

Digital technology and senior citizens in the city of Osijek: a quantitative study

Petr Balog, Kornelija; Faletar, Sanjica; Jakopec, Tomislav

Source / Izvornik: **Libellarium : časopis za istraživanja u području informacijskih i srodnih znanosti**, 2022, 13, 75 - 94

Journal article, Published version

Rad u časopisu, Objavljena verzija rada (izdavačev PDF)

<https://doi.org/10.15291/libellarium.3906>

Permanent link / Trajna poveznica: <https://urn.nsk.hr/urn:nbn:hr:142:821717>

Rights / Prava: [Attribution 4.0 International](#)/[Imenovanje 4.0 međunarodna](#)

Download date / Datum preuzimanja: **2025-02-23**



FILOZOFSKI FAKULTET
SVEUČILIŠTE JOSIPA JURJA STROSSMAYERA U OSIJEKU

Repository / Repozitorij:

[FFOS-repository - Repository of the Faculty of Humanities and Social Sciences Osijek](#)



dabar
DIGITALNI AKADEMSKI ARHIVI I REPOZITORIJI

Digital technology and senior citizens in the city of Osijek: a quantitative study

Kornelija Petr Balog

Odsjek za informacijske znanosti

Filozofski fakultet Sveučilišta J. J. Strossmayera u Osijeku

kpetr@ffos.hr

Sanjica Faletar

Odsjek za informacijske znanosti

Filozofski fakultet Sveučilišta J. J. Strossmayera u Osijeku

sfaletar@ffos.hr

Tomislav Jakopec

Odsjek za informacijske znanosti

Filozofski fakultet Sveučilišta J. J. Strossmayera u Osijeku

tjakopec@ffos.hr

Libellarium 13, 2 (2022): 75–94

UDK: 004-053.9(497.5 Osijek)

Izvorni znanstveni rad / Original Scientific Paper

Primljeno / Received: 09. 09. 2022.

Prihvaćeno / Accepted: 31. 12. 2022.

doi: 10.15291/libellarium.3906



Abstract

Purpose. The world population is continuously ageing, and a significant amount of efforts has already been dedicated to increasing the quality of life of the population in the age-group of 65+. A way to achieve this goal is to introduce older generations to the benefits of digital technology. This paper presents the findings of a study on digital technology adoption and the online information needs of senior citizens in the city of Osijek, Croatia.

Methodology. The study was conducted on a sample of 188 participants from September to December 2021. The data was collected by the means of a paper survey distributed to respondents in several locations: a local senior care home, the farmers market, and a non-profit organization.

Findings. The respondents in our sample prefer smartphones (49.5%) and personal computers or laptops (27.7%) over tablet computers and smartwatches. The internet is used by almost 70% of the respondents, mostly for purposeful searches for information or communication. E-learning, e-shopping, or e-government applications are used rarely. The study detected significant differences in digital technology use concerning gender, age, life satisfaction and living with a partner.

Social implications. In order to support and promote the active ageing of senior citizens in Osi-

jek, a more systematic approach at the level of city administration is needed in order to ensure a better understanding and use of digital technology by this vulnerable demographic group.

Originality. The paper presents a valuable contribution to further understanding the digital technology adoption, skills and online information behaviour of senior citizens in Osijek, Croatia.

KEYWORDS: digital technology, digital technology use, online information needs, senior citizens, Osijek (Croatia)

1. Introduction

The increased life expectancy has led to the growth in the size and proportion of older persons in the world population. In 2020 there were 727 million persons aged over 65 in the world, and over the next three decades, those numbers will continue to rise (United Nations Department of Economic and Social Affairs, Population Division 2020). For example, in 2051, Croatia is expected to have 30.7% of the population aged 65 or older (Eurostat 2020).

In the Republic of Croatia there was 22.5% of the population aged 65+ in 2021. The proportion of older citizens in Osijek is similar to the data at the national level. The latest census reported that the city of Osijek had a population of 75 535 inhabitants in 2021, whereas the number of inhabitants aged 65+ was 16 823 or 22.3% (Croatian Bureau of Statistics 2021).

Since older people are facing numerous challenges in their everyday lives, some related to their physical and cognitive loss of faculties, and some related to poverty, social exclusion and ageism (European Commission 2007; World Health Organisation 2020), the United Nations (UN) Decade of Healthy Ageing (2020-2030) invited governments, international agencies, academia, the media and other agents to improve the lives of older people (United Nations 2020). International documents such as the UN Principles for Older Persons (United Nations 1991) draw the attention of the international audience to the problems and rights of older persons who should be able to live independently, participate in society, receive appropriate care, achieve self-fulfilment, and live in dignity (United Nations 1991). Although relatively slowly at the beginning, digital technology has been increasingly used by the elderly and contributing to their well-being. For example, Freund and Riediger (2003) have established a positive relationship between digital technology adoption and the subjective well-being of senior citizens.

This paper presents the findings of a study into digital technology use and online information needs of senior citizens in Osijek, Croatia. It also tries to understand how digital technology use is influenced by different factors such as gender, age, educational level, life satisfaction, etc.

2. Active ageing and the use of digital technology

Many countries strive to create age-friendly environments which support active and healthy ageing. These initiatives require a comprehensive approach to redesigning social and physical environments and can be supported by digital tools and services (van Staal-

duinen et al. 2021). The use of digital technology, which typically includes smartphones, personal computers, laptops, tablets, the internet and related services, can help older people not only to preserve their health, safety and social connectedness, but also to raise their self-esteem, improve their functional capacity, and increase their subjective well-being and life satisfaction (Hofer et al. 2019; Morris et al. 2012).

