DIGITAL SKILLS OF EMPLOYEES - DESIRED VERSUS ACTUAL

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This paper is an output of the projects: VEGA no. 1/0188/24 Hybrid work regimes as a result of companies learning from the crisis and the implications of their implementation for the people management; and VEGA no. 1/0328/21 Post-pandemic business management: identifying temporary and sustainable changes in sequential and parallel management functions in the context of the COVID-19 pandemic.

Abstract: The aim of our research was to investigate the actual level of digital skills and the level required to practise a profession, to identify significant differences and to suggest appropriate training methods. The research was conducted by questionnaire among respondents from Slovakia, the Czech Republic and Spain. The results of the research show that employees do not reach the level of digital skills required by employers, the expectations of the highest level of skills were in the field of cyber security, where statistical significance between the desired and actual value was also demonstrated. There was no statistically significant dependence of respondents' skill level on education or job position.

Keywords: digital competences, literacy, skills, learning needs, education

1 Introduction

The competitiveness of European industry depends on its ability to cope with the transition to digitalisation and innovation. All processes implemented must ensure sustainability. In line with these needs, Europe's priorities are also set, where it is expected to ensure Europe's technological sovereignty and transform itself into a digital, technological and industrial leader with the strengthening of the EU single market. In conceiving the research design, we have drawn on the European Union's commitment and the European Commission's 2016 Digitising European Industry initiative.

A special report by the European Court of Auditors concludes that EU businesses are not taking full advantage of the innovation benefits of advanced technologies. Digitalisation is supposed to be the key to better business performance. The Commission's actions within the framework of the adopted strategy, where the establishment of European Digital Innovation Hubs and the setting of conditions for the 2021-2027 programming period (ECR, 2024) are considered highly effective, are to be highly commended. Governmental materials have been adopted within the individual Member States, for example the 2030 Strategy for Digital Transformation and the action plans ensuring digital transformation.

Through empirical research, we want to contribute to information identifying the gap between actual digital skills and the required digital skills for a selected group of professions. We draw on the European Digital Competence Framework (DigComp) and the description of learning outcomes in terms of Bloom's Taxonomy in five domains of digital skills and competencies to construct the research and build our hypotheses.

2 Theoretical background

The pressure to digitise, which involves not only acquiring new IT equipment and systems, but also exploiting the opportunities presented by new technologies, is enormous. The transition to a digital economy requires companies to adapt to new business models and global trends, bringing much greater control over products, while offering greater opportunities to tailor products to increasingly individual customer requirements.

Digital transformation, which involves all kinds of industries and economic sectors, is essential to keep many businesses competitive. As part of the ongoing digital transformation of the economy and society, the industrial society is transforming into an information society (Stareček et al., 2023) and subsequently into a knowledge society. Organizations that are unable to meet the timely and harmonized adoption, implementation, and use of technology solutions will not thrive or, in the worst case, will not survive. Measuring the extent of the digitalisation of industry in the EU has been monitored by the European Commission since 2014 through the Digital Economy and Society Index (DESI), which summarises five[1] indicators: connectivity, human capital, use of supported services, integration of digital technologies and digital public services, thereby tracking Member States' progress in digital competitiveness (European Commission, 2023).

2.1 Literature review

While information and communication technologies (ICT) is the foundation of innovation, it starts with people, making human capital critical within intellectual capital. Human resources and competencies are the most valuable capital in society, a source of created value and sustainable competitive advantage in a dynamically changing environment (Kowal et al., 2022). The real challenge of digitalization is not the technology, because the introduction of new technology in the workplace is not just about hardware and software, but about the workforce having to adopt it, learn how to use it, and change their behaviour (Bala & Venkatesh, 2016; Colbert at al., 2016).

The digital revolution is fundamentally affecting the labour market. The use of digitalization, automation and robotization is gradually changing job roles, new forms of employment are emerging, and employers' requirements for employee competencies are changing (Kotíková et al., 2019). The necessary knowledge, skills and attitudes are required to successfully manage changes in labour market status in order to maintain current living standards, promote high levels of employment and cultivate social cohesion with a view to the future society and the world of work (Európsky parlament, Rada a Komisia; 2017). Digital literacy, i.e. the demonstrable ability to confidently, critically and responsibly use digital technologies to work in a digital society, becomes a prerequisite for an individual's employability, thereby increasing their chances of getting a job, keeping a job, or transitioning to another job. In addition to the effective use of digital technologies, there is a need to build awareness of basic literacies in the areas of cyber security, media literacy, and the ability for increasingly necessary digital hygiene (Mirri.gov.sk, 2022).

The process of digital transformation requires skills and knowledge that enable users to extract and exchange data, analyse it and transform it into useful information (Štaka at al., 2022), which means that almost all jobs require some level of digital skills and knowledge (Ananiadoui & Claro, 2009). As a result, employers increasingly demand knowledge workers who are highly skilled (Kefela, 2010) and are an increasingly important strategic resource for them (Middleton & Hall, 2021).
Digital technologies used in the workplace are increasingly advanced and digital literacy skills have become critical skills in the digital age (Nikou et al., 2022). These are mastery of ICT applications to solve cognitive tasks at work; skills that are not technology-based as they do not relate to the use of any particular software program; skills that support higher order thinking processes; and skills related to cognitive processes that support continuous learning for employees (Claro et al. 2012). Employees should be competent and keep their skills up to date (Ali & Richardson, 2018).

