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The impact of the COVID-19 crisis on the development of the information society in Slovenia

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Abstract: Digital transformation is trending pursuant to the almost ubiquitous use of digital technology by private and public sectors, and general populations. The disruption caused by advancing technology requires strategic responses to mitigate the negative aspects of such disruption and generate positive change. Other disruption, moreover, such as the COVID-19 pandemic, additionally imposes limitations on what we consider to be normal life, further engendering the utilization of digital technology. Even though the impact of digital transformation can be assessed by means of different metrics, including the Digital Economy and Society Index (DESI), they do not provide sufficient clarity in terms of pain points and improvement possibilities. The differences in relation to the availability of said technology and the skills necessary for its optimal use, which are closely related to user education level, age, and economic status, are additional parameters governments and policymakers need to consider, and data-driven decision-making is essential to ensure optimal policy-making and investment *vis-à-vis* digital transformation, such as the EU Recovery and Resilience Facility. This paper analyses Slovenia's digital transformation between 2018 and 2021, using data collected from more than 5,000 respondents, to detect technology use differences in terms of demographics, focusing on the digital divide and the COVID-19 crisis, and compares Slovenia's experience with other EU Member States, focusing especially on online public administration services. Our results evidence that the digital divide is the main differentiating factor in Slovenia and that gender is accordingly not of great import, and that Slovenia's oldest generation and some members of younger generations face problems when endeavoring to digitally integrate. Compared to other EU Member States, Slovenia is average according to DESI, but the findings show that EU Member States should take its specifics into account to address their own DT paradigm.

Keywords: e-government, digital transformation, digital divide, COVID-19.

JEL : O33, J18

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Introduction

In recent years, technological development has significantly affected the way societies work and interact. We are in the midst of the Fourth Industrial Revolution and its concomitant technological development has changed societies and their populaces' habits in an unprecedented fashion in terms of impact incidence and speed (Schwab, 2017). This change and its accompanying opportunities require appropriate government action to optimally support such societal transformation (Manda and Ben Dhaou, 2019). The question is how?

Digital transformation (DT), the term that best encapsulates the change engendered by digital technology on all aspects of human life and responses to it, encompassing the radical change resulting from the rapid development of information and communication technology (ICT) and the increasing use of digital technology in the public and private sectors (Vial, 2019), is reshaping the private and public sectors. DT encompasses the profound change taking place in society and industry through the use of digital technology (Majchrzak et al., 2016) and organizationally engenders innovation by means of strategic development that incorporate the implications of DT on operational performance (Hess et al., 2016). Therefore, a comprehensive self-assessment of digital maturity is the first step to be taken on the path toward successful DT (Westerman et al., 2014, p. 180).

Most countries assess and compare digital maturity levels by means of different indices, including the United Nations E-Government Development Index (EGDI), DESI and the European Digital Progress Report (EDRP). DESI is especially important for the European Union and its Member States because it provides a generalized view of digital development, including data on Internet access and use, and digital literacy, technology integration and public service (Strutynska et al., 2021), and said data and its collection from various sources is aligned with the strategies and long-term goals of the European Union (European Commission, 2021a). One of DESI's data-gathering tools is the annual 'ICT usage in households and by individuals, which is conducted by Member States' statistical offices for Eurostat. A large part of said data is collected and used in the context of the EU's digital targets for 2030, as set by the EU Digital Decades' Compass. DESI is published annually and available online, and there are data hidden below its headlines that policymakers can importantly benefit from, and we used this more comprehensive micro data when writing this paper. Our thorough analysis of said data and the impact of the recent COVID-19 crisis highlight how said crisis and concomitant mitigating government measures affected societal DT and the different demographic groups thereof.

This study aims to engender a better understanding of the opportunities and challenges that countries like Slovenia face when adopting digital transformation agendas to leverage the social and economic benefits of the digitally-driven Fourth Industrial Revolution by studying and analyzing microdata provided by 'ICT usage in households and by individuals with a focus on Slovenia. Therefore, the following

questions were put forward: i) Which general and government public online services were used by Slovenia's citizens and how said use was related to the COVID-19 crisis? ii) Which demographic and economic factors influenced said use and what can we learn? iii) How did Slovenia's experience compare to other EU Member States?
A four-year longitudinal study related to the use of digital tools, including the Internet, by households and individuals in Slovenia was conducted to address these questions. The paper is organized as follows: the second section encompasses a literature review and our theoretical framework; the third section describes Slovenia's digital society and its performance during the COVID-19 crisis; the fourth section focuses on research methodology; the fifth section provides results and a discussion on the case of Slovenia; and the final section provides our concluding remarks.

