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Advanced Digital Skills in the Information Society-Poland Compared to the European Union

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Abstract:

Purpose: *The purpose of the considerations undertaken in the article is to analyze the level of advanced digital skills in Poland in the context of the formation of this phenomenon in EU countries, and to identify measures aimed at increasing the number of citizens with advanced digital skills.*
Design/Methodology/Approach: *the article uses the following research methods to achieve the stated purpose of the work: critical analysis of the literature on the subject, causal analysis method, comparative analysis method and case study method.*
Findings: *The conducted analysis indicates that the indicators characterizing the advanced digital skills of citizens in Poland significantly deviate from the level presented by EU member states. This dissonance may have very serious consequences for the emergence and dissemination of technological and social innovations, technological progress and competitiveness. This problem may constitute a significant barrier to the further development of the information society in Poland and requires intervention by the government and local administration.*
Practical implications: *The results of the study may provide important information for state and local government administration bodies and educational institutions in the development of skills relevant to the formation of the information society.*
Originality/value: *The research conducted in the article indicates an important issue in the formation of advanced digital skills of citizens in the information society in Poland and contributes to the solution of this problem.*

Keywords: *Advanced digital skills, information society, internet.*

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1. Introduction

Digital skills play a key role in the conditions of the information society. It is generally accepted that they should be, together with literacy, the basis that prepares modern people for life in a digital civilization. They enable citizens to participate fully, consciously and satisfactorily in social, economic and political life (Śledzińska and Włoch, 2021). This is due to the fact that nowadays practically all spheres of human functioning, increasingly, are based on solutions using information and communication technologies, for the operation of which adequate digital skills are required.

The concept of digital skills is subject to hierarchization and grading, since the level of their development is a consequence of the knowledge and experience of individuals. Accordingly, digital skills can be divided into basic and advanced (above basic). The subject of interest in this article is advanced digital skills of Polish citizens, compared to other EU member states. This choice is conditioned by the fact that currently the dynamics of development of individual countries, in virtually all areas of their functioning, is associated with the progressive digital transformation, which requires the employment of specialists with sufficiently high digital skills.

The consequences of a possible deficit in advanced digital skills of citizens can be very serious and lead to the formation of a gap between countries that are saturated with advanced digital skills of citizens and those that are severely deficient in this matter.

2. Literature Review

Active participation of citizens in the information society requires having the appropriate skills to use information and communication technology, which enables access to many areas of social and economic life. Having these skills, known as digital skills, is a necessary and sufficient condition to function in the digital reality and derive certain benefits from it (Polyakova *et al.,* 2019; Deceanu *et al.,* 2010).

The role and importance of digital skills for the social and economic development of the state, social groups and individual citizens, requires that we take a closer look at this concept.

First of all, it should be noted that skills are (https://www.psychologia...):

- acquired in the course of development through learning and learning and learning new things,
- are related to talent and aptitude for specific things,
- practically everyone can acquire skills, although not everyone will have these skills developed at the same level,

- skills are something that can be learned.

Digital skills are variously understood in the literature. According to the definition adopted by UNESCO, digital skills should be understood as a range of skills to use digital devices, communication applications and networks to access and manage information; they enable people to create and share digital content, communicate and collaborate, and solve problems for effective and creative self-fulfillment in life, learning, work and social activities in general (https://www.unesco...).

According to another definitional approach, digital skills are a complex composition that includes (Kompetencje cyfrowe...): digital, information and communication and functional skills. An interesting division of digital skills was presented by J. van Dijk, who distinguished the following types (van Dijk, 2003):

- Operational skills - the action required to operate a digital medium (knowing the buttons),
- Formal skills - in terms of handling the formal structure of the medium, such as browsing or navigation,
- Information skills - related to evaluating information in the process of searching available information resources,
- communication skills - mailing, creating an online identity, attracting attention and expressing opinions,
- strategic skills - using the digital medium as a means to achieve specific professional and personal goals
- Content creation skills - make concrete contributions to the Internet with generating ideas, plans or projects.

The types of digital skills presented are characterized by different levels of sophistication of knowledge necessary for their practical implementation. Not only digital skills are important, but also digital awareness (Drab-Kurowska, 2021; Budziewicz-Guzlecka, 2020; 2021). The differentiating factors are the different level of information awareness of citizens and their functioning in environments with different spread of information culture (Thalassinos *et al.,* 2013; 2023).

