DIGITAL SKILLS AND HUMAN RESOURCES: A KEY DRIVER OF DIGITAL TRANSFORMATION IN NORTH MACEDONIA

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Abstract: In times of global digital transformation, the development and application of digital skills is a key factor for the productivity and competitiveness of the employees. This paper analyzes the level of application of digital skills among employees in the Republic of North Macedonia, by investigating their knowledge, abilities, and readiness to use information and communication technologies (ICT) in everyday professional activities. Through a survey, insight is gained into the real situation of digital literacy and the need for training, retraining, and continuous learning. The results show that, although a large part of employees successfully use mobile devices, email, social networks, and basic office applications, there is still a deficit of advanced digital competencies, especially in areas such as software installation, multimedia editing, programming, and cybersecurity.
The paper in detail elaborates the different types of digital skills according to the European DigComp framework and identifies 21 key competencies grouped into five categories. It also reviews global and European initiatives, strategies, and instruments aimed at strengthening digital literacy among people of all ages. The research also points to differences in digital skills based on age, geographical location, educational and socio-economic status. The conclusion points to the need for a systemic approach to digital transformation through educational policies, public-private partnerships, and structured training for employees. The increased involvement of institutions and companies in creating conditions for adapting to the digital society is also of crucial importance. Inclusive economic growth can be achieved, and the challenges of the fourth industrial revolution can be successfully addressed only through the full readiness of human resources.
Keywords: digital skills, digital transformation, human resources, ICT, companies

1. INTRODUCTION

In an era defined by rapid technological progress, changing market dynamics, and the initiated process of deglobalization, digitalization appears as the main challenge in the operation of companies across all sectors of national economies. Namely, the emergence and development of information technology, automatic data processing, and rapid exchange of information have created conditions for the integrating global knowledge, potentially activating all human capabilities in the digitalization process. The application of digitalization, on the one hand, facilitates the use of natural human intelligence, but on the other hand, affects the labor market and the operational functions of companies, impacting organizations across all sectors of national economies.
Practically, the digital economy and digitalization today enter in almost every aspect of people's lives and in all sectors of socio-economic life. Its impact is deep and causing significant changes in the way people work and communicate in the world. Considering different sectors in national economies, digitalization enhances healthcare by improving diagnostics, personalizing treatment methods, and directing administrative tasks, leading to better patient services and outcomes, and reduced costs for healthcare institutions. In the financial sector, digitalization expedites criminal activity detection, facilitates financial transactions, optimizes trading strategies, and provides personalized financial solutions. The manufacturing sector benefits from digitalization through predictive maintenance, control and quality improvement, automation of repetitive tasks, and enhanced efficiency and productivity in work processes. Regarding transport, autonomous cars and smart traffic management systems improve the flow of people and goods, reducing traffic accident risks and pollution, especially in urban areas. In education, digital tools enable personalized learning, facilitating knowledge dissemination and textbook access. Furthermore, in logistics, digitalization significantly streamlines inventory and production processes, improves coordination, communication, and customer support, and enables efficient delivery of materials and finished products. These are only some sectors and advantages enabled by digitalization.

Therefore, due to the significant advantages of this process, widespread digitalization and the creation of a digital economy are rapidly developing, creating new opportunities, but also challenges for professionals, businesses and governments. This approach requires developing specific skills, knowledge, and competencies crucial for success in the digital economy. Therefore, to remain competitive, individuals, companies and organizations in general must invest in continuous learning and develop digital skills to understand the dynamics of digital transformation and overcome new ways of communication and collaboration. In this way, they can use advantage of the opportunities offered by the digital economy and adapt to the challenges of this new era of economic development.
The research aims identify the level of digital technologies applied by employees in North Macedonia. For this purpose, the subjects of research are skills, knowledge, and competencies in the digital economy, as well as digital skills. A survey was conducted to identify the level of digital technologies used and digital skills possessed by employees.