Many contemporary authors write about concepts such as active, smart or healthy ageing. *Smart ageing* (Nouchi and Kawashima 2014) is a concept that advocates the positive acceptance of the later stages in life emphasizing the importance of cognitive training, nutrition, and exercise. Research on smart ageing investigates strategies for retaining and improving the cognitive abilities of healthy elderly people, including the use of digital technology. Video games, for instance, have been proven to improve some cognitive functions of healthy older adults (Basak et al. 2008), in particular earlier untrained cognitive functions (Boot et al. 2011; Lovden et al. 2010; Bonnechère et al. 2021; Ballesteros et al. 2014; McDougall and House 2012). The concept of *active ageing*, on the other hand, refers to the active life of older people in various domains – personal, family, social and professional. The WHO defines active ageing as a process of optimizing opportunities for health, participation and security in order to increase the quality of life as people age (2002). Active ageing includes a mix of continuous labour market participation, housework and provision of care for others, participation in community life (also voluntary work), and active leisure (e.g. hobbies, sports, travel, creative activities) (Avramov and Maskova 2003). Digital technology is believed to be a significant factor that supports active ageing. It can prevent decline, compensate for lost capabilities, aid care, and enhance existing capabilities (Parra et al. 2014). Finally, *healthy ageing* is defined as “creating the environments and opportunities that enable people to be and do what they value throughout their lives” (World Health Organization 2020). For senior citizens, this does not mean “being free of disease or infirmity”, but having well-controlled health conditions that have little influence on their wellbeing (World Health Organization 2020). Healthy ageing is furthermore strongly connected to digital technology: technologies for independent living (e.g. measuring physical activity, monitoring diet, monitoring blood pressure, etc.) and technologies for assisted living (e.g. smart home technologies, health and wellness technologies or cognitive support systems) (Koch 2010).

Several authors tried to identify factors that facilitate the usage of digital technology by older people. In Europe, 44.0% of people aged 65-74 never used a computer in 2017 (in 2008, it was as high as 70.0%). Across the EU member countries, the share of people from that age group that have never used a computer was just higher than two-thirds in Italy and Romania, and nearer to three-quarters in Croatia (73.0 %), Bulgaria (74.0 %) and Greece (78.0 %). In most EU countries, women aged 55-74 years were more likely than their male counterparts to have never used a computer (although the reverse was true for countries Estonia, Ireland, Finland, Sweden and Hungary) (European Union 2020). Digital technology is also more likely to be used by senior citizens (65-70) with higher education and those who are living with a partner (Vroman et al. 2015).

The COVID-19 outbreak in 2020 and the related confinement and social distancing measures intensified the usage of digital technology across generations. According to Eurostat (2021a), 61.0% of those aged 65-74 used the internet (in the three months prior to the survey) in 2020 (2021b). The highest number of users aged 65-74 in the European Union was in Denmark (94.0%), Luxemburg and Sweden (both 91.0%), and the lowest in Bulgaria (25.0%), Croatia (28.0%) and Greece (33.0%).

The data about technology usage in the USA give evidence of the increase in digital technology adoption among the American seniors. Around four in ten (42.0%) of adult Americans aged 65+ reported owning smartphones in 2016 (Anderson and Perrin 2017), and 61.0% in 2021 (Faverio 2022). In 2016, 32.0% of seniors owned a tablet computer (Anderson and Perrin 2017), whereas, in 2021, it was 44.0% (Faverio 2022). Social media were used by 34.0% of seniors in 2016 (Anderson and Perrin 2017) and 45.0% in 2021 (Faverio 2022).

The research showed that, in 2019, older Europeans (aged 65-74 years) most frequently used the internet for sending/receiving e-mail (44.0%), while they were less likely to use other forms of communication, such as telephone or video calls over the internet (24.0%). They also used the internet for finding health information (34.0%) and for internet banking (31.0%), but only a small percentage made use of social media (18.0%) (European Union 2020). Health information is the most prominent type of information sought by senior citizens, but they also look for information about cultural events such as concerts (Hofer et al. 2019). A growing share of older people are using the internet for online shopping; however, they remain less likely than other age groups to make purchases over the internet. In 2019, online purchases were made by 28.0% of older Europeans (aged 65-74). Seniors in Denmark (65.0%), the Netherlands (56.0%) and Sweden (54.0%) shopped online most, whereas senior citizens in Romania (3.0%) and Bulgaria (2.0%) tended not to engage in online shopping (European Union 2020).

The research has also shown substantial differences in technology adoption within the older adult population based on factors such as age, household income, educational attainment (Anderson and Perrin, 2017), attitudes, or socio-personal characteristics (Vroman et al. 2015).

3. Context of the study

3.1. Senior citizens in Croatia: quality of life and the use of digital technology

Croatia has been experiencing a continuous decrease in population accompanied by its ageing. In the majority world countries, old age is perceived to start with retirement at the age of 65¹, and according to the population estimates for the Croatian population from 2019, 20.8% of population is over 65 (Croatian Bureau of Statistics 2020).²

In Croatia, 86.0% of households had internet access in 2021 (Eurostat 2021). In 2019, 28.0% of population aged between 65-74 used computers and 35.0% used the internet. Interestingly, the biggest increase of computer and/or internet usage in relation to 2018

¹ In Croatia, the official retirement age is 65, although certain categories of population can retire earlier (e.g. policemen, war veterans, and people with disabilities).

