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Original Research Paper

New Information Technologies in Improving the Population's Information Culture

Oksana Koshelieva[1*], Oksana Tsyselska[2], Olena Kravchuk[3], Volodymyr Mironov[4], Nataliia Miatenko[5] and Ihor Baida[3]

[1]Dept. of Television Journalism and Acting, Faculty of Film and Television, Kyiv National University of Culture and Arts, Kyiv, Ukraine
[2]Dept. of Directing and Actor's Skills, Faculty of Theater, Film and Variety, Kyiv National University of Culture and Arts, Kyiv, Ukraine
[3]Dept. of Film and Television Arts, Faculty of Film and Television, Kyiv National University of Culture and Arts, Kyiv, Ukraine
[4]Dept. of Information Technology, Faculty of PR, Journalism and Cybersecurity, Kyiv National University of Culture and Arts, Kyiv, Ukraine
[5]Dept. of Event Management and Leisure Industry, Faculty of Event Management and Show Business, Kyiv National University of Culture and Arts, Kyiv, Ukraine

*Corresponding author: renisenb@ukr.net (**ORCID ID:** 0000-0002-1653-2103)

ABSTRACT

In today's information society, increasing the population's information culture as a way of developing society and civilization becomes very important. The reason is that global transformations are taking place practically in all spheres of activity in all developed, developing, and underdeveloped countries. This article aims to assess the state of information culture in society. **Methodology:** The method of statistical analysis helps to assess information technology skills according to the OECD classification. The investigation revealed mutual correlations between such indicators as basic critical, strategic thinking process skills and the ability to learn actively and solve complex problems. **Results:** At the beginning of the study, information technology and information skills are classified according to different characteristics: operational, formal, information, strategic, technical, and cognitive abilities in using technology. The article assessed the technical skills of the population, including the ability to use computer equipment. In addition, the research set system skills, which consist of the ability to make decisions and evaluate situations. Based on the analysis results using induction and deduction methods, comprehensive problem solutions are proposed. The totality of the obtained research allows understanding of the ability of the population to use technology, which affects the development of the society's information culture. According to the study results, it is found that there is a lack of basic process skills in society. At the same time, system skills directly affect the ability to solve various needs. At the same time, there are enough technical skills that help even repair the equipment and solve simple technical problems. It is also determined that, in general, the working population has sufficiently developed critical thinking and can solve complex problems and comprehensively assess the situation.

HIGHLIGHTS

◉ This article aims to assess the state of information culture in society.
◉ The article assessed the technical skills of the population, including the ability to use computer equipment.
◉ In addition, the research set system skills, which consist of the ability to make decisions and evaluate situations.
◉ Based on the analysis results using induction and deduction methods, comprehensive problem solutions are proposed.

Keywords: Information technology, information culture, critical thinking, problem-solving, technical skills

The issue of information technology is quite researched in academic circles. At the same time, this problem becomes more relevant every year due to the constant integration of technology in all spheres of society and its activities (Barnes, 2018). The widespread digitization of all life processes forms new connections between humanity and computers. People are forced to use automation tools not only in their work activities but also for simple household tasks (Allmann & Blank, 2021). Today, it is almost impossible to use utilities or conduct any business transactions without computer skills. At the same time, computerization extends to all spheres of life, including medicine, education, and transportation. Under such conditions, everyone must improve their digital skills using computers and mobile devices and, as a result, develop an information culture.

Information culture is becoming a new type of communication, allowing a person to move freely in space and create effective connections with other people, authorities, or organizations responsible for the effective functioning of society. At the same time, information culture is an informational activity that characterizes the quality of human life through the information: its collection, transmission, and usage.

Many scientists and experts study information culture by assessing the digital skills and competencies of the population, forming the concept of so-called information literacy (Milenkova, Keranova & Peicheva, 2019). The results of the analysis are quite similar among all researchers: despite the rapid development of society and active technological support of all life processes, there is still a significant part of the population that does not have enough developed skills to perform the simplest actions. This problem affects the older generation and young people who use the Internet more often for entertainment rather than for solving their own problems (Deursen & van Dijk, 2011). It suggests that information culture is not just the ability to operate technology but a set of personal characteristics that allow a person to develop in the informatization direction.

The article aims to identify the basic skills of the population in the use of information technology as the main factor in the formation of information culture.