2. DIGITAL SKILLS – CLASSIFICATION AND SIGNIFICANCE

According to various researches in the world and Europe, the level of knowledge, skills, or competencies possessed differs across all countries depending on age, gender, geographical area, and the social and educational aspect among different socio-economic groups of the population. Namely, it is generally known that "younger generations, practically born into the world of new technologies with access to smartphones, laptops, tablets, iPads, and iPods, are readier for new advanced technologies and quickly adapt to changes" (Plowman et al., 2012) compared to middle and older generations. There is also a significant difference between the population living in underdeveloped countries and developed countries, which are leaders and creators of advanced IT. Of course, the differences are also significant depending on whether people live in rural, underdeveloped environments without Internet access and urban environments in certain countries. Of course, belonging to a certain social class also plays a role; it can be said that a large number of people from lower social classes and vulnerable groups in the world still cannot afford access to advanced IT, unlike members of higher social classes.
Although research finds different formulations regarding what is meant by skills, knowledge and competencies depending on when and where they were conducted, it can still be generally said that "this group of knowledge, skills, and competencies includes science, technology, engineering and mathematics (STEM), as well as advanced digital skills in programming and managing advanced IT systems" (Janevski 2022, p. 162). At the same time, it is necessary to raise the level of digital literacy and competence for all citizens in the world, including those in the EU countries and the Republic of North Macedonia, so that they can successfully use digital opportunities as the digitalization process progresses.
In response to the need for a commonly accepted framework for strengthening human capital and promoting citizens' digital literacy, the European Commission first published the European Digital Competence Framework for Citizens in 2013. According to DigComp, which is becoming a recognized basis for developing national digital competence plans and programs in European countries, digital competencies are "competences necessary for personal development and satisfaction, active citizenship, and social inclusion in society and employment.
Due to the rapid development of the digital economy, DigComp concepts regarding competencies have been updated several times, from version 1.0 in 2013, version 2.0 in 2016, to the latest version 2.2 in 2022. Table 1 compares the five competency areas between DigComp versions 1.0 and 2.0 to highlight their differences.

Table 1: Areas of Digital Competence based on version 1.0 and version 2.0

	Competence areas version 1.0	Competence areas version 2.0
Inter-related areas with overlapping points and cross-references	1. Information	1. Information *and data literacy*
	2. Communication	2. Communication *and collaboration*
	3. Content creation	3. *Digital* content creation
Cross-cutting across all areas	4. Safety	4. Safety
	5. Problem solving	5. Problem solving

Source: Vuorikari et al., 2016

DigComp 2.0 classifies the competencies in the five areas in more detail similarly to version 1.0, ranging from 1 to 5. The ordering and updating of the competencies do not arises from a hierarchical approach, but from a conceptual aspect, the need for harmonization, rapid technological changes and the current needs of citizens for a better understanding of programming and coding. The changes made in the first phase of the update are best seen in Table 2, which also provides a clear description of the competencies through the descriptors in versions 1.0 and 2.0.

Within the framework of European initiatives, the European Commission has set ambitious goals for the digital skills and competences of its citizens to be achieved by 2030; specifically, 80% of adults should possess basic digital skills and 20 million employed ICT specialists with gender balance. (Digital skills initiatives, 2023)

The Republic of North Macedonia is gradually introducing digitalization and ranked 63rd out of 134 countries worldwide according to the 2021 DSGI (Digital Skills Gap Index). In 2023, it was on the penultimate place in Europe regarding the digitalization of public services.

To intensify activities for the successful digital transformation of society, the Government of the Republic of North Macedonia considers following European and global trends, which include: integrating digital skills into curricula from primary to higher education; focusing on developing advanced digital skills in areas such as artificial intelligence, robotics, and quantum computing; encouraging cooperation between educational institutions, businesses, and non-governmental organizations; and developing online platforms to connect the supply and demand of digital skills. Innovative approaches are integral to the digitalization process and can be applied through: hybrid teaching models combining online and physical presence; the use of educational laboratories and practical work with new technologies; programs for retraining adults; and mentoring programs connecting experienced professionals with young job seekers. (Government of the Republic of Macedonia, 2023)

Table 2: Comparison of competence descriptors in version 1 and 2

Competences version 1.0	**Competences version 2.0**
1.1 Browsing, searching and filtering information	1.1 Browsing, searching and filtering data, information and digital content
1.2 Evaluating Information	1.2 Evaluating data, information and digital content
1.3 Storing and retrieving information	1.3 Managing data, information and digital content
2.1 Interacting through technologies	2.1 Interacting through digital technologies
2.2 Sharing information and content	2.2 Sharing through digital technologies
2.3 Engaging in online citizenship	2.3 Engaging in citizenship through digital technologies
2.4 Collaborating through digital channels	2.4 Collaborating through digital technologies
2.5 Netiquette	2.5 Netiquette
2.6 Managing digital identity	2.6 Managing digital identity
3.1 Developing content	3.1 Developing digital content
3.2 Integrating and re-elaborating	3.2 Integrating and re-elaborating digital content
3.3 Copyright and Licenses	3.3 Copyright and Licenses
3.4 Programming	3.4 Programming
4.1 Protecting devices	4.1 Protecting devices
4.2 Protecting personal data	4.2 Protecting personal data and privacy
4.3 Protecting health	4.3 Protecting health and well-being
4.4 Protecting the environment	4.4 Protecting the environment
5.1 Solving technical problems	5.1 Solving technical problems
5.2 Identifying needs and technological responses	5.2 Identifying needs and technological responses
5.3 Innovating and creatively using technology	5.3 Creatively using digital technologies
5.4 Identifying digital competence gaps	5.4 Identifying digital competence gaps

