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Digital Skills as a Significant Factor of Human Resources Development

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Abstract: Digital technologies play a key role in reviving the world economy. The EU has pledged to combine recovery support with resilient digital transformation. The COVID-19 pandemic highlighted the lack of digitization in Slovakia and the shortcomings of digital skills in citizens and communication with institutions. Digital skills are important and should form part of educational policy. ICT skills can help people succeed in the labour market and improve communication with public administration. Digitization and globalization increase the importance to communicate through the Internet, applications, and other e-based gadgets. Digital skills are one of the essential parts of e-Government, so people can use e-Government services in communication with public administration. The current crisis is affecting citizens' use of online services. Indices concerning the digital economy are analysed, such as the digital economy and society index DESI and e-Government digital skills (EGDI) from 2018 to 2021 revealed a stagnant state in 2018 and 2019, and in 2020, there was a decrease in basic digital skills. The next index is E-Government Digital Index. It focuses on human capital and digital skills in these indices. The paper analyses and identifies the digital skills of citizens in the context of e-Government development and describes the use of e-Government services by EU citizens with a focus on the Slovak Republic. The data were collected through a questionnaire survey of Slovak Republic citizens' digital skills according to selected categories, the use of e-Government services as well as awareness of e-Government services. Solutions that improve e-Government in the Slovak Republic are gradually being implemented. Improving digital skills according to the National Coalition for Digital Skills and Professions in the Slovak Republic is one of the priorities of The Ministry of Education, Science, Research and Sport of the Slovak Republic, which has adopted an action plan for 2019–2022 to improve the results in the DESI index by 2025 and focus on the digital skills required by employers. The survey revealed that in Slovakia, the majority of schools offer only weak support for digital education (about the EU-27 average of 68% and 45%, respectively). The research also revealed a decreased level of digital literacy among young people. These competencies are very important to gain a position in the labour market in the digital society. The projects aim to support the development of digital skills of primary and secondary school students, and the integration of new technologies into teaching.

Keywords: digital skills; DESI index; EGDI index; e-Government

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1. Introduction

The Internet has intensified digital transformation by bringing access to various information. New ways of interacting support knowledge creation and sharing. On the one hand, digitization and globalization reduce the importance of geographical lines because people and societies connect at an international level. On the other hand, the situation of

COVID-19 puts pressure on people. Under these circumstances, they have to communicate through the Internet, applications, and other e-based gadgets. In addition, people need information about e-Government, information and communication technologies, and digital skills, which are vital for staying in touch with public administration and other institutions. Solutions that improve e-Government in the Slovak Republic are gradually being implemented. Digital skills are one of the essential parts of e-Government, so people can use e-Government services when they need to communicate with public administration. During the COVID-19 pandemic, people can use electronic services for various purposes and to avoid contact with others.

As COVID-19 is continuing to spread all over the world, governments are pointing to digital assets for our economy. Emphasis is on high-speed networks and connectivity, supercomputers, data and artificial intelligence, as well as basic and advanced digital skills that support national economies and develop society. The digital skills necessary for the current context of high use of information and communication technology in all areas are acquired in formal and informal contexts. Traditional education incrementally adopts the policies, curricula, and methods young people need. The formal and controlled learning environment contributes significantly to the knowledge and skills required for digital literacy. However, this knowledge and these skills are diverse and vary according to the development of technologies and society [1].

The extant knowledge views the integration of the relevant business skills for the 21st century with the outlook and competencies of ensuring sustainable development as key to the further development of European society and economy [2]. Digital skills are important and should form part of educational policy [3].

This article identifies and stratifies digital skills in selected age categories. Furthermore, it provides information on digital skills based upon the Digital Economy and Society Index (DESI). The DESI index monitors progress in these areas in each member state [4,5]. Research reveals that the DESI index has been widely used as a comparing means, while regression analysis only recently has started being used in order to achieve statistically significant results in analysis [6]. Member states have put in place concrete measures to mitigate the impact of the pandemic.

Digital technologies will also play a key role in reviving the world economy. The European Council and the Commission have pledged to combine recovery support with a parallel transition to a climate neutral and resilient digital transformation. The EU put together some underlying strategies and goals, so that they could revive the economic member states in their union, but these difficulties also have a global character.

The COVID-19 pandemic highlighted the lack of the digital economy in Slovakia and the shortcomings among the country's population in terms of connectivity, acquisition of digital skills and digitization of schools, households, companies, and public services. Information systems in schools, public institutions, or hospitals are not ready for digital communication and remote operation. This means that ICT skills can help people succeed in the labour market and improve communication with public administration [7,8]. Digital technologies play a role during the COVID-19 pandemic, too, and support the recovery of the economy in all EU member states, including Slovakia [9]. The current crisis is affecting societal indicators of citizens' use of online services. This article interprets the findings from the DESI 2021 report and the results of the Human Resources Index from 2018 to 2021. Improving digital skills is one of the priorities of the Digital Transformation Strategy of Slovakia 2030 [10] and the related action plan for 2019–2022 [11]. The action plan aims to adapt the education system and focus on the digital skills required by employers. The strategy mentions the need for development, so-called soft skills—productive personal qualities that characterize the relationship in the social environment and competencies for involvement in the functioning of the digital society. Business sectors have demanded reforms of the education system in order to reduce the mismatch between the skills that graduates acquire in educational institutions and the skills required by employers [12,13]. The country has adopted an action plan to improve the results in the DESI index by 2025.

This document contains solutions for improving, for example, human capital, retaining ICT graduates, and more [14]. In the DESI 2021 index and in the area of human capital, Slovakia ranks 19th among all 27 EU countries. The resulting values are shown in Table 1.

Table 1. The level of DESI in the field of human capital.