Employee digital literacy has significant implications for organizations that rely on a skilled workforce to remain competitive in the digital age (Farrell et al., 2021). Therefore, decision-makers and managers should pay close attention to the level of digital literacy of their employees (Nikou et al., 2022)

[1]five indicators up to and including 2020: connectivity, human capital, use of internet services, integration of digital technologies and digital public services; and four indicators from 2021: human capital, connectivity, integration of digital technology and digital public services.

and take systematic approaches that support digital skills development to a strategic level (Mazurchenko et al., 2022).

Numerous studies show that digital skills are increasingly required by all types of businesses (Iniesta-Alemán et al., 2020), and they expect their employees to have the latest digital technology skills related to various abilities in using digital devices and applications, as well as information and communication applications (Suarta et al., 2023). Skills requirements in job advertisements are also important indicators to identify the skills required by employers (Kowal et al, 2022).

According to Ferreira et al. (2023) a rapidly changing work environment requires rapidly changing skills, what may have been sufficient in the past may not be able to address what will be critical in the future. They also note that a strategic approach to future development ensures that individuals can keep their skills relevant while preparing their careers for the future.

2.2 Theoretical background of the research

The changing content of work due to the overall development of science, technology, production and the economic prosperity of society are determined by two factors: the introduction of new technologies that give priority to cognitive competences and psychomotor skills and the development of new organisational forms that create new requirements with an emphasis on diversity, flexibility and quality of work activities.

The European Framework of Reference has defined eight key competences that are necessary for personal fulfilment and development, employability, social inclusion, sustainable lifestyles, successful living in a peaceful society, for managing life with a responsible attitude to health and active citizenship (Official Journal of the EU, 2018). Key competences are a dynamic combination of knowledge, skills and attitudes that individuals need to develop throughout their lives. Each of the competences defines and at the same time delineates the core knowledge, skills and attitudes related to that competence.

Digital competence encompasses the confident, critical and responsible use and engagement with digital technologies for learning, work and participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including coding), security (including digital wellbeing and cyber security literacy), intellectual property issues, problem solving and critical thinking (Official Journal of the EU, 2018).

Digital literacy integrates information and data literacy, communication and collaboration, media literacy, digital content creation, security, intellectual property issues, problem solving and critical thinking. It means that digitally literate individuals understand the functioning of digital technologies (computers, mobile phones, internet and other devices), have skills in working with digital tools (software, online platforms for various purposes, etc.), have the ability to critically assess and recognise information (whether information is relevant or false), know how to protect themselves in the online space (protection of personal data, use of strong passwords, adherence to cyber security principles), have communication skills (ability to communicate effectively in the online space, create content for different platforms, etc.) and are creative and innovative (use of new tools for creating content, projects, etc.).

According to Barykin et al. (2020, p. 4), who propose to complement the structure of digital competence with experimental and scientific research skills, digital literacy consists in the "ability to select, critically evaluate various data and information through experimentation, scientific research and using technological potential, being aware of their own and respecting mutual rights, to create common and joint knowledge and apply them in creating globally competitive products."

Digital skills for the 21st century are divided into the following areas (Van Laar et al, 2019): Information skills area (to search, evaluate and manage digital information), Communication skills area (to transfer information online, to prepare a presentation of this information), Collaboration skills area (to work effectively in teams with the intention of achieving a common goal and to be able to take joint responsibility for tasks and work outcomes), critical thinking (ability to make informed judgements about information and communication based on sufficient reasoning and evidence), creativity (appropriate use of online tools, online resources to create online content) and problem solving (use ICT to analyse a problem and knowledge to find a solution to a problem).

The European Digital Competence Framework (DigComp), published by the European Commission in 2013, offers a tool to improve the digital competence of European citizens and supports national frameworks and strategies for digital skills (Digitálna koalícia, 2023). DigComp describes in the form of learning outcomes (according to Bloom's taxonomy) five areas of digital competences (information and data literacy, communication and collaboration, digital content creation, security and problem solving) at six levels of difficulty (Tulinska, 2021), which correspond to the European Qualifications Framework (EQF). The description of each level includes knowledge, skills and attitudes described in one descriptor for each level of each competency.

Since 2013, the framework has been updated several times and the latest major update released in 2022 (DigComp 2.2) provides more than 250 new examples of knowledge, skills and attitudes, taking into account emerging technologies (artificial intelligence, the Internet of Things, data technology or new phenomena resulting from the pandemic crisis, which have led to the need for new and increased requirements in the area of digital competence for citizens and workers) in order to help European citizens in self-assessment, identification of training offers and job search (Digitálna koalícia, 2023).

The attitudes of a digitally competent individual are defined by the Official Journal of the European Union (2018): "Working with digital technologies and digital content requires an insightful and critical, yet curious, open and forward-looking approach to their development. It also requires an ethical, safe and responsible approach to using these tools."