Through the prism of digital skills, it is also possible to create a classification system for citizens functioning in the information society. This can be done using a very interesting division conducted by U. Eco, who grouped the global society into three layers (Eco, 2002; Tyagi *et al.*, 2023):

- TV proletariat, grouping elderly, uneducated people, residents of small towns and non-urbanized areas, (residents of economically and socially backward countries), who do not have sufficient skills to use modern communication and information technologies,

- digitariat, connecting people who use practically the opportunities created by communication and information technology, while lacking knowledge of the functioning of these solutions,
- cognitariat, i.e., people who combine skills use the solutions and are able to manage or control them effectively, programmers, etc.

This division makes it possible to assign a specific range of digital skills to each social group:

- Those with no digital skills at all. According to the 2021 survey, 57.03% of Polish citizens declare a lack of digital skills, with the average of EU countries at 42.08% (https://ec.europa.eu). At the same time, those who have never used the Internet account for as much as 11.14% in Poland, while the average of member states is 7.70% (https://www.statista.com).
- Those with basic digital skills. In Poland, at least basic digital skills were declared in 2021. 22% of citizens, with the average of EU countries at 28% (DESI, 2022),
- people with advanced (above basic) digital skills.

To fully clarify the classification of digital skills, it is necessary to divide them into basic and advanced. A sample classification of digital skills is shown in Table 1.

Table 1. *Basic and advanced digital skills*

Lp.	Basic digital skills	Advanced digital skills
1.	Computer literacy	Programming web and app development
2.	Data entry	Digital business analysis,
3.	Social media	Digital marketing and content creation
4.	Web-based communications and research	Digital design and data visualization
5.	Word processing	Digital product management
6.	Secure information processing	Data science
7.		User experience design

Source: *https://www.salesforce.com.*

Basic digital skills are the foundation of skills in the modern world, knocking down citizens to actively participate in the information society. Advanced digital skills, on the other hand, are the basis for the development of innovative product and service solutions, opening up new functional possibilities for society and the economy. They are the ones that largely determine the competitiveness of countries and social welfare under the conditions of the information society.

It can be said that people with advanced digital skills are the elite of the modern world, shaping the information culture of society. They are the ones who set the tone for the digital transformation of society, being, on the one hand, ambassadors and pioneers of new technologies and, on the other hand, often their creators.

Given the role and importance of advanced digital skills for the development of individual countries, it is worth conducting an analysis of the formation of these skills in Poland in the context of other EU countries.

3. Research Methodology

The primary sources of data used in the article are materials based on research and reporting by the European Commission of the European Union, Unesco, Statista and Salesforce. Theoretical considerations were based on the available literature treating the problems of the information society and information and communication technologies.

To achieve the stated purpose of the paper, the following research methods were used in the article: critical analysis of the literature on the subject, causal analysis method, comparative analysis method and case study method.

4. Data Analysis

When proceeding to analyze the level of development of advanced digital skills in Poland and EU countries, it should be noted that this issue is relatively rarely raised in statistics. This is difficult to understand, especially as one considers the importance of such digital skills, in shaping the digital future of countries.

In addition, it is important to note the use of different terms in statistics for the range of digital skills studied, which is evident in the presentation of data. The first point to be considered in the analysis is the relation of the share of citizens with supernumerary digital skills in Poland to the average of EU member states. This relationship is shown in Table 2.

Table 2. *Beyond basic digital skills in Poland and EU countries in 2022*

		Poland	EU average
1.	Beyond basic digital skills (% osób)	21%	26%

Source: *Digital Economy and Society Index (DESI 2022).*

The data presented in Table 2 shows that Poland ranks well below the average of EU countries in terms of secondary digital skills. This is a strongly unfavorable situation, as it indicates a significant skills deficit in the studied area. By comparison, in Finland the share of citizens with advanced digital skills is more than 50%.

Expanding on Table 2 is another summary (Table 3), in which, for a complete picture of the location of advanced digital skills, the data presented were related to the degree of urbanization.

