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## Article

# Digital divide and the use of digital public services during the COVID-19 pandemic

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# Digital Divide and the Use of Digital Public Services During the COVID-19 Pandemic

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## Abstract

The COVID-19 pandemic enhanced digital transformation. With the spread of the pandemic and the introduction of epidemiological measures, citizens were enforced to use the Internet to an increased extent. The digital divide among citizens and the capability of citizens to get an equal level of services has also come to the fore. The paper explores the changes in the use of e-government services and the impact of the pandemic on the citizens' attitudes toward Internet use in Croatia. The analysis is based on the survey data. The results show that due to the pandemic, citizens became more dependent on IT equipment. Citizens spend more time using digital public services than in the pre-pandemic period. The results also reveal differences in the COVID-19 impact on the use of digital public services between different groups of population.

## Introduction

The COVID-19 pandemic changed digitalization's role and perception and boosted digitalization in the public sector (European Commission, 2021, European Commission, 2021a). With the spread of the pandemic and the introduction of epidemiological measures to combat the pandemic (lockdown, closure of numerous activities that required physical contact, socializing or gathering, etc.), there was a greater necessity for citizens to use digital technologies. Digital technologies became necessary to work, learn, shop, access many public services (including health services), get information, and entertain. The report made by Crahay et al. (2021) on the digital response to COVID-19 in the European Union (EU) countries shows that member countries developed or enhanced the implementation of digital technologies and solutions in the public sector (online platforms, informative chatbots, repositories, mobile applications, online portals, etc.) and that pandemics enforced governments and public administrations to provide additional ways to deliver public services. However, the research of Roseth et al. (2021) implies that despite the digitalization of a range of services in a short period, improvements in the availability and quality of digital public services are needed.

Very soon after the pandemic started, those with no network connection, necessary devices, or IT knowledge became excluded (De et al., 2020; Seifert et al., 2020). So, the pandemic has reemphasized the digital divide and inequalities associated with digital exclusion (Li, 2022, Lai and Widmar, 2021). The paper explores the change in the use of digital public services and the impact of the pandemic on the citizens' attitudes toward Internet use. The paper primarily focuses on the situation on the islands for several reasons. Croatia has 78 islands and 524 islets (Ministry of Regional Development and EU Funds, 2022), and 49 islands are permanently inhabited. Although there are no official data on the density of broadband access on the islands, the literature indicates that the relevant indicators of the density of broadband access on the islands are lower than the Croatian average and that there is not sufficient commercial interest in building broadband networks on the islands (Lator d.o.o., 2011). There are several limitations due to which there is insufficient interest or there are high costs of developing broadband networks on the islands, such as the different distances between the islands and the mainland, the number of settlements on the islands, the population density of the islands and others (Lator d.o.o., 2011). In addition, due to the restriction of passenger transportation from the island to the mainland and epidemiological measures during the lockdown, it was more difficult for island residents to access different services. During the pandemic, there were many challenges on the islands, and the digital gap between the islands and the mainland came to the fore even more. Therefore, the paper investigates how people on the islands adapted, to what extent they used the Internet during the pandemic and for what purposes, and how the pandemic affected the acceptance of digital public services among residents.

The remainder of the paper is structured as follows. The second section contains a review of the literature. The third section provides a short overview of the methodology. The fourth section contains the survey results and the fifth section summarizes the conclusions.

## Theoretical Background

### Literature review

Digital public services or e-government services can be defined as the use of technology to provide services to the citizens and the use of information and communication technology in public administration procedures and consist of obtaining information, downloading and/or returning filled-in forms, and going entirely electronically through

an administrative procedure (Eurostat, 2022; European Commission, 2023). Literature indicates many positive impacts of e-government. European Commission (2021b) stresses the public sector as one of the flagships of the EU's Recovery and Resilience Facility that will help Europe emerge stronger and more resilient from the current crisis. Countries with a higher level of public sector digitization were more successful in providing public services to citizens during the lockdown that followed as a response to the pandemic. Also, they proved to be more resilient in continuously providing public services to the citizens (Crahay et al., 2021).