In our empirical research, we are concerned with digital knowledge and skills as one of the components of key competences. The intention of our research was to investigate the actual level of digital skills and the level required for the profession in line with the objectives of the VEGA project no. 1/0188/24 Hybrid work regimes as a result of companies learning from the crisis and the implications of their implementation for the people management. On this basis, to identify the essential differences and the resulting training needs and to propose appropriate training modalities.

3 Research methodology

Based on the research design, we established three research hypotheses (formulated as null and alternative) as follows:

Hypothesis 1:
1H0a,b,c,d,e: There is no relationship between the actual level of digital skills and the desired level required for the profession in the areas of (a) information and data literacy, (b) communication and collaboration, (c) digital content creation, (d) cyber security, and (e) problem solving.
1H1a,b,c,d,e: The desired level of digital skills required for a profession in a) information and data literacy, b) communication and collaboration, c) digital content creation, d) cyber security, e) problem solving, is statistically significantly higher than their actual level.

Hypothesis 2:
2H0: There is no relationship between the actual level of digital skills and educational attainment.

2H1: The actual level of digital skills is conditional on educational attainment.

Hypothesis 3:
3H0: There is no relationship between the actual level of digital skills and job position.
3H1: There is a statistically significant relationship between actual level of digital skills and job position.

In order to verify the research hypotheses, a research model was developed and a questionnaire survey was subsequently conducted among line managers and employees – specialists in food production from Slovakia, the Czech Republic and Spain. According to the occupational classification (SK ISCO-08, 2020): line managers (no. 3122001 Master/supervisor in food production) and employees (no. 2141002 Specialists – technologists in food production and no. 3142006 Technologist in food production).

The questionnaire survey was conducted in the months of January to February 2024. The individual indicators were rated by the respondents on a 7-point Likert scale from 0 to 6, with the following meanings according to Bloom's taxonomy: 0 – not required, 1 – remembering level, 2 – understanding level, 3 – applying level, 4 – analysing level, 5 – evaluating level, 6 – creating level.

The research model consisted of parameters and five groups of research variables. Parameters consisted of variables characterizing the research sample, namely: P1 – country, P2 – education, P3 – occupation (function in the company).

The first group of variables (1.1A, 1.1R ... 1.9A, 1.9R) included an assessment of the level of their own digital skills (actual - A) and the digital skills required by their businesses (required - R) in the area of information and data literacy. The second group of variables (2.1A, 2.1R ... 2.5A, 2.5R) concerned the assessment of the level of digital skills in communication and collaboration, the third group (3.1A, 3.1R ... 3.8A, 3.8R) the level of digital content creation, the fourth group (4.1A, 4.1R ... 4.6A, 4.6R) the level in cyber security and the fifth group (5.AS, 5.1R ... 5.4A, 5.4R) the level in cyber security. The significance of the research model variables along with the results of the descriptive statistics are presented in Table1 ... Table 5.

In addition to the standard methods of scientific work (analysis, synthesis, comparison), the methods of evaluation of research variables in Excel and statistical verification of hypotheses in Jamovi were used in the paper. These were the following statistical tests and tools: descriptive statistics, Levene's test, non-parametric alternative of ANOVA test (Kruskal-Wallis test, Durbin-Wattson test for autocorrelation, Shapiro-Wilk test, Binomial logistic regression and Multinomial logistic regression.

4 Results and Discussion

We present the results of the research in the following structure: research sample, reliability of the research instrument, descriptive statistics and outliers of the results, evaluation according to Bloom's taxonomy, testing the statistical significance of the research hypotheses, and drawing conclusions.

4.1 Research sample

The research sample consisted of 186 respondents from industry C – Manufacturing, division 10 – food manufacturing, 11 – beverage manufacturing (according to SK NACE).

Table 1: Research sample

Parameters		Number	% share
P1 – country	Slovakia	61	32.81
	Czech Republic	68	36.56
	Spain	57	30.65
P2 – education	Secondary	51	27.42
	Higher education	135	72.58
P3 – function in the company*	Line manager	106	56.99
	Employee	80	43.01

*Note: according to the occupational classification SK ISCO-08, 2020), a line manager is no. 3122001 Master/supervisor in food production and Employee no. 2141002 Specialists – technologists in food production and no. 3142006 Technologist in food production.

4.2 Reliability of the research instrument

The research instrument (questionnaire) contained five groups of scale-type variables; therefore, reliability was tested using Cronbach's α and McDonald's ω.

The reliability of the 1st group of scale variables (1.1A, 1.1R ... 1.9A, 1.9R) reached α = 0.70, ω = 0.73 (overall). Reliability of individual variables reached α values from 0.67 to 0.71, ω from 0.70 to 0.73.

The scale reliability of the 2nd group of variables (2.1A, 2.1R ... 2.5A, 2.5R) reached α = 0.51, ω = 0.56 (overall). Reliability of individual variables ranged from 0.40 to 0.55 for the coefficient of α, from 0.50 to 0.59 for the coefficient of ω.

The scale reliability of the 3rd group of variables (3.1A, 3.1R ... 3.8A, 3.8R) was α = 0.74, α = 0.78 (overall). Reliability of individual variables ranged from 0.70 to 0.76 for the coefficient of α, from 0.74 to 0.79 for the coefficient of ω.