1. Digital Transformation, society and government

While digitization refers to the conversion of information from analog to digital, and the automation of processes, DT refers to changes that ICT can bring about in organizations' business models, products, processes, and organizational structures (Hess et al., 2016). The term 'transformation' is often used to denote notable change, including modernization and innovation, and said transformation further embeds digital technology into governmental business processes, service delivery models and culture, restructuring how governments perform basic functions and govern (OECD, 2016). Vial et al. (2019) define DT as 'a process where digital technologies create disruptions, triggering strategic responses from organizations that seek to alter their value creation paths while managing the structural change and organizational barriers that affect the positive and negative outcomes of this process. In the context of the public sector, DT can also be seen as the process of moving from traditional to digital government (Vlahović and Vracic, 2015; Androniceanu et al., 2022).
DT encourages digital government, an evolutionary step that follows e-government (McLoughlin et al., 2013). Whilst e-government refers to the use of ICT in delivering information and services to citizens, Digital Government refers to the use of digital technology as an integrated part of governmental modernization strategies and activities to create public value (Androniceanu and Georgescu, 2022). Whatever the term used, the main goal is to examine how the public sector ecosystem uses ICT to improve its service delivery, change organizational processes and culture, and create value in the period concerned (Mergel et al., 2019). And to best improve service delivery and efficiency in such ecosystems, DT is a strategic imperative (Gong et al., 2020).
Digital government represents a step forward from merely digitizing existing offline processes, but there is a lack of understanding regarding social constructions and, the behavior, attitudes and cognitions of individual actors or transformational change (Meijer and Bekkers, 2015). Furthermore, citizens, their role in DT, and their digital literacy are vital to better understanding this paradigm. (Dodel and Aguirre, 2018).

Because citizens experience a technological change in their life and work, they expect public administrations to act accordingly and use similar technology when delivering public service (Mergel et al., 2019). Furthermore, pursuant to the increased availability of information, social media and the consequential possibility of cooperation and co-creation, citizens expect the relationship between themselves and public administrations to be accordingly transformed (Torfing et al., 2016).
However, if we desire digital societies to best evolve through the evolution of the information society by the intensive use of technologies and digital media (Bavec et al., 2019, p. 70; Budea, 2021), users must have access to the necessary technology and make use of it at work and in their personal lives. This evolution can be defined as the transformation of information societies into new single organisms in the field of global and universal time-space (Khazieva et al., 2018), and digital skills are a necessary condition for DT to be optimally beneficial. Binkley et al. (2012, p. 36) categorized digital skills as a component of 21st Century Skills, including ways of thinking and working, and tools for working and living. Although all 21st Century Skills are not underpinned by ICT, digital skills do better enable their integration (Van Laar et al., 2017). Quantitative and qualitative self-evaluation surveys are often used to measure digital skills, including the EU's qualitative 'ICT usage in households and by individuals (Eurostat, 2021), which provides three indicators for DESI's human capital dimension, three indicators for its connectivity dimension and one indicator for its digital public service dimension (Eurostat, 2021).
The results of these surveys have been greatly affected by the COVID-19 Crisis, whereby people were increasingly willing to digitally transform than previously because they regarded DT as the only available option: the limitations on movement and physical social interaction, lockdowns, and much more pursuant to the crisis persuaded many to make better use of ICT. The extensive use of ICT, including its use in developing medical/healthcare treatments, made the global response to this crisis more effective than would have been the case without it, reducing the spread of the disease (Shaw et al., 2020). Different applications were developed to trace contact and movement, report epidemic status, and verify vaccination status (Whitelaw et al., 2020). Many citizens were simply mandated to use ICT and older adult populations with low levels of digital skills found it harder to adapt to the new paradigms imposed by the pandemic (Garcia et al., 2021). Srisathan and Naruetharadhol (2022) evidenced that people, regardless of age, were more likely to digitalize during the COVID-19 crisis than before, but they nonetheless struggled to transform their digital behavior during the crisis itself.

