Digital Skills of Working Age Population in Croatia

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Abstract – **In the focus of the paper are digital skills of working age population in the Republic of Croatia as one of its fundamental pillars of scientific, technological, educational and overall socio-economic development. Moreover, this research perceives a certain level of digital skills development as an unavoidable precondition for Croatia's involvement in the overall development of the modern world. This research results are based on the comprehensive statistical analysis of the public opinion survey. The methodology involves hypotheses testing afterwards using a two-step random sample. Post stratification has been created on the basis of gender, age, size of residence, education level and working status of respondents. The analysis of the data showed that there is no statistically significant difference in digital skills between men and women and that there is a statistically significant difference in digital skills depending on the age and level of education of the respondents.**

Keywords*: *statistical analysis, digital skills, public opinion survey, case study of Croatia

I. INTRODUCTION

The 21st century has been marked by strong technological change and constant technological innovation. Over time more ICT variables, like broadband Internet usage, individual-level of Internet use or e-commerce have been contributed to economic development [1]. Evidently, digital transformation encompasses much more than the technologies themselves. It refers to radical changes *in modus operandi* of people work and communicates and accordingly presupposes the development of digital skills.

The named skills cover a wide range of competencies, acquired over time through education, formal instruction and non-formal self-learning. In a fast-changing knowledge economy, 21st-century digital skills drive organizations' competitiveness and innovation capacity [2].

The developed digital skills of the working age population ensure the adaptability of the workforce, which is the basis for economic growth and development [3]. Although the entire working staff should possess them in order to be effective and agile in work [4], the employees in digital-intensive industries dispose more advanced levels of digital skills than employees in other industries. The findings [5] that indicate better salaries in digital-intensive industries comparing with those in other industries seems as incentive toward more intensive digital skills acquisition by all.

The European Union also play an active role in strengthening cooperation in digital education by making available, guidelines, instruments, technical and expertise as well as developing a new European platform for digital education. Moreover the European Commission's Digital Education Action Plan (2021-2027) [6] sets out a vision for quality, inclusive and affordable digital education in Europe. It builds on the 2018-2020 Action Plan, which aimed to make better use of digital technology in (i) teaching and learning, (ii) improving education and (iii) developing digital competences and skills.

Based on available statistical data from previous research, the paper explores more detailed the digital skills of the population in the Republic of Croatia. A survey is conducted to analyze the impact of completed education level, age and gender of respondents on digital skills levels. The named has been carried during July and August 2021 with 429 respondents aged 18 to 65 years. After the theoretical part, the empirical findings interpretation, concluding notes and implications for further research are enclosed at the paper end.

II. DIGITAL SKILLS

Digital skills serve to wider auditory to secure create content, conveniently select digital tools, and solve a variety of problems in the digital environment [7]. Even though no unambiguous classification of digital skills areas, there are several relevant frameworks for measuring digital skill levels. Eurostat [8] namely divides digital skills into four areas of competence while the DigComp measurement framework sets out one more. The latter framework also provided a common language on how to identify and describe the 5 key areas of digital competence [9].

Detailed insight in area of competence reveals its high complexity. The first one *(information and data literacy)* include activities like searching for information, identifying information needs, analyzing information and its sources, and organizing data in a digital environment.

The second one *(communication and collaboration)* monitors virtual interaction with other users of digital tools, sharing content in various formats, using e-Public

administration services, creating and managing a digital identity, and knowing the norms of behavior on the Internet. The third one *(digital content creation)* include creating digital content, manipulating and modifying your own and others' content, understanding digital licenses, and troubleshooting using a variety of programming languages. By developing skills for creating digital content, the users can more effectively create digital content, express themselves creatively, modify other people's content and create templates that will later save time and facilitate future creation of digital content [10]. Activities within the forth area of competence (*digital security)* include device and data security, understanding the importance of setting security policies, the ability to avoid online abuse, and striking a balance between online and offline life. The last area of competence *(digital problem solving)* cover activities related to solving technical problems, identifying the need for digital tools, the possibility of using technology for creative purposes and the ability to identify the need to improve their own skills are important for this area and seems as essential for solving technical difficulties, selecting appropriate digital tools and participating in lifelong learning [11] Finally, levels of expertise according to the DigComp framework cover the 5 level ranges from no skills to advanced skill level [12].