The scale reliability of the 4th group of variables (4.1A, 4.1R ... 4.6A, 4.6R) was α = 0.90, α = 0.92 (overall). Reliability of individual variables ranged from 0.89 to 0.90 for the coefficient of α, from 0.90 to 0.93 for the coefficient of ω.

The scale reliability of the 5th group of variables (5.1A, 5.1R ... 5.4A, 5.4R) was α = 0.56, ω = 0.63 (overall). Reliability of individual variables ranged from 0.48 to 0.61 for the coefficient of α, from 0.59 to 0.64 for the coefficient of ω.

We consider the above reliability values of our research instrument to be reasonable, despite the fact that authors such as Hanák (2016), Kolarčík (2013), and Marko (2016) report desired values of Cronbach's α > 0.7. According to Ullah (2018), Cronbach's α values around 0.5, although low, are still acceptable and are most often due to the smaller number of items in the respective group of variables. Therefore, the reliability was further supplemented by the McDonald's coefficient ω (Marko, 2016), whose value satisfies the above condition.

4.3 Descriptive statistics and description of extreme values of the results

From the descriptive statistics, we provide two tables for each group of variables. One table shows the mean and standard deviation (due to the limited scope of the paper), and for each variable we compare the rating of the desired and actual level of digital skills and the difference between them (Table 2 … Table 11). A difference greater than 1 is shaded in grey. The second table shows the frequencies of the ratings of each variable (from 0 to 6) for the desired and actual levels according to Bloom's taxonomy.

Table 2 Evaluation of research variables in the area of Information and Data Literacy

I.	INFORMATION AND DATA LITERACY AREA (working with the Internet)	Required skill level (R)		Actual skill level (A)		Difference
		AVG	STDEV	AVG	STDEV	
1.1	Getting up-to-date information for work (exchange rate tickets, tax returns, weather information, pollen situation...)	5.188	0.571	3.704	0.664	1.484
1.2	Use of information from published price lists for goods and services	3.935	0.990	1.925	0.795	2.010
1.3	Completing and submitting online forms for state and public institutions (health insurance, social insurance...)	3.500	0.668	2.683	0.616	0.817
1.4	Using information from maps and navigation	2.441	0.498	1.301	0.472	1.140
1.5	Use of information	3.952	0.572	3.258	0.439	0.694

	published by public authorities and institutions (government, ministries, statistical office, tax office, social security, health insurance...)					
1.6	Use of data from publicly available portals (cadaster portal, trade register, commercial register, FINSTAT...)	4.597	0.573	4.016	0.653	0.581
1.7	Use of published publicly available data from the Internet (Open data)	4.167	0.402	3.478	0.562	0.689
1.8	Use of data from commercial databases (Albertina, Datamax, European databank, Kompass, Golden Pages...)	2.774	0.692	4.22	0.728	-1.446
1.9	Implementation of online marketing	2.108	0.831	1.581	0.695	0.527

Table 3 Level of evaluation of research variables in the area of Information and Data Literacy according to Bloom's Taxonomy

Varia ble/ level	0	1	2	3	4	5	6	Bloom's taxonomy (level of most assessments)
1.1 R	0	0	0	3	7	128	48	evaluate, create
1.1 A	0	0	6	56	111	13	0	apply, analyse
1.2 R	0	0	16	49	52	69	0	apply, analyse, evaluate
1.2 A	0	63	76	46	0	1	0	memorize, understand, apply
1.3 R	0	0	1	108	60	17	0	apply, analyse
1.3 A	0	11	41	130	4	0	0	understand, apply
1.4 R	0	0	104	82	0	0	0	understand, apply
1.4 A	0	131	54	1	0	0	0	memorise, understand
1.5 R	0	0	0	35	125	26	0	analyse, evaluate
1.5 A	0	0	0	138	48	0	0	apply, analyse
1.6 R	0	0	0	8	59	119	0	analyse, evaluate
1.6 A	0	0	2	32	113	39	0	analyse, evaluate
1.7 R	0	0	0	2	151	33	0	analyse, evaluate
1.7 A	0	0	3	94	86	3	0	apply, analyse
1.8 R	0	0	70	88	28	0	0	understand, apply
1.8 A	0	0	0	33	79	74	0	analyse, evaluate
1.9 R	0	53	62	69	2	0	0	understand, apply
1.9 A	5	85	79	17	0	0	0	memorize, understand

The frequency table (Table 3), which shows a comparison of the desired and actual digital skills level for the respective pair of variables, confirms the fact that the desired digital skills level is 1 to 2 levels higher than the actual digital skills level of the respondents. The highest level (creating level) is only required in 1 case (variable 1.1 R). The most frequently required and actual levels are 3 (applying) and 4 (analysing). Level 0 (not required) occurs only minimally.