2. Slovenia's digital society, digital government, and COVID-19

2.1. Slovenia's digital society

Slovenia's information and later on digital society has been shaped by different governments and their strategies and action plans, most of which focused on the public sector. Slovenia adopted its 'Development Strategy for the Information

Society 2020' in 2016 (Government of the Republic of Slovenia, 2016), which is aligned with the EU's Digital Agenda for Europe. This represents a commitment to the timely development of the digital society, and the use of opportunities enabled by ICT and the Internet for general economic and social benefit.

The Slovenian Development Strategy 2030 was adopted in 2017 to establish a systemic approach to sustainable development (the Government of the Republic of Slovenia, 2017) and quality of life improvement, wherein the Slovenian position was described as 'lagging behind in the development of the digital society, which is a result of low levels of investment in the development of digital skills and technologies and the lack of coordinated development of the entire area despite the relatively equal distribution of the high-speed broadband network.' The strategy also incorporated the necessary sustainable development goals to implement the global development plan set out in the UN's 2030 Sustainable Development Agenda (United Nations, 2015).

According to the most recent report on EU Member States' digital performance, Slovenia has been a modest developer, moving above the EU average (European Commission, 2021a). The path to being an optimal digital society is open but long-term.

2.2. E-government and digital government in Slovenia

Slovenia's government detected a critical percentage of ICT and Internet users interested in using online public sector services in 2000, a tipping point (Dečman and Jukić, 2021), so it implemented a change to best facilitate said usage.

Firstly, it strategically adopted the Electronic Commerce and Electronic Signature Act in 2000, followed by different strategies and action plans, among them the Strategy for E-commerce in the Public Administration 2001 to 2004, the E-government Strategy of the Republic of Slovenia 2006 to 2010, the Public Administration Development Strategy 2015 to 2020, and others (Ministry of Public Administration, 2015). Slovenia's Ministry of Public Administration prepared its Strategy for digital public services 2030 in 2020 to best develop a society that understands how to deal with change, uncertainty and challenge, which sets a clear goal for digital public service development, focusing on its private citizens and private enterprise.

Secondly, the online state portal eUprava was established in 2001, which provided a one-stop-shop for all online government information and services for its citizens and the private sector, was renewed in 2006 and 2016. The eVEM portal was established in 2007 and all online private sector services were made available there; it represents a one-stop-shop for company registration, is free of charge and has managed to reduce registration times from 60 to 4 days. The integration of various other systems and platforms followed, including many state registries and databases, to better enable public administration transformation and efficiency.

Thirdly, a special government agency for informatics was established in 1993 to further develop the nation's ICT infrastructure and e-government, with this responsibility for e-government being transferred to the Ministry of the Information Society in 2001 and then to the new Ministry of Public Administration in 2004 (Banjac, 2017). Slovenia's government established the Strategic Council for Digitalization, composed of the following six working groups in 2021: public administration and the digital society; health; the digitalization of education; the economy and the business sector; new technology; and digital diplomacy. Finally, the government established a new Ministry for Digital Transformation in 2022 to succeed its Strategic Council for Digitalization.

2.3. COVID-19 in Slovenia

The first confirmed case of COVID-19 in Slovenia was registered on March 4, 2020, and The National Institute of Public Health (NIPH) declared an epidemic on March 12, 2020, which lasted until May 15, 2020, when Slovenia became the first country in Europe to declare its epidemic is over. During the **first wave,** control measures were strict and demanded that all schools and educational institutions be closed, all public transport services be stopped, all non-essential services be shut, and all gatherings of people be prohibited, including a prohibition on movement outside a citizen's municipality of residence (Ružić Gorenjec et al., 2021), and remote working encouragement. The **second wave,** second lockdown, and new control measures commenced in the autumn of 2021, including mandatory mask-wearing in all public places, curfew, freedom of movement limitation to statistical regions and later to municipalities of residence, the closure of schools, and implementation of online learning, the closure of non-essential shops and services, and the ban on all events and gatherings of six or more people. The **third wave,** commencing in the spring of 2021, also engendered control measures, including mandatory mask-wearing in public places, freedom of movement limitation to statistical regions, curfew, the closure of ski resorts and cultural institutions, public transport limitation and restriction on travel to other countries. The **fourth wave** followed in the autumn of 2021, but with fewer restrictions for those with Green Passes.

