

The influence of age on digital literacy in Serbia

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Abstract: The development of information and communication technologies (ICT) has imposed the need for digital literacy and computer handling by employees at all organizational levels. Younger generations learn about ICT through formal and informal education, as well as through everyday activities. On the other hand, older employees have little or no experience with ICT technologies. Accordingly, improving their digital literacy, competencies, skills, and thinking is necessary. Only in this way will they be able to meet the needs of modern business. This study aims to investigate the level of use and knowledge of digital technology among Serbia's older population. The potential influence of age on people's digital literacy in Serbia was investigated. In addition, the PROMETHEE methodology was used in order to perform a comparative analysis of the different age groups of the population based on the level of ICT usage for different purposes in everyday life.

Keywords: digital literacy, age, digitalization, computer skills, Promethee methodology

1 Introduction

The main feature of the 21st century is rapidly growing digitalization. New technologies have significantly impacted the way of living and working. During the COVID-19 pandemics, the world faced with the intensive demand for Information-Communication Technologies (ICT) infrastructure and services. New circumstances created the need for a more intensive studies of the impact of socio-demographic characteristics on the population's digital literacy. Digital literacy includes a set of actions in order to reach the aim which is the acquisition of knowledge in the use of ICT – computers and Internet [1]. It refers to the skills required to live, learn, and work in a society where communication and information systems are fast changing due to digital technology. The abilities needed for

navigating a fragmented and complicated information system have been identified as digital skills [2].

A shortage of digital literacy and obstacles like difficult access to technology, telecommunications, information, and financial level are major contributors to an increasing multidimensional digital divide. The non-uses, or inefficient use of ICT, may lead to social exclusion. This fact must be considered in studies about how older people and marginal groups utilize new technologies [1].

ICT provides significant opportunities for all members of society, regardless of age. Digital technologies can help people gain new skills, live independently, and improve health and social care services for the elderly [3]. The ICT's enable this age group to access goods and services that otherwise would be more difficult to get: trips, services, online banking, online shopping, etc. Despite numerous benefits, there is still age-related digital divide. Senior citizens are still more reserved about adopting new technologies. The elderly still lags behind in using and benefiting from IT in general and the Internet in specific [4]. While the Internet is used by all or nearly all citizens from 25 to 34 years old, it is rare among the older generation in many European countries [5]. In the 28 countries of the European Union, 26 per cent of older adults (aged 65–74) use the Internet frequently compared to 88 per cent of people aged 16–24, 78 per cent of EU citizens, aged between 16 and 74, used the Internet for networking and information seeking [6]. This digital divide means that the elderly is prevented or disinterested to use and to exploit the potential of Internet usage and IT in general [7]. To address the digital demands of the elderly, a "multiage" society requires the design and creation of new areas of learning and communication.

Numerous studies have pointed to the existence of a link between the economic development of countries and the level of digital literacy, which is particularly noticeable when it comes to the elderly population and rural areas [8]. The digital gap affects many aspects of life in developing countries, limiting access to contemporary technologies but also preventing these countries from progressing further. Due to low digital literacy, many people in developing countries need more digital skills to utilize technology fully.

Republic of Serbia as the transition country is still under the process of digitalization. Digitalization is the most dynamic sector in the past ten years. Development of digital skills is defined by the Strategy of Digital Skills Development in the Republic of Serbia for the period 2020-2024, which implies the improvement of digital knowledge and skills of all citizens [9]. This is especially important for elderly if we take into account that the Republic of Serbia is characterized by the process of demographic aging of the population. Although the ICT sector is constantly growing, the communication infrastructure in the Republic of Serbia needs to be further improved, especially when it comes to the communication infrastructure in rural areas. Scientists in Serbia have begun to deal

more with the phenomena of digital literacy in the last decade, but the research is still rare and non-systematic.

This paper opens a particularly important topic – types of Internet usage among the age groups in Serbia. The authors specifically seek the answer to the question whether there are differences between younger and older population related the purpose of using the Internet. Thereby, two main objectives were specified: 1) to rank age groups according to their activities on the Internet and 2) to recognize Internet activities that should be affirmed and improved among older people.

2 Literature review

People of various ages, from teenagers to the elderly, use the Internet for various reasons, and their activities differ according to their interests. Teenagers are more engaged in online gaming, but those in their 20s and 30s use the Internet for social networking and searching for people. Older people use it to stay up to date on world events. However, little is known about the depth and breadth of technology use by older adults or whether it differs from younger adults' usage patterns [10].