Human Capital	Slovakia		Europe Union	Reaching the EU Average
	Rank	Score	Score	
DESI 2018	19	43.8	47.1	3.3
DESI 2019	20	41.8	49.3	7.5
DESI 2020	18	44.2	47.9	3.7
DESI 2021	18	42.9	47.6	4.7

Source: europa.eu, (online). (cit. 2022-1-18). Available on the Internet: <https://lnk.sk/pcr9>. Own processing.

The score that presents the proportion of citizens who report having digital skills has declined. The share of citizens with more than basic digital skills is 27%, which is the best score in the Visegrad Four region, but it still lies below the EU average of 31%, as shown in Table 2.

Table 2. The level of digital skills according to DESI.

Digital Skills		Slovakia				EU DESI 2021 v (%)
		DESI 2018 v (%)	DESI 2019 v (%)	DESI 2020 v (%)	DESI 2021 v (%)	
(%) individuals	Basic digital skills	59	59	54	54	56
	Intermediate digital skills	33	33	27	27	31
	Basic software skills	63	63	56	56	58

Source: europa.eu, (online). (cit. 2022-1-18). Available on the Internet: <https://lnk.sk/pcr9> Own processing.

From the table above, we can see the stagnant state in 2018 and 2019. In 2020, there was a decrease of 5% of the population with "at least basic digital skills". As a result, Slovakia fell below the EU average in 2020. An identical situation occurred in 2020, in the area of "more than basic digital skills", where there was a reduction of 6% of the population. In 2018, 63% of the population had at least basic software skills, but in 2020, 56% of the population had these skills. The situation from 2020 is identical to the situation in 2021 where there was no improvement or deterioration. Slovakia also fell below the EU average in the area of human resources.

In human capital, Slovakia reaches the 19th place out of all EU countries. The score, which can be interpreted as the proportion of citizens who report having digital skills, has decreased. The share of ICT professionals in the total number of employees have risen to 4.2%, but this share is below the EU average of 4.3%. In the field of ICT, the share of graduates is at the level of 3.9%, where Slovakia has managed to reach the EU average of 3.9%. The next problem is the low level of digital literacy among young people. From the results and evaluation of the Slovak State Inspectorate, up to 45% of schools do not have a qualified IT teacher [15].

The survey revealed that in Slovakia, the majority of primary (63%) and lower secondary schools (62%) offer only weak support for digital education (EU-27 68% and 45%, respectively). In addition, the survey showed that teachers almost always allow students to use ICT for projects or class work [16]. On the other hand, young people and children make extensive use of digital tools and the Internet for entertainment, and the DESI report states that only four out of ten are able to create presentations, graphs, or work with spreadsheets. The situation is particularly serious in families at the lower socio-economic levels. There

are several initiatives in Slovakia, such as the IT Fitness test [17] or the IT Academy [18]. These projects aim to support the development of digital skills of primary and secondary school students, the integration of new technologies into teaching, and the development of university study programmers in data science, Internet of Things, computer networks, and business information systems. Slovakia tries to solve problems in this area through the National Education Program. This program emphasizes the need to increase the use of digital technologies in the classroom and to improve the digital skills of both students and teachers. There is an active National Coalition for Digital Skills and Professions of the Slovak Republic, which works closely with the government [19].

The next index is the E-Government Digital Index (EGDI). The EGDI metric consists of three different parts. The Online Service Index (OSI) assesses the maturity of a country's e-Government website, including its national website and related portals, and related portals of departmental websites such as education, employment, social services, and health and the environment. The Telecommunication Infrastructure Index (TII) assigns the country a telecommunications infrastructure based on five factors: Internet customers, fixed telephone lines, smartphone subscribers, fixed Internet subscribers, and fixed broadband services. The Human Capital Index (HCI) is measured by the level of adult literacy and education in the region [20].

In 2020, the number of countries that achieved a very high EGDI index increased (values greater than 0.75). In the year 2018, it was 40 countries and in 2020, it was 57 countries. The countries with a high EGDI index are Denmark (1), Republic of Korea (2), Estonia (3), Finland (4), United States of America (10), Austria (15), Poland (24), Czech Republic (39), Slovakia (48), Hungary (52), etc. The data show that Slovakia and other low-income countries can achieve a high level of e-Government. Slovakia reached a very high level in EGDI; the country ranked 49th in 2018 and 48th in 2020 [21].

The E-Participation Index examines the state of the government use of information and communication technologies in three areas, which are: providing public information and access to information, involving citizens in contributions and discussions on public policies and services, and involving citizens in decision-making processes. In this index, Slovakia ranked 70th. This result is not sufficient, and Slovakia does not provide an additional amount of information and access to information in the field of e-Government. Soon, Slovakia should also focus on high-quality information for students and all people in the country as well as on other parameter indexes of EGDI, in order to increase competitiveness at least within the Visegrad Four or the EU [22].

Slovakia does not achieve the best results in any of the areas in the DESI (human capital), which are interconnectivity, human capital, use of Internet services, and digital public services. The score has fallen below the EU average. The strategy of the Slovak Republic consists of the reform of education and adaptation to technological development and of better equipping students with skills and competencies for living and working in the digital economy. The main challenge will be to transfer this strategy into concrete actions, secure funding, and use current initiatives such as the IT Fitness Test to improve and increase the level of digital skills and impact the majority of the population. The digital reforms and investments included in the plan should help modernize Slovakia.

In Table 3, the different areas affected by digitalisation are presented. A number of authors identify the need for digital literacy and digital skills in different sectors. Digital skills will be needed in math competitions, in the video game industry, in primary schools, etc. The interest of educators or leaders increases the digital level of students as well, as they are forced to work in an online space using ICT tools.

Table 3. Literature review of different areas of digital skills/literacy.