Table 4 Evaluation of the research variables in the area of Communication and Cooperation

II.	COMMUNICATION AND COOPERATION AREA (collaboration tools and social networks)	Required skill level		Actual skill level		Difference
		AVG	STDEV	AVG	STDEV	
2.1	For group (team) collaboration we require the use of MS Outlook	4.473	0.852	3.919	1.148	0.554
2.2	For group collaboration we require the use of Google Calendar	4.355	0.814	3.371	1.417	0.984
2.3	For group collaboration we require the use of MS Exchange	2.758	0.598	1.172	0.651	1.586
2.4	For group collaboration, we require the use of shared files on Google Drive	4.382	0.749	2.355	0.652	2.027
2.5	For group collaboration we require the use of social networks (Facebook)	4.306	0.868	4.102	0.910	0.204

Table 5 Level of evaluation of the research variables in the area of Communication and Collaboration according to Bloom's Taxonomy

Varia ble/ level	0	1	2	3	4	5	6	Bloom's taxonomy (level of most assessments)
2.1 R	0	0	0	36	34	108	8	analyse, evaluate, create
2.1 A	0	4	21	43	36	82	0	analyse, evaluate
2.2 R	0	0	2	34	46	104	0	analyse, evaluate
2.2 A	0	24	30	47	23	62	0	apply, analyse, evaluate
2.3 R	0	2	55	115	14	0	0	understand, apply
2.3 A	17	127	37	3	2	0	0	memorize, understand
2.4 R	0	0	2	44	35	105	0	apply, analyse, evaluate
2.4 A	0	18	84	84	0	0	0	understand, apply
2.5 R	0	0	2	44	35	105	0	apply, analyse, evaluate
2.5 A	0	0	5	53	46	82	0	apply, analyse, evaluate

Table 4 shows that the use of software tools such as MS Outlook, Google Calendar, Google Drive and social networking are highly demanded by enterprises (around level 5) and the ratings of the actual level of use are close to them (except for Google Drive, where the difference is 2.027). Among our respondents' businesses, the least popular application is MS Exchange, which scores the lowest in both average desired and actual values.

The frequency table (Table 5), which shows a comparison of a pair of variables assessing the desired and actual level of digital skills, confirms, as in the first group of variables, that the desired level of skills is 1 to 2 levels higher than the actual level. Only in the case of variable 2.5 can we say that the actual level reaches the desired level. The highest level (production level) is the desired level only in 1 case (variable 2.1 R). The most frequent required and actual levels are 3 (apply) and 5 (evaluate). Level 0 (not required) occurs only minimally.

Table 6 Evaluation of research variables in the area of Digital Content Creation

III.	DIGITAL CONTENT CREATION AREA (office tools and corporate IS)	Required skill level		Actual skill level		Difference
		AVG	STDEV	AVG	STDEV	
3.1	Use of MS Office and all its applications to create electronic documents	5.909	0.289	4.565	0.727	1.344
3.2	Use of MS Excel to create calculations and graphs	4.849	0.707	2.839	0.369	2.010
3.3	Using MS Word for administration	5.855	0.353	4.495	0.707	1.360
3.4	Use of MS Power point for presenting	3.29	0.772	2.059	0.634	1.231
3.5	We require the use of other office software at work	1.129	0.336	0.946	0.726	0.183
3.6	Use of all enterprise IS modules	1.355	0.491	3.294	0.433	-1.939
3.7	Use of selected IS modules according to job classification	4.382	0.53	3.317	0.467	1.065
3.8	Use of the employee portal (data related only to a specific employee – absence registration, leave...)	3.828	0.722	3.226	0.865	0.602

Table 7 Level of evaluation of the research variables in the area of Digital Content Creation according to Bloom's Taxonomy

Varia ble/ level	0	1	2	3	4	5	6	Bloom's taxonomy (level of most assessments)
3.1 R	0	0	0	0	0	17	169	evaluate, create
3.1 A	0	0	0	22	41	119	4	analyse, evaluate
3.2 R	0	0	0	0	62	90	34	analyse, evaluate, create
3.2 A	0	0	30	156	0	0	0	understand, apply
3.3 R	0	0	0	0	0	27	159	evaluate, create

3.3 A	0	0	1	20	51	114	0	analyse, evaluate
3.4 R	0	6	18	78	84	0	0	apply, analyse
3.4 A	1	29	114	42	0	0	0	understand, apply
3.5 R	0	162	24	0	0	0	0	memorize, apply
3.5 A	54	88	44	0	0	0	0	memorize, apply
3.6 R	0	121	64	1	0	0	0	memorize, apply
3.6 A	0	0	0	140	46	0	0	apply, analyse
3.7 R	0	0	1	1	110	74	0	analyse, evaluate
3.7 A	0	0	0	127	59	0	0	apply, analyse
3.8 R	0	0	1	64	87	34	0	apply, analyse, evaluate
3.8 A	0	0	40	77	56	13	0	understand, apply, analyse

Table 6 characterizes the high required level of digital skills using MS Office (5.91), MS Word alone (5.86), MS Excel (4.85), lower level of using MS Power Point (3.29) and high level of using selected enterprise IS modules (4.34). Enterprises are least likely to require the use of other office software (as opposed to MS Office) and the use of all enterprise IS modules. These variables also show the largest difference between the desired and actual levels.

When projected into Bloom's taxonomy (Table 7), we see that firms require the highest level of skills in MS Office overall, MS Excel and MS Word specifically, while the reality is at least 1 level lower. At the same time, variable 3.5 (use of other office software) is not required at all in up to 54 cases.