² World Health Organisation distinguishes between three types of senior citizens: “young olds” (60-74), “old olds” (75-84), and “oldest olds” (85+) (World Health Organization Centre for Health Development, 2004). In 2019 the estimated population of Republic of Croatia was 4 065 253 inhabitants (in comparison to the previous year estimate the population decreased by 0.6%). The highest percentage of older citizens was in the category “young olds” (18.6%), followed by “old olds” (7.2%) and “oldest olds” (2.2%) (Croatian Bureau of Statistics 2020).

was noted for the age group 55-64, with an increase of 8.0% (Croatian Bureau of Statistics 2019). According to Eurostat (2020), 37.0% of the population in Croatia aged between 65-74 (who used the internet during the last three months) used social media, 67.0% made an online or video call, 86.0% read online news, 23.0% listened to music online, 78.0% looked for information, 54.0% received or sent e-mails, but only 34.0% used internet banking. In 2019, only 10.0% of Croatian senior citizens performed online purchases (European Union 2020).

Croatia (together with Lithuania) has only 12.0% of members of the older population who have above-basic overall digital skills. Only a few European Union countries scored lower than Croatia (the lowest results had Romania – 7.0%, and Bulgaria – 4.0%) (Eurostat 2020).

There is a need to find new ways to provide a better standard of living and improve the quality of life for this segment of the population in Croatia, and many believe that one way of achieving that goal is through the use of digital technology.

4. Study

4.1. Methodology

In this paper, authors will present only a portion of the findings obtained in a quantitative study that aimed to explore the perceptions and the use of digital technology by senior citizens in the city of Osijek, Croatia. In this paper, only the findings related to their actual use of digital technology will be presented, including their digital skills, online activity and online information needs.

The study tried to answer the following research questions:

RQ1: What digital technology do senior citizens use?

RQ2: What digital skills do they have?

RQ3: What are they doing online?

RQ4: What are their online information needs?

RQ5: Are there differences in the sample concerning the respondents' demographic data?

RQ6: Is there a connection between the adoption of digital technology and life satisfaction in the sample?

The study was conducted with the help of an anonymous printed survey,³ consisting of 15 questions of different types: open, closed and Likert-type questions. In order to obtain answers to the set research questions, the survey questions were grouped into two thematic sections. In the first section, the respondents provided their demographic data (gender, age, education level, family status, and life satisfaction). In the second section, they described their use of digital technology and online information needs (type and motivation). The data were analysed with the help of the SPSS statistical software, and statistical differences were calculated with the help of the chi-square and Kruskal-Wallis test (for non-parametric group testing).

³ The survey can be obtained from authors upon request.

The study was conducted from September through December 2021. In order to reach as diverse a population as possible, the survey was distributed to the respondents at several locations in the city: in the local senior care home, at the local farmers market, and at workshops for senior citizens organized by a local non-profit organization. It must be mentioned that the research sample was obtained with great difficulty since the research was carried out during the COVID-19 epidemiological measures, and this demographic group was particularly cautioned by physicians to avoid physical contact with other people. Since the study population were senior citizens, the survey was conducted with the help of interviewers in the following manner: after describing the goal of the study and obtaining their informed consent to participate in the study, the respondents were handed out a printed survey, and the researchers read the questions aloud. The respondents could choose to either fill out the survey on their own, or the researcher both read the questions aloud and noted their answers in the survey (which was most frequently the case). On several occasions, when respondents did not fully understand the questions, the researchers explained the meaning of the questions to them. Several respondents decided they did not need any help, and they filled out the survey entirely on their own. It should be noted that the respondents did not express any anxiety about the presence of the researcher and their help in filling out the survey. On the contrary, they felt relaxed and often initiated discussions and shared their thoughts about some additional issues raised by the survey.

The sampling of the research subjects for this research provided for the collection of respondents from various subgroups of senior citizens. This, in turn, enabled the researchers to obtain a better insight into their specific experiences, needs and competencies. However, the sample is not representative of the population of senior citizens of the city of Osijek, and this is considered to be a limitation of this study.

4.2. Findings

4.2.1. Respondents' general characteristics

A total of 188 respondents participated in the study: 52 (27.8%) male and 135 (72.2%) female. The average age of respondents is 74 (with the majority of respondents in the 'young olds' category), and all are retired.⁴ The largest portion of participants has a high school degree (49.7%). Almost the same number of respondents are living with a partner (49.7%) and alone (50.3%). The majority of respondents (72.9%) are satisfied with the quality of their life. Although the respondents who live with partners and male respondents are somewhat more satisfied with their life than female respondents and respondents who live alone, the statistically significant difference regarding the perceived satisfaction with the quality of life is identified only concerning the education level: the respondents who have the highest educational level ($\chi^2 = 6.324$, $p=0.042$) are most satisfied with their lives (Table 1).

⁴ Some research participants retired earlier due to the nature of their profession (e.g. policemen, war veterans) or illness. Therefore, an additional age category was added (48-64 years).

Table 1. Respondents demographic characteristics

		N	%
Gender	Male	52	27.8
	Female	135	72.2
	Missing	1	0.5
Age	48-64	17	9.2
	65-74	86	46.7
	75-84	59	32.1
	85+	22	12.0
	Missing	4	2.1
Education	Elementary school	33	18.0
	High school	91	49.7
	College or university	59	32.2
	Missing	5	2.7
Family status	Living alone (single, widowed, divorced)	94	50.3
	Living with a partner	93	49.7
	Missing	1	0.5
Working status	Retired	188	100
Life satisfaction	Satisfied	137	72.9
	Neither satisfied nor unsatisfied	39	20.7
	Not satisfied	12	6.4

4. 2. 2. Digital technology adoption

Smartphones are used by the largest number of respondents (49.5%). Personal computers and/or laptops (27.7%) are used to a larger degree than tablets (12.2%) and smart watches (3.7%). A total of 66.3% of respondents indicate that they are actively using the internet (Table 2).

Table 2. Use of digital technology

	N	%
Internet	120	66.3
Smartphones	93	49.5
Personal computers/laptops	52	27.7
Tablets	23	12.2
Smart watches	7	3.7

A statistically significant difference was identified concerning the following variables: age, education, and life with a partner. Those under 65 tend to use smartphones and the internet more frequently than the older respondents in the sample. The same applies to those who live with a partner. They also use smartphones and the internet more often than the respondents who live alone. Respondents with the highest educational level use personal computers or laptops and the internet more than the respondents with a lower level of education (Table 3).