Reference	The Main Purpose of the Study	Topic	Year
Maureen, Van der Meij et al. [23]	The experiment involved two classes. Where digital storytelling was used in class, the literacy of the children increased significantly.	Supporting Literacy and Digital Literacy Development in Early Childhood Education Using Storytelling Activities	2018
Nacu, Caitlin et al. [24]	On the one hand, the paper describes how the heuristic evaluation method was adapted. Subsequently, it was found to be important to promote the digital skills of youth in the 21st century.	Designing for 21st Century Learning Online: A Heuristic Method to Enable Educator Learning Support Roles	2018
Nkadimeng, Ankiewicz [25]	The area of research is the video game as a tool for education and the needs of 21st century learners. Possibilities of Minecraft Ed for learning.	The Affordances of Minecraft Education as a Game-Based Learning Tool for Atomic Structure in Junior High School Science Education	2022
Kenderov [26]	Mathematical competitions took place throughout the whole storm. The article identifies the use of software for a better and deeper understanding of mathematical facts and phenomena.	Mathematics Competitions: An Integral Part of the Educational Process	2022
Tinmaz, Lee et al. [27]	The article observes that interest in the topic of digital literacy and digital skills has grown since 2013.	A Systematic Review on Digital Literacy	2022
Jackman, Sanderson et al. [28]	COVID-19 has also affected the lives of PhD students and researchers. This caused a shift to an online presence and working from home, which had a positive impact, but also negative psychological consequences.	The Impact of the First COVID-19 Lockdown in the UK for Doctoral and Early Career Researchers	2021
Laakso, Korhonen et al. [29]	Students perceived game design as an inspiring and challenging activity. The game design project emerged as a pedagogically meaningful way of engaging students in knowledge-generating learning and linking students' formal and informal learning.	Developing Students' Digital Competences through Collaborative Game Design	2021
Cote, Milliner et al. [30]	Verifying the digital skills of students preparing for a stay abroad during their studies.	Preparing Japanese Students' Digital Literacy for Study Abroad: Is More Training Needed?	2017
Zhao, Pinto et al. [31]	Research shows that the majority of university students and teachers have a basic level of digital competence.	Digital Competence in Higher Education Research: A Systematic Literature Review	2021
Madsen, Thorvaldsen et al. [32]	In Norway, professionals' use of digital tools correlates more strongly with teacher educators' attitudes towards digital technologies in education.	Teacher Educators' Perceptions of Working with Digital Technologies	2018

2. Materials and Methods

The aim of this article is to point out the digital skills of the population of the Slovak Republic in individual selected categories such as education, age groups, and others. The aim is also to identify the state of digital skills and to find out the level of digital skills of the population of Slovakia and their awareness of e-Government. The primary survey was conducted electronically and completed by 290 respondents. The stratification of respondents was carried out on the basis of the identification questions, which are in Table 3. Respondents were divided on the basis of age, economic classification, and highest level of education. The results of the primary research are displayed graphically. Primary research includes the level of digital skills for using e-Government services.

Four types of digital skills were defined, from which the respondent could choose. The levels of digital skills are as follows.

- I do not have digital skills—I cannot communicate through public technologies with public administration authorities (exclusively personal contact, I do not use a computer, Internet, etc.);
- Basic language user—I am aware that I can use digital technologies in my contact with the authorities, but I do not use them, I communicate with the authorities in person;
- Independent user—I am able to use some functions of the online public service (eznamka.sk, katasterportal.sk, and so on);
- Experienced user—I actively use several online public administration services (national portal slovensko.sk, national health portal, and so on).

The research questions (Table 4) are based on the research assumptions resulted from previous studies. A research assumption is connected to each research question, in order to achieve the research goal. The aim of the research, as mentioned above, is to find out the state and level of digital skills of Slovakian population and their awareness of e-Government.

Table 4. Overview of the research questions.

Research Objective	Research Assumptions	Research Questions/Areas
The aim of the study is to find out the state of digital skills and the level of digital skills of the inhabitants of Slovakia and their awareness of e-Government	More than half of respondents are sufficiently informed about e-Government services	Awareness of e-government services
	More than $\frac{3}{4}$ of respondents have advanced digital skills	Digital skills in communication with public administration
	Less than half of students do not have advanced digital skills	Digital skills in communication with public administration based on age category
	More than half of students are not advanced users	Digital skills based on economic classification
	More than half of advanced users literally know what e-government means	Level of digital skills to be informed about e-Government
	More than 20% of advanced users have the ability to retrieve information	Digital skill levels

The achieved results reflect and identify the state of digital skills of the inhabitants of the Slovak Republic, which is at an average level. There are population groups that do not have sufficient digital skills, such as the student group, but also the group of elderly people. Mainly, students should be more informed and communicate with the state as close as possible through the available tools of electronic readers and citizen cards with chips.

This situation could improve after the introduction of a mobile application for communication with the state, which is in a testing phase. Another interesting result is knowledge about e-Government.

This term has been used in society for several years, but we can see that some population groups that have a lower or basic level do not have knowledge about e-Government. This problem should be solved at the state level, since even the situation with COVID-19 would simplify and make communication with citizens via the Internet easier and more efficient.

The questionnaire covered three areas. Information on electronic public administration. The level of digital skills that respondents have when using e-Government services. Identification of these areas based on age, economic classification, or education. A base file of the following size was used in the calculation: 5,449,652 population [22]. The variability

of the base set represents a value of 0.5. The confidence interval was 95% and the maximum permissible error range was 5.8%.

$$\sigma = \sqrt{p*(1-p)} = \sqrt{0.5*(1-0.5)} = 0.5$$

$$n \geq t^2_{1-\frac{\alpha}{2}} * \frac{\sigma^2}{\Delta^2} = 1.96^2 * \frac{0.5^2}{0.058^2} = 286 \text{ respondetov}$$

Explanatory text:
n—minimum sample size (minimum number of respondents);
σ^2—the variance calculated from the standard deviation;
t_1—$\alpha/2 -$ critical value from the tables;
Δ—the maximum permissible margin of error;
p—variability of the base set (trait proportion).