The aforementioned formalized our objectives of clarifying the degree of ICT adoption in Slovenia, analyzing the data from 2018 to 2021 to detect ICT use development trends with regard to COVID-19 and detecting the demographic difference. Other research (Nimrod, 2020; Feldmann et al., 2021) has also found a correlation between government measures in response to COVID-19 and internet use.

3. Methodology

3.1. Participants

The focus of our research was a representative sample of the population of the Republic of Slovenia, the household and individuals living in them, aged between

16 and 74. Respondents were selected randomly, whereby the adequate representation of all demographic parameters, such as age, gender, and income group was ensured. The additional imbalance was adjusted for using household and individual weights to further ensure data adequacy. Representative samples were provided by the Statistical Office of the Republic of Slovenia (SURS), and even though respondents were not the same each year, sample representation guarantees a sufficiently high level of result reliability for longitudinal research.

3.2. Instrument

Data were collected in cooperation with Eurostat based on the annual survey Usage of Information and Communication Technology in Households and by Individuals, which is conducted annually. The data were obtained for all EU Member States from 2018 to 2021; in Slovenia's case, a representative sample was created by SURS using the Slovenian Central Population Registry. Data were collected by means of an electronic (web) questionnaire, Computer-Assisted Personal Interviewing (CAPI) before COVID-19, and Computer-Assisted Telephone Interviewing (CATI) during COVID, which were conducted between March and the end of May each year (Figure 1).

Figure 1. Timeframe for the Slovenian COVID-19 survey and restriction intervals

	2018												2019												2020												2021											
Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Survey	x	x	x										x	x	x										x	x	x										x	x										
Restrictions																									x	x	x				x	x	x				x	x								x		

Because the questionnaires changed over the years concerned, we had to determine a core set of questions that were included each year, which consequently reduced the set of indicators suitable for longitudinal analysis. The number of questions and concomitant indicators, including demographic variables, in 2018, 2019, 2020, and 2021 were 185, 241, 213 and 245 respectively, with only 27 being acceptable for comparison.

Most of the questions targeted respondents who had used the Internet in the three months preceding data collection, focusing on: means of accessing the Internet, internet activity and use of the Internet in relation to online public service.

3.3. Procedure

We prepared a database containing response data for 2018 to 2021 before analyzing it, using Microsoft Excel and SPSS 27 software to do so. Firstly, we conducted a frequency analysis of weighted data for individual and demographic group samples. Secondly, we conducted nonparametric testing to assess group difference significance. In terms of gender difference (2 groups), we utilized Mann-Whitney U testing to determine the difference between males and females for ordinal indicators

and Chi-squared testing for proportions to detect differences for dichotomous indicators. In terms of age group difference (6 groups), Kruskal-Wallis H testing was conducted because three or more categorical, independent groups were analyzed with regard to an ordinal dependent variable. Finally, the Chi-square test of homogeneity was conducted to determine the difference between the binomial proportions of three or more independent groups, such as the income group, in relation to a dichotomous dependent variable. Observation independence was a precondition for these tests and a sufficiently large sample (N > 1600) was ensured.

4. Results and discussion

The tables below evidence the percentages of people using specific technologies and services. Different groups are compared and difference significance is denoted by means of letter classification; if group letters written after the percentage sign are different, the difference is significant; if the letters are the same the difference is insignificant even if values are different; if no letter is used, the assumptions for statistical testing were not met, e. g. cells with an expected count of less than 5, or *p* values above .05.