Literature Review

Various human qualities related to the use of information and computer technology have been described in the scientific literature. Different terms are used to describe a person's ability to do various tasks using the tools of informatization. With the spread of digital technology, a variety of terms are standard such as:

- information technology;
- information and computer technology;
- computer literacy (Bawden, 2008).

These and other concepts form the theoretical basis for conducting research and gathering statistical information. Experts, organizations, and sociologists evaluate their population and the economy by using information technology in society and the formation of the computer literacy concept. At the same time, all these concepts compose the components of information culture.

Despite the different approaches to understanding information culture, scholars have a standard view that information technology plays a dominant role in determining the necessary skills to function effectively in society and developing nations. In most cases, these concepts include working with computers, Internet technology, and multimedia devices in combination with personal competencies such as commitment, responsible education, etc. (Hatlevik, Ottestad & Throndsen, 2015). All these concepts allow assessing the information culture level with the help of indicators, where the basic level is defined by the simplest functions, and the advanced level by programming, modelling, and management skills.

However, despite the general understanding of the criteria for assessing information culture, the full range of skills needed to evaluate the full potential of information and computer technology in a developed society remains uncertain, debatable, and resonant. To date, it cannot be clearly established what skills people must have to fully cover all the necessary needs that may arise during active practice (Hatlevik, Ottestad & Throndsen, 2015). In view of the impossibility of defining a complete set of competencies as well as its mass application in society, it is essential to focus on a basic set of computer and computer technology use skills that

will allow anyone, regardless of age or gender, social status or life position to perform the simplest, but at the same time, most necessary actions with computer technology.

A significant amount of research is devoted to information culture, defined as a unique phenomenon of the information society. Depending on the concept of information culture, it can be represented by society, the individual, or a specific social group (Helsper & Van Deursen, 2015). If we consider information culture in the context of information technology use, it is understood simultaneously as the information culture of the individual in terms of computer skills and as a set of skills and abilities necessary for a group of people to develop themselves, the company and the state (Knox, 2014).

Vujičić *et al.* (2020) explore computer literacy through the ability to use technology and software with the internet. The author believes that young people should have some information technology skills and be able to evaluate technology critically. The ability to create content with the help of special software is also essential. Critical thinking as a fundamental skill combined with logic and the search for alternative solutions, the ability to generalize and improve different processes plays a key role here. Critical thinking skills are advanced abilities that enable a person to learn and understand the implications of new information for current and future problems (OECD, 2022).

Along with critical thinking, important are the skills that a person acquires in the process of learning and practical work. They include:

- active learning, particularly understanding new information and working through it to solve current and future problems;
- strategically choosing various methods and procedures for learning that are relevant to the situation at hand;
- self-monitoring and controlling the work of others or organizations to improve the situation and take corrective action.

Classification of skills and technologies can differ depending on their application or learning purposes. Thus, Iordache, Mariën & Baelden (2017) found 13 models of digital literacy and identified five main criteria for digital skills:

- operational;
- technical;
- formal;
- digital content creation;
- strategic skills.

Information technology skills are directly related to the skills of evaluating a situation according to an internal understanding of the problem encountered. That means that not only technical skills but also cognitive abilities, as defined by the basic standards of critical thinking, are important for the development of information culture. However, Van Laar *et al.* (2017) confirm that information skills cannot be limited to technical skills, as an individual's characteristics (such as determination, responsibility, and ability to analyse and find solutions to problems) are more often important for solving certain problems. Moreover, in contrast to digital skills, personal skills, which consist of the desire to learn and the ability to handle information easily, are more important in today's society. That is explained by the fact that personal qualities are motivational for learning different technologies, while the ability to use technology and technology does not guarantee problem-solving.

One essential ability that defines soft skills is the critical thinking skill, which allows making reasoned opinions and selecting the right information to carry out certain work. In particular, additional essential components of critical thinking are:

- analysis;
- evaluation;
- justification;
- logical reasoning;
- novelty.

These authors note that the most important personal characteristics that determine the overall ability to think critically are:

- flexibility;
- cultural awareness;
- ethical awareness;
- self-learning;
- purposefulness;
- lifelong learning (Fig. 1).