Table 3. Digital technology adoption by demographic characteristics

	Age				χ^2	p
	48-64	65-74	75-84	85+		
Smartphones	82.35%	60.47%	35.59%	27.73%	22.329	0.000
Internet	94.12%	84.15%	48.28%	23.81%	42.974	0.000
	Life with a partner		χ^2	p		
	Life with partner	Life without partner				
Internet	80.90%		51.65%	17.183	0.000	
Smartphones	58.06%		40.43%	5.820	0.016	
	Education			χ^2	p	
	Elementary school	High school	College or university			
Internet	39.39%	72.41%	76.79%	15.068	0.001	
Computer/ Laptop	12.12%	27.47%	38.98%	7.586	0.023	

4. 2. 3. Digital technology skills

When responding to the question about their knowledge of specific digital technology skills, which included a Likert-type scale (1 - I fully disagree, 2 - I fully agree), the largest portion of respondents indicate that they know how to use smartphone applications (47.5%) and social media (38.6%). While about half know how to send an email (42.5%), only a few have the skill to use MS Excel (8.3%) or PowerPoint (6.9%) (Table 4).

Table 4. Digital skills

	N	%
Smart apps	85	47.5
E-mail	77	42.5
Social media	70	38.6
MS Word	44	24.5
MS Excel	15	8.3
MS PowerPoint	12	6.9

A statistically significant difference in digital skills was identified concerning the following variables: age, education and life satisfaction. MS Word is used most frequently by respondents with the highest educational level. MS Excel and MS PowerPoint are used most frequently by respondents with the highest education level and the youngest respondents. Email, social media and smart apps are used most frequently by respondents with the highest education level, respondents who are satisfied with their life and the youngest respondents. Since the distribution of responses did not meet the assumption of normality, a non-parametric test (Kruskal-Wallis) was used to calculate the statistically significant difference between the groups. For that reason, Grouped Median was used instead of the Mean (Table 5).

Table 5. Digital skills by demographic characteristics

	Age (Median)				χ^2	p
	48-64	65-74	75-84	85+		
MS Excel	1,692	1,714	1,404	1,211	9.928	0.019
MS PowerPoint	1,750	1,600	1,413	1,167	8.953	0.030
Email	3,500	3,125	1,824	1,375	10.932	0.012
Social media	3,400	3,036	1,676	1,353	14.593	0.002
Smart apps	4,438	3,605	1,735	1,353	43.634	0.000
	Education (Median)			χ^2	p	
	Elementary school	High school	College or university			
MS Word	1,250	1,759	2,545	22.684	0.000	
MS Excel	1,133	1,549	1,875	18.686	0.000	
MS PowerPoint	1,133	1,466	1,854	21.061	0.000	
Email	1,308	2,200	3,538	22.455	0.000	
Social media	1,545	2,375	2,692	6.075	0.048	
Smart apps	1,435	3,471	3,385	14.315	0.001	
	Life satisfaction (Median)			χ^2	p	
	Not satisfied	Neither satisfied nor unsatisfied	Satisfied			
Email	1,714	1,692	3,071	7.518	0.023	
Social media	1,857	1,556	2,565	6.641	0.036	
Smart apps	2,333	1,955	3,396	6.997	0.030	

4. 2. 4. Online activity

The respondents who indicated that they used the internet (via smartphones, laptops, tablets, etc.) were then asked to provide answers regarding their online activity i. e. to indicate what they do when they go online. The largest portion indicated that they look for specific information that they need in order to make a decision, solve a problem or learn more about something (e.g. find information about public transport, check out the post office working hours, learn about the COVID-19 symptoms – 53.7%) and to stay abreast with day-to-day news (e.g. reading news portals – 50.0%). Browsing the internet is identified by almost a third of the respondents (28.7%) who are surfing the internet for no specific reason, reading just to pass the time. The internet is used for communication by a significant number of respondents, whereas sending text or image messages (via WhatsApp and Viber) is used more frequently (40.4%) than video messaging (34.0%) and e-mail (28.7%). The least practiced online activities in our sample are online shopping (9.0%), accessing e-government services (5.9%) and online learning (4.3%) (Table 6).

Table 6. Online activity

	N	%
Look for specific information	101	53.7
Stay abreast with current news	94	50.0
Text/Image messaging	76	40.4
Video communication	64	34.0
Surfing (reading) to pass the time	54	28.7
E-mail	54	28.7
Entertainment (watching videos, listening to music)	46	24.5
Internet banking	37	19.7
Health tracking	25	13.3
Online shopping	17	9.0
E-government	11	5.9
Learning	8	4.3
Something else	21	11.2

A statistically significant difference in online activity is identified concerning the following variables: age, gender and life satisfaction. Information required for specific life situations/decisions etc. is sought most often by the youngest group of respondents. The youngest group of respondents goes online most often to read news portals in order to stay abreast with current news, and to surf/browse the internet for fun. Text/image messaging is also used most often by the youngest group of respondents. Video communication is used more frequently by female respondents, the youngest group of respondents and respondents who are satisfied with life. Female respondents and respondents who are satisfied with their life go online most often to entertain themselves (watch videos, listen to music, etc.). Respondents aged 65-74 go online most frequently to track their health. Respondents who fall in the age group 85+ track their health least frequently (Table 7).