The subject of the primary research was the population of the Slovak Republic. The respondents consist of citizens of all regions in Slovakia. Furthermore, for employees in the age group from 40 to 49 years and other categories from 20 to 29 with a university II. degree and with a high school diploma, see Table 5. In the research, the companies, schools, and public institutions were contacted to reach the required sample.

Table 5. Identification of the respondents.

Which Age Category Do You Belong to?	**Number of Respondents**	**Total in (Number) and (%)**
from 60 years	31	290 100%
from 50 to 59 years	60	
from 40 to 49 years	57	
from 30 to 39 years	51	
from 20 to 29 years	51	
up to 19 years	39	
What is your economic position?	**Number of respondents**	**Total in (number) and (%)**
employed	178	290 100%
student	64	
entrepreneur	41	
retired	7	
What is your highest level of education?	**Number of respondents**	**Total in (number) and (%)**
primary school	30	290 100%
high school with graduation	55	
first degree university	19	
university II. degree	166	
university III. degree	19	

Own processing.

Table 6 shows the methodology of the work from analysis to conclusion with a detailed description of individual methods and data used. The individual phases of the research took place in chronological order.

Table 6. Methodology of the article.

Paper	Information	Method	Research Phase
Main data collection	Data focused on digital skills (during COVID-19).	Analysis	I.
Analysis	Index DESI, Index EGDI, Scientific articles, knowledge and experience of the authors. Based on the analysis, a questionnaire was created for the combination of primary and secondary data.	Analysis, method of collecting and processing information, extraction and compilation methods, method of abstraction	II.
Survey	Based on the research, the main goal of the research, research assumptions and research were created. See Table 3.	-	III.
	The authors of the research questionnaire were the authors of the article. The evaluation was carried out in the Microsoft Excel program. The minimum sample of respondents for data relevance is to obtain n = 286 respondents.	-	IV.
	The object of the survey: Respondents are citizens of the Slovak Republic in all age categories, economic status, and educational attainment. The questionnaire was conducted electronically and was created with the Google Docs tool. Subsequently, the questionnaire was distributed among companies, public administration employees, university employees, and students of various age categories. In the evaluation, stratification based on age, economic status, and a combination of other questions was used, which allows for reaching the goal.	-	V.
	Data collection took place for 30 days during the COVID-19 pandemic in 2022. After completing the collection of the questionnaire, the data were downloaded into Excel format, where it was subsequently processed and evaluated. Summary of tools: electronic questionnaire, Google Docs, Microsoft Excel.	-	VI.
Conclusion	Subsequently, conclusions were drawn from the analysis and conducted research, supplemented and supported by other scientific articles.	Synthesis method, deduction method, induction method, generalization method	VII.

3. Results

The results of the primary research showed the awareness of e-Government services, which revealed moderate results among respondents; meanwhile, 39% respondents are not informed about e-Government services. See Figure 1.

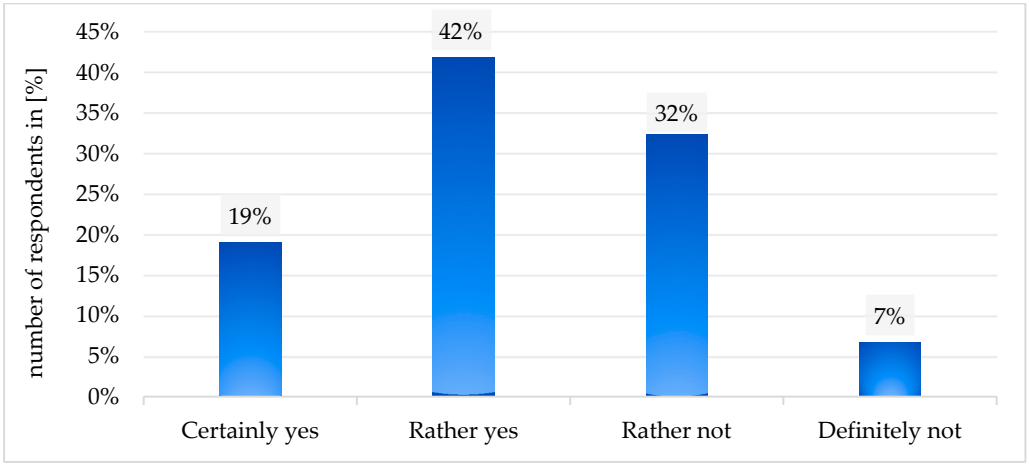

Figure 1. Awareness of e-Government services.

It means that only 19% of the respondents are informed about e-Government services and 42% of the requested respondents are not well informed, but this represents 62% of respondents. As a result, 49% of responses are not enough informed about these services.

Even though the government has among its priorities to improve digital skills, this strategy should also include informing citizens about the use of the electronic services provided by the state authorities. For digital skills in the field of communication with public administration, see Figure 2. The largest group of respondents is the independent user, making up 56%.