4.1. Internet access and use

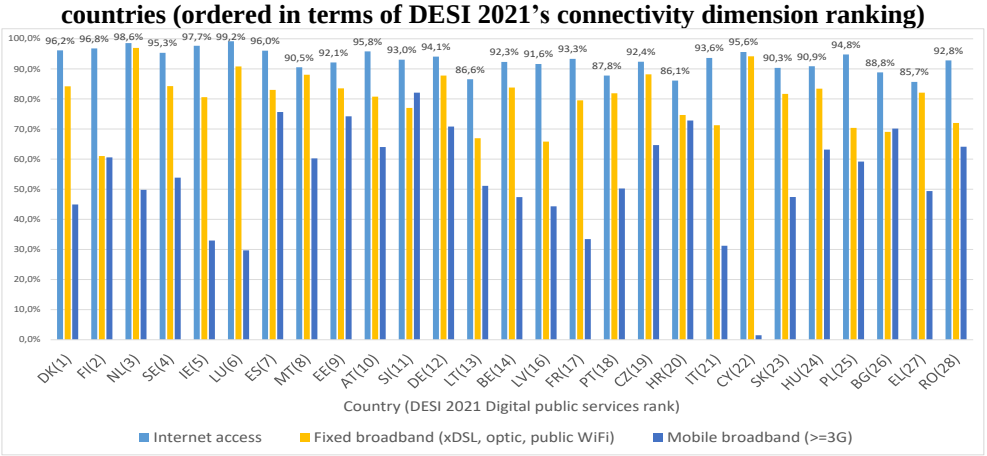
Internet access was measured using the following variables: Internet access availability and access type, that is, fixed or mobile. Table 1 evidences that the percentage of Slovenian households with Internet access increased year on year, getting closer to the maximum possible value for those who want to access it. Regarding the ratio of fixed to mobile access, one can see that mobile broadband access is becoming the predominant means of accessing the Internet, even for lower-income group households. Furthermore, a statistically significant difference with regard to household income was detected every year, meaning fixed broadband internet access might still be too expensive for lower-income groups. The same problem was not detected for mobile connection.
The number of households with fixed broadband access did not decrease over the years and the main reason for its relatively lower percentages in the last years considered was that new households only used mobile connections.

Table 1. Percentage of households with fixed or mobile broadband access.

Income quartile[4]	Percentage of households with Internet access				Percentage of households with fixed broadband connection				Percentage of households with mobile broadband connections			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
I1	62.7%[a]	70.1%[a]	73.8%[a]	83.5%[a]	91.9%[a]	86.6%[a]	77.4%[a]	70.9%[a]	95.0%[a]	87.5%[a]	99.4%[a]	99.4%[a]
I2	89.6%[b]	88.6%[b]	91.0%[b]	89.7%[b]	98.0%[b]	92.0%[b]	84.6%[b]	81.3%[b]	92.8%[b]	96.9%[b]	97.5%[b]	98.5%[b]
I3	95.9%[c]	96.7%[c]	98.7%[c]	95.5%[c]	98.7%[c]	95.9%[c]	91.6%[c]	80.6%[c]	97.7%[c]	96.8%[b]	98.5%[c]	98.6%[b]
I4	99.2%[d]	99.4%[d]	99.5%[d]	97.5%[d]	99.8%[d]	97.4%[d]	96.8%[d]	90.8%[d]	99.7%[d]	99.5%[c]	99.5%[d]	100.0%[c]
I5				99.6%[e]				88.6%[e]				100.0%[c]
Total	86.8%	88.7%	90.8%	93.0%	97.6%	93.5%	88.4%	82.8%	96.5%	95.8%	98.7%	99.2%

Slovenia is ranked 13th (Figure 2) in terms of DESI's connectivity dimension (European Commission, 2021a) and within this context, the best-ranked countries excel at 1Gb take-up, Very High Capacity Fixed Network (VHCFN) coverage, 5G coverage and other advanced technologies (European Commission, 2021a). In line with the EU's goal for connectivity in its Digital Decade, in which it is planned that every European household will have access to high-speed internet coverage by 2025 and gigabit connectivity by 2030 (European Commission, 2021b), Slovenia needs to do a great deal.