Table 8 Evaluation of Cyber security research variables

IV.	CYBER SECURITY AREA	Required skill level		Actual skill level		Difference
		AVG	STDEV	AVG	STDEV	
4.1	Use a suitable and up-to-date web browser, e.g. Microsoft Edge, Google Chrome, Mozilla Firefox, Opera	5.538	0.531	4.242	0.429	1.296
4.2	Use of effective virus protection	5.989	0.103	5.754	0.48	0.235
4.3	Backing up important data regularly	5.973	0.367	5.812	0.392	0.161
4.4	Knowing the meaning of http cookies	2.548	0.530	1.403	0.554	1.145
4.5	Verifying the security of connections to websites where an employee enters sensitive information to prevent the leakage of sensitive information	6.000	0.000	5.710	0.511	0.290
4.6	For any email message that asks to check passwords or other sensitive data, verify that it is not a fake sender	5.995	0.073	5.641	0.481	0.354

Table 9 Level of evaluation of research variables in the area of Cyber security according to Bloom's taxonomy

Variable / level	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**Bloom's taxonomy (most assessments)**
4.1 R	0	0	0	1	0	83	102	evaluate, create
4.1 A	0	0	0	0	141	45	0	analyse, evaluate
4.2 R	0	0	0	0	0	2	184	create
4.2 A	0	0	0	0	4	37	145	evaluate, create
4.3 R	0	1	0	0	0	0	185	create
4.3 A	0	0	0	0	0	35	151	evaluate, create
4.4 R	0	0	87	96	3	0	0	understand, apply
4.4 A	0	116	66	3	1	0	0	memorize, understand
4.5 R	0	0	0	0	0	0	186	create
4.5 A	0	0	0	1	2	47	136	evaluate, create
4.6 R	0	0	0	0	0	1	185	create
4.6 A	0	0	0	0	0	67	119	evaluate, create

The area of Cyber security was ranked the highest of all the areas addressed (Table 8) in terms of both the required and actual level of digital skills. Of the six pairs of variables, in up to four cases the desired level was greater than 5.90, with the 4.5 R variable (verifying the security of the connection to the website...) reaching the highest value of 6 for all respondents. In the case of these variables, the actual level of digital skills also reaches high values. Knowing the meaning of http cookies is the least important for businesses.

The high level of digital skills in this area is also reflected in Bloom's taxonomy (Table 9), where the highest level, create, is found in high proportion.

Table 10 Evaluation of research variables in the area of problem solving

V.	PROBLEM-SOLVING AREA	Required skill level		Actual skill level		Difference
		AVG	STDEV	AVG	STDEV	
5.1	Solving technical problems	2.849	0.497	1.866	0.784	0.983
5.2	Identification of needs and technological solutions	5.414	0.536	3.043	0.605	2.371
5.3	Creative use of digital technologies	4.742	0.899	2.937	1.317	1.805
5.4	Identifying gaps in digital competence	4.866	0.414	3.871	0.564	0.995

Table 11 Level of evaluation of research variables in the area of problem solving according to Bloom's taxonomy

Variable/ level	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**Bloom's taxonomy (most assessments)**
5.1 R	0	0	36	145	2	3	0	understand, apply
5.1 A	0	63	93	22	8	0	0	memorize, understand
5.2 R	0	0	0	0	4	101	81	evaluate, create
5.2 A	0	0	28	124	32	2	0	understand, apply, analyse
5.3 R	0	0	0	13	66	63	44	analyse, evaluate, create
5.3 A	0	48	9	39	80	10	0	memorise, apply, analyse
5.4 R	0	0	0	0	30	151	5	analyse, evaluate
5.4 A	0	0	0	43	124	19	0	apply, analyse

The evaluation of the Problem Solving area showed a relatively high gap between the desired and actual level of digital skills (Table 10, Table 11) in favour of the desired skills. The largest difference was observed for variable 5.2 Identification of needs and technological solutions (>2). When translated into Bloom's taxonomy, the desired level is the skills performing evaluation and creation, while the actual skills are at the level of understanding, applying and analysing. Similarly, for variable 5.3 Creative use of digital technologies, the difference between the desired and actual levels of digital skills is 1.805. Enterprises also require respondents to be proficient in identifying digital competency gaps at the analysing and evaluating level, but the difference between the desired and actual value is less than 1. The actual value is at the applying and analysing level. The least required skill is technical problem solving (level understand and apply), while the actual skill level is memorise and understand.

4.4 Testing the statistical significance of the hypotheses

Testing the statistical significance of hypothesis 1

Since the variables of the research model consisted of variables that were assessed two times by the respondents, once the level of the respective variable required by the company, the second time the actual level of their own skills, pairs of variables (required and actual) were investigated.

Levene's test of Homogeneity of variances did not show normality of the research sample for all variables, so we used a non-parametric alternative to the ANOVA test, namely the Kruskal-Wallis test. The results are presented in Table 12 to

Table 16. Statistically significant relationships are highlighted in grey.