However, the main obstacle in the development of digital skills is the digital divide, meaning the differences in the ability of people, individuals and countries to access information and communication technology and the Internet. The named divides persons, individuals and states into those who have access to information and communication technology and the Internet and those who do not. The literature on digital division deals with two dimensions such as: (i) digital divide between individuals referring a gap between different groups of people (people with lower education, people with lower incomes, the elderly, minorities, people with disabilities, the unemployed, people from isolated rural areas, women) [13] and (ii) digital divide between countries referring a gap between developed and underdeveloped countries, due to differences in income and education [14].

One of the obstacles in the development of digital skills is the intergenerational gap and resilience to digital literacy. People's life expectancy has increased, so it is important that the older generations work on developing digital skills and thus integrate better into modern society [15]. However, the problem is the fear of change in the resilience to digital literacy that occurs due to insecurity in the use of technology, distrust of technological solutions, lack of technical equipment for Internet access and others. This problem can be solved by various training programs for the elderly and workshops in city libraries [16]. Likewise, the trainers for elderly is expected to be more “flexible and sensitive to the participant’ pace, needs wishes and constraints” [17].

Last, but not least, in the context of Croatia, it is worth emphasizing and praising that the National Coalition for Digital Skills and Jobs in the Republic of Croatia has been established in late 2018. [18]. The same is also adopted the Charter on Digital Jobs with seven goals and eighteen priorities regarding digital workplaces. All these activities are in accordance with EU initiative to increase digital skills and the number of employees in the ICT sector. The mission of the Coalition is to actively encourage the creation of new jobs and increase the number of employed digital professionals in Croatia, realized due to the entry of technology into business and everyday life. Moreover, in order to continue the project, Europe has planned to create a central web hub (Core Service Platform) [19] for sharing the experiences including news, videos, webinars, online events and educational programs of all EU countries involved in the project.

III. EMPIRICAL RESEARCH

A. Methodology and reserch outputs

The research dealing with digital skills of working age population in Croatia was carried out through a questionnaire. The questionnaire compilation was preceded by a studying of forms and content that is in line with the relevant requirements of statistical literature and practice [20],[21] .The survey was modeled on the European Digital Competence Framework for Citizens and the Eurostat Digital Skills Indicator.

The questionnaire consists of two parts. The first one refers to sociodemographic data about the respondent, and the second part consists of fifteen questions about digital activities. Each question refers to a specific activity. The questions are closed-ended with three offered answers. Each answer represents the degree of digital skill for that activity. The questionnaire covered five areas of competence: information and data literacy, communication and collaboration, digital content creation, digital security and digital problem solving. There are three issues for each area of competence.

TABLE 1: DISTRIBUTION OF RESPONDENTS BY AGE

	Frequency table: Age			
Category	Count	Cumulative Count	Percent	Cumulative Percent
26- 35	114	114	26,57343	26,5734
46- 55	78	192	18,18182	44,7552
18- 25	73	265	17,01632	61,7716
36- 45	87	352	20,27972	82,0513
56-65	77	429	17,94872	100,0000
Missing	0	429	0,00000	100,000

Source: Authors' research

Data collection took place in July and August 2021 online. Respondents, 429 of them from different regions of Croatia, completed the questionnaire through various social networks, by personal contacts and using e-mail communication. The study involved working age population; people aged 18 to 64 years. The questionnaire was completed by 241 women (56.2%) and 188 men (43.8%).

TABLE 2: DISTRIBUTION OF RESPONDENTS ACCORDING TO COMPLETED LEVEL OF EDUCATION

Category	Frequency table: Completed level of education			
	Count	Cumulative Count	Percent	Cumulative Percent
College education	89	89	20,74592	20,7459
Higher education	132	221	30,76923	51,5152
Highschool education	192	413	44,75524	96,2704
Phd degree	16	429	3,72960	100,0000
Missing	0	429	0,0000	100,0000

Source: Authors' research

Table 1 shows the distribution of respondents by age while Table 2 presents distribution of respondents according to completed level of education. Sociodemographic data about the respondents are completed by their distribution according employment status. That distribution is shown by Table 3.