Figure 2. Percentage of households with fixed or mobile internet access in EU countries (ordered in terms of DESI 2021's connectivity dimension ranking)



[4] I1 - Lowest; I2 - Second lowest; I3 - Second highest; and I4 - Highest quartile. In 2021, the number of income groups increased to five, so the following was applied: I1 - Lowest equivalised net current monthly income group; I2 - Low to medium equivalised net current monthly income group; I3 - Medium equivalised net current monthly income group; I4 - Medium to high equivalised net current monthly income group; and I5 - Highest equivalised net current monthly income group.

Figure 2 also depicts only small differences among EU member states regarding households' internet access, however, in some countries like the Netherlands and Cyprus, households with fixed broadband connections are predominant. Only in Slovenia and Bulgaria is the percentage of households with mobile broadband connection greater than the percentage of households with a fixed broadband connection.

Regarding the impact of the COVID-19 crisis on income groups, only 2021's results were of utility because DESI's methodology changed in 2021. Accordingly, no significant difference was detected for income groups (2,3) and (4,5), indicating that in terms of mobile access in Slovenia, the difference may be diminishing. We were unable to detect any other change resulting from COVID-19. To further analyze the aforementioned indicators with regard to the financial impact, DESI needs to be modified: DESI merely merges broadband price indices in terms of representative baskets of fixed, mobile and converged broadband offers, and decomposing these indices to separate fixed and mobile prices would be of great benefit.

4.2. Individual internet use

Internet use frequency shows that the percentage of Internet users increased over the years concerned (Table 2) and although the overall increase was almost linear, some groups, like the oldest group, evidenced spikes of up to 10% in 2021, most likely because of the COVID-19 crisis. Research shows that this can also be related to increased stress (Nimrod, 2020) because internet use enhanced the well-being of the oldest age groups. In some countries, such as China (Li et al., 2021), the crisis even led to an increase in internet addiction.

In terms of daily use levels, values close to 100% indicate that if people had used the Internet in the preceding three months, they did so on a nearly daily basis. In terms of gender, no significant difference in terms of the percentage of '3-month Internet users' (Table 2, Columns 1-4) was detected, except in 2018 ($p=.035$, $z=-2.112$). In terms of income groups, a significant difference was detected in almost every year, evidencing that income is still an important determining factor in terms of internet use. In terms of age, the percentage of people using the Internet had previously decreased with age, but we detected an increase for all age groups during the COVID-19 crisis except for the youngest age group: being digital natives/users, their behavior was unlikely to be and was not affected by the crisis. In terms of daily use indicators, no statistically significant difference was identified in relation to gender while some statistically significant difference regarding income groups existed until 2021, when COVID-19 forced all age groups to use the Internet on a daily basis.

Table 2. Percentage of internet users

	Internet use in the preceding 3 months				Daily use			
	2018	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
Gen.								
M	81.9%[a]	84.2%[a]	87.2%[a]	88.8%[a]	98.9%[a]	97.4%[a]	98.5%[a]	98.6%[a]
F	77.6%[b]	82.0%[a]	86.0%[a]	89.2%[a]	98.9%[a]	97.0%[a]	98.3%[a]	98.0%[a]
Inc. quar.								
I1	61.9%[a]	65.1%[a]	72.6%[a]	78.1%[a]	95.8%[a]	93.5%[a]	97.3%[a]	99.3%[a]
I2	68.1%[b]	72.3%[b]	80.2%[b]	84.9%[b]	99.0%[b]	95.5%[a]	96.9%[a]	97.9%[a]
I3	84.6%[c]	88.9%[c]	94.5%[c]	91.8%[c]	99.4%[b]	98.1%[b]	98.5%[ab]	98.4%[a]
I4	94.4%[d]	95.5%[d]	97.1%[c]	97.7%[d]	100.0%[b]	99.6%[b]	99.8%[b]	98.8%[a]
I5*				99.5%[d]				99.6%[a]
Age group								
16-24	98.9%[a]	99.5%[a]	98.6%[a]	97.7%[a]	99.5%[a]	98.1%[a]	99.5%[a]	100.0%[a]
25-34	95.3%[a]	98.1%[a]	99.0%[a]	95.8%[a]	100.0%[a]	98.0%[a]	100.0%[a]	100.0%[a]
35-44	93.7%[a]	94.0%[a]	97.6%[a]	99.3%[a]	99.3%[a]	99.7%[a]	100.0%[a]	99.1%[a]
45-54	85.2%[b]	89.4%[b]	92.1%[b]	95.2%[a]	97.6%[a]	96.0%[a]	98.2%[a]	100.0%[a]
55-64	58.0%[c]	69.6%[c]	79.1%[c]	83.3%[b]	98.6%[a]	96.5%[b]	95.8%[b]	96.4%[b]
65-74	46.7%[d]	47.0%[d]	51.4%[d]	61.7%[c]	98.9%[a]	89.9%[c]	92.6%[c]	91.1%[d]
Total	79.8%	83.1%	86.6%	89.0%	98.9%	97.2%	98.4%	98.3%