In turn, technical skills are defined as the ability to use various devices, including computers, tablets, mobile devices, and software, to perform practical tasks, navigation, and orientation (Van Laar *et al.* 2017). The primary technical skills that define information competence are:

Critical thinking skills	
	Search
	Identify / Select
	Locate
	Access / Retrieve / Restore
	Organize
	Synthesise
	Share
	Distributied cognition
	Multitasking
	Digital problem-solving skills
	Analyse and evaluate
	Transmedia navigation
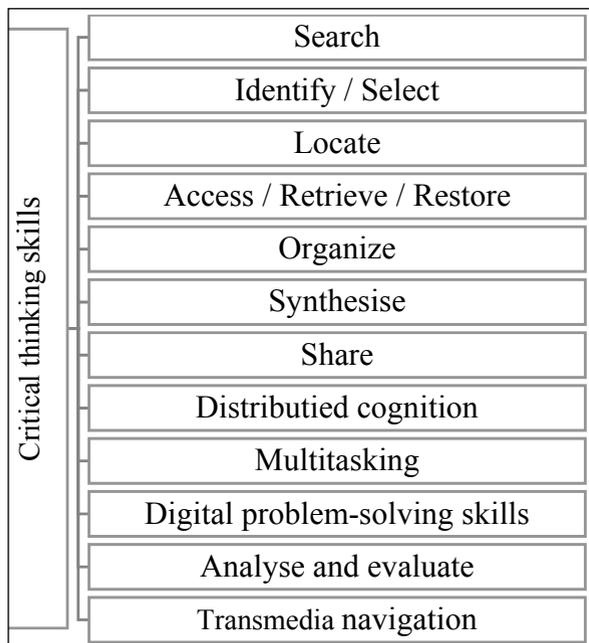
Source: Iordache, Mariën & Baelden (2017).

Fig. 1: Personal skills determining the quality of critical thinking

- knowledge of computer and information technology and an understanding of the basic functioning of essential devices and programs;

- proficient use of information and computer technology, and an understanding of which programs or resources can be used to solve specific tasks;

- searching, which means the ability to sort information and navigate the Internet clearly to find relevant, up-to-date information and process it.

Thus, information management skills are the combined use of information technology to effectively search and process information to make informed decisions or select a source of information that will help solve certain tasks (Van Laar *et al.* 2017).

The core competencies include the ability to determine which type of technology can be used to solve problems, obtain information from different sources, assess the usefulness and reliability of data,

and manage information for their own purposes. Researchers Van Deursen, Courtois & Van Dijk (2010) define essential information skills as the skills needed to find, select, and process information using digital media devices. However, they confirm the need for critical thinking as an essential personal skill for the ability to apply computer skills. Thus, Van Deursen, Courtois & Van Dijk (2010), van Deursen & van Dijk (2011) identified:

- Fundamental skills. Operational skills include the ability to use software and computer technology.

- Formal skills. The ability to use computer technology and the Internet, the ability to navigate the Internet space.

- Strategic skills. The ability to use the Internet for a variety of purposes that solve current problems and avoid future ones.

After some time, the author's team (Van Laar *et al.* 2019) defined additional necessary information skills, including information quality, communication, cooperation, critical thinking, creativity, and problem-solving ability. As a result, they define three levels of computer literacy (Van Deursen & Van Dijk, 2016):

- Technical skills define traditional literacy. It has a direct impact on formal and information skills and an indirect impact on strategic skills;

- Formal literacy, is defined by a set of technical and personal characteristics which influences strategic skills;

- Strategic skills - a higher level of strategic computer skills provides a higher level of information skills and professional use of technology.

The Digital Skills for Tangible Outcomes (DiSTO) project (Helsper *et al.* 2015; van Deursen *et al.* 2016) categorized skills by complexity as well as by functional need:

- basic skills form operational skills;
- search skills - skills to navigate and retrieve information;
- creative skills - enable the creation of content.
- social skills - create communication skills using information technology.

Among information skills, information literacy, defined as the cognitive skill needed to evaluate information sold by Internet tools critically, should also be highlighted (Eshet, 2004).

Iordache, Mariën & Baelden (2017) identified the main activities an information-literate person performs on the Internet using technological and cognitive skills. They include the ability to search, select, find, accept, store, and disseminate different information to manage it through all situations related to daily life and professional work. The literature also identifies problem-solving skills that can positively impact the development of digital technologies and competencies. They allow users to positively influence the development of digital skills and competencies and help identify the right digital tools needed to achieve goals or solve various technical or conceptual problems (Iordache, Baelden & Marien, 2016). Problem-solving skill is the ability to identify digital needs and resources make informed decisions using the most relevant digital tools according to needs and goals, and use technology and computer tools creatively to solve technical problems and develop competencies (Janssen *et al.* 2013).