Crahay et al. (2021) notice 3 groups of factors on which, viewed from the perspective of public administration, the spread of public services as a response to the health crisis depends. First, human capital factors include the level of civil servants' digital skills, the capacity of public administrations to innovate and change, and public administrations' knowledge of reusable tools that can accelerate digital improvements and change. The second group of factors is government factors which include the level of cross-administration collaboration to mutualize resources and skills and the level of partnership with private organizations, information transparency, availability of financial resources, adequate public procurement schemes, crisis management, and existing framework for delivering digital public services. The third group of factors is technological factors, including access to collaborative communication tools, level of civil servants' access to documents and data, access to hardware for remote work, IT infrastructure, and cybersecurity.

Chatzoglou et al. (2015) investigated the intention to use e-government services in Greece and showed that perceived usefulness, trust, Internet experience, peer influence, computer self-efficacy, and perceived risk are the factors on which the use of e-government services among citizens depends. Kumar et al. (2007) based on a literature review dealing with the use of e-government services, conclude that the adoption of e-government services depends on user characteristics, website design, as well as on data security and privacy. Vishanth et al. (2016) analysis show that satisfaction with the use of e-government services depends on information quality, system quality, trust, and costs.

The literature on the digital divide indicates that Internet use is more widespread among the young population than among the elderly (Lee and Porumbescu, 2019). Alzahrani et al. (2018) investigate the differences in citizens' trust in e-government between men and women. Al-Hujran et al. (2015) investigate factors that impact the adoption of e-government and show that citizen attitude toward using

e-government services is the most significant determinant of citizen intention to use e-government services. Hooda et al. (2022), Carter and Bélanger (2005), and Bélanger and Carter (2008) notice that the intention to use e-government depends on the trust in e-government, trust of the Internet, and perceived ease of use. Samsami and Schøtt (2022) and Acheampong (2021) investigate entrepreneurs' adoption of digital technologies before and during the pandemic. Some literature deals with how the pandemic affected citizens' acceptance of digital technologies. The literature indicates that many still prefer traditional service delivery over digital public services (Alzahrani et al, 2018). Citizens' attitudes about digital public services are essential for accepting this type of service.

COVID-19 revealed many weaknesses and vulnerabilities in the digital space (European Commission, 2021a). Some categories of the population are excluded from using digital technologies. The problem is that many citizens are still not Internet users or do not have access to the Internet (European Parliament, 2015, DigitalEurope, 2022). Moreover, most European countries have a significant urban-rural digital divide due to low network deployment in less-dense

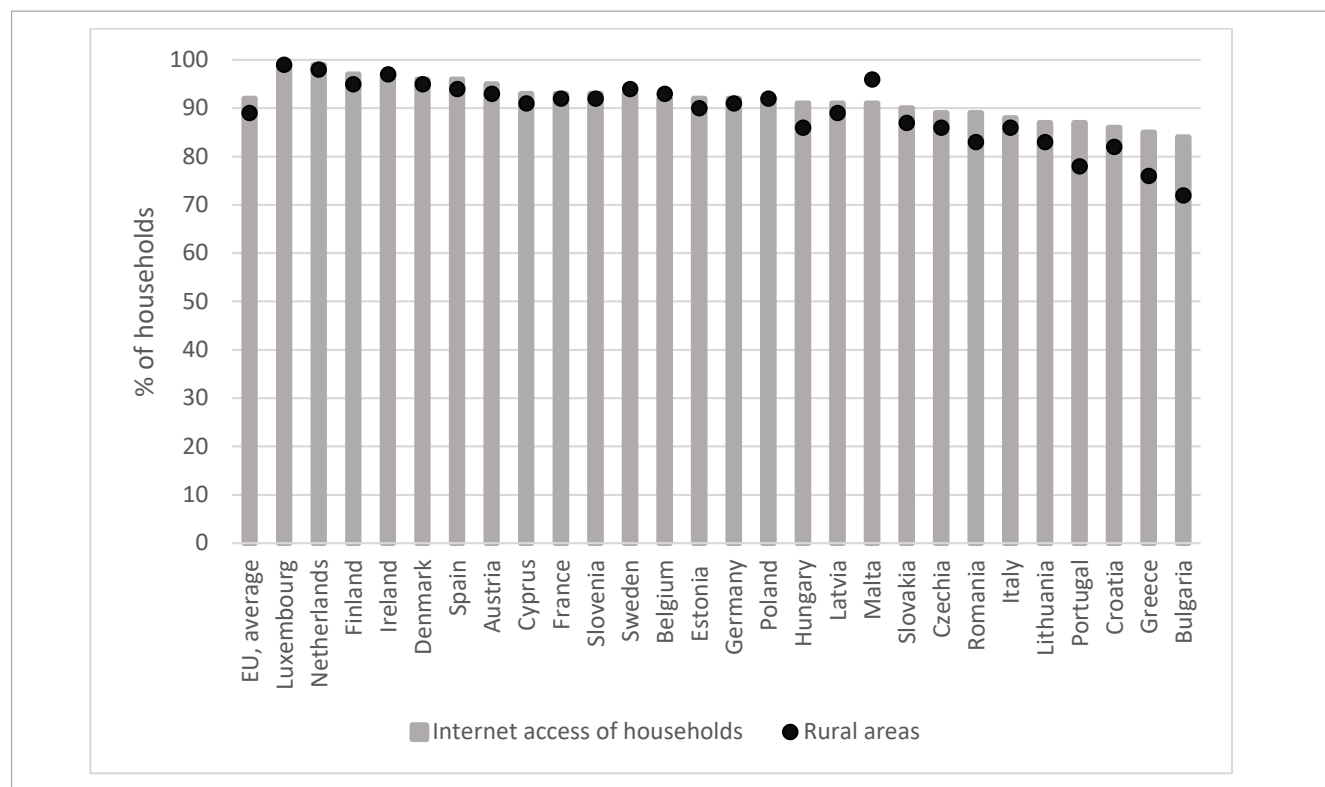
areas (DigitalEurope, 2022). In the paper, OECD's definition of the digital divide is used. It refers to "the gap between individuals, households, businesses, and geographic areas at different socio-economic levels concerning both their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities" (OECD 2022, 200-201).