M - Male; F - Female; I1 - lowest income quartile (IQ); I2 - second lowest IQ; I3 - second highest IQ; I4 – highest IQ; I5 - new highest IQ.*

In terms of general ICT services, such as finding information about goods and services on the Internet, usage increased over the years to around 85% in 2021; gender insignificantly affected use for such purposes; and citizens from higher income groups used these services more. Focusing on age, the older population had previously been less keen on using the Internet for finding information about goods or services, but the COVID-19 crisis engendered an increase in their usage for such purposes in 2021; interestingly, the percentage of users in all of the other age groups increased in 2020 but decreased in 2021.

An additional element pursuant to the COVID-19 crisis was that citizens were forced to access many services online than beforehand, such as healthcare, purchasing goods and services, banking, and public administration services.

The data evidence statistically significant gender differences regarding seeking health-related information online, in a similar fashion to that evidenced in Spain (Garín-Muñoz et al., 2022). Regardless of income or age group, an almost equal percentage of users, with no significant difference, sought health-related information online in 2020 and 2021, with a percentage increase in 2020 and a decrease in 2021, which correlates with the findings of Jayasinghe et al. (Jayasinghe et al., 2020), wherein a considerable deficiency in information reliability and quality was noted, including the majority of websites exhibiting low to moderate readability and

usability: people may have shifted back to traditional media, like the radio, television and printed newspapers.

Table 3. Specific online service use in the preceding 3 months

	Searching for information about goods and services				Searching for health-related information				Internet banking			
	2018	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**	**2018**	**2019**	**2020**	**2021**
Gen.												
M	89.6%^{a}	84.1%^{a}	87.9%^{a}	84.1%^{a}	51.5%^{a}	50.9%^{a}	61.7%^{a}	53.7%^{a}	52.0%^{a}	50.1%^{a}	61.9%^{a}	66.9%^{a}
F	83.8%^{b}	83.7%^{a}	89.3%^{a}	84.9%^{a}	70.5%^{b}	65.3%^{b}	72.5%^{b}	68.4%^{b}	53.2%^{a}	58.6%^{a}	57.6%^{a}	61.3%^{b}
Inc. quar.												
I1	77.8%^{a}	71.1%^{a}	74.3%^{a}	72.2%^{a}	55.5%^{a}	50.3%^{a}	62.1%^{a}	58.1%^{a}	39.0%^{a}	36.2%^{a}	39.4%^{a}	46.2%^{a}
I2	85.9%^{ab}	83.5%^{b}	86.4%^{b}	83.1%^{ab}	57.5%^{a}	59.0%^{a}	68.4%^{a}	64.4%^{a}	41.4%^{a}	45.8%^{a}	53.4%^{b}	57.1%^{ab}
I3	86.3%^{ab}	86.0%^{bc}	90.7%^{bc}	87.5%^{bc}	63.4%^{a}	59.4%^{a}	66.4%^{a}	57.8%^{a}	53.0%^{b}	59.4%^{b}	59.2%^{b}	68.0%^{bc}
I4	91.8%^{b}	91.8%^{c}	95.5%^{c}	92.1%^{c}	66.1%^{a}	61.2%^{a}	71.0%^{a}	62.9%^{a}	66.1%^{c}	71.4%^{c}	76.6%^{c}	76.1%^{c}
I5*				94.6%^{c}				65.6%^{a}				79.6%^{c}
Age gr.												
16-24	86.3%^{a}	79.5%^{a}	91.5%^{ab}	79.3%^{a}	51.9%^{a}	50.4%^{a}	67.4%^{a}	58.0%^{a}	35.6%^{a}	41.3%^{a}	46.1%^{a}	50.0%^{a}
25-34	88.4%^{a}	88.7%^{a}	91.9%^{b}	84.3%^{a}	62.6%^{ab}	60.1%^{a}	72.7%^{a}	57.0%^{a}	66.4%^{b}	64.6%^{b}	73.1%^{b}	73.8%^{b}
35-44	87.8%^{a}	83.6%^{a}	89.3%^{ab}	88.0%^{a}	65.4%^{b}	62.9%^{a}	71.3%^{a}	63.5%^{a}	62.3%^{bc}	65.4%^{b}	71.2%^{b}	76.0%^{b}
45-54	86.9%^{a}	85.9%^{a}	89.2%^{ab}	87.8%^{a}	60.4%^{ab}	53.8%^{a}	64.0%^{a}	61.3%^{a}	53.3%^{cd}	63.4%^{bc}	64.4%^{b}	69.5%^{b}
55-64	87.1%^{a}	80.5%^{a}	86.6%^{ab}	81.2%^{a}	64.4%^{ab}	57.9%^{a}	61.8%^{a}	61.1%^{a}	42.4%^{ad}	50.4%^{ac}	45.7%^{a}	56.5%^{a}
65-74	80.5%^{a}	76.9%^{a}	78.5%^{a}	82.8%^{a}	51.0%^{ab}	61.1%^{a}	58.5%^{a}	64.1%^{a}	35.4%^{a}	34.7%^{a}	40.4%^{a}	43.4%^{a}
Total	**86.8%**	**84.1%**	**88.6%**	**84.5%**	**60.8%**	**57.8%**	**66.9%**	**60.9%**	**52.6%**	**56.7%**	**59.8%**	**64.2%**

