Measurement of Digital Intelligence (DQ)

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***Abstract**: Our present society is permeated by the Internet and the rapidly evolving technology that presents us with new challenges. Both our way of working and entertainment has changed. We had to learn and acquire many new things. Such new knowledge and skills are digital competence (DQ), to which the European Union pays special attention, which is proved by nothing better than the fact that in 2006 the European Parliament and of the Council ranked it among the 8 key competences for lifelong learning. There are several definitions of DQ in the literature that approach digital competence from different perspectives, and there are also differences in its name, but relatively few researchers have tried to measure it. The aim of the study is to assess the digital competence of the population aged 14 to 75 with a validated measurement tool and to present different aspects of DQ.*

***Keywords**: DQ, internet, technology, digital competence*

1 Introduction

Our present society is characterized by digital technology, the internet and rapid development. The achievements of the digital age allow users to obtain and exchange information quickly, but owning new tools does not mean that we can use them correctly [1]. Their proper use requires so-called digital intelligence (DQ) [2], the importance of which is supported by many factors, such as the fact that more and more international organizations are developing programs for it [3; 4], online education and online working well [5]. The need for DQ is further reinforced by job expectations [6], which are set against employees [7; 8], but the knowledge acquired at the desk is often not the same as the skills and abilities expected in the workplace [9; 10].

Information and communication technology (ICT) is the foundation of our time and the engine of innovation [11], but lifelong learning [12] may have never been more relevant to the development of a knowledge-based society and the rapid uptake of innovations. Despite the growing recognition of the importance of acquiring competencies related to digitalization and ICT tools [13] and the nearly 20-year history of the digital competence literature [14], no universal definition has been developed to date [15].

2 Digital intelligence (DQ)

In the field of digital competencies, we can come across several terms by which the authors mean the same phenomenon or approximately similar. There are many reasons behind the different names and definitions, which can be traced back to the field of science represented by researchers and the content of digital competence. As a result, the following terms can be found in the literature regarding digital competence: ICT literacy, digital literacy, computer literacy or even media literacy [16; 17]. The reason for this is to be found in the fact that the phenomenon is addressed from many different disciplines, and that digital knowledge is also interpreted in different depths [18; 19; 20].

Previous empirical studies pointed to differences inbetween different segments of the population regarding the digital knowledge and skills (based on gender, age, education, and ethnicity). Younger generations, or so-called "digital natives," have higher digital literacy because they live their entire lives in the age of the Internet and digitalization, whether at home or school [21]. However, significant differences in digital skills, digital use, and content production among members of the young group have also been reported in the literature [22; 23]. In addition, some studies have found that while young people have advantages in operational and formal digital skills, older generations outperform them in terms of content (information and strategic) digital skills. [24].

3 Research Method

The data collection took place between 01-15.06.2020 online, on the QuestionPro platform. Snowball method has been used during the distribution of the questionnaire. It consisted of two main sections, the socio-demographic questions and the section measuring digital knowledge. As the questionnaire could only be accessed and completed online, the sample could not be considered representative.

For measure digital knowledge, the Internet Skill Scale (ISS) has been used, which was developed and validated by Van Deursen et al. [25], and consisted 35 questions and 5 factors, respectively. The 5 factors of ISS are Operational, Information Navigation, Creative, Social and Mobile. Fillers had to use a 5-point Likert scale to decide for each statement how much they considered it true for themselves (1 = strongly disagree, 5 = strongly agree).

In my research, I sought answers to three research questions and related hypotheses. In the following, I present the research questions and hypotheses and then the results.

Q1: How much digital knowledge does each generation have?

Q2: Is there a relationship between age, gender and the level of digital literacy?

Q3: Is there a significant difference in the level of digital literacy between men and women?

For the research questions presented, have we formulated the following hypotheses?

H1: There is a significant difference in digital knowledge between each generation.

H2a: There is a negative, strong relationship between age and digital knowledge.

H2b: Digital knowledge does differ by gender.

H3: Digital knowledge is higher for men than for women.

4 Results

The questionnaire was completed by 187 people (131 women and 56 men; mean age: 27,214; SD = 9,938), and nearly 63% of the respondents were young people of generation Z. In terms of age, the youngest filler is 16 years old, while the oldest is 75 years old.