### Digital divide and Internet use in the European Union

According to Eurostat (2021) data, the share of households with internet access in EU countries has been increasing. In 2021, on average 92% of households had internet access in the EU. Croatia is below the EU average, and it is, along with Greece and Bulgaria, the country with the lowest level of Internet access among households (86%) (Figure 1). Eurostat's (2021) data on Internet access of households by the degree of urbanization point to significant differences in Internet access rates in towns and rural areas. This divide is enormous in Croatia. Also, individuals in Croatia used the Internet more rarely than in most other EU countries (Eurostat, 2021).

**Figure 1**

*Internet access in European Union countries, 2021*



Source: Author, based on Eurostat (2021) data.

The evidence about the digital divide is stark. As stated in the European Commission (2021a) COVID-19 showed a new digital divide, not only between well-connected urban areas and rural and remote territories, but also between those who can fully benefit from an enriched, accessible, and secure digital space with a full range of services, and those who cannot. Thus, European countries' Recovery and Resilience Plans and the European Commission proposed "Path to Digital Decade" plan shows that EU countries are putting efforts to foster digital transformation and achieve better global resilience. EU digital transformation targets for 2030 are a digitally skilled population and highly skilled digital professionals, secure and sustainable digital infrastructures, the digital transformation of businesses, and the digitalization of public services (European Commission, 2021a, European Commission, 2022).

In 2021, 54% of EU and 63% of Croatian citizens had at least basic overall digital skills (Figure 2). The level of overall digital skills varies by gender and by age. In most countries, more men than women have at least basic digital skills. Also, the share of people with at least basic overall digital skills is higher among people younger than 25 than among people older than 55.

