# The Importance of Digital and Soft Skills in the Digital Age

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Abstract: In our digital age, the effects of digital transformation, the scope and speed of current changes, and the emergence of digital technologies have led to a radical transformation of workplaces, resulting in a reduction of demand for employees carrying out routine, manual tasks, while evokes a need for digitally-skilled employees emphasising the importance of digital and soft skills for business growth. Organisations need to equip their employees with different types of skills to achieve organisational goals in order to benefit from investments in digital technologies. While practitioners and academics are increasingly focusing on the importance of the human factor of digital transformation processes, there is limited knowledge about the impacts of digital transformation on the digital skills of the employee and how organisations can guide employees through the digital transformation journey, yet. This study provides an important insight into a specific country's context, which has not been sufficiently examined. This paper aims 1) to investigate how the digital transformation has changed the demand for human workforce (Q1a) and the challenge in the lack of digital skills (Q1b) and 2) to examine the importance of soft skills as an impact of digital transformation (Q2). The target group of the research is the managers and white collar workers of Hungarian manufacturing companies. The data collection was in spring 2021. Descriptive statistics and relationship analyses (Cramer's V and Kendall's Tau) were used to analyse the collected data (n=489). The research investigates an important social-digital phenomena determining how digital transformation arises significant demands on digital and soft skills. Results indicate that digital and soft skills such as critical thinking, complex problem solving, adaptability, resilience and creativity are essential to successfully exploit the digital transformation. The result can add value and stimulate new research on digital and soft skills and provide a useful benchmark for other countries.

Keywords: Digital transformation, Digital skill, Soft skill, Manufacturing, Hungary

#### 1. Introduction

By digitising industrial processes, organisations are able to easily enhance their performance, but are facing significant challenges with regard to the management of human resources. The use of digital technologies can be viewed from a technical preparation and knowledge standpoint (digital competence) or an equipment usagerelated behaviour standpoint (digital attitude). Difficulties concerning the digital competences of employees include the use of digital technologies, the understanding of the opportunities and hazards of the Internet and communication via electronic media. Individuals must be able to use digital technologies for a given purpose in a conscious, productive manner. Digital attitude refers to employees' behaviour and mindset with regard to the responsible use of available information and digital technology and collaboration with smart technologies. The challenge, however, is that in the absence of information and digital competence, employees become fearful of losing their jobs to digitalisation. Although digital technologies are able to replace human labour, this is not true in every situation. Training and continuous education will play a significant role, as people now performing tasks subject to automation will be moved to new areas, where they can produce more added value, which, however, will require employees to have the appropriate mindset. Numerous academic studies have highlighted that the biggest challenge of digital transformation for many organisations is to find ways to develop their employees' digital skills and competence (Kane et al, 2019; Dery et al, 2017). Human labours need to be up-skilled to use digital technologies autonomously, to perform value-adding tasks in production and to collaborate with an autonomous employee (Longo, 2020). At the same time, digital skills and competence alone are not enough, other soft skills will also be needed. Research by leading consultation companies, like World Economic Forum (2020) indicates that most organisations require skills such as critical thinking, complex problem solving, adaptability and resilience (Trenerry et al. 2021). The era of digital transformation is therefore creating a demand for a digitally-skilled employee, emphasising the importance of digital and soft skills (Scuotto et al, 2021).

Our research complements existing research in several ways. The paper contributes to the emerging but still limited literature investigating the human workforce needs related to the digital transformation of Hungarian companies. Second, this study aims to analyse the importance of soft skills for digital transformation.

This paper thus contributes to the debate by exploring the relationship between digital and soft skills that together can shape the organisational success of digital transformation. Finally, our findings have policy implications. The paper describes the key soft skills that universities need to focus when designing study programmes and student learning objectives. Universities need to prepare their students to be future-ready for the challenges posed by digital transformation.