Table 3. *People with secondary digital skills in the EU by degree of urbanization in 2021.*

Lp.	Country	City	Cities and suburbs	Rural areas
1.	Netherlands	55,72%	46,69%	45,58%
2.	Finland	55,38%	44,42%	41,30%
3.	Ireland	46,59%	37,36%	35.00%
4.	Denmark	45,62%	35,66%	28,96%
5.	Sweden	43,10%	32,46%	26,48%
6.	Austria	42,51%	30,32%	27,94%
7.	Spain	41,93%	34,08%	32,69%
8.	Luxembourg	41,12%	32,32%	26,71%
9.	Croatia	40,19%	b/d	28,29%
10.	France	36,59%	28,14%	25,93%
11.	Malta	35,29%	36,32%	22,97%
12.	Portugal	33,90%	26,42%	20,79%
13.	Czech Republic	33,51%	22,47%	18,65%
14.	Estonia	33,04%	21.03%	24,54%
	European Union	32.73%	23,93%	19,90%
15.	Belgium	31,55%	24,42%	23,16%
16.	Slovakia	30,05%	20,82%	15,27%
17.	Hungary	28,94%	20,76%	14,04%
18.	Poland	28,83%	19,68%	14,34%
19.	Lithuania	27,36%	20,51%	19,35%
20.	Latvia	27,31%	24,98%	18,65%
21.	Italy	26,69%	21,21%	18,04%
22.	Cyprus	26,56%	13,89%	15,42%
23.	Greece	26,30%	24,88%	10,96%
24.	Slovenia	26,10%	20,80%	16,04%
25.	Germany	22,49%	16,73%	15,67%
26.	Romania	14,26%	9,10%	3,67%
27.	Bulgaria	12,81%	5,47%	2,98%

Source: *EU digital skills divide: cities outpace rural areas, https://ec.eutopa.eu/eurostat/web/products-eurostat-news/w/ddn/20230320*

The data in Table 3 shows that in the presented ranking, Poland ranks 18th among EU countries if the urban population is taken into account, and only 23rd if rural areas are taken into account. Also in the case of this ranking, Poland deviates significantly in level from the average of member states.

The difference is particularly drastic if the countries at the top of the list are taken into account in the comparison. In the case of cities, this difference is twofold, while if rural areas are taken into account it is even more than threefold. In Poland, in particular, there is a very strong disparity between the supernumerary digital skills of people living in urban and rural areas. Such a situation indicates the formation of communities with different speeds of development in terms of progress in digital transformation.

Another analytical area to address is the issue of ICT employment. By definition, people with advanced digital skills are employed in this area. Table 4 presents data on ICT specialists and obsolvers.

Table 4. *ICT specialists and ICT graduates in Poland and EU countries in 2021.*

		Poland	EU average
1.	ICT specialists (% of employed persons aged 15-74)	3,5%	4,5%
2.	Women ICT specialists (% of ICT specialists)	16%	19%
3.	ICT graduates (% of graduates)	3,7%	3,9%

Source: *Digital Economy and Society Index (DESI 2022).*

The data presented in Table 4 refers to three issues. The first relates to specialists employed in the ICT field. In this matter, Poland ranks far below the average of EU countries. The leaders in this ranking are Sweden (8%) and Finland (7.4%). The second issue presented in the table is related to the share of women among ICT specialists.

In the case of Poland, only 16% of those employed in the ICT field are women, with the average of EU countries at 19%. There should be no discrimination in this area. An analysis of preferences when choosing a field of study in Poland indicates that women are not interested in studying and then working in the ICT field. The share of women among ICT professionals is highest in Bulgaria (28%) and Romania and Malta (26%).

The third issue relates to ICT graduates. Here, too, Poland ranks below the EU average, but nevertheless the gap in this case is not large. The share of ICT graduates is highest in Ireland (8.6%), Estonia (8.4%), Finland (7.5%) and Romania (6.7%).

An important aspect of analyzing the formation of advanced digital skills is the question of the age of those who have this resource. Table 5 shows data on the share of people employed in ICT up to the age of 34.