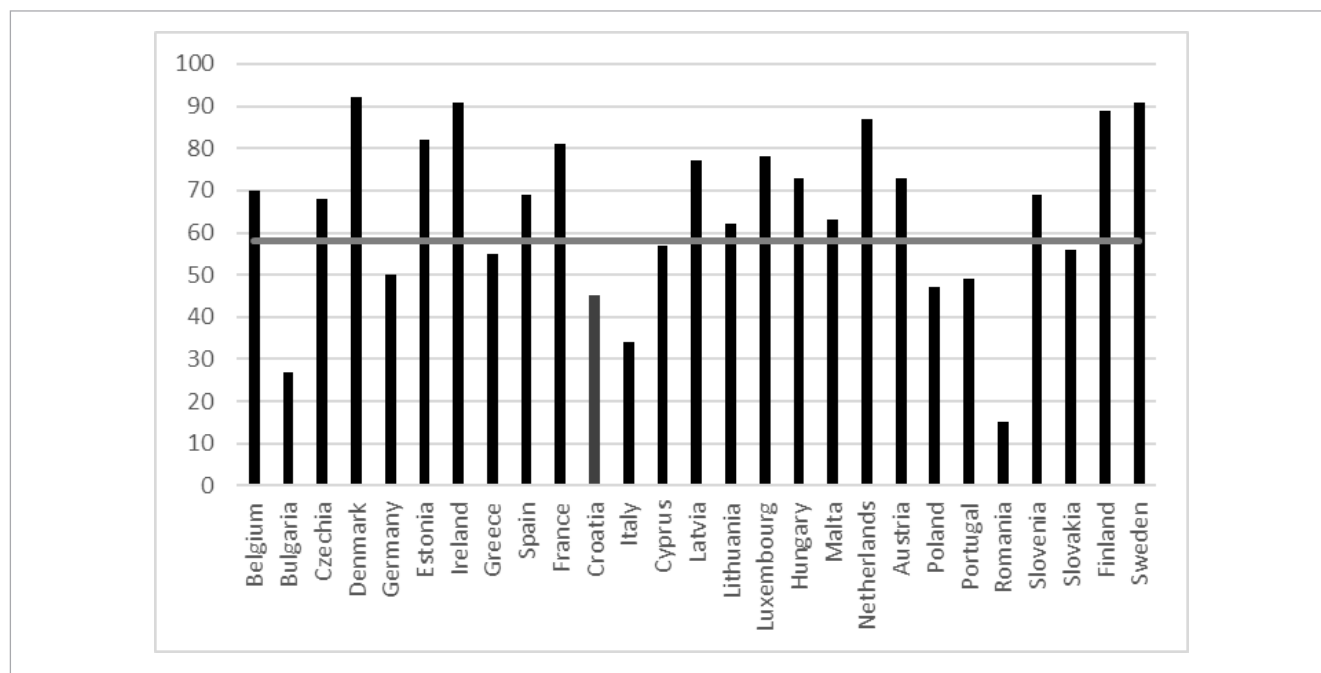
Data in Figure 3 show an increase in citizens' use of the Internet for interacting with public authorities during the ten years. EU citizens most frequently used e-government services to obtain information from public authorities' websites (47% of citizens in 2021), followed by submitting completed official forms (44%) and downloading official forms (38%).

Croatia is among the EU countries with the lowest percentage of citizens who use the Internet for interaction with public authorities (Figure 4.). Croatian citizens mostly used e-government services in 2021 to obtain information (42%). Only 34% of the citizens used it for downloading official forms and 24% for submitting completed official forms.

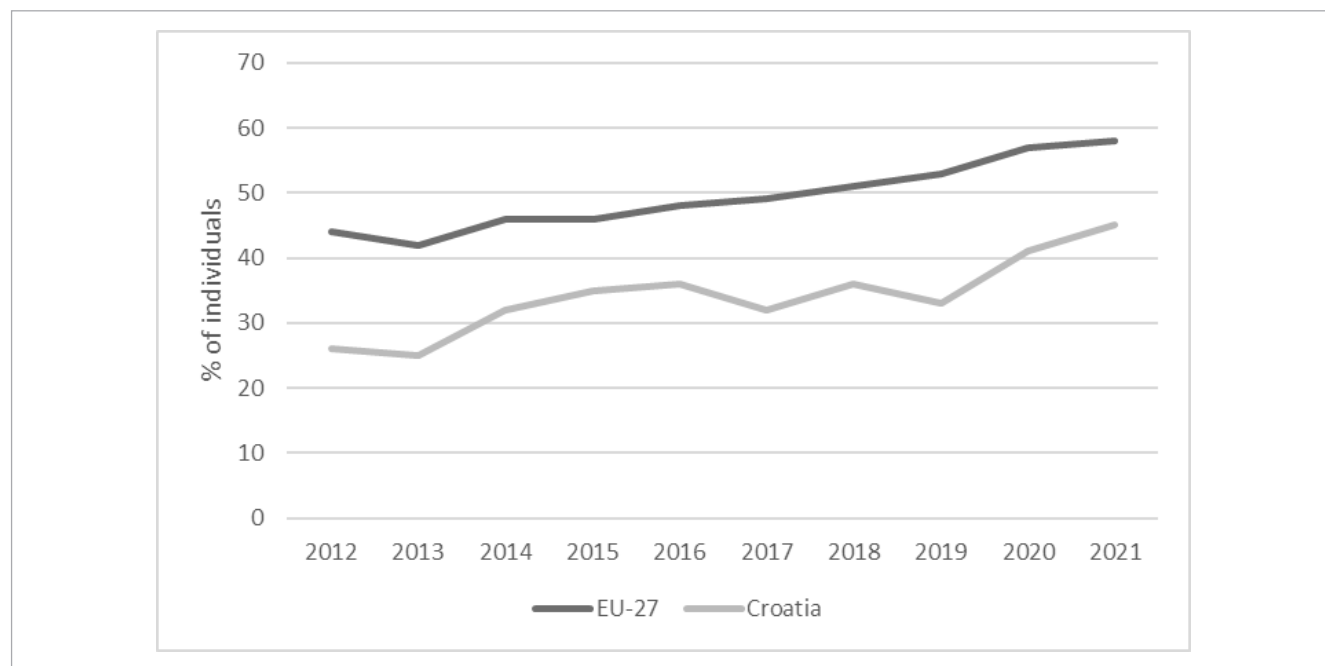
Digital Economy and Society Index report also notice a slight increase in the use of digital solutions during the COVID-19 pandemic by citizens and enterprises (European Commission, 2022). The EU 2030 digitalization targets for public services are that all vital public services should become online, 100% of citizens should have access to medical records, and 80% of citizens should use digital IDs.