The rest of this paper is organised as follows. Chapter 2 provides an overview of digital transformation, digital skills and soft skills. Chapter 3 describes the research methodology. This is followed by the section on the results of the research (Chapter 4). Finally, in Chapter 5, we discuss the implications of our results for practitioners and highlight the limitations of our study.

# 2. Theoretical Background

## 2.1 Digital Tansformation

The industrial revolutions of the last three centuries have had a major impact on the social characteristics of today. New technologies and new ways of perceiving the world have triggered profound changes in economic systems and social structures (Schwab, 2016). From the steam engine of the 1760s onwards, technology has evolved exponentially, constantly improving itself and acting as a kind of recursion, where new technologies have been created based on the old ones. Schumpeter explained this phenomenon in terms of innovation waves (Figure 1), explaining that each innovation wave does not last in the same way and is shortened due to the rapid development of new technologies (Jovanović et al., 2018).

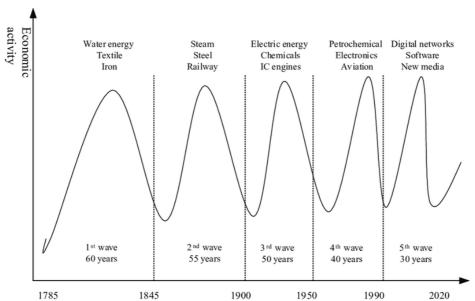


Figure 1: Schumpeter's Long Waves of Innovation. Source: Jovanović et.al, 2018

We are now in the 5<sup>th</sup> wave of innovation, where digital technologies are becoming the driving force for change. One of the most important revolutions in modern business is the shift from traditional to digital business models, i.e. digital transformation to achieve higher levels of competitiveness.

Digital transformation is "a fundamental change process, enabled by the innovative use of digital technologies accompanied by the strategic leverage of key resources and capabilities, aiming to radically improve an entity (...) and redefine its value proposition for its stakeholders" (Gong and Ribiere, 2021).

In this fifth wave of innovation, three eras of digital transformation can be distinguished.

- Digitisation: involves the migration of processes and systems (e.g. paper-based) to a digital platform. Digitisation is the process of converting data previously captured on analogue media into a form that can be interpreted by computer systems using a digitisation tool.
- Digitalisation: refers to the further integration and optimisation of digital technologies and IT capabilities to improve processes and services. In the case of digitalisation, automation through digital technologies (e.g. robotics or artificial intelligence) enables higher levels of productivity, more

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- efficient, safer and more convenient operations (Company and Manyika, 2017), and transforms the world of work, creating new types of digital/virtual work (Valenduc and Vendramin, 2017).
- Digital transformation: refers to the systemic and extensive use of digital technologies (Verhoef et al., 2019).

The impact of digital transformation have led to a significant change of working environments, a decreasing need for employees performing manual tasks (Bertani et al., 2020; Szabó-Szentgróti et al. 2021), while the need for digitally trained employees is steadily increasing (Kozanoglu and Abedin, 2020).

#### 2.2 Digital Skills

Digital competence is about the ability to apply digital skills (knowledge and attitude). "It involves the confident, critical and responsible use of, and engagement with digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking" (European Commission, 2019).

Sufficient proficiency in the use of digital technologies is a key competence not only for those in the IT sector, but for all citizens. There are multiple methods available to determine the level of digital competence (Morrison and Rooney, 2017; Gekara et al., 2019). The first edition of the European Digital Competence Framework for Citizens (Ferrari, 2013) was published in 2013, and has since been revised twice. The reference material, which describes the areas and levels of digital competence, outlines eight incremental levels in the development of digital competence (Carretero, et al., 2017). Hiring, finding and developing an employee with digital competence often pose major challenge (Karacay, 2018) and the issue is of the highest priority to the European Union. In 2022, only 54% of Europeans possessed basic digital skills, and less than one-third (26%) advanced digital skills, which means that the majority of the EU population still do not possess an adequate level of digital competence, even though most companies and vacant positions do specifically require such competence. The DESI 2022 index, used to assess the development of the digital economy and society, places Hungary at the 22nd place. Less than half (49%) of the Hungarian population have at least basic digital skills.