Table 7. Online activity by demographic characteristics

	Age (N, %)				χ^2	p
	48-64	65-74	75-84	85+		
Look for specific information	16 (94.12%)	53 (61.63%)	28 (47.46%)	3 (13.64%)	28.500	0.000
Stay abreast with current news	12 (70.59%)	52 (60.47%)	27 (45.76%)	2 (9.09%)	21.782	0.000
Surfing (reading) to pass the time	10 (58.82%)	29 (33.72%)	12 (20.34%)	2 (9.09%)	14.715	0.002
Text/Image messaging	11 (64.71%)	46 (53.49%)	17 (28.81%)	1 (4.55%)	25.244	0.000
Video communication	8 (47.06%)	38 (44.19%)	15 (25.42%)	1 (4.55%)	16.796	0.001
Health tracking	3 (17.65%)	18 (20.93%)	4 (6.78%)	0 (0%)	9.976	0.019
	Gender					
	Female		Male		χ^2	p
Video communication	52 (38.52%)		12 (23.08%)		3.976	0.046
Entertainment	28 (20.74%)		18 (34.62%)		3.896	0.048
	Life satisfaction					
	Satisfied	Neither satisfied nor unsatisfied	Not satisfied		χ^2	p
Video communication	2 (16,67%)	8 (20,51%)	54 (39,42%)		6.555	0.038
Entertainment	1 (8,33%)	3 (7,69%)	36 (26,28%)		7.542	0.023

4. 2. 5. Online information needs

Respondents were then asked about the type of information they look for online. Most respondents look for weather information (48.5%) and current news, both from Croatia and abroad (46.9%). This is followed by health information and services (36.2%) and cooking tips and recipes (39.3%). The smallest portion of respondents is looking for information about possible leisure activities in the local community in which they could participate, such as excursions, workshops, sports activities, etc. (18.1%) (Table 8).

Table 8. *Online information needs*

	N	%
Weather	91	48.4
Current news	88	46.8
Cooking	72	38.3
Health information and services	68	36.2
Retirement (system, benefits, lifestyle, etc.)	51	27.1
Hobby (gardening, painting, etc.)	46	24.5
Sport	42	22.3
Culture (books, exhibitions, theatre shows, etc.)	42	22.3
Entertainment/Showbusiness (actors, singers, etc.)	40	21.3
Leisure activities	34	18.1
Something else	13	6.9

A statistically significant difference in online information needs is identified concerning the following variables: age, gender and life satisfaction. Information about sports is sought most frequently by male respondents and respondents in the age group 65-74. Information about entertainment/show business is sought most frequently by the youngest group of respondents and respondents who are satisfied with their life. Information about cooking and culinary recipes is required most frequently by female respondents and the youngest group of respondents. Hobby information is required most often by the youngest group of respondents. The youngest group of respondents also seek, more often than their older counterparts, information about the weather, current news and health information and services (Table 9).

Table 9. *Online information needs by demographic characteristics*

	Age (N, %)				χ^2	p
	48-64	65-74	75-84	85+		
Sport	5 (29.41%)	26 (30.23%)	9 (15.25%)	1 (4.55%)	9.317	0.025
Entertainment/ Show-business	6 (35.29%)	23 (26.74%)	11 (18.64%)	0 (0%)	9.546	0.023
Cooking	12 (70.59%)	46 (53.49%)	12 (20.34%)	0 (0%)	37.698	0.000
Hobby	6 (35.29%)	29 (33.72%)	10 (16.95%)	1 (4,55%)	11,398	0,010
Weather	11 (64.71%)	49 (56.98%)	24 (40.68%)	4 (18.18%)	13.783	0.003
Current news	13 (76,47%)	46 (53.49%)	24 (40.68%)	2 (9.09%)	21.018	0.000

	Age (N, %)				χ^2	p
	48-64	65-74	75-84	85+		
Health information and services	9 (52.94%)	25 (29.07%)	13 (22.03%)	2 (9.09%)	10.387	0.016
	Gender		χ^2	p		
	Female	Male				
Sport	19 (14.07%)		23 (44.23%)		19.603	0.000
Cooking	67 (49.63%)		5 (9.62%)		25.385	0.000
	Life satisfaction			χ^2	p	
	Satisfied	Neither satisfied nor unsatisfied	Not satisfied			
Entertainment/ Show-business	1 (8.33%)	3 (7.69%)	36 (26.28%)		7.524	0.023

5. Concluding discussion

The study presented in this paper examined the adoption of digital technology (smartphones, smartwatches, tablets, personal computers and laptops, the internet and related services) by senior citizens in the city of Osijek, Croatia, with special emphasis on their digital skills, online activity and online information needs. In addition, the study tried to identify if there are any differences in senior citizens' technology adoption, digital skills and online information needs concerning their general demographic characteristics (gender, age, educational level, life with a partner) and life satisfaction.

Respondents in our sample prefer smartphones (49.5%) and personal computers or laptops (27.7%) over tablet computers and smartwatches, which are used least frequently. Internet is used by almost 70% of respondents. Statistically significant differences were identified in relation to the following variables: age, education and life with a partner. The internet is used most frequently by the youngest group of respondents (aged 48-64), the most educated respondents, and those living with partners. Smartphones are used most frequently by the youngest group of respondents, and those living with a partner. On the other hand, computers/laptops are used most frequently by the most educated group of respondents. The findings are supported by Vroman et al (2015) who found out that digital technology is more likely to be used by senior citizens with higher education levels and who live with a partner (RQ1). The findings relating to the use of computers are supported by the 2019 national study revealing that 28% of the Croatian population aged between 65-74 used computers (Croatian Bureau of Statistics 2019), and the US study which identified that in 2021 a total of 61% adult Americans aged 65+ owned smartphones, and 44.0% owned a tablet computer (Faverio 2022). Although the data from 2019 indicated that 35.0% of the population aged between 65-74 used the internet, our findings show an increase in the

internet usage (the internet is used by almost twice as many respondents – 66.3%). This is in alignment with the 2019 detected increase in computer and/or internet usage by the age group 55-64 (Croatian Bureau of Statistics, 2019). It seems that, although Croatian senior citizens lag behind in computer/internet adoption to other more developed countries, they are embracing digital technology faster than before.