Compared to other age groups, older persons are still less likely to use the Internet, and education is a major factor in Internet use among older adults [11]. Accordingly, the study of computer utilization by older people is growing since this demographic has considerably increased its use of information and communication technology (ICT) in everyday activities, personally and professionally [12]. Olson et al. (2011) conducted the research aimed to highlight age-related variances and similarities in technology usage and frequency [10]. Their findings provide insights into the technology-use behaviors of older and younger persons, giving an outline for expectations regarding knowledge differences. They concluded that younger persons employ a wider range of technology than older adults. In the literature, few reasons for age disparities in ICT literacy and learning could be find. First, there could be generational effects. Senior citizens did not grow up with digital technology. Therefore, they belong to a different technology generation than younger people [13]. Second, differences between young and old may be explained by factors other than changes in fluid intelligence. Individuals might have sensory and motor function issues as they age, which can harm ICT's learning process and user experience [14]. Finally, the physical and cognitive abilities of elderly persons vary.

According to Agudo et al. (2012), the elderly use ICT as a type of education that these generations of the elderly need and want to learn, and they consider this point in their lives as the appropriate time to approach ICT [15]. The elderly mostly utilizes the Internet to get information and to be familiar with news and current events (reading newspapers online). Russell et al. (2008) conducted an online

survey of older Australians (55+) [16]. They found that emailing improved satisfaction with family communication, enabling older adults to widen their close networks, and leading to in-person interactions. Other internet activities, such as browsing and online shopping, did not provide the same consequences as emailing. Except for utilizing the Internet for communication, the changes in social capital remained steady after a particular frequency of Internet use [17]. Barbosa et al. (2018) analyzed social capital and Internet use in old age and across age groups [18]. Older adults were less likely to have a high degree of social capital. Besides, frequent Internet users had higher levels than other users and non-users within this age range. The Internet appears to aid in preserving, accumulating, and mobilizing social capital. Proper training and support systems must be created based on seniors' aims, abilities, and experience to minimize computer anxiety and enhance motivation, particularly in the early stages of learning [19, 20].

3 Experimental

3.1 Data set

This analysis relies on the data from the report “Usage of Information and Communication Technologies in the Republic of Serbia, 2022”, published by Statistical Office of the Republic of Serbia and online available [21]. This report contains the data of the extensive survey conducted among the population from RS. The focus of this study was on the question:

For which of the following activities did you use the Internet (including via apps) for private purposes, in the last three months?

The offered answers for this question were classified into five categories of internet activities: Communication (4 items), Access to information (2 items), Civic and political participation (2 items), Use of entertainment (5 items), E-health (4 items), Other online services (2 items) (Table 1). There were 6 age groups: a) 16-24, b) 25-34, c) 35-44, d) 45-54, e) 55-64, f) 65-74. The empirical analysis is based on the data for 2022.

ITEM	Abbreviation
Communication	
Sending/receiving e-mails	COM1
Telephoning over the Internet (via web cam) (using apps, such as Skype, Messenger, WhatsApp, FaceTime, Viber, Snapchat, Zoom, MS Teams, Webex)	COM2
Participating in social networks (creating user profile, posting messages)	COM3

or other contributions on Facebook, Twitter, Instagram, Snapchat, etc.)	
Sending online messages via Skype, Messenger, WhatsApp, Viber, Snapchat	COM4
Access to information	
Finding information about goods and services	INF1
Reading online newspapers, magazines	INF2
Civic and political participation	
Posting opinions about civic or political issues via websites or social media (such as Facebook, Twitter, Instagram, Youtube)	PART1
Taking part in online consultations or voting to define civic or political issues (urban planning, signing petitions)	PART2
Use of entertainment	
Listening or downloading music (web radio, music streaming)	ENT1
Watching television program over the Internet from TV broadcasters	ENT2
Watching video on demand from commercial services (such as Netflix, HBO GO, Amazon Prime, Maxdome, Apple TV, etc.)	ENT3
Watching video content via sharing services (such as YouTube)	ENT4
Playing or downloading games	ENT5
E-health	
Seeking health-related information	EHEA1
Making an appointment with a doctor over website or app	EHEA2
Online access to own medical record	EHEA3
Using other medical services over website or app instead of going to hospital or doctor (such as obtaining prescription or online consultations)	EHEA4
Other online services	
Selling goods or services over website or app (such as eBay, Facebook, Marketplace)	OTH1
Internet banking (including mobile banking)	OTH2

Table 1
The offered answers and their abbreviations

3.2 Methodology

PROMETHEE method is one of the newest methods in multi-criteria analysis, and is known as one of the most effective and the simplest in this field. It was developed by Jean-Pierre Brans and Bertrand Mareschal. For the purpose of this study, PROMETHEE method was used in order to rank the age groups depending on the type of the internet activities that the respondents usually do. The analysis was performed using the Decision Lab software, as a sophisticated application of the PROMETHEE method.

4 Results and discussion

The initial step in this analysis was the use of the entropy method in order to determine the relevant weights for each indicator. On the basis of such allocation of weights and by using the PROMETHEE method, the order of age groups presented in Table 2 was obtained.