Table 12 Results of testing the research variables in the area of Information and Data Literacy (Kruskal-Wallis test)

Variables	χ^2	df	p	ε^2
1.1 R. 1.1 A	14.41	4	0.006	0.07
1.2 R. 1.2 A	7.35	4	0.119	0.03
1.3 R. 1.3 A	7.52	4	0.111	0.04
1.4 R. 1.4 A	5.49	3	0.139	0.02
1.5 R. 1.5 A	4.31	2	0.116	0.02
1.6 R. 1.6 A	18.19	4	0.001	0.09
1.7 R. 1.7 A	7.43	4	0.115	0.03
1.8 R. 1.8 A	4.67	3	0.197	0.02
1.9 R. 1.9 A	1.94	3	0.584	0.01

Table 13 Results of testing the research variables in the area of Communication and Cooperation (Kruskal-Wallis test)

Variables	χ^2	df	p	ε^2
2.1 R. 2.1 A	18.25	4	0.001	0.09
2.2 R. 2.2 A	16.13	4	0.003	0.08
2.3 R. 2.3 A	6.00	4	0.199	0.03
2.4 R. 2.4 A	5.26	3	0.154	0.03
2.5 R. 2.5 A	5.53	4	0.240	0.03

Table 14 Results of testing the research variables in the area of Digital Content Creation domain (Kruskal-Wallis test)

Variables	χ^2	df	p	ε^2
3.1 R. 3.1 A	12.22	4	0.020	0.07
3.2 R. 3.2 A	3.50	2	0.170	0.02
3.3 R. 3.3 A	30.61	4	<0.001	0.16
3.4 R. 3.4 A	7.64	3	0.054	0.04
3.5 R. 3.5 A	0.53	2	0.770	0.00
3.6 R. 3.6 A	6.35	2	0.040	0.03
3.7 R. 3.7 A	5.95	2	0.051	0.03
3.8 R. 3.8 A	6.53	4	0.160	0.03

Table 15 Results of testing the research variables in the area of Cyber security (Kruskal-Wallis test)

Variables	χ^2	Df	p	ε^2
4.1 R. 4.1 A	15.58	2	0.0004	0.08
4.2 R. 4.2 A	57.66	3	<0.001	0.31
4.3 R. 4.3 A	63.80	2	<0.001	0.34
4.4 R. 4.4 A	5.13	4	0.27	0.03
4.5 R. 4.5 A	187.00	4	<0.001	1.00
4.6 R. 4.6 A	65.35	2	<0.001	0.35

Table 16 Results of testing the research variables in the area of Problem solving (Kruskal-Wallis test)

Variables	χ^2	Df	p	ε^2
5.1 R. 5.1 A	8.66	4	0.070	0.05
5.2 R. 5.2 A	4.09	4	0.391	0.02
5.3 R. 5.3 A	8.28	4	0.079	0.04
5.4 R. 5.4 A	7.82	3	0.054	0.04

It is clear from the results presented in Table 12 to Table 16 that only the results presented in Table 15 (cyber security area) can be considered statistically significant after excluding variable 4.4 (knowledge of the meaning of http cookies), which can be done given the significance of the other variables in this group.

In the other groups of variables, a maximum of three variables were statistically significant. Therefore, we conclude that

- We accept the hypothesis 1H0a. 1H0b. 1H0c. 1H0e. We reject hypothesis 1H1a. 1H1b. 1H1c. 1H1e. Thus, we fail to show a statistically significant relationship between the actual level of digital skills and the required level needed for the occupation in the area of (a) information and data literacy. b) communication and collaboration. (c) digital content creation (e) problem solving.
- We accept hypothesis 1H1d, reject hypothesis 1H0d, i.e., the desired level of digital skills required for a profession in cyber security is statistically significantly higher than their actual level.

Testing the statistical significance of hypothesis 2

We tested the statistical significance of hypothesis 2 by means of logistic regression. This method was used because the conditions for linear regression were not met. Namely, both the Durbin-Wattson test for autocorrelation and the normality test (Shapiro-Wilk) showed a p value <0.05. Binomial logistic regression was used for variables, which took 2 values and Multinomial logistic regression was used for variables, which took more than 2 values. The results of testing the 1st group of variables are shown in Table 12.

Table 17 Results of logistic regression testing the dependence of the research variables of the Information and Data Literacy domain on educational attainment

Model	Deviance	AIC	R^2_{McF}	R^2_N	χ^2	df	p
1.1 A	351.9591	363.9591	0.0208	0.0261	7.37	3	0.0582
1.2 A	409.4373	421.4373	0.0049	0.0063	1.90	3	0.5726
1.3 A	306.6129	318.6129	0.0111	0.0136	3.89	3	0.3275
1.4 A	232.3483	240.3483	0.0149	0.0182	3.74	2	0.1723
1.5 A	211.3119	215.3119	0.0052	0.0087	1.1085	1	0.2924
1.6 A	362.0781	374.0781	0.0087	0.0110	3.1726	3	0.3658
1.7 A	308.4372	320.4372	0.0067	0.0081	2.0701	3	0.5580
1.8 A	385.8205	393.8205	0.0000	0.0000	0.0134	2	0.9933
1.9 A	383.8024	395.8024	0.0055	0.0071	2.1283	3	0.5462

From Table 17 it can be seen that from the 1st group of variables, there was no statistically significant relationship between the actual level of digital skills and educational attainment (p>0.05). Similar testing was carried out on all groups of variables and there too the p<0.05 value occurred in only one case. For these reasons, we accept the null hypothesis 2H0 and reject the alternative hypothesis 2H1. Thus, we conclude that there is no relationship between the actual level of digital skills and educational attainment and we fail to show, that the actual level of digital skills is conditional on educational attainment.