Thus, different classifications of digital skills that determine the ability to use technology and influence the formation of an information culture are presented in the academic literature and international organizations' reports. Yet, at the same time, regardless of the different interpretations of information skills, they all perform the same function: they allow a person to solve current and strategic tasks more quickly, efficiently, and effectively.

Methodology

In order to carry out empirical analysis, this study uses statistical analysis to assess information technology skills classified according to the OECD (2022). These skills include:

- basic skills include critical thinking, active learning ability, strategy building,
- and self-control;
- integrated problem-solving ability;
- technical and systems skills form the whole set of information skills needed for a modern person.

OECD 2020 data were selected for the analysis, which allows for analyzing the skills of employees of different companies from different countries (OECD Skills for Jobs, 2022).

The selected skills allow to fully assess the level of information culture and determine the relationship between process, technical and system skills, as well as the ability to solve problems and find alternative solutions. Positive values of the indicators show a lack of skills in the information society, while negative values show an excess of skills. The higher is the absolute value, the greater is the imbalance. The scale of assessment results is formed by a minimum value of - 1 and a maximum value of + 1. The maximum value reflects the greatest skills deficit observed across the countries in the sample. Correlation analysis using Pearson's coefficient, the statistical significance of which is checked with Student's statistic, is used to assess the relationships.

RESULTS

Depending on their development level, countries have populations with more developed or less developed information skills. For example, statistics show that the most deficient technological skills are in the countries of the European Union, and the least in Argentina, Brazil, Bulgaria, Peru, South Africa, Cyprus, Malaysia, and Romania. At the same time, critical thinking skills and the ability to actively learn are evident in the countries where the population has the greatest need for development (Fig. 2).

In comparison with basic technological skills in the European Union and other countries, a slight excess of technical skills is found, which is reflected in Fig. 3. Employees of companies have sufficient skills to select the use, installation, support, and even repair of equipment.

A lack of systemic skills in working with information technology is also identified in different countries. In particular, workers have a low level of critical perception of information, its evaluation, and decision-making based on the analysis results, which can be seen in Fig. 4.

The findings also suggest a lack of comprehensive problem-solving skills. At the same time, according to the results of the World Economic Forum in
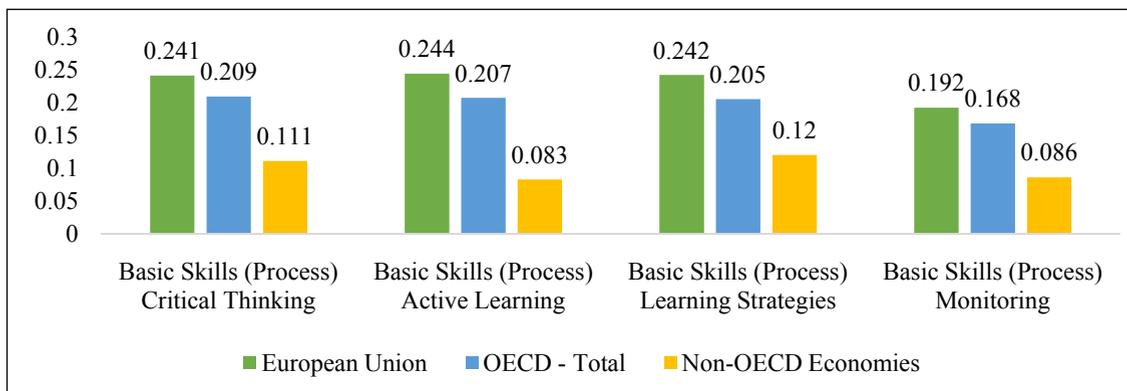
Source: OECD Skills for Jobs (2022).