Rank	Age groups	Phi	Phi+	Phi-
1	25-34	0.551	0.776	0.225
2	16-24	0.292	0.642	0.350
3	45-54	0.214	0.607	0.393
4	35-44	0.112	0.556	0.444
5	55-64	- 0.395	0.292	0.687
6	65-74	- 0.775	0.107	0.881

Table 2
Ranking results

It can be seen that, on the first place are people from the 25-34 years old and on the last the oldest respondents. The members of the 25-34 age group use the internet very intensive and for all purposes (Figure 1). They are very active users and the only activities with negative are related to the E-health – (*Online access to own medical record*) and Access to information (*Reading online newspapers, magazines*). Young people, 16-24 years old are on the second rank, and the most interested in communication and entertainment (Figure 2).

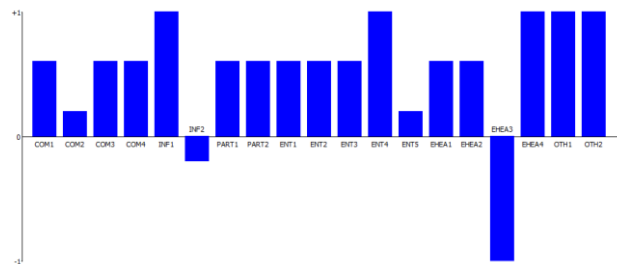


Figure 1
Profile for age group 25-34 years

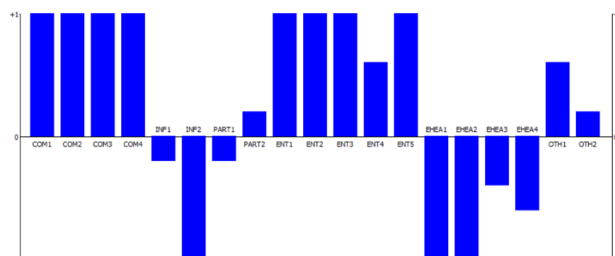


Figure 2
Profile for age group 16-24 years

Respondents in their 45-54 hardly use the Internet for the entertainment and communication. They are usually focused on the e-health. This group read the magazines and newspaper, make online consultations or vote (Figure 3). The next age group (respondents between 35 and 44 years) mostly use the internet for the following activities: gathering information about goods and services, reading the newspapers and magazines, posting opinions about civic or political issues, selling goods and services and usage of Internet banking (Figure 4).

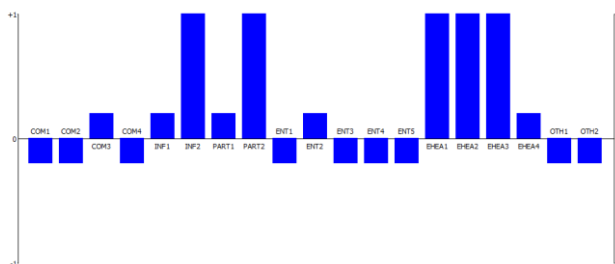


Figure 3
Profile for age group 45-54 years

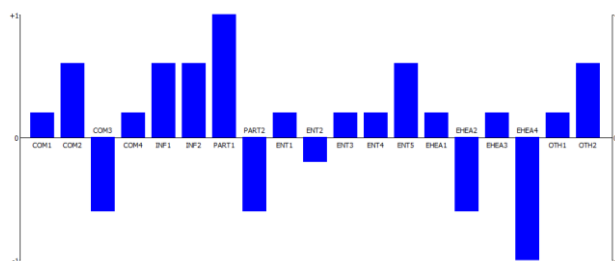


Figure 4
Profile for age group 35-44 years

Taking into account the negative Phi values, deficiencies in the Internet activities among 55+ age group have been proven. When it comes to the population 55-64

years old, all internet activities are characterized as negative except reading newspaper or magazines and using the medical services over website or app instead of going to hospital or doctor (Figure 5). The same is with the oldest who are just making appointments with a doctor over website or app and access to own medical record online (Figure 6). This opens the door to interventions that could give support to older adults' learning and Internet appropriation processes, getting them started on the web.