# 2.3 Soft Skills

Digital transformation requires not only digital skills and competence, but also other key individual traits from employees (Dremel et al., 2017). Specific expertise is losing significance, while the value of adaptive employees with a diverse range of skills and expertise is growing (Kergroach, 2017). The World Economic Forum (2020) considers the following to be the most desirable competencies in the era of Industry 4.0: complex problem solving, critical thinking, creativity, human resources management, coordination, emotional intelligence, judgement and decision-making, service-orientation, negotiation and cognitive flexibility. Organisations are also facing challenges in the retraining and further education of employees, as these require existing skills such as critical thinking, complex problem solving, adaptability and resilience (Trenerry et al. 2021). In this technology-driven environment, "soft" skills, such as problem solving and creativity, are becoming increasingly important (Grundke et al., 2018). In their study, Chuang and Graham (2018) have emphasised that in addition to the increasing need for specific skills, certain fundamental soft skills of employees, such as problem solving ability and critical thinking, are being highlighted. In the course of our research, we examined the following soft skills:

- Complex problem solving: problem solving skill is a combination of cognitive and motivational
  processes applied in various situations and tasks; as an ability, it allows an individual to accomplish
  goals that could not be achieved through simple, well-known routine or algorithms (Dossey, et al,
  2000).
- Critical thinking: a set of situation-dependent general cognitive skills; a process of purposeful, self-regulatory judgment and evaluation, in the course of which the individual employs cognitive capabilities and strategies to increase the probability of a desired outcome, decision (Facione, 1990).
- Adaptability: includes the ability to adapt to change, i.e. to various roles and workplace duties, and the ability to perform effective work under shifting priorities (Binkley et al., 2012).

<sup>&</sup>lt;sup>1</sup> https://ec.europa.eu/newsroom/dae/redirection/document/88704

- Creativity: the skill/ability to create; it is a unique alignment of personal attributes, mental and practical skills and includes all temperaments and factors of the personality that allow for creation. It is also apparent in behaviour and conduct (Binkley et al., 2012).
- Resilience: the ability to remain flexible and composed in case of shock, which ensures functional survival (Block Block, 1980).

# 3. Research Methodology

This paper aims 1) to investigate how the digital transformation has changed the demand for human labour (Q1a) and the challenge in the lack of digital skills (Q1b) and 2) to examine the importance of soft skills as an impact of digital transformation (Q2).

In the course of our research, we aimed to find answers to the following questions:

- Q1. How has digital transformation changed
- Q1a. the demand for human workforce and
- Q1b. the challenges posed by the lack of digital skills of the employees?
- Q2. What has been the impact of digital transformation on the importance of soft skills?

Based on the literature and existing research, we have made the following hypotheses:

H1a. Digital transformation has reduced the demand for human workforce.

H1b. Digital transformation has intensified the challenge posed by a lack of digital skills of the employees.

H2. A list of soft skills can be determined, which are important factors as an impact of the digital transformation.

#### 3.1 Data Collection

The data used in the analysis are from primary sources, from an online questionnaire survey conducted in the spring of 2021 (Obermayer et al., 2022). Questionnaires have been completed by managers and white-collar employees of Hungarian organisations. We have invited more than 50 000 companies to complete our questionnaire; we have queried their e-mail addresses from the database of Bureau van Dijk Orbis<sup>2</sup>. We have selected the target group based on two criteria: firstly they must be Hungarian enterprises, secondly they must be manufacturers. The questionnaire has contained the following parts:

- Introduction, experiencing/perceiving digitalisation (24 questions)
- Digital toolbox / Industry 4.0 and its applications (26 questions)
- Human-machine interface (trust and fear) (19 questions)
- The supporting role of leadership (9 question)
- Organisational culture learning organisation (9 question)
- General questions (5 questions)