Source: Vuorikari et al., 2016

From the above, it can be concluded that numerous global initiatives are underway to improve digital skills and knowledge through the modernization of educational systems, strategies, and action plans aimed at enhancing digital skills, knowledge, and competencies among the wider population. The efforts and approaches to the digitalization process in accordance with the outlined digitalization plan, the implementation of which in our country also depends on many other factors, aim to prepare students, the workforce, i.e. citizens for the digital era, as well as to order to overcome digital inequality and strengthen the country's economic competitiveness.

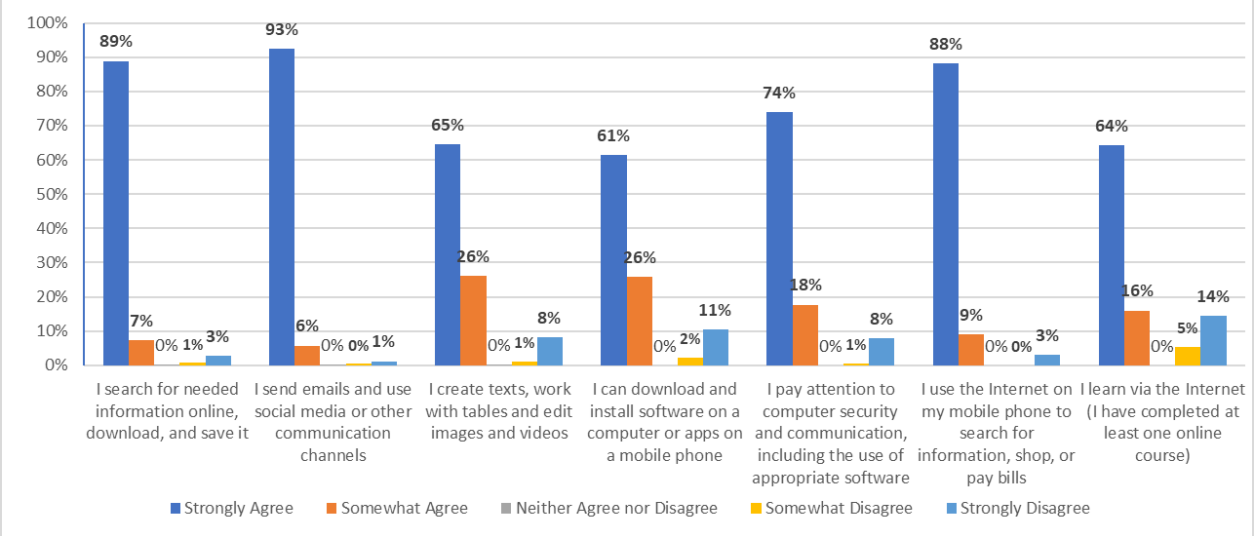
3. IDENTIFYING THE LEVEL OF DIGITAL SKILLS APPLICATION AMONG EMPLOYEES-EMPIRICAL RESEARCH

The digital skills of employees are a key factor for the successful use of ICT in work processes. To identify the level of digital technology use by employees, this survey section analyzed questions about their digital skills. The results on digital skills use among respondents showed that 64% learned online, meaning they completed at least one ICT-related online course, because online education is increasingly accessible and flexible, providing easy access to quality educational materials. This is also a result of the growth of digital learning platforms, the possibility of individualizing learning based on user needs, as well as the global trend of digitalization in education. 14% of respondents do not use digital technologies and do not possess digital skills, indicating a potential unwillingness or unavailability of online training for certain groups. (Graph 1)

Almost 88% of respondents successfully use the Internet via mobile devices to search for information, make purchases or pay bills, because the majority of the population in our country uses mobile devices, offering convenience and ease in their daily digital activities. In addition, the increased use of mobile applications, secure online payment solutions, and stable internet connections allow users to feel secure and efficiently carry out their obligations via smartphones and tablets. This tendency is also driven by the increasing number of digital services, e-commerce, and cashless transactions, which are becoming part of the daily life of the modern user.