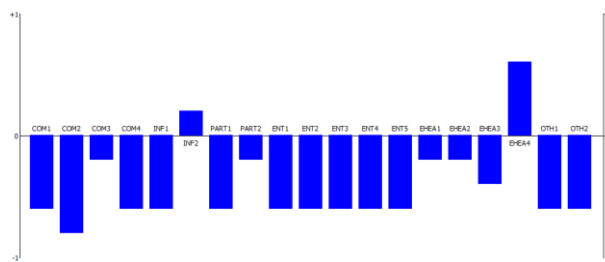


Figure 5
Profile for age group 55-64 years

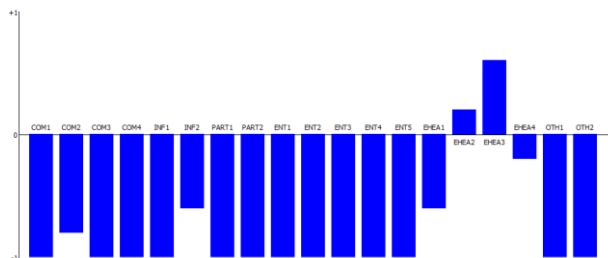


Figure 6
Profile for age group 65-74 years

The results given above talks about the nineteen different activities over the Internet, divided in five fields, for different age groups of people. In-depth information about various Internet activities revealed age inequalities. The adolescents and people of early 30's realize frequent and various Internet activities as the entrainment, gathering information, communication, online shopping etc. In the adolescent time everyone is eager to learn more. Individuals in their late 30's and early 50's are generally less active on the Internet, as most of them might be busy in their corporate life and personal life. Also, the purpose for using the Internet has been changed. They use the Internet much less for communication, entertainment, downloading and playing online games, but the product research, online banking and E-health is a bit more that in the case of individuals from the previous groups.

Finally, in this study, skill deficiencies for the older population have been highlighted. Older adults are still less likely to adopt the Internet when comparing to other age groups [11]. There is no clear definition of an older or senior citizens and existing studies use different thresholds for the empirical analysis. According to the extensive literature review conducted by Oh et al. (2021), most of the authors suggest the population 50+ [22]. Accordingly, we considered the age groups: 55–64, 65–74 and more than 75 as elderly. When it comes to these age groups, all internet activities are characterized as negative except reading newspaper or magazines and using the medical services over website or application instead of going to hospital or doctor. The same is with the oldest who are just making appointments with a doctor over website and access to own medical record online. Health care in particular is a domain in which older adults adopt the Internet as a useful tool [23]. They hardly use internet activities for communication, entertainment, civic and political participation, online shopping, etc.

Access to innovation and new technologies is vital for avoiding generational divides and ensuring that the elderly do not feel excluded from modern society [15]. Besides, there are many factors that affect the digital literacy of the older population. According to Ragnedda and Mutsvairo (2018), the ICT access depends on their purchasing power or management capacity [24]. Older adults are one of the least likely demographic groups to have a computer in their homes. Considering the low pensions in Serbia, Internet usage will be greater if they could buy computers and Internet packages for more favorable prices. Besides, social capital and level of education determine the frequency of Internet use [11, 18].

Previous studies indicated that the older population often shows an interest in learning about computers. Still, they are determining their ability to succeed, especially when using the Internet [25-27]. The process of learning something new differs between younger and older people [28]. This implies that specialized learning activities for senior adults should be devised. Training programs aimed at improving the ICT abilities of the elderly can help them overcome their skepticism about new technology. Accordingly, there is a need to support older persons' digital learning and adoption of Internet knowledge and get them started online.

Conclusions

Obtained results point to the conclusion that policymakers in Serbia should have in mind the age differences and adjust the policies to support education of the elderly in the field of digital knowledge. The bearers of economic policy and economic development policy in Serbia realized the importance of ICT late. They needed to be sufficiently aware of the challenges that arise for every economy from the growing global competitiveness of developed countries. The main problem is that there needs to be a necessary level of sophistication and awareness in the state

administration when it comes to institutionalizing the problem of the digital divide. In the absence of such institutionalization, any efforts to reduce the country's digital divide carry a huge risk of failure and ineffectiveness of the financial resources used. The experience of developed countries shows that the digital divide problem is challenging to fit into the general context of a country's economic policy. That is why it is simpler to treat this problem through a large number of local government bodies that cover the areas of education and economic development. In order to make progress in bridging the digital divide, economic policymakers must be well aware of the potential of information technologies.

Obtained empirical results lead to potentially important policy recommendations. Based on the results from previous research and this study, we argue that it is important to invest more in training, education, and support for older adults who face difficulties with ICT and to consider diverse learning preferences in the conception of technology trainings. Training programs designed to improve ICT skills of older population can in general help them to overcome concerns and doubts related to new technology. It is also necessary to accredit digital skills development programs for citizens, particularly taking into account vulnerable categories such as the elderly, persons with disabilities, poor citizens and persons in rural areas, with continual citizens' awareness-rising of the need to adopt digital skills.

Senior citizens should be trained as much as possible in basic digital skills, which include learning the basics of how smartphones and the Internet work together to deliver applications, information, and messages, including skills to set up new accounts and create passwords, research, search, download, and using online and mobile applications. This training could be implemented in premises such as retirement clubs, libraries, homes for the elderly, etc. Positive effects could also be achieved through peer education so that trained older persons carry out further training in basic digital skills.

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