The largest portion of respondents know how to use smartphone applications (47.5%), send an email (42.5%) and use social media (38.6 %). The respondents indicated a general lack of skills to use MS Word (24.5%), Excel (8.3%) or PowerPoint (6.9%). The findings on social media are supported by the US study conducted by Faverio (2022) among American seniors who found out that 45% of Americans aged 65+ used social media. Similar to the digital technology adoption, statistically significant differences in the digital skills are identified concerning the following variables: age and education. In addition, a statistically significant difference for digital skills is identified concerning life satisfaction. Only the most educated and the youngest group of respondents have skills to work with MS Word, Excel or PowerPoint. Smart applications and social media are used most frequently by the most educated and the youngest group of respondents and respondents who are satisfied with their life (RQ2). The findings are supported by Freund and Riediger (2003), who established that senior citizens with higher internet skills were found to have a higher level of life satisfaction. Concerning their activity when they connect to the internet and go online, the largest portion of respondents is purposefully looking for information. They are either searching for specific information required to make a decision, solve a problem or learn more about something (53.7%) or they are looking for information to stay abreast with day-to-day news (50.0%). About a third is surfing the internet for no specific reason. While the internet is used for communication by a large portion of the respondents, they send text or image messages slightly more frequently (40.4%) than video messages (34.0%). The fewest number of respondents shop online (9%), access e-government services (5.9%), or engage in e-learning activities (4.3%). Similar findings to those of our study were obtained in another study (Eurostat 2020), which revealed that in 2019 a total of 10% of senior citizens in Croatia purchased online, 78% looked for information, and 86% read online news. Unfortunately, our findings confirm that Croatian senior citizens lag behind their peers in the European Union, particularly when it comes to online shopping – the data from the EU study (European Union 2020) showed that in 2019, a total of 28.0% older Europeans (aged 65-74) made online purchases. Again, statistically significant differences in online activity are identified concerning the following variables: age, gender and life satisfaction. The youngest group of respondents and the most educated undertake almost all types of online activity most frequently. Female respondents and those who are satisfied with their life go online most often to entertain themselves (watch videos, listen to music etc.) (RQ3).

When online, most respondents look for weather information (48.5%) and current news (46.9%). This is followed by health information and services (36.2%), and cooking tips and recipes (39.3%). Less than a third look for information about retirement benefits and lifestyle, hobbies, sports, culture and leisure activities in the local community. The EU study (European Union 2020) identified similar interests of respondents for health information and information about cultural events. Again, statistically significant differences in online information needs are identified concerning the age, gender and life satisfaction. All types of information are sought most frequently by the youngest respondents. Male respondents look more frequently for information about sports, and females for cooking tips and

recipes. Show-business information is sought most frequently by the youngest group of respondents and respondents who are satisfied with their life (RQ4).

Similar to Anderson and Perrin (2017), we also found that there are substantial differences in technology adoption based on factors such as age and educational attainment. Nevertheless, we also found that factors such as gender and life with or without a partner can impact technology adoption. Our findings do not support an earlier study that established that women aged 55-74 are more likely than their male counterparts to have never used a computer (European Union, 2020).

More specifically, in our research, for *digital technology adoption*, the statistically significant difference is identified in relation to the respondents' age, education and life with a partner. Similar to the digital technology adoption, the statistically significant difference in the *digital skills* is identified concerning age, education and life satisfaction. The statistically significant difference in *online activity* is identified in relation to age, gender and life satisfaction. Finally, the statistically significant difference in *online information needs* is identified concerning age, gender and life satisfaction (RQ5).

The youngest respondents (48-64) and most educated respondents proved to be the most technology savvy and the heaviest users of the internet in the sample. The youngest respondents probably adopted computers/the internet even before they retired and only continued using them in retirement recognizing their obvious advantages. Respondents living with partners (who might be more technology savvy and can instruct and motivate them) are also more prone to using digital technology than those who live alone.

Similar to Freund and Riediger (2003), we detected a strong relationship between the use of digital technology and subjective well-being i.e. life satisfaction of our respondents. The respondents who used digital technology to keep in touch with their family and friends (e-mail, social media, video communication), for monitoring their health (e.g. through smartphone applications) or for (online) entertainment tended to be more satisfied with their life than the other respondents in our sample (RQ6).

The research presented in this paper gives evidence about the slow but growing digital technology adoption among senior citizens in Osijek, Croatia. Our findings support some other studies which show that a growing percentage of the older population is finding digital technology to be a useful tool that can help them in their everyday lives. It can help them monitor their health, find out the required information, and enhance their communication with family and friends, alleviating thus their social exclusion. However, the findings show that senior citizens fail to recognize the advantages the technology can bring in relation to their health, particularly those that fall into the categories of "old olds" (75-84), and "oldest olds" (85+). Interestingly, the oldest participants in our study pay the least attention to online health information and services.

If persons over 65 in Osijek are expected to become active and healthy citizens, independent and engaged members of their communities and connected with their families, a systematic approach aimed at their digital technology education should be designed. At the moment, all the activities related to the improvement of their quality of life through digital education are uncoordinated and arbitrary, depending mostly on civil society organisations. What is needed is a strategic plan which includes a series of continuous, staged, educational workshops with educators trained in the work with senior citizens (taking into account their physical and cognitive limitations) that should be organized by the city administration, in conjunction with social and health services, educational institutions and civil associa-

tions. A flexible training programme, designed to meet their diverse skills and needs, should be provided as a part of a comprehensive and collaborative effort aimed at raising the quality of life of senior citizens and contributing to their active living.