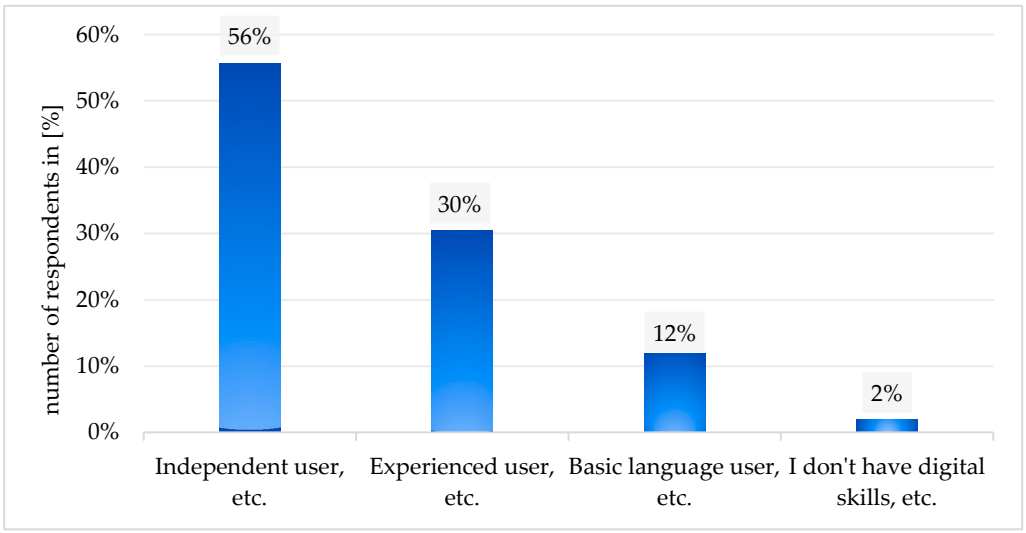

Figure 2. Digital skills in communication with public administration.

The second group consists of experienced users, making up 30% of respondents and the penultimate 12% group consists of respondents with basic language use. The good result is that only 2% of respondents do not have any digital skills.

A detailed analysis based on age shows that the most experienced users are in the age group of 40 to 59, which makes up 43% of respondents of all age categories. Figure 3 shows that digital skills in communication with public administration are most represented in the age categories from 30 to 59 years.

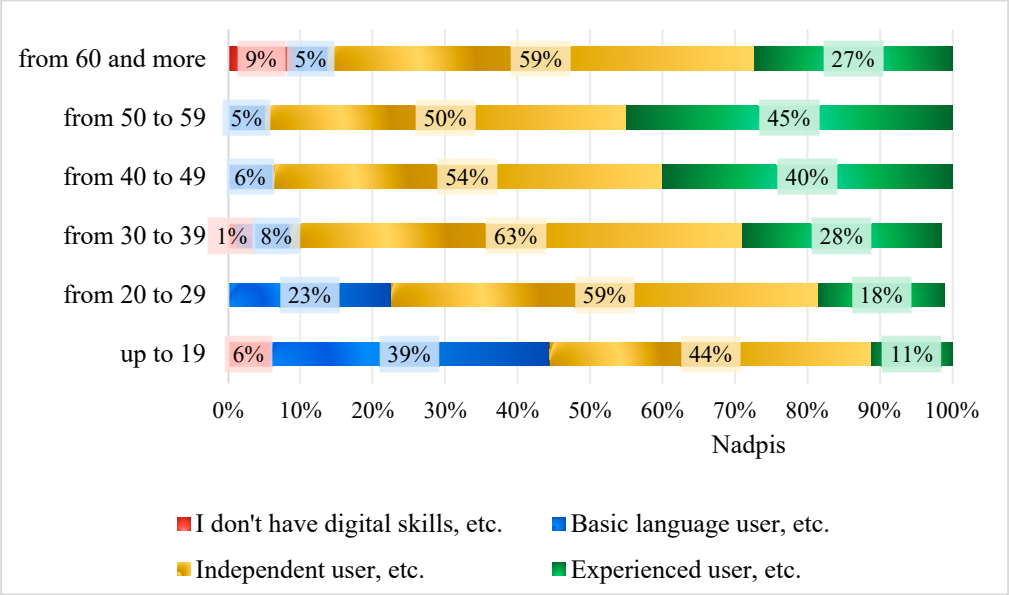

Figure 3. Digital skills in communication with public administration based on age category.

Figure 4 shows that if respondents belong to a lower age category, they have basic digital skills. This also follows from the analysis, which identifies the need to transform the education system. Individual users make up the largest representation across all categories (student, employee, entrepreneur).

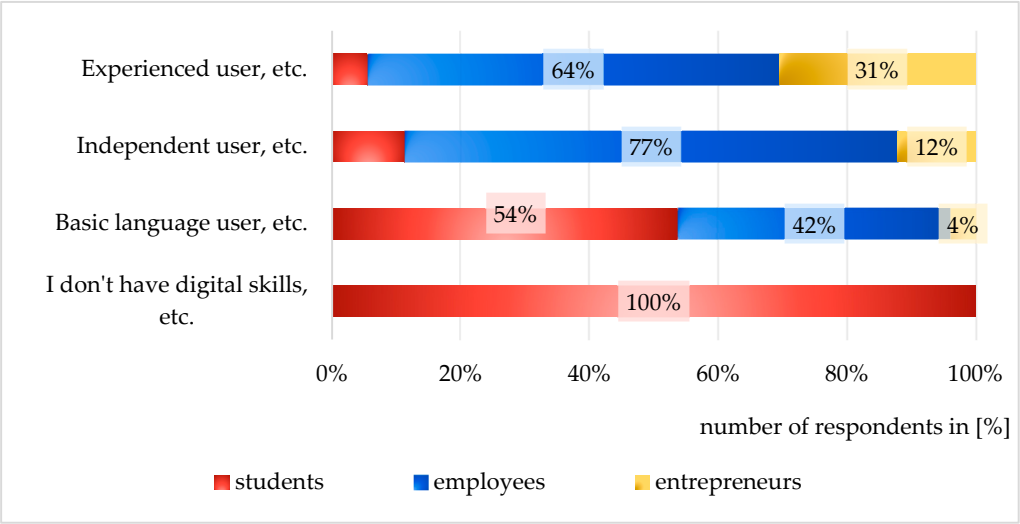

Figure 4. Digital skills based on economic classification.