**Figure 2**

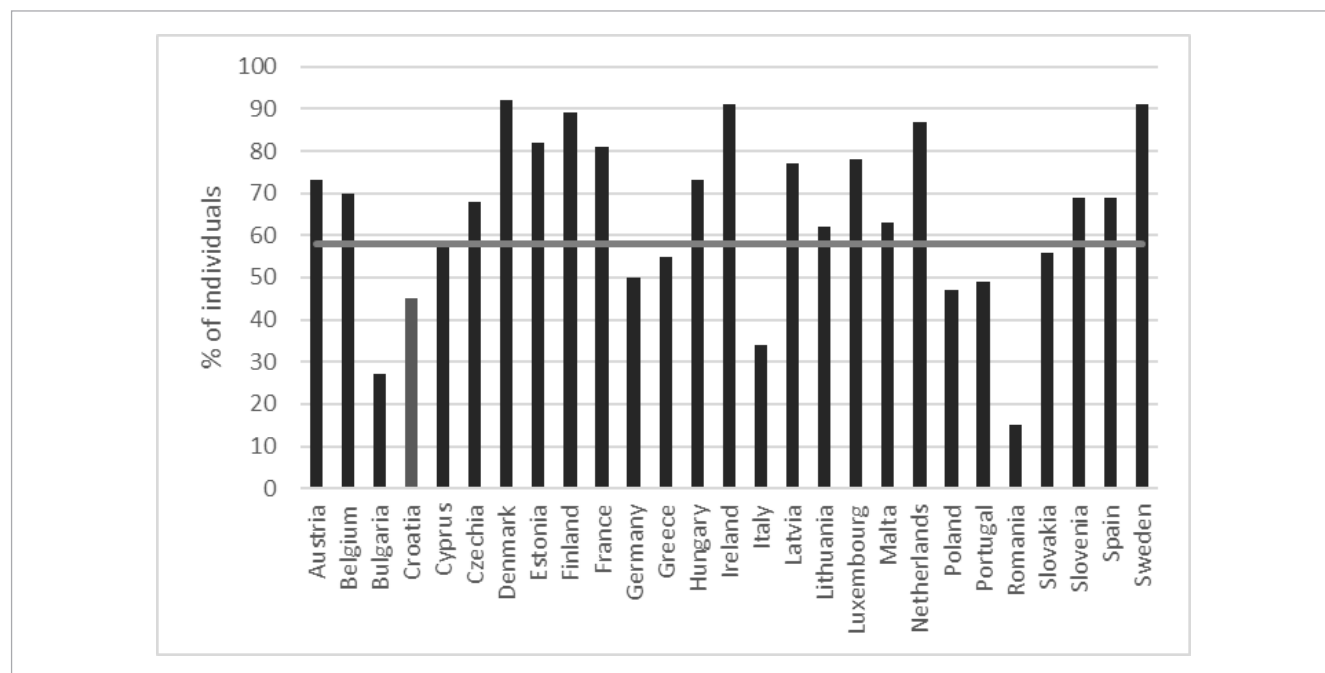
*Individuals with basic or above basic overall digital skills, %*



Source: Author, based on Eurostat (2021) data

**Figure 3***Internet use for interaction with public authorities in EU-27, 2012-2021*

Source: Eurostat database.