TABLE 3: DISTRIBUTION OF RESPONDENTS BY EMPLOYMENT STATUS

Category	Frequency table: Employment status			
	Count	Cumulative Count	Percent	Cumulative Percent
Student	66	66	15,38462	15,3846
Employed person	278	344	64,80186	80,1865
Unemployed person	50	394	11,65501	91,8415
Other	35	429	8,15851	100,0000
Missing	0	429	0,00000	100,0000

Source: Authors' research

Prior to statistical data processing, it was necessary to quantify the answers from the survey. Each question from the survey was offered three answers. Each answer represented one skill level: basic, intermediate or advanced. Then, for each respondent, based on the quantified answers from the questionnaire, the arithmetic mean was calculated. This arithmetic mean represents overall level of digital skills. A respondent for whom the arithmetic mean is in the interval from 1 to 1.5 has a basic level of digital skills. Those whose arithmetic mean is in the interval from 1.5 to 2.5 have an average level of digital skills and respondents for whom the arithmetic mean is in the interval from 2.5 to 3 have an advanced level digital skills. Statistical data processing was performed using the program TIBCO Statistica 14.0.0 (2020).

B. Results interpretation

In order to ensure the validity of the obtained statistical processing results of the conducted public opinion poll, it was unavoidable to investigate whether the necessary condition of normality of distribution is met. So, the first step was the implementation of the Kolmogorov-Smirnov normality test. For this distribution the Kolmogorov-Smirnov test value is d = 0.05683, and the level of p value is p <0.15. Based on such results it is concluded that the curve is of normal shape.

In the second step of the statistical analysis the descriptive analysis has been made. Its results have shown that the value of the arithmetic mean is 1.94. This number represents average level of the digital skills. Theoretical minimum value is 1 (all activities from the survey are at the basic level) and the maximum value is 3 (all activities from the survey are at the advanced level). Belonging value of the standard deviation is 0.533895. The results are shown in Table 4.

TABLE 4: RESULTS OF DESCRIPTIVE STATISTICS FOR SURVEY DATA

Variable	Descriptive statistics (Total digital skills)				
	Valid N	Mean	Minimum	Maximum	Standard deviation
Digital skills	429	1,949184	1,000000	3,000000	0,533895

Source: Authors' research

Statistical analysis of digital skills by gender has been carried out using t test. For this purpose t test was calculated for independent samples by groups. The test shows whether there is a statistically significant difference in the level of overall digital skills by gender. Empirical test value is -1.02435, the degrees of freedom are 427, and the empirical level of significance (p value) is 0.306. So, these result values lead to the conclusion that there is no statistically significant difference in the overall level of digital skills by gender. The results are shown in Table 5.

TABLE 5: STATISTICAL ANALYSIS RESULTS OF THE DIGITAL SKILLS DEPENDENCE ON THE GENDER OF THE RESPONDENTS

Variable	T- test: Grouping: Gender (Total digital skills) Group 1: Female Group 2: Male								
	Mean Female	Mean Male	t- value	df	p	St.Dev. Female	St.Dev. Male	F- ratio Variances	P Variances
Digital skills	1,9259	1,9791	-1,0244	427	0,3062	0,51092	0,5619	1,2097	0,1649

Source: Authors' research

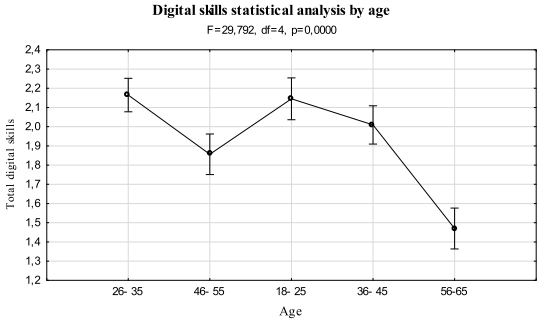
For the analysis of digital skills by age groups, the analysis of variance with one variable factor (One Way ANOVA) was used. The results of One Way ANOVA analysis show whether there is a statistically significant difference in the level of overall digital skills by age groups. In this case study the F-ratio is 29,792, the degrees of freedom are 4, and the empirical level of significance (p value) is 0,000. According these values it follows that there is a statistically significant difference in the overall level of digital skills by age groups. The results of the analysis are shown in Table 6.