Fig. 2: Assessment of basic information skills of workers around the world
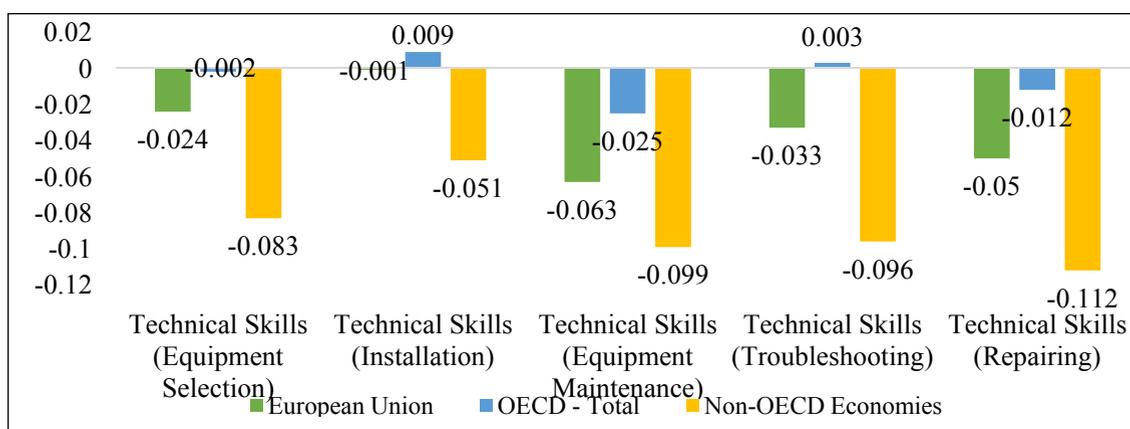
Source: OECD Skills for Jobs (2022)

Fig. 3: Technical Skills Assessment of Workers Around the World
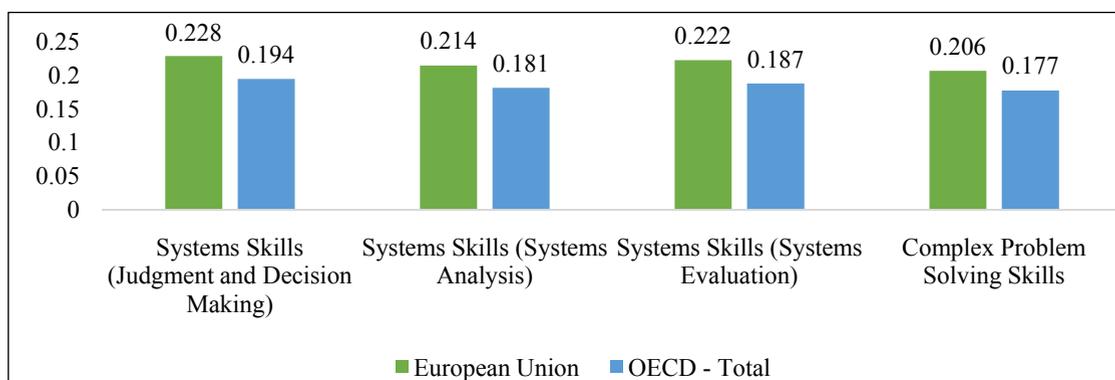
Source: OECD Skills for Jobs (2022)

Fig. 4: Systems Skills Assessment of Workers Across Countries

Davos, the first place among all skills of future employees is complex problem solving (CPS).

This skill includes two qualities: looking for new solutions and being responsible for the result without transferring it to others, and fully implement the work following the management requirements.

With the constant growth of information, this skill is becoming increasingly in demand among employers, allowing them to find responsible employees capable of seeking problem solutions.

The study of process system skills identified a strong direct relationship between complex

problem-solving skills and critical thinking, as shown in Table 1. Critical thinking is most strongly related to complex decision-making skills and the ability to evaluate, seek and use information objectively. With dynamic automation in all sectors of the economy, the ability to think critically needs constant development through well-defined work procedures.

Correlation analysis of technical and complex problem-solving skills indicates a low inverse relationship between technical skills and finding the best solution.

The analysis also identifies a low inverse relationship between equipment support skills and complex problem solving and between equipment repair skills and complex problem-solving skills.

Moreover, the analysis identified high direct correlations between different skills. In particular, it is observed that the ability to make decisions systematically depends directly on the ability to analyze and evaluate information. At the same time, analysis and evaluation of information occupies an important place in critical thinking and, accordingly, in information culture formation.