4.1 Internet Skill Index

To properly analyze the data, it is essential to test the reliability of the measurement scales, for which I calculated the Cronbach's alpha values for each dimension based on the responses obtained. According to the test, the α coefficient is greater than 0.70 everywhere except for one factor, which is a good opportunity to model the results of the survey in the considered population [26], however, the exception factor in our case is above 0.6, which it is still within the acceptable range. Table 1 shows the Cronbach's alpha factors obtained for the groups of questions in the questionnaire.

Table 1 Coefficient of Reliability of the Cronbach Alpha by the 5 Sub-Dimension of ISS

Dimension	Cronbach Alfa	Number of Items
Operational	0,858	10
Information Navigation	0,606	8
Social	0,812	6
Creative	0,864	8
Mobile	0,757	3

Based on the Cronbach's alpha coefficients of the internal consistency of the groups of questions in the received questionnaire, it can be concluded that the possibility of modelling the results of the survey is very good for all factors. A comprehensive analysis of the Cronbach's alpha coefficient shows that reliable results can be expected from the analysis.

4.2 Correlation analysis

Table 2 Correlation between age and Internet Skill Scale score

		Age	Gender	SzumISS score
Age	Pearson Correlation	1	-,065	-,261**
	Sig. (2-tailed)		,378	,000
	N	187	187	187
Gender	Pearson Correlation		1	-,261**
	Sig. (2-tailed)			,000
	N		187	187
SzumISS score	Pearson Correlation			1
	Sig. (2-tailed)			
	N			187

**. Correlation is significant at the 0.01 level (2-tailed).

As shown in Table 2, there is a weak, negative significant relationship between age and measured digital knowledge ($r = -0.261$, $p < 0.01$). It means that with increasing age, the rate of digital knowledge decreases slightly. Furthermore, there is a weak and negative significant relationship between gender and measured digital knowledge. ($r = -0.261$, $p < 0.01$).

4.3 Average scores of dimensions of Internet Skill

Because the ISS has a proper Cronbach's alpha value for both the factors and as a whole, it was possible to generate scores for each factor and the instrument as a whole. In the following, I present the development of the scores obtained in this way. The maximum score that can be achieved with the measuring tool is 175, the total scores achieved by the respondents ranged between 74 and 171 (Mean = 141,412; SD = 11,552). By gender, the average score for men is 146.43, while for women, it is 139.29.

Table 3 The average scores of dimensions of IS

Dimension	Mean - Male	SD - Male	Mean - Female	SD - Female
Operational	4,896	0,327	4,818	0,340
Information Navigation	2,841	0,413	2,751	0,375
Social	4,735	0,523	4,725	0,415
Creative	4,000	0,777	3,388	0,931
Mobile	4,744	0,589	4,534	0,762

Table 3 shows the average scores achieved by each factor by gender. The results show that the fillers performed worse in two dimensions (Information Navigation and Creative). In the Creative dimension, the respondents encountered statements about the creation and editing of files and various digital contents. In the Information Navigation dimension, respondents encountered statements about navigating websites and searching the Internet. To examine the gender differences, Mann-Whitney U test has been performed, according to which there is a significant difference in the digital knowledge of men and women based on the scores obtained ($U = 2324.5$, $p = 0.00$).

Conclusions

The present research aimed to test the Internet Skill Scale in Hungary and to assess the level of digital knowledge. The significance and novelty of the research lie in the fact that it has not been used in Hungary yet as a measurement tool. A supplement to the Digital Economy and Society Index (DESI) [27] used at the European Union level, as I examined digital competence from a relatively different perspective than DESI.

Two of my hypotheses formulated at the beginning of the research were confirmed, but one was not confirmed.

H1: There is a significant difference in digital knowledge between each generation. This hypothesis was confirmed because there was a significant difference between the scores achieved by each generation.

H2a: There is a negative, strong relationship between age and digital knowledge. The first part of the second hypothesis proved not to be true, as it was confirmed that the younger ones scored higher; however, age has only a weak influence on digital knowledge.

H2b: Digital knowledge does differ by gender. The second part of the second hypothesis proved to be true, as it was confirmed that there is a difference between digital knowledge by gender. This difference is weak but significant.

H3: Digital knowledge is higher for men than for women. The last hypothesis was also confirmed, as they scored higher on average for men, and the Mann-Whitney U test showed a significant difference between the two sexes in terms of digital literacy.

The present research is based on an online survey, but in the future, it will be extended offline to achieve a larger sample size. The measurement tool used does not cover all segments of digital knowledge, which I intend to remedy by adding additional elements later. To this end, the ISS is also compared with other measuring instruments.

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