Acknowledgments

The manuscript was created within the EU project “Zlatne godine” funded by the European Social Fund, “Pridruži se - Aktivni u mirovini”, aimed at capacity building for non-governmental organizations for the advancement of active participation and social inclusion of retired people. The project coordinator is Udruga PLANTaža. More information about the project is available at <https://www.zlatne-godine.eu/>.

Data deposit: The datasets generated by the survey research during and/or analysed during the current study are available in the in PUH (Croatian Research Data Repository) at <https://puh.srce.hr/s/myq8GdjBEdN3AA9>.

References

- Anderson, Monica, and Andrew Perrin. 2017. "Tech Adoption Climbs among Older Adults." *Pew Research Center*. Accessed May 22, 2022. <https://www.pewresearch.org/internet/2017/05/17/tech-adoption-climbs-among-older-adults/>.
- Avramov, Dragana, and Miroslava Maskova. 2003. *Active Ageing in Europe*. Strasbourg: Council of Europe. Accessed August 25, 2022. <http://www.avramov.org/media/upload/2013/12/demoen.pdf>.
- Ballesteros, Soledad, Antonio Prieto, Julia Mayas, Pilar Toril, Carmen Pita, Laura Ponce de Leon, Jose M. Reales, and John Waterworth. 2014. "Brain Training with Non-action Video Games Enhances Aspects of Cognition in Older Adults: a Randomized Controlled Trial." *Frontiers in Aging Neuroscience* 6, Article 277: 1–14. <https://doi.org/10.3389/fnagi.2014.00277>.
- Basak, Chandramallika, Walter R. Boot, Michelle Voss, and Arthur F. Kramer, 2008. "Can Training in a Real-Time Strategy Video Game Attenuate Cognitive Decline in Older Adults?" *Psychology and Aging* 23, no. 4:765-77. <https://doi.org/10.1037/a0013494>.
- Bonnechère, Bruno, Malgorzata Klass, Christelle Langley, and Barbara Jacquelyn Sahakian. 2021. "Brain Training Using Cognitive Apps Can Improve Cognitive Performance and Processing Speed in Older Adults." *Scientific Reports* 11, 12313. <https://doi.org/10.1038/s41598-021-91867-z>.
- Boot, Walter R., Arthur F. Kramer, Daniel J. Simons, Monica Fabiani, and Gabriele Gratton. 2008. "The Effects of Video Game Playing on Attention, Memory, and Executive Control." *Acta Psychologica* 129, no. 3:387–98. <https://doi.org/10.1016/j.actpsy.2008.09.005>.
- Croatian Bureau of Statistics. 2019. "Usage of Information and Communication Technologies (ICT) in Households and by Individuals, 2019, First Results." *First Release* 56, 2.3.2. Accessed June 6, 2022. https://www.dzs.hr/Hrv_Eng/publication/2019/02-03-02_01_2019.htm.
- Croatian Bureau of Statistics. 2020. "Population Estimate of Republic of Croatia, 2019." *First Release* 57, 7.1.3. Accessed August 10, 2022. https://www.dzs.hr/Hrv_Eng/publication/2020/07-01-03_01_2020.htm.
- Croatian Bureau of Statistics. 2021. *Population by Age and Sex, by Settlements, 2021 Census*. Accessed January 3, 2023. <https://dzs.gov.hr/vijesti/objavljeni-konacni-rezultati-popisa-2021/1270>
- European Commission. 2007. *Overcoming the Barriers and Seizing the Opportunities for Active Ageing Policies in Europe: ACTIVAGE: Final Report HPSE-CT-2002-00102*. Luxembourg: Office for Official Publications of the European Communities.

- Eurostat. 2021a. *Digital Economy and Society Statistics - Households and Individuals*. Accessed June 11, 2022. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Digital_economy_and_society_statistics_-_households_and_individuals.
- Eurostat. 2021b. *How Popular is Internet Use Among Older People?* Accessed June 12, 2022. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20210517-1>.
- European Union. 2020. *Ageing Europe: Looking at the Lives of Older People in the EU: 2020 edition*. Luxembourg: Publications Office of the European Union. <https://doi.org/10.2785/628105>.
- Faverio, Michelle. 2022. "Share of Those 65 and Older Who Are Tech Users Has Grown in the Past Decade." *Pew Research Center*. Accessed August 20, 2022. <https://www.pewresearch.org/fact-tank/2022/01/13/share-of-those-65-and-older-who-are-tech-users-has-grown-in-the-past-decade/>.
- Freund, Alexandra M., and Michaela Riediger. 2003. "Successful Aging." In *Handbook of Psychology*, edited by R. M. Lerner, A. Easterbrooks, and J. Mistry, 601-628. New York, NY: Wiley.
- Hofer, Matthias, Eszter Hargittai, Moritz Büchi, and Alexander Seifert, 2019. "Older Adults' Online Information Seeking and Subjective Well-Being: the Moderating Role of Internet Skills." *International Journal of Communication* 13: 4426–4443. Accessed September 8, 2022. <https://ijoc.org/index.php/ijoc/article/view/10981>.
- Koch, Sabine. 2010. "Healthy Ageing Supported by Technology – a Crossdisciplinary Research Challenge." *Informatics for Health and Social Care* 35, nos. 3-4: 81-91. <https://doi.org/10.3109/17538157.2010.528646>.
- Lövden, Martin, Lars Bäckman, Ulman Lindenberger, Sabine Schaefer, and Florian Schmiedek. 2010. "A Theoretical Framework for the Study of Adult Cognitive Plasticity." *Psychological Bulletin* 136, no.4: 659–676. Accessed August 15, 2022. https://pure.mpg.de/rest/items/item_2099481/component/file_2099480/content.
- McDougall, Sine, and Becky House, 2012. "Brain Training in Older Adults: Evidence of Transfer to Memory Span Performance and Pseudo-Matthew Effects." *Aging, Neuropsychology, and Cognition* 19, nos. 1-2: 195-221. <https://doi.org/10.1080/13825585.2011.640656>.
- Morris, Meg, Elizabeth Ozanne, Kim Miller, Nick Santamaria, Alan Pearce, Catherine Said, and Brooke Adair. 2012. *Smart Technologies for Older People - a Systematic Literature Review of Smart Technologies That Promote Health and Wellbeing of Older People Living at Home*. Melbourne: The University of Melbourne, Institute of a Broadband-Enabled Society. Accessed September 2, 2022. <http://farseeingresearch.eu/wp-content/uploads/2012/07/MORRIS-Smart-technologies-for-older-people-MEG2.pdf>.