DISCUSSION

The importance of information culture is growing dynamically in the information society. At the same time, information culture is seen as a new type of communication that allows a person to choose information and use it to solve specific problems freely. In an information society, information culture is an activity that helps receiving, transmitting, storing, and use different types of information. Critical thinking skills are also essential, which, combined with the ability for active and effective learning and self-discipline, will contribute to the mastery of skills in the use of technology and technology. However, information culture should not be viewed only in a psychological or

Table 1: Relationship between basic information skills and the ability to solve complex problems

Sl. No.	Skills	1	2	3	4	5
1	Basic Skills (Process) Critical Thinking	1,000				
2	Basic Skills (Process) Active Learning	0,975	1,000			
3	Basic Skills (Process) Learning Strategies	0,838	0,912	1,000		
4	Basic Skills (Process) Monitoring	0,941	0,948	0,927	1,000	
5	Complex Problem Solving Skills	0,980	0,974	0,838	0,932	1,000

Source: Author's calculation based on OECD Skills for Jobs (2022).

Table 2: Relationship between technical skills and complex problem solving

Sl. No.	Skills	1	2	3	4	5
1	Technical Skills (Installation)	1,000				
2	Technical Skills (Equipment Maintenance)	0,528	1,000			
3	Technical Skills (Troubleshooting)	0,597	0,955	1,000		
4	Technical Skills (Repairing)	0,584	0,991	0,961	1,000	
5	Complex Problem Solving Skills	0,023	-0,340	-0,161	-0,268	1,000

Source: Author's calculation.

Table 3: Relationship between systemic skills and complex problem solving

Sl. No.	Skills	1	2	3	4
1	Systems Skills (Judgment and Decision-making)	1,000			
2	Systems Skills (Systems Analysis)	0,976	1,000		
3	Systems Skills (Systems Evaluation)	0,979	0,992	1,000	
4	Complex Problem Solving Skills	0,989	0,982	0,981	1,000

Source: Author's calculation based on OECD Skills for Jobs (2022).

pedagogical context. It should be viewed as a definition of objective and subjective conditions for an individual to learn how to use technology to solve everyday problems and work. At the same time, using computer technology alone is not enough, as the correlation analysis proves the importance of personal skills in working with various techniques and using the software. If information culture is perceived only from a technical point of view, it is the optimal way of using information and data to solve problems using the ability to collect, transmit, process, and store data. In other words, information culture is not an indicator of general culture but a professional culture. In this sense, it shows the reserve of knowledge in different areas and fields.

Informational skills, as opposed to personal skills, are obtained through schooling and higher education. The main sciences that provide a person with basic knowledge about informatization are: mathematics, computer science, cybernetics, design theory, and other exact sciences. An essential component of information culture in this context is the understanding of the importance of new information technologies used to automate various working processes. Also, this knowledge is needed to solve non-standard situations that require a creative solution. In this aspect, information culture is the knowledge of how to process, store, transmit and use the information and the ability to direct it to solve various problems.

Actually, to some extent, modern information culture is the result of a new type of thinking, which is formed as a result of active human activity with the use of information and intellectual work, and new technologies. This new culture combines the old requirements for information culture with the new ones into a single unit. So, it is essential to perceive information culture not as a phenomenon that arose in the scientific and technological revolution but as an active infrastructure that penetrates all areas of human life and in all stages of social human development.

CONCLUSION

Information culture is the result of various human creative abilities, which manifests itself in different aspects:

- the use of technical devices: from the telephone

to the personal computer, local networks, and the Internet;
- ability to analytically process information to solve certain problems;
- the ability to use information technology in work and daily activities;
- the skill of synthesizing information and selecting the most critical data from different sources while determining their relevance, actuality, and credibility;
- the skill of working with different information;
- the knowledge of the peculiarities of the information flows and the use of this knowledge in practical activities.

The population's competencies determine the ability to use technology and affect the information culture's development. Skills for using technology and working with information are divided according to their period of use; in particular, they can be operational and strategic. Skills can be formal and informational, determining the technical and cognitive ability to use the information and various computer devices.

The analysis revealed a lack of basic process skills and system skills directly related to the ability to solve various tasks. However, there is no identified deficit or excess of technical skills in information technology that affect complex problem solving among the interviewees. On the contrary, people who participated in the survey have sufficient computer skills and can make simple repairs or solve simple problems, using the development of critical thinking and competence in solving complex problems.

REFERENCES

Allmann, K. and Blank, G. 2021. Rethinking digital skills in the era of compulsory computing: methods, measurement, policy and theory. *Information, Communication & Society*, **24**(5): 633-648.