Testing the statistical significance of hypothesis 3

Testing the statistical significance of hypothesis 3 was carried out in a similar way to hypothesis 2 by means of logistic regression. Also, in this case the conditions for linear regression were not met. Both the Durbin-Wattson test for autocorrelation and the normality test (Shapiro-Wilk) showed a p value <0.05. The results of testing Group 1 variables are shown in Table 18.

Table 18 Results of logistic regression testing the dependence of the research variables in the area Information and data literacy on job position

Model	Deviance	AIC	R^2_{McF}	R^2_N	χ^2	df	p
1.1 A	357.2363	369.2363	0.0061	0.0077	2.65	3	0.5326
1.2 A	409.5890	421.5890	0.0045	0.0058	1.73	3	0.6047
1.3 A	306.4680	318.4680	0.0116	0.0141	3.39	3	0.3088
1.4 A	234.5419	242.5419	0.0056	0.0069	1.39	2	0.5159
1.5 A	212.4060	216.4060	0.0001	0.0001	0.01	1	0.9044
1.6 A	355.8643	367.8643	0.0257	0.0323	9.63	3	0.0246
1.7 A	306.1743	318.1743	0.0140	0.0170	4.30	3	0.2277
1.8 A	385.8276	393.8276	0.0000	0.0000	0.01	2	0.9969
1.9 A	376.1411	388.1411	0.0254	0.0323	9.96	3	0.0204

For hypothesis 3, the situation is similar to hypothesis 2. In a similar manner, the results of which are presented in Table 18, testing of all groups of variables was carried out, and there too a p-value of <0.05 occurred in only three cases. For these reasons, we accept the null hypothesis 3H0 and reject the alternative hypothesis 3H1. Thus, we conclude that there is no statistically significant relationship between the actual level of digital skills and job position.

5 Conclusion

Based on the analysis of theoretical sources and respondents' views from the empirical research conducted in the three countries, we concluded that creating conditions for organized continuous education and learning by doing allows to increase employees' innovative abilities, risk-taking abilities at an acceptable level, and to develop cognitive and psychomotor endowments that also support affective attitudes and agility, while at the same time reinforcing the intention to embrace digital technologies.

The aim of the paper was to examine the actual level of digital skills and the level required for the profession. Based on this, to identify the essential differences and the resulting learning needs and to propose appropriate learning pathways.

The results of the research showed that employers' desired level of digital skills in each of the identified areas is higher than employees' actual level of digital skills, however, only the relationship in the area of cyber security proved to be statistically significant among the areas studied. At the same time, the actual level of digital skills was not found to be statistically significant in relation to educational attainment or job position. It is therefore very important that employers place emphasis on further, continuous training for employees.

Training organized in enterprises should be aimed at meeting the current standard requirements for work performance in the workplace and also prospectively prepare employees to achieve the expected results and performance in the future, prepared along two basic lines.

The first line is workplace learning in terms of team and group work. Learning by doing is becoming an increasingly important element for employee learning. In many countries, researches are conducted (Buligina & Sloka, 2022), where researchers analyse different aspects affecting the implementation of work-based learning. In this implementation of learning by doing, digital skills are increasingly important. The importance should be seen from several aspects, it is mainly the interest (motivation) to perform the tasks and duties set, the willingness and ability to update one's knowledge and skills in the professional field, the ability to work independently, the personal interest to perform the tasks, loyalty to the company, the attitude to work, the interest and ability to improve knowledge and skills. This requires the creation of organisational units incorporating team learning into teamwork.

The second line is organised training in cooperation with educational institutions or by implementing training programmes developed by the relevant training departments in the company. This approach requires close cooperation between educational institutions, the business sector and decision-makers. Training institutions must develop training programmes in line with the requirements of the decision-making sphere, the requirements of international institutions, the needs of enterprises and the current labour market. They must keep pace with changes in the labour market and consistently incorporate cognitive and psychomotor learning objectives in their educational programmes to meet the needs of the digital transformation and the emerging digital economy.

HR managers, in collaboration with line managers, should develop career plans for individual employees that show how they can move from their current level to a higher job level. In addition to employee digital competency development, interdisciplinary skills development programs should also be targeted, which could significantly improve employees' growth prospects with the application of modern digital technologies. Appropriate pilot training programmes should be designed based on the identified training needs and the identified critical requirements of employees for different levels of skills, which include technical skills, technological skills and soft skills. For example, employees should understand that technology is important not only for the business to remain competitive but also for their personal development and career growth.

The limitations and constraints of our research were in terms of the orientation to the three selected European countries and in terms of the orientation to a specific sector within the statistical classification of economic activities.

Suggestions for further research are in the analysis and subsequent elaboration of specific educational activities in support of digital transformation and the preparation of adult education institutions for cooperation with the business sector.

We are aware that a real transformation of industry can be achieved by the joint action of the countries of the European Union, with the effective support of the European Economic and Social Committee as an advisory body of the European Union, which brings together representatives of workers' and employers' organisations and other interest groups. Genuine digital competitiveness of businesses requires a smart and combined knowledge and skills strategy that enables current and future employees to meet the tough challenges of today.

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