A high number of respondents, i.e. 74%, responded that they pay attention to security when working on a computer and communicating, including the use of appropriate software. This indicates that awareness of cybersecurity is constantly growing, especially due to the increased risks of online threats, such as hacker attacks, phishing, and misuse of personal data. Frequent media reports on cybercrime, data theft, and financial fraud, along with educational campaigns on safe internet use, motivate users to take preventive measures. The use of antivirus programs, strong passwords, two-factor authentication and regular system updates are some of the measures that respondents apply to protect their digital activities. The fact that 61% of respondents can download and install software or mobile applications independently suggests that some users still have limited technical knowledge or lack of confidence in performing such tasks. This can be explained by the fear of installing malware, a lack of experience with different operating systems or complex installation processes for certain applications. Some respondents may rely on help from others (professionals, family members) or avoid downloading software due to concerns about device and data security.

Graph 1: Level of using ICT



Source: author's own research

65% of respondents successfully create texts, work with tables or edit multimedia; 26% partially, while 8% do not know how to create texts, work with tables, or edit multimedia. This indicates that there is a certain gap in digital skills among respondents, which may be the result of insufficient training, limited practical experience or lack of need to use these tools in everyday activities. In addition, it can be concluded that although the majority have sufficient knowledge of working with digital tools, a significant part of the respondents still needs additional training

and support to improve their competencies in this area. This data can serve as a basis for creating training and educational programs to develop basic and advanced digital skills.

The high percentage (93%) of positive responses regarding the daily use of email and social networks (owing to the wide availability of the Internet, simplified platform interfaces, and a high dependence on online communication for personal, professional, and social needs) indicates that using email and social networks has become a normal part of everyday life, enabling fast and efficient communication, information sharing, and interaction with various communities.

The results show that 89% of the respondents successfully search, download, and save information on the Internet, which indicates a high level of basic digital literacy. This means that the majority of respondents have the ability to use search engines, filter relevant data, and manage digital resources in an organized and efficient manner. Only 3% of the respondents expressed strongly disagreement, indicating that a very small percentage of people still have challenges navigating the digital environment.

Based on this data, it can be concluded that companies should provide structured training programs aimed at improving advanced digital skills, such as multimedia creation, technical support, and cybersecurity. HRM plays a key role in providing resources and tools for these programs. Given that only 64% of respondents have completed an online course, HRM should promote a culture of lifelong learning through online platforms. This will encourage employees to engage in training and improve their competencies.

4. DISCUSSIONS

Based on relevant academic sources, the digital transformation significantly impacts the labor market and jobs. Almost 40% of existing jobs in the United States are in professions likely to be reduced by digital transformation, and the situation is similar in other countries. This means that worldwide by 2030, between 75 million and 375 million employees will need to change their occupations and skills and knowledge to avoid unemployment; this should be understood as an alarm. This means that digital technologies are likely to change and disrupt companies in the future, threatening millions of jobs in the medium and long term. Therefore, it is necessary for companies and employees (i.e., human resources), to prepare for digitalization and to improve their skills, qualifications and knowledge of digital technologies by studying their basic principles and becoming familiar with their application (Janevski, 2022, p. 40).

Digital transformation is not only a technological process but also a way of thinking that cover all aspects of an organization. It is a strategic tool for growth and development, an instrument for innovation, improving operational efficiency, and reducing costs (Masit, 2020).

However, the digitalization process of companies depends on the economic situation of the country or region, and the size of the companies. Smaller companies tend to be less digitalized, which affects their employees. (EFAD, 2024). In the context of these findings, it is advisable for organizations to invest in the development of digital skills among their employees, to adopt flexible working models and to encourage lifelong learning. This will enable them to adapt better to changes and increase their market competitiveness.

Digital transformation offers significant opportunities to improve work processes, but it also requires a proactive approach regarding education, adaptation and change management (Klisaroski & Angelova, 2025).

5. CONCLUSIONS

Companies should invest in developing digital skills and adapting employees to new technologies. Continuous investment in education and science is necessary. The possibility of flexibility in the workplace is also of great importance and therefore they should introduce hybrid and flexible working conditions to improve the balance between professional and private life. Government institutions and educational centers should develop digital literacy programs for different professional groups. The workforce should be prepared for the transition to new professions through retraining and continuous learning. Companies should collaborate with educational institutions to create programs that prepare employees for the new roles resulting from digital transformation. They should also consider the ethical aspects of automation to minimize the negative impact on employees. Companies that consider ethics when introducing technology gain a higher level of trust from their employees. Therefore, employers should establish clear policies to support employees who lose their jobs, such as financial compensation and retraining programs. Governments and businesses should continue monitoring the latest trends in technology and their impact on the labor market to make informed decisions.

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