From the primary research, it can be stated that based on the economic classification, which is divided into students, employees, and entrepreneurs, this category consists of 203 respondents. It was positively assessed that no entrepreneur or employee indicated that he did not have digital skills. This option in the selected category was indicated only by students, who represent 1% of respondents. Respondents who have basic digital skills are primarily students, up to 54% of respondents, and this category represents 36% of respondents.

Respondents who consider themselves to be independent users make up 46.8% of the respondents. Employees have the largest representation in this category. The number of students with increasing levels of digital skills is declining. Experienced users are employees and then entrepreneurs, 33%. Only 6% of students marked the answer of an

experienced user. This confirms that improving digital skills in schools is important, so that employers' requirements correspond to the abilities and demands of staff and are able to communicate with public authorities and use e-Government services.

The survey implies that if the respondents can define e-Government, they are more experienced. This trend can be seen in Figure 5. This result is seen from 17% of respondents to 81%. This group of respondents can clearly define e-Government. Almost the same inversion of answers applies to respondents who have never encountered this term. We can assume that experienced users in this field are not willing to use e-Government services and do not need to be informed about e-Government.

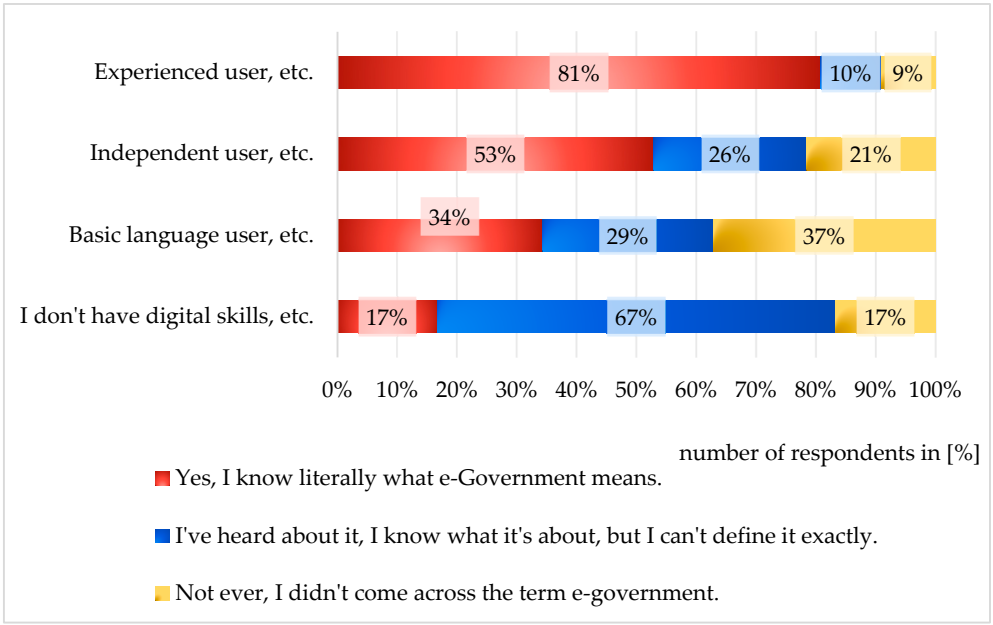

Figure 5. Level of digital skills in relation to being informed about e-Government.

On the contrary, the worst rated issue was the use of copyright. For this question, only 23.13% of students said that their level of skill was advanced and that they knew how and when to use licenses and copyrights; 35.07% of respondents said that they knew how to use links to content that was protected by copyright and 41.79% of respondents know that the content can be protected by copyright.

Only 23.13% of respondents stated that theyhave the ability of content creation on an advanced level and these respondents said they could create complex multimedia content, know how to use many digital tools and environments, and can program a website. Comprehensive digital content in various formats can be created by 37.31% of respondents, who can also use tools to create websites or blogs. The remaining 39.55% of respondents can create simple digital content (e.g., text, tables, images, audio files) in at least one format.

When working with SW, 20.15% of respondents stated that they can use several programming languages, can design, create, and modify databases, which is an advanced level, 46.27% of respondents know the basics of at least one programming language, and 33.58% can only modify simple software and application features or change their default settings.

The area "information retrieval" was evaluated as the one in which the least respondents reached an advanced level (11.94%),although they are able to use advanced search strategies to find reliable information such as RSS. However, 66.42% of respondents can use various search tools and the remaining 21.64% of respondents can search for information using a search tool.

The resulting graphical representation of the distribution of the levels of those digital skills in which the respondents achieved the worst average results can also be seen in Figure 6.