- Nouchi, Rui, and Ryuta Kawashima. 2014. "Improving Cognitive Function from Children to Old Age: a Systematic Review of Recent Smart Ageing Intervention Studies." *Advances in Neuroscience*, Article ID 235479. <https://doi.org/10.1155/2014/235479>.
- Parra, Christian, Patricia Silveira, Iman Khaghani Far, Florian Daniel, Eling D. de Bruin, Luca Cernuzzi, Vincenzo D'Andrea, and Fabio Casati. 2013. "Information Technology for Active Ageing: a Review of Theory and Practice." *Foundations and Trends in Human-Computer Interaction* 7, no. 4: 351–444. <https://doi.org/10.1561/11000000053>.
- United Nations. 1991. *United Nations Principles for Older Persons: adopted by general assembly resolution 46/91 of 16 December 1991*. Accessed May 12, 2022. <https://www.ohchr.org/Documents/ProfessionalInterest/olderpersons.pdf>.
- United Nations. 2020. *Decade of Healthy Ageing: Plan of Action*. Accessed May 4, 2022. <https://www.who.int/initiatives/decade-of-healthy-ageing>.
- United Nations Department of Economic and Social Affairs, Population Division, 2020. *World Population Ageing 2020 Highlights: Living Arrangements of Older Persons (ST/ESA/SER.A/451)* New York: United Nations. Accessed August 12, 2022. https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/undesa_pd-2020_world_population_ageing_highlights.pdf.
- van Staalduinen, Willeke, Carina Dantas, Joost van Hoof, and Andrzej Klimczuk. 2021. "Building Inclusive Environments for All Ages with Citizens." *Sheldon 3rd Online Conference Meeting 14th October 2021*. Accessed August 19, 2022. <https://futurium.ec.europa.eu/en/active-and-healthy-living-digital-world/library/building-inclusive-environments-all-ages-citizens>.
- Vroman, Kerryellen G., Sajay Arthanat, and Catherine Lysack, 2015. "Who over 65 is Online? Older Adults' Dispositions Toward Information Communication Technology." *Computers in Human Behavior* 43: 156-166. <https://doi.org/10.1016/j.chb.2014.10.018>.
- World Health Organisation. 2020. *Healthy Ageing and Functional Ability*. Accessed September 3, 2022. <https://www.who.int/news-room/questions-and-answers/item/healthy-ageing-and-functional-ability>.
- World Health Organization Centre for Health Development Kobe, Japan). 2004. *A Glossary of Terms for Community Health Care and Services For Older Persons*. Kobe: WHO Centre for Health Development. Accessed June 19, 2022. <https://apps.who.int/iris/handle/10665/68896>.

Sažetak

Digitalna tehnologija i starije osobe: rezultati kvantitativnog istraživanja u gradu Osijeku

Cilj. Svjetska populacija nezaustavljivo stari te se značajan segment napora u svijetu ulaže u povećanje kvalitete života osoba 65+. Jedan od načina da se to postigne je upoznati građane treće životne dobi s prednostima koje im donosi digitalna tehnologija. Ovaj rad donosi rezultate istraživanja o usvojenosti digitalne tehnologije i informacijskih potreba na internetu osoba treće životne dobi u Osijeku, Hrvatska.

Metodologija. Istraživanje je provedeno na uzorku od 188 ispitanika u razdoblju od rujna do prosinca 2021. Podaci su prikupljeni papirnatim upitnikom koji se ispitanicima dijelio na nekoliko lokacija: u domu za stare i nemoćne, na tržnici te putem neprofitne organizacije.

Rezultati. Ispitanici u našem uzorku preferiraju pametne telefone (49,5 %) i osobna računala ili laptove (27,7 %) u odnosu na tablete ili pametne satove. Gotovo 70 % ispitanika koristi Internet, poglavito za ciljano traženje informacija ili za komunikaciju. Aplikacije za e-učenje, e-kupovinu ili e-Građanin u uzorku se koriste rijetko. Istraživanje je otkrilo značajne razlike u korištenju digitalne tehnologije u uzorku u odnosu na spol, dob, zadovoljstvo životom te život s partnerom.

Društveni značaj. Aktivno starenje osoba treće životne dobi u gradu Osijeku može se osigurati i promovirati jedino kroz sustavan pristup na razini grada Osijeka. Jedino će takav pristup osigurati bolje razumijevanje i uporabu digitalne tehnologije ove ranjive društvene skupine.

Originalnost. Rad predstavlja značajan doprinos boljem razumijevanju razini usvojenosti digitalnih tehnologija, vještina za rad s njima te informacijskom ponašanju na internetu osoba treće životne dobi u Osijeku.

KLJUČNE RIJEČI: digitalna tehnologija, građani treće životne dobi, informacijske potrebe, Osijek (Hrvatska), uporaba digitalne tehnologije