Table 1: Relevant Questions of the Part I. and II. of the Questionnaire

Category	Variables	Questions Answers and associated codes							
		How has digital transformation organisation?	tion changed the following factors in the						
		Demand for human workforce	1: significant reduction						
ı			2: moderate reduction						
	1		3: moderate increase						
			4: significant increase						

<sup>&</sup>lt;sup>2</sup>https://www.bvdinfo.com/en-gb

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Category	Variables	Questions	Answers and associated codes				
		The challenge presented by a lack of digital skills of the employee	1: did not increase at all				
			2: minor increase				
	2		3: significant increase				
			4: total increase				
		What has been the impact of digital transformation on the importance of the following soft skills?					
	3	Adaptability	1: not important at all				
п	4 Creativity		2: more likely to be unimportant				
	5	Critical thinking	3: more likely to be important				
	6	Complex problem solving	4: very important				
	7	Resilience					

## 3.2 Sample

There were 489 evaluable responses in the sample (n = 489). 11% of respondents were white-collar employees, 89% were management (72% senior management). We have determined the size of the organisations based on the number of their employees (Figure 2): half (53%) of respondents were small organisations with 11-50 employees, 20% were medium-sized organisations with 51-250 employees, 17% were micro-organisations with no more than 10 employees, and 10% were large organisations with more than 250 employees.

Due to the predominance of micro, small and medium-sized organisations (SME), the sample was representative of the Hungarian corporate sector as a whole.

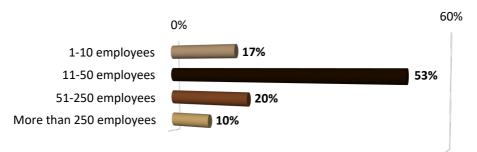


Figure 2: Distribution of Employee Numbers (%)

#### 3.3 Analysis

Kendall's Tau coefficient ( $\tau$ ) is suitable for investigating our correlations; it may assume values in the interval [-1, 1] interval. Results are provided at the 5% significance level. If the p value of V or  $\tau$  is less than 0.05, the correlation between the two variables shall be considered significant. The absolute value of significant results describes the strength of the correlation (Sajtos and Mitev, 2007): 0: no correlation; [0, 0.2]: weak correlation; [0.2, 0.7]: medium correlation; [0.7, 1]: strong correlation; 1: deterministic correlation. Since  $\tau$  can be both positive and negative, the associated sign is also relevant, as it determines the type of the relationship. A negative (positive)  $\tau$  value means that the higher the level of one variable, the lower (higher) the level of the other.

## 4. The Results of the Research

#### 4.1 General State of Affairs

We have examined mode, means and relative standard deviation (RSD). The results are summarised in Table 2. We have marked the columns of the table with a light brown (low value) to dark brown (high value) colour scale.

**Table 2: Descriptive Statistics** 

Cat.	Var.	Questions	Mode (1-4)	Mean (1-4)	Relative standard deviation (%)				
		How has digital transformation changed the following factors in the organisation?							
	1	Demand for human workforce	2	2.15	26.55				
ı.	2	The challenge presented by a lack of digital skills of the employee	3	2.70	27.96				
	What has been the impact of digital transformation on the importance of the following soft skills?								
	3	Adaptability	4	3.52	19.01				
II.	4	Creativity	4	3.54	19.46				
	5	Critical thinking	3	3.19	24.05				
	6	Complex problem solving	4	3.61	17.31				
	7	Resilience	4	3.47	20.60				
	Cole	our scale interpretation for each column: lower			higher value				

The majority of the answers have assigned similar importance to certain soft skills (questions 3-7). The majority of the respondents considered all soft skills either very important (answer 4) or important (answer 3). The answers 'mean points to the same conclusion, as the opinions of respondents do not deviate much from the mean (relative deviation is less than 30%).