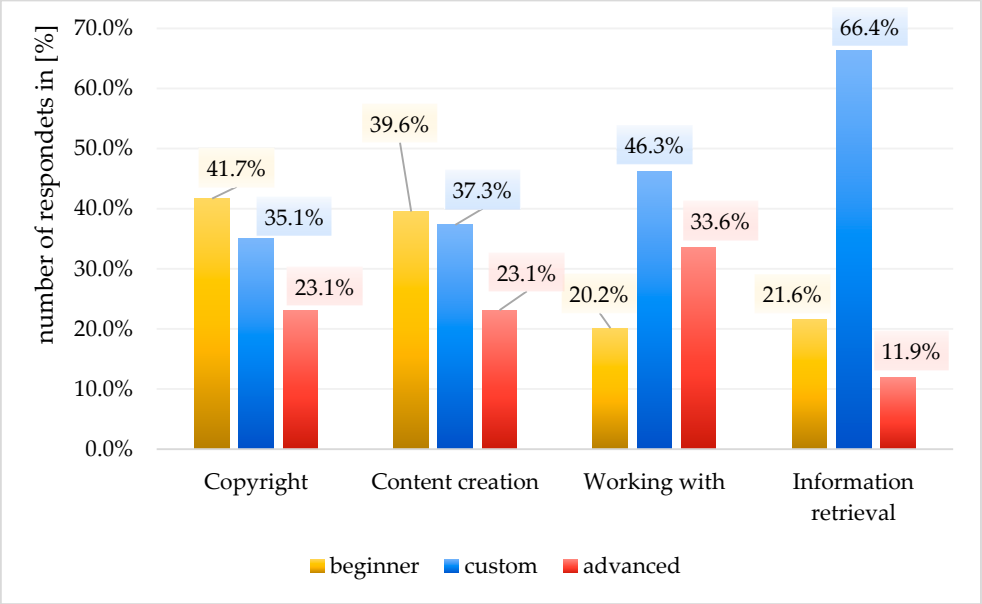

Figure 6. Digital skill levels.

The evaluation of individual questions can be seen in Table 7. The questions are ranked according to the average result of the respondents. The level columns show the percentage values according to how many respondents stated that they reach each level of the selected skill.

Table 7. Evaluation of individual issues related to digital skills.

Categories	Questions	Average (%)	Level (% Respondents)		
			1	2	3
Content creation	Copyright	60.45	41.79	35.07	23.13
Content creation	Content Creation	61.19	39.55	37.31	23.13
Content creation	Working with SW	62.19	33.58	46.27	20.15
Information processing	Information retrieval	63.43	21.64	66.42	11.94
Security	Data security	63.93	41.79	24.63	33.58
Information processing	Evaluation of information	65.67	44.78	13.43	41.79
Problem solving	Solving technical problems	67.41	24.63	48.51	26.87
Problem solving	Improving digital skills	68.91	21.64	50.00	28.36
;	Health protection	69.15	20.15	52.24	27.61
Security	Equipment safety	71.89	19.40	45.52	35.07
Problem solving	Solving non-technical problems	72.64	20.90	40.30	38.81
Content creation	Edit content	73.13	7.46	65.67	26.87
Security	Environmental Protection	73.38	11.94	55.97	32.09
Communication	File sharing	77.86	11.94	42.54	45.52
Communication	Online services	79.60	2.99	55.22	41.79
Information processing	Information storage	79.85	14.18	32.09	53.73
Communication	Communication tools 2	84.08	17.91	11.94	70.15
Communication	Communication tools 1	93.78	3.73	11.19	85.07

Own processing.

Content creation is the category that most shows students' creativity, and creativity is one of the skills that will play an important role in the ability of graduates to enter the

labour market. It is, therefore, important for students to focus on this area while studying at university, especially if students have knowledge gaps in this area and, thus, try to improve their position and expand their opportunities for the future.

4. Discussion

Digital skills have been essential for many people during the COVID-19 pandemic in order to find a new job or keep a current job since the employers need highly qualified people with strong digital skills, and furthermore, the question about improving digital skills for all people without difference has been raised. The e-Government could help all people to keep in touch with the public administration during the COVID-19 pandemic. We have compared the results and realized the results in the field of digital skills.

To fully use the potential of digitization, it is necessary to know how it affects current jobs and what skills are needed to perform these jobs. Many skills that were considered optional a few years ago and were not considered very important then have in a few years become critical. It is also necessary for jobseekers to be equipped with soft skills, such as communication in online and offline environments or organizational skills [33,34].

The development of information and communication technology (ICT) has a significant impact on employment, as it creates more jobs in the information technology (IT) sector, such as software development, outsourcing, hardware manufacturing, etc. In addition, the impact of digitization has been discovered in other service sectors such as trade, industry, finance, and healthcare [35,36]. The global creation of hundreds of millions of jobs in the last few years has brought a great boom in society, and so digitalization has accelerated the economic growth and prosperity of countries by increasing employment opportunities for their citizens [37]. Digital skills are not a solution for everything today, but they are important and should be part of education policy [38].

Companies claim that automation technologies that use artificial intelligence and robotics will generate benefits for their users, businesses, and economies by increasing productivity and economic growth [39,40]. This will reduce the status of some professions, but automation will change much more. Sixty percent of occupations have at least 30% percent of routine work activities that can be automated. It will also create new professions that do not yet exist, as many other technologies have in the past. While almost half of all work activities have the potential to become automated, the number of jobs replaced by 2030 is likely to be smaller due to technical, economic, and social factors that affect the introduction of automation [41]. Developed economies are more affected by automation than developing ones. Although there are concerns about job losses, automation may bring higher demand for labour and workers if it brings economic growth, as technological progress triggers productivity growth. The demand for work is also linked to better health care, investment in infrastructure, and energy [42].

Interactions between people and technology are becoming commonplace and an important part of everyday life, yet not everyone has access to these technologies. The digital divide speaks of a growing gap between discriminated members of society (poor, elderly, disabled, etc.) who do not have access to computers or the Internet, and the rich middle classes who have this access [43,44].

The cooperation between the public and private sectors is of big importance. Against this backdrop, public and private sectors need to work together to tackle pandemics. It is expected that several jobs will be added soon in the field of digitalization and automation—149 million by 2025 based on Microsoft data science—hence, it is necessary to improve the digital skills of the population [45].

Some authors said that the number of e-services is increasing, Internet and mobile coverage is increasing as well as Internet speeds, the number of ICT users is growing, the quality of digital education is improving, technologies are no longer key for IT but also for the economy, industry, healthcare, education, and overall for everyday life [46].

Not surprisingly, other authors have said that digital literacy should meet future needs. On the one hand, young people have helped to improve their digital skills. On the other

hand, these digital skills need to be measured and the evolution of digital skills needs to be monitored [47].