**Figure 4***Internet use for interaction with public authorities in the last 1 year, 2021*

Source: Eurostat database.

## Methodology

In this paper, the analysis is based on the survey conducted in 2020 among Croatian citizens living on the islands. The survey covered participants from islands of different sizes and different proximity to the mainland of Croatia, namely islands Pag, Dugi otok, Krk, Cres, Rab, Vir, Lošinj, Pašman, Ugljan, Iž, Susak, Olib, Ilovik, Silba, and Zlarin.

The questionnaire was sent to around 1,000 citizens by e-mail. E-mail addresses were collected from the Internet and covered owners of family farms, citizens who rent apartments, companies on the islands, and other individuals living on the islands. The snowball sampling technique<sup>1</sup> was then used, which is common sampling procedure used when it is very hard or expensive to use other sampling procedures. The survey was made in LimeSurvey, and could be accessed on a computer, tablet, or mobile phone. The results were analyzed using the statistical program SPSS Statistics 23.

The questionnaire consisted of several themes related to this topic. Most questions were measured using a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Additionally, the survey contained questions revealing the participants' socio-demographic characteristics (age, level of education, gender, residence, etc.).

The age of the survey participants ranged from 24 to 77 years. 42% of respondents were males, and 58 females. Data about education show that 36% of respondents had at least secondary education, and others had higher education. 87% of respondents stated that they are permanent residents of the island, 10% spend more than 3 months per year on the island, and the rest spend less than three months per year on the island.

## Empirical Analysis

The COVID-19 pandemic has affected the use of IT equipment. Of the total number of surveyed citizens, 41.7% stated that they use IT equipment more than in the pre-pandemic period. Slightly more women than men increased the use of IT equipment. At the same time, people under the age of 65 increased the use of IT equipment to a greater extent than older people, which is expected considering the introduction of remote work and education during the lockdown, which

demanded more significant use of IT equipment. 25.0% of people over the age of 66 increased their use of IT equipment during the lockdown.

Further, 38.6% of respondents used e-payments more than in the period before the pandemic. At the same time, the most significant increase occurred among the elderly population, i.e. people over 65 years old. 50% of people over 65 used e-payments more than before the pandemic. Observed by gender, women started using e-payments more than men compared to the pre-pandemic period.

The results indicate a positive relationship between security and privacy concerns due to increased Internet use and age. Thus, older people are most concerned about safety and privacy, and people under 30 are the least concerned. By gender, women are more concerned about Internet security and privacy than men. As many as 58.5% of men are not concerned about security and privacy, while this percentage among women amounts to 40%.

Furthermore, during the pandemic, the most significant number of respondents began to spend more time on the Internet searching for daily news and general information, 28.6% of them. In addition, 25.0% of respondents started spending more time online shopping, and 17.9% on sending and receiving e-mails. 15.2% of respondents stated that they now spend more time on digital public services than in the pre-pandemic period (Table 1). At the same time, slightly more women (17.7%) than men (13.3%) increased the time they use digital public services, although the t-test tests no statistically significant differences.

Statistically significant differences in the time spent on the Internet during the pandemic exist when differences are observed concerning the age of the respondents. Thus, during the pandemic, people between 30 and 59 increased the time spent on digital public services the most, while those under 30 did the least (chi-square: 0.110).

Most respondents stated that after the pandemic, they would continue to use the Internet as they did during the pandemic. This is what 67% of respondents claim, while 16% of them disagree with that statement. Interestingly, among the people who stated that they would continue to use the Internet to the same extent, the majority are citizens older than 60. In the group of people who said that after the pandemic, they would no longer use the Internet to the same extent as during the pandemic, the majority are people under 35. This indicates a reduction in the differences between the younger and older population in Internet use. Observed by gender, 63.3% of female and 77.5% of male respondents stated that they would use the Internet to the same extent as during the pandemic.

<sup>1</sup> Snowball sampling is a non-probability technique where participants are asked to recruit other participants in the research which could be difficult to reach otherwise.