The following figure (Figure 3.) illustrates the answers to the question of how digital transformation has impacted the demand for human workforce at the organisation. The results show that 21% of respondents believed that the demand for human workforce has increased at the organisation, while 79% indicated a rather moderate decrease in the demand for human workforce.

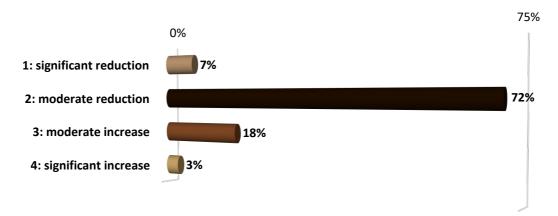


Figure 3: Demand for Human Workforce

The majority of respondents have considered the lack of digital skills to be a major challenge. 95% of respondents believe that the significance of the challenge has: somewhat increased (33%), greatly increased (49%) or absolutely increased (13%) due to the lack of digital skills of the employee.

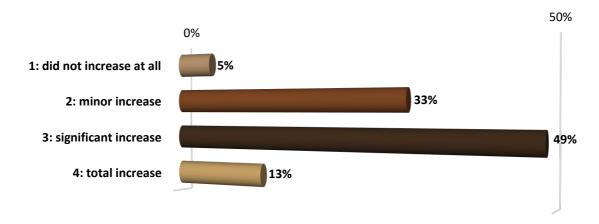


Figure 4: The Challenge Presented by a Lack of Digital Competence of the Employee (no. of Persons)

We also examined the importance of soft skills. The more important a skill, the darker brown the background colour. The majority of respondents have considered all soft skills to be very important (or important). Based on the mean from Table 2, the most important soft skill is complex problem solving, the second most important is creativity, then adaptability, followed by resilience and, in last place, critical thinking.

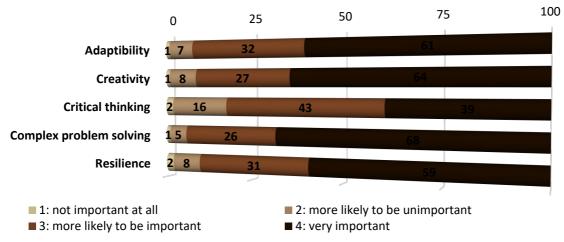


Figure 5: Importance of Soft Skills (%)

#### 4.2 Correlation Analysis

The diagonal sections of Table 3 show the deterministic correlations with a black background, which means that each variable is in perfect correlation with itself. As for the empty cells, there we have found no significant correlation.

Table 3: The Significant Kendall's tau ( $\tau$ ) Correlations

	Variables		I.  How has digital transformation changed the following factors?		II.				
Cat.					What has been the impact of digital transformation on the importance of the following soft skills?				
			1	2	3	4	5	6	7
I.	1.	Demand for human workforce				0.119	0.109		

	2.	The challenge presented by a lack of digital skills of the employee			0.146	0.118	0.116	0.119	0.108
	3.	Adaptability		0.146		0.407	0.272	0.413	0.271
	4.	Creativity	0.119	0.118	0.407		0.476	0.502	0.414
II.	5.	Critical thinking	0.109	0.116	0.272	0.476		0.405	0.395
	6.	Complex problem solving		0.119	0.413	0.502	0.405		0.474
	7.	Resilience		0.108	0.271	0.414	0.395	0.474	

Weak	0 <	[T]	≤ 0.2
Medium	0.2 <	[T]	≤ 0.7
Strong	0.7 <	T	< 1
Deterministic		[T]	= 1

Among significant correlations, cells with a light brown background indicate weak, those with a darker brown background indicate medium correlation (we have found no instances of strong correlations). All  $\tau$  values are positive, which means that where the answer to the question had a higher code assigned to it, respondents to the questionnaire were also assigned higher codes. Based on the results of the correlation analyses, the changes resulting from digital transformation (Category I., variables 1-2) have shown significant (weak) correlation with the importance of soft skills (Category II., variables 3-7):

- The more the demand for human workforce (variable 1) resulting from the digital transformation grew, the more important employee creativity (variable 4,  $\tau$  = 0.119) and critical thinking (variable 5,  $\tau$  = 0.109) became.
- The greater the challenge posed by the lack of digital skills of the employee (variable 2), the more important all soft skills became.