Apart from these scientists, others argued that the digital divide should be approached more comprehensively, between different sections of the population, addressing not only Internet access, skills and use, but also the consequences of skills. Digital skills improve the quality of work performance, lead to higher incomes and a higher chance of employment. In addition, skills are important for their contribution to emancipation, empowerment, and self-realization [48]. The outcomes of this article show the need to monitor and measure the digital skills that workers should attain. Moreover, employees have to adapt to changing job requirements and organization practices related to new digital skills [49].

Digital skills are oriented toward the economy's needs at this time. Importantly, the main goal is to reach sufficient skills in digital literacy that citizens need in their everyday lives—from online search to digital content creation—in order to be able to live and work in the digital economy. The shortage of basic digital skills creates barriers not only in personal growth, but there is also the risks and concerns of digital literacy in modern technologies and a risk of people not finding a good paid job [50].

There are many platforms where citizens can improve their digital skills. People who have access to digital skills have better economic opportunities. Digital skills can reduce unemployment in the state and have other positive effects on the economy. In light of the very fast pace of technological change and the generally slow pace of formal educational institutions to adapt to such changes, non-formal education can play a critical role in providing young people with further opportunities to hone their digital skills and adapt their skill set to job-market needs [51,52].

The current state of the COVID-19 pandemic has emphasized the existing shortcomings in the digital economy of Slovakia and in Slovak society. Areas such as connectivity, digital skills acquisition, and the digitization of schools and public services have come to the fore. Within the public sector, the greatest pressure was on information systems in hospitals, schools, and public institutions, etc. These institutions were not materially or personally prepared for the sudden transition to online operation [53].

Many educational institutions and organizations are changing and improving their teaching methods and trying to provide a flexible, comfortable, and safe learning environment for their students [54]. The article states that teachers have low or moderately low digital competences, as well as the absence of some competences, especially those related to the evaluation of educational practice [55]. Furthermore, it is necessary to continue to focus on this area and to deepen knowledge and to design a more practical and personalized educational program for students. Therefore, it is necessary to get to know and implement the ISTE standards in educational institutions in order to improve the quality of the education [56].

Many authors agree a viewpoint in which it is said that people need digital skills to be able to find high quality work, and that digital skills are not only essential for education and health but for all of industry, and so forth. If we look for different viewpoints that are presented, we can see the same arguments about this topic, but we can also see that digital skills help young people get a job faster and that a lack of digital skills could create barriers for personal growth. It is very likely that digital skills will be important to master in the future.

Contributions and Limitations

Our study has several limitations (Table 8). It does not include practical tasks performed by the respondents and, therefore, it is not possible to establish the digital level of the respondents based on correctly developed tasks. The survey is not only aimed at one group of the population, or two. Further comparison regarding selected population groups with targeted quota selection based on age or gender should be the focus.

Table 8. Insights from this study and the limits.

Insight	Execution	Limitation and Opportunities for Further Research
Level of digitalization	Use of DESI and EGDI index	Practical test tasks for respondents
Survey	Several population groups	Selected one or two population groups
Country research	Slovakia	Conducting research in foreign countries
The area of e-Government digitization	e-Government	This area is not an area often identified in the research

Furthermore, the definition of a new concept of digital poverty could be used, which would identify survey participants' access to the Internet, quality of technology, income, etc. These research gaps represent opportunities for further research.

5. Conclusions

The article has been supplemented with several new literature sources that support our results, such as "educational institutions and organizations are changing and changing their teaching methods and trying to provide a comfortable, safe and flexible learning environment for their students".

Among the limitations of other research is that a certain part of the articles in the field of digitization investigated the perception and level of digital competences. The articles were devoted to the data collected by the authors themselves as part of the research, but they were often supplemented with sources from transnational or national institutions [57].

Other limitations include the lack of a test of digital tasks that would accurately identify individual digital gaps.

Furthermore, few studies are devoted to teaching and learning methods. As already mentioned, certain groups of data do not combine quantitative and qualitative research results. Further investigations, such as age or economic groups (retirees, PhD. students, teachers only) would provide interesting results [58–61].

Digitization and e-Government is not paid sufficient attention. Within this area, a small number of studies have been carried out within Slovakia, which would accurately identify digital levels.

The current crisis has deepened and highlighted the shortcomings in e-Government. The level of digital skills and awareness of electronic services has an impact on the use of electronic services. The aim of the article was to point out the level of digital skills of the inhabitants of the Slovak Republic in individually selected categories, in addition to finding out information about e-Government. The results of the primary survey and analysis show that the level of digital skills is below average, and some age groups do not have sufficient digital skills to use all e-Government services. The Slovak government and the relevant Ministry of Investment, Regional Development and Informatization have not developed a strategy or document for the coming years that would increase the level of digital skills. Improving digital skills is one of the EU's priorities and strategies for digital transformation by 2030. The adopted action plan for 2019–2022 focuses on the development of soft skills. The level of digital skills in the Slovak Republic is becoming stagnant, which is confirmed by the DESI index. Digital skills are a key aspect of raising the living standards of citizens. In the long term, investing in human capital and increasing digital skills can bring benefits to the Slovak economy, for example in creating greater resilience of the economy in times of crisis or pandemic and make it so that people would prefer to communicate through the e-Government services. The coronavirus pandemic in Slovakia caused a significant disruption of educational activities. New ways of teaching and learning require innovative, creative, and inclusive solutions. The primary surveys imply that the people would like to be informed through new informing web portals to increase information about e-Government, so that they can find on this web a lot of different information about e-services that are launched and that are in preparation.

Future research should be interested in the digital level and the use of the application for communication with the state. For example: What options does this app provide? How

can students and seniors communicate with the state through the application? In addition to this area, another subject of research should be a comparison between the communication channels of other countries and Slovakia, such as Denmark, Finland, etc., since they are leaders in this field.

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