TABLE 6: STATISTICAL ANALYSIS RESULTS OF THE DIGITAL SKILLS DEPENDENCE ON THE AGE GROUPS OF THE RESPONDENTS

Effect	Unvariate results Sigma- restricted parameterization Effective hypothesis decomposition				
	Degress of Freedom	Digital skills SS	Digital skills MS	Digital skills F	Digital skills p
Intercept	1	1556,614	1556,614	6930,427	0,00
Age	4	26,766	6,692	29,792	0,00
Error	424	95,233	0,255		
Total	428	121,999			

Source: Authors' research

Graphic presentation of the digital skills analysis by age is shown by the Graph 1. It graphically confirms that the conclusion about statistically significant dependence between digital skills and the age of the respondents is valid.



Source: Authors' research

Graph 1 Graphic presentation of the digital skills statistical analysis by age

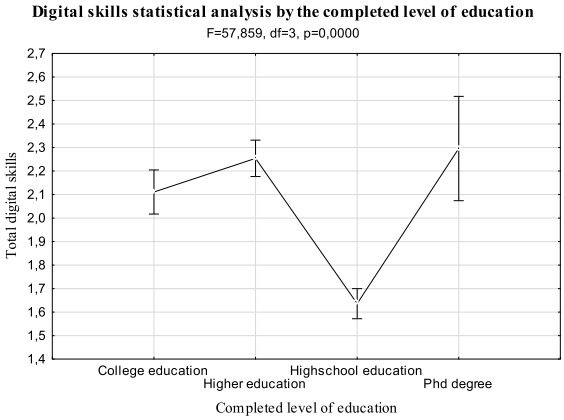
For the analysis of digital skills by completed level of education, the analysis of variance with one variable factor (One Way ANOVA) was used. The analysis shows whether there is a statistically significant difference in the level of overall digital skills depending on the completed level of education. In this particular study, the F-ratio is 57,859, the degrees of freedom are 3, and the empirical level of significance (p value) is 0.00. Based on these values, it can be concluded that there is a statistically significant difference in the overall level of digital skills depending on the completed level of education. The results of the analysis are shown in Table 7.

TABLE 7: STATISTICAL ANALYSIS RESULTS OF THE DIGITAL SKILLS BY THE COMPLETED LEVEL OF EDUCATION

Effect	Unvariate results Sigma- restricted parameterization Effective hypothesis decomposition				
	Degress of Freedom	Digital skills SS	Digital skills MS	Digital skills F	Digital skills p
Intercept	1	795,5601	795,5601	3903,339	0,00
Completed level of education	3	35,3774	11,7925	57,859	0,00
Error	425	86,6215	0,2038		
Total	428	121,9989			

Source: Authors' research

Graph 2 presents results of the digital skills statistical analysis by the completed level of education. It graphically confirms that the conclusion about statistically significant dependence between digital skills and the respondents completed level of education is also valid.



Source: Authors' research

Graph 2 Graphic presentation of the digital skills statistical analysis by the completed level of education

IV. CONCLUSION

Based on findings concise in theoretical part the individuals need to develop different digital skills in order to ensure a better quality of life and existence. Developed digital skills in the population, positively reflects on business as well; organizations become more competitive, it is easier to adapt to frequent changes in the market which ultimately has a positive impact on the economy.

Consequently, this study was designed and provided among Croatian sample, as presented above. The research was conducted through a questionnaire consisting of socio-demographic and digital skills questions. The obtained data were statistically processed in computer software. The research findings reveal that (a) there is no statistically significant difference between the levels of digital skills by gender, (b) there is a statistically significant difference according to age and (c) there is a

statistically significant difference according to level of completed education.

Findings referring on (a) were expected. It once again confirms that Croatia, as a democratic country, has provided equal conditions for all its citizens to acquire digital skills since childhood. On the other hand the finding referring on (b) implies the need for younger generation to get involved and help elder population to acquire or improve digital skills, and consequently substitute the lack of digital literacy or problems of accessibility and usability. Finally, findings referring on (c) confirm the strategic role of education and justify new investments in this sector. The assistance and efforts of the European Union in improving the digital skills by making available, guidelines, instruments, technical and expertise etc. are also of particular importance.

In summary, these findings are in line with previous research as mentioned in theoretical parts, but also additionally stress the need for new investments of efforts in education people, especially elders regarding upgrading digital skills. Letter named serve as recommendation to the community to work more on this issue in order to achieve sustainable growth and development of society as a whole. We argued as well that National Coalition for Digital Skills and Jobs in the Republic of Croatia and central web hub in progress (mentioned above as well), as valuable step forward for the successful further development of digital skills in Croatia and beyond.

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