cognitive, social and technical.

Table 2. Division of the competences of the future

Technical	Social	Cognitive
• Basic and advanced digital competences • Engineering competences	• People management • Collaboration with other employees • Emotional intelligence	• Creativity • Flexibility • Critical thinking • Problem solving

Own development based on: DELab UW, *Kompetencje Przyszłości. Jak je kształtować w elastycznym ekosystemie edukayjnym?* https://www.delab.uw.edu.pl/wp-content/uploads/2019/09/Kompetencje_przyszlosci_Raport_DELabUW.pdf, 2018, pp. 16-17 (15.07.2020).

Technical skills will still be of great interest. People are needed to understand how high technology works, so that it can be developed, introduced and adapted to given needs. Social skills are equally important competences, as they are difficult to be replaced by machines, especially empathy. What is important in this case is the ability to establish relationships, as well as to sense reactions. In addition, there are cognitive competences called mental competences, requiring the employee to solve more complex problems [D. Zatoński, 2020]. They are especially proficiency in thinking and finding answers outside the box. Moreover, the McKinsey Global Institute report presents competences that will be of less importance in the future. These include physical and manual skills. The demand for these skills continues to decline as automation grows [McKinsey Global Institute, 2018].

SUMMARY

Industry 4.0 contributes not only to technological development, but also to new relationships between people and machines. These relations significantly influence the shaping of competences necessary to perform activities at work [Gracel, Makowiec, 2017, p. 125]. The relationship between man and machine is established by skilled workers who can carry out their supervisory tasks properly and efficiently [Beretschek I. et al., 2015, p. 15]. Generally, in repetitive activities, machines will be perfect, while in making decisions, creating or judging in these aspects, people will still be indispensable. However, there are also activities where technology combines the competences of man and machine. This applies to "teaching" artificial intelligence or interpreting the effects of their work. These relationships will increase people's potential in cognitive or communication aspects [D. Zatoński, 2020].

The aim of the article was to identify the competences of the employee of the future. First of all, they include soft skills, including creativity, empathy,

teamwork, critical thinking, problem solving or the use of technical knowledge through technology. The answer to the question regarding the impact of the potential of technology on the future labour market was also important. On the labour market, this applies to activities in an unpredictable environment, as well as to a profession that requires knowledge, experience and interaction with other people. In addition, the least potential for automation are activities in managerial positions, as well as in research, education and medicine. In interpersonal relations, man has a significant advantage over technology.

It should be added that employees will be able to keep their jobs, but only on the condition of further improvement of qualifications. According to a report prepared by Manpower Group, 90% of Polish companies declare increasing the qualifications of employees by 2020. Enterprises notice that finding the right candidate with an ideal profile is not so easy [Manpower Group, 2019, p. 6]. Currently, an important aspect for employees is stable employment. In the future, having the above skills will be a matter of security [McKinsey & Company, 2018, p. 6]. It is also worth adopting the role and competence of managers in the Industry 4.0 concept in the continuation of research. Especially since their participation is crucial in the era of the digital revolution.

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