**Table 1***Time spent on the Internet for different activities compared to the pre-pandemic period*

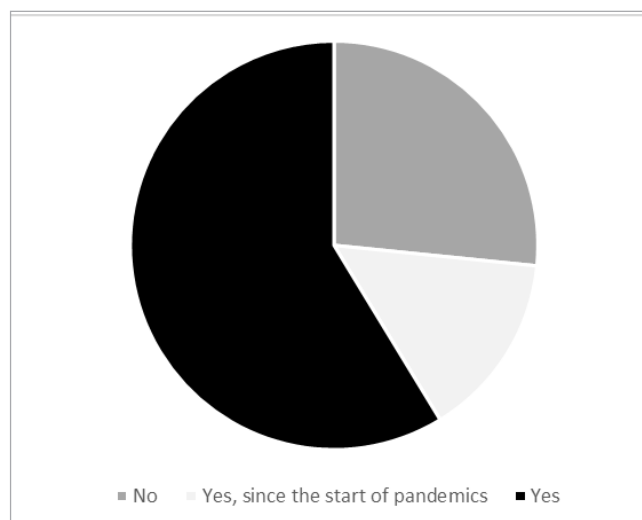
	Searching for the daily news and general information	E-mails	Games	Shopping	E-banking and m-banking	Public services
	%	%	%	%	%	%
Less time	8.9	3.6	21.4	9.8	0.9	14.3
The same time as before	62.5	78.6	64.3	65.2	82.1	70.5
More time	28.6	17.9	14.3	25.0	17.0	15.2

*Source: Authors' research*

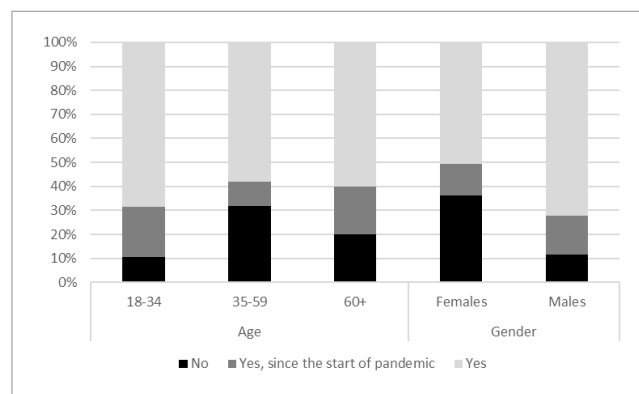
Figure 5 shows how many people use the e-government service and whether they used it before the pandemic or started using it only after the start of the COVID-19 pandemic.

The survey results indicate that 59% of respondents used the e-government service before the pandemic. Furthermore, 15%

Observed according to the age of the respondents, as many as 89.5% of people under 35 stated that they use the e-government service and many of them do this since the pandemic. Every fourth person (25.0%) under 30 stated that they did not use the e-government service before the pandemic but started using it. Also, many citizens older

**Figure 5***Use of e-government services**Source: Authors' research*

of respondents started using the e-government service after the start of the COVID-19 virus pandemic. This indicates that the pandemic has encouraged some citizens to use digital public services. Of these, 98.1% stated that even after the pandemic, they would continue to use digital public services, which leads to several conclusions. First, among some citizens, the need for public services has overcome resistance to digitization, and it will have lasting positive consequences on the use of public services. Second, although the survey did not examine the satisfaction of using public services, the fact that the respondents stated that they plan to continue to use digital public services indicates satisfaction with the use and that there has been an increase in trust in these services.

**Figure 6***Use of e-government services by age and gender**Source: Authors' research*

than 60 stated that they have started using e-government services since the pandemic. As many as 22.2% of people over 65 started using the e-government service during the pandemic. Mensah and Mi (2017) research showed a positive relationship between age and intention to use e-government services. This research shows that the pandemic influenced the increase in the use of e-government services among all age categories.

Observed by gender, more men than women started using the e-government service during the pandemic. Thus, 16.3% of men stated that they did not use e-government services before the pandemic but had started using them. The same is true for 13.1% of women. Interestingly, as many as 36.1% of women stated that they did not use and do not plan to use the e-government services in the future, while 11.6% of



men stated the same. The low level of digital skills hampers the more significant expansion of digital public services and could deepen the digital divide.

**Table 2**

*Differences in attitudes between users and non-users of e-government services*

		Users	Non-users
I use IT equipment more due to the pandemic, mean	Mean	3.13	3.10
	S.D.	1.340	1.520
The pandemic increased digitalization in the public sector, mean	Mean	3.91	3.85
	S.D.	1.085	1.231
I am concerned about security and privacy due to the increased use of the Internet, mean	Mean	2.68	2.86
	S.D.	1.286	1.484

*Source: Authors' research*

The data in Table 2 show differences in attitudes between users of e-government services and those who are not users of e-government services. The survey results indicate no correlation between the increase in the use of IT equipment during the pandemic period and the use of e-government services. Both users of e-government services and those who do not use e-government services increased their use of IT equipment to the same extent during the pandemic.