Barnes, S.A., Kispeter, E., Eikhof, D.R. and Parry, R. 2018. Mapping the museum digital skills ecosystem: Phase one report.

Bawden, D. 2008. Origins and concepts of digital literacy. *Digital literacies: Concepts, policies and practices*, **30**: 17-32.

Eshet, Y. 2004. Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Edu. Multimedia and Hypermedia,* **13**(1): 93-106.

Hatlevik, O.E., Ottestad, G. and Throndsen, I. 2015. Predictors of digital competence in 7th grade: a multilevel analysis. *Journal of Computer Assisted Learning*, **31**(3): 220-231.

Helsper, E.J. and Van Deursen, A.J.A.M. 2015. Digital skills in Europe: Research and policy. *Digital divides: The new challenges and opportunities of e-inclusion*, **195**: 125.

Helsper, E.J., Van Deursen, A.J. and Eynon, R. 2015. Tangible outcomes of Internet use: from digital skills to tangible outcomes project report. Available at: http://eprints.lse.ac.uk/61807/1/__lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_Helsper,%20E_Helsper_Tangible%20outcomes_2015.pdf

Iordache, C., Baelden, D. and Marien, I. 2016. Reconsidering digital skills: A theoretical questioning of the skills that define e-inclusion.

Iordache, C., Mariën, I. and Baelden, D. 2017. Developing digital skills and competences: A quick-scan analysis of 13 digital literacy models. *Italian J. Socio. of Educa.*, **9**(1).

Janssen, J., Stoyanov, S., Ferrari, A., Punie, Y., Pannekeet, K. and Sloep, P. 2013. Experts' views on digital competence: Commonalities and differences. *Computers & Education*, **68**: 473-481.

Knox, J. 2014. Digital culture clash: "massive" education in the E-learning and Digital Cultures MOOC. *Distance Education*, **35**(2): 164-177.

Milenkova, V., Keranova, D. and Peicheva, D. 2019. Digital skills and new media and information literacy in the conditions of digitization. In *International Conference on Applied Human Factors and Ergonomics* (pp. 65-72). Springer, Cham.

OECD, 2022. Definitions used in the OECD Skills for Jobs Database. https://www.oecd.org/els/emp/OECD%20Skills%20for%20Jobs%20Definitions.pdf

OECD, 2022. Skills for Jobs. https://stats.oecd.org/Index.aspx?DataSetCode=SKILLS_2018_TOTAL#

Van Deursen, A.J.A.M., Courtois, C. and Van Dijk, J. 2010. Internet skills. *Vital assets in an information society. Enschede, the Netherlands: University of Twente.*

Van Deursen, A.J.A.M., Helsper, E.J. and Eynon, R. 2014. Measuring digital skills. *From digital skills to tangible outcomes project report.* https://www.lse.ac.uk/media-and-communications/assets/documents/research/projects/disto/Measuring-Digital-Skills.pdf

Van Deursen, A.J. and van Dijk, J.A. 2011. Internet skills performance tests: are people ready for e-Health? *J. Medical Internet Res.*, **13**(2): e1581.

Van Deursen, A.J. and Van Dijk, J.A. 2016. Modeling traditional literacy, Internet skills and Internet usage: An empirical study. *Interacting with Computers*, **28**(1): 13-26.

Van Deursen, A.J.A.M., Helsper, E.J. and Eynon, R. 2016. Development and validation of the internet skills scale (ISS). *Information, Communication & Society*, **19**(6): 804–823.

Van Laar, E., Van Deursen, A.J., Van Dijk, J.A. and De Haan, J. 2017. The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, **72**: 577-588.

Van Laar, E., van Deursen, A.J., van Dijk, J.A. and de Haan, J. 2019. Determinants of 21st-century digital skills: A large-scale survey among working professionals. *Computers in Human Behavior*, **100**: 93-104.

Vujičić, M.D., Stankov, U., Kovačić, S., Vasiljević, Đ. A., Pivac, T., Čarkadžić, J., ... and Cimbaljević, M. 2020. Digital Skills and Behaviors of Youth That Are Relevant for Digital Culture: A Two-Country Self-Evaluation Perspective. In *Examining the Roles of Teachers and Students in Mastering New Technologies* (pp. 128-149). IGI Global.