In Category II. (variables 3-7), all correlations were significant at a medium level.

- The more important one soft skill, the more important another.
- The strongest correlation was between the importance of creativity (variable 4) and complex problem solving (variable 6) ( $\tau$  = 0.502).

This means that of the 5 skills examined, if one was more important, the other would be more important as well.

## 5. Summary and Conclusions

The purpose of the research was to investigate how the digital transformation has changed the demand for human workforce (Q1a) and the challenge in the lack of digital skills (Q1b) and to examine the importance of soft skills as an impact of digital transformation (Q2). There were two main research questions, the first was descriptive and the second was related to relationship analysis.

The first hypotheses were: H1a. Digital transformation has reduced the demand for human workforce. H1b. Digital transformation has intensified the challenge posed by a lack of digital skills of the employees. Based on the analyses, we have accepted hypothesis H1a. and found that they correspond to the theory put forward by Bertani et al. (2020) and Szabó-Szentgróti et al. (2021), as they determined a decreasing need for employees performing manual tasks. Based on the findings, we have accepted hypothesis H1b. Our results are consistent with the findings of past research (Karacay, 2018) in that one of the most significant challenges during digital transformation is that organisation do not have or cannot find employees with appropriate digital skill.

The second hypothesis was: H2. A list of soft skills can be determined, which are important factors as an impact of the digital transformation. Based on our results, we have accepted hypothesis H2. We can conclude, that critical thinking, complex problem solving, adaptability, resilience and creativity, as soft skills, are important

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factors from a digital transformation perspective. Our findings are consistent with past research, Trenerry et al. (2021); Grundke et al. (2018) and Chuang-Graham (2018).

The results of the relationship analyses shows that these soft skills are very important as companies need to ensure that their human labour has the right skills for digital transformation. Our finding is outstanding because a coexistence can be observed regarding the soft skills. That is why it is necessary to focus on the appropriate training and upskilling of the human labour.

## 5.1 Practical Implication

During digital transformation, it is particularly important that employees are able to acquire and develop digital competencies and decisive soft skills. Digital transformation means challenge, change and uncertainty for both the organisations and their employees. Organisations struggle to be competitive, and are therefore looking for employees with high adaptability. Resilience and adaptability are relevant skills, as they are both linked to adaptation and coping with significant change and difficulties. Employees with such skills are more successful during the transformation, as they prove to be more proactive and take on more responsibility with regard to adaptation to evolving situations. Organisations that develop and involve their employees have the advantage of being able to automate knowledge. Further education is an important precursor of digital transformation considering that, according to our findings, the more and more digitalised work environment demands both digital competence and soft skills from employees. A key factor in the future successful implementation of digital transformation is providing digital attitude training to employees, which prepares them to accept the usage of complex digital solutions. The organisation is responsible for providing its employees with sufficient information and education, and therefore for alleviating resistance to adaptation. Based on the results of prior studies, we have developed a digital identity development program focusing on preparing employers and employees for collaboration with digital technologies during the digital transformation. The final program is a postgraduate course recommended for business partners, enterprises and individuals.

## 5.2 Limitation and Futures Studies

The current study has some limitations. The survey's result was based on a Hungarian sample of manufacturing companies. As further research, other countries from the European Union should be analysed focusing on those where the DESI index is higher. In the future we plan to expand our study to a qualitative research to get more deepen insights. A case study methodology would allow exploring the topic.

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