Table 5. *Percentage of people employed in ICT under the age of 34 in 2022*

Lp.	Country	People employed in ICT between the ages of 15-34	Lp.	Country	People employed in ICT between the ages of 15-34
1.	Slovakia	83,8%	14.	Slovenia	67,2%
2.	Romania	82,4%	15.	Sweden	67,1%
3.	Croatia	79,3%	16,	Greece	65,9%
4.	Malta	78,4%	17.	Austria	65,5%
5.	Hungary	76,7%	18.	Cyprus	65,3%
6.	Poland	76,7%	19.	France	64,5%
7.	Portugal	76,1%	20.	Denmark	64,4%
8.	Italy	75,3%	21.	Belgium	64,3%
9.	Estonia	74,9%	22.	Germany	64,2%
10.	Lithuania	73,9%	23.	Luxembourg	64,2%

11.	Czech Rep.	73,4%	24.	Spain	63,2%
12.	Latvia	72,6%	25.	Bulgaria	59,6%
	EU average	67,8%	26.	Ireland	56,3%
13.	Netherlands	67,4%	27.	Finland	52,6%

Source: *ICT education – a statistical overview, https://ec.europa.eu/eurostat/statistics-explained/SEPDF/cache/59430.pdf*

As can be seen from the data presented in Table 5, people employed in ICT at companies and institutions in Poland are mostly relatively young. More than 76% of them are under the age of 34, which bodes well for the future.

5. Discussion

The data analysis presented in the article indicates that the advanced digital skills of Polish citizens are well below the average of EU member states. This is a very unfavorable situation, as the lack of advanced digital skills can be a very significant barrier to the country's economic and social development, especially in terms of creating and spreading innovation. The distance to countries where the percentage of citizens with advanced digital skills is high will grow, making Poland less competitive.

Raising the level of intensity of above-basic digital skills in Poland is not possible in the short term, so the existing competency gap will affect digital transformation for at least a few more years. Nevertheless, measures that can improve the existing state of affairs are already necessary. It will be particularly difficult to influence an increase in the share of people with advanced digital skills, in rural areas. The main barriers in this matter are to be found in the relatively low level of education of Poland's rural population and serious deficiencies in basic digital skills.

Increasing the percentage of citizens with advanced digital skills in Poland requires action on the part of state, business and educational institutions. In the author's opinion, they should be taken as early as secondary school and continued at the academic level. It is necessary to make qualitative changes in school curricula so that students graduate from high school with a significantly higher level of digital skills than is currently the case (the current curriculum requirements can be assigned a basic level).

It would be a good practice for business or local administrations to order the creation of ICT-oriented classes, especially in areas where there is a particular deficit of secondary digital skills. Consideration should also be given to the introduction of a mandatory baccalaureate in the subject of Computer Science, which will include content related to supernumerary digital skills. The proposed changes will increase the level of digital literacy among Poland's young citizens and perhaps make them more interested in academic education in this area.

The problem will be teaching staff, who may not have advanced digital skills. The solution may be training for digital teachers, organized at the state's expense and via the Internet.

The deficit of citizens with advanced digital skills in Poland is also evident in another analytical approach, which considers ICT specialists. The result of the analysis shows a relatively low share of ICT specialists among the working population in Poland. On the one hand, this could mean that there are simply too few ICT specialists in Poland.

On the other hand, the reason for the low value of the indicator may be the relatively low saturation of Polish enterprises and institutions with ICT-based solutions, for the operation of which ICT specialists are required. Thus, the problem may relate to the low level of advancement of digital transformation in enterprises and institutions in Poland. When analyzing the issue of ICT specialists in Poland, attention should also be paid to the high level of emigration of young educated people and the brain drain, both of which may reduce the number of ICT specialists in Poland.

An issue that must necessarily be addressed when analyzing the level of advanced digital skills of citizens in Poland is the question of academic education and especially graduates in the field of ICT. The data presented shows that Poland ranks only 17th in this matter. This result does not allow for dynamic changes in the number of people with advanced digital skills.

A positive aspect related to advanced digital skills, is the issue of the age of those poisoned in jobs requiring high ICT skills. In the case of Poland, more than 76% of those employed in the ICT field are under the age of 34. That means their advanced digital skills are likely to last at least 30 years.

6. Conclusion

Comparing the level of advanced digital skills in Poland with the member states of the European Union, it should be noted that the degree of their development in Poland is at a relatively low level. This state of affairs is very unfavorable, because it does not allow for the proper development of the information society, which by its nature should be oriented towards the creation of technological and social innovations, dynamic technical progress and competitiveness. Without an adequate level of advanced digital skills, this is impossible to achieve.

Their deficit is a very serious problem for the state, so it is necessary to take specific decisions that could improve the level of advanced digital skills of Polish citizens over the next few years. These actions must be comprehensive and systemic and among the potential initiators of this process can be mentioned state and local government institutions and business.

The goal of these activities should be to create a digital education system that would function at the level of secondary schools and universities.

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