Users of e-government services agree to a greater extent that the digitization of public services has increased during the pandemic. Such results indicate that the dissemination of information about available digital public services could contribute to an increase in the number of users of e-government services.

The research results indicate that people who do not use e-government services have higher online privacy concerns than users of e-government services. This is a significant result that shows that the level of online privacy concern could be one of the predictors of citizens' intention to use e-government services. Investigating the development of smart city models, van Zoonen (2016) stressed that smart city technologies and urban big data create privacy concerns among citizens. The survey results in Croatia also show that the similar is valid on the public sector level.

## Conclusion

This research contributes to the literature dealing with the digital divide and the acceptance of digital public services by analyzing the changes caused by the COVID-19 virus pandemic from the perspective of citizens. The COVID-19 pandemic has increased the need for the use of IT equipment among citizens regardless of their socio-demographic characteristics. The survey results indicate that since the pandemic started, citizens have spent more time on the Internet. Also, the pandemic accelerated digitization in the EU's public sector, which indicates the results of research conducted in Croatia. Thus, 72.1% of citizens living on the islands consider that the digitization of the public sector increased during the pandemic. However, the problem is that Internet infrastructure is not equally available on the whole territory of the Republic of Croatia. Thus, the quality of service is not the same. This problem could be noticed on the islands, where there is often a problem with poor internet availability, but also it is more difficult for the population living on the islands to get products and services than on the mainland. During the lockdown period, transportation from the island to the mainland was difficult and significantly reduced due to the implementation of epidemiological measures. On some islands, the Internet is slower or less accessible, leading to problems with digital public services. This problem was particularly pronounced during the lockdown period and during the entire pandemic period when the need for health-related and education-related public services was greater.

The COVID-19 pandemic influenced the level of acceptance of digital public services. The research results indicate that all population categories began to use the Internet and digital public services more during the pandemic. Differences between younger and older people in Internet use are decreasing. However, regarding digital public services, research results show a lower tendency for women to use digital public services. Thus, COVID-19 exposed many gaps and inequalities where improvements are needed. Despite the development of digital public services, the differences between citizens have deepened during the pandemic. A low level of digital skills hampers a more substantial increase in the use of digital public services. In addition, research results reveal that people's tendency to use e-government services also depends on their trust in those services and online privacy concerns. The pandemic additionally raised the question of the digital divide among citizens and the capability of citizens to get an equal level of public services.

This research contributes to understanding the limitations of greater use of digital public services, which is essential to analyze how to remove these obstacles and to avoid further deepening the gap between users and non-users of public services. Namely, even though further digitization brings numerous advantages, providing all citizens with equal availability and quality of public services is essential.

This research has some limitations. First, it would be necessary to investigate the impact of the pandemic on the use of e-government services on a larger sample of citizens in different European countries. Second, it would be interesting to investigate the level of trust in e-government services among citizens and sources of differences in more detail. The above provides opportunities for further research.

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## Digitalni razkorak in uporaba digitalnih javnih storitev med pandemijo COVID-19

### Izvleček

Pandemija COVID-19 je okrepila digitalno preobrazbo. S širjenjem pandemije in uvedbo epidemioloških ukrepov so bili državljani prisiljeni v večji meri uporabljati internet. V ospredje je dodatno stopilo vprašanje digitalnega razkoraka med državljani in zmožnosti državljanov, da dobijo enako raven storitev. Članek raziskuje spremembe pri uporabi storitev e-uprave in vpliv pandemije na odnos državljanov do uporabe interneta na Hrvaškem. Analiza temelji na anketnih podatkih. Rezultati kažejo, da so državljani zaradi pandemije postali bolj odvisni od uporabe informacijske opreme. Državljeni porabijo več časa za uporabo digitalnih javnih storitev kot v obdobju pred pandemijo. Rezultati razkrivajo tudi razlike v vplivu COVID-19 na uporabo digitalnih javnih storitev med različnimi skupinami prebivalstva.

*Ključne besede:* digitalne javne storitve, storitve e-uprave, državljani, digitalni razkorak, uporaba interneta