Optimally utilizing online banking and other online financial services demands trust and advanced digital skills, such as using digital identities. The percentage of online banking users increased during the period concerned, with an especially large spike of 10 percentage points being detected for males in 2020, who subsequently overtook female users in 2021, a significant difference being measured. Garín-Muñoz et al. (2022) also detected gender differences in terms of online banking in Spain in that females used it less than males. We additionally detected significant income group differences, with wealthier citizens using online banking more than the other income groups. Similar results were obtained by Zagalaz Jiménez and Aguiar Díaz (2019), who evidenced a positive relationship between income and online banking use. We further detected that the youngest group, with less income, and the oldest group, with lower levels of digital skills and trust in ICT, used online banking less than the other demographic groups.

4.3. Online public sector service use

The percentage of users seeking public sector information and forms online decreased between 2018 and 2019, but the COVID-19 crisis engendered a significant increase of 20 percentage points between 2019 and 2021 in such use, especially in terms of completing and submitting online forms, which is considered technically complex, with male users surpassing female users in 2020 and 2021. Similar gender difference regarding e-government use was also detected by Garín-Muñoz et al. (2022). The COVID-19 crisis in all likelihood engendered the increase in the percentage of younger age groups submitting online forms pursuant to them being more digitally literate than the relatively older age groups. In line with Rodriguez-Hevía et al. (2020), we found that digital literacy increasingly influenced e-government adoption and utilization. Table 4 contains the percentage of online public sector services used by internet users in the preceding 3 months.

Table 5. Percentage of online public sector services used by internet users in the preceding 3 months

	Obtaining information from web sites and public sector apps				Downloading/printing forms from web sites and public sector apps				Submitting completed forms using web sites and public sector apps			
	2018	2019	2020	2021	2018	2019	2020	2021	2018	2019	2020	2021
Gen.												
M	48.6%^{a}	49.9%^{a}	63.6%^{a}	65.6%^{a}	30.2%^{a}	30.7%^{a}	33.3%^{a}	33.7%^{a}	23.1%^{a}	24.0%^{a}	39.6%^{a}	44.6%^{a}
F	51.4%^{b}	57.8%^{b}	66.3%^{a}	69.9%^{a}	40.0%^{b}	33.6%^{a}	40.2%^{b}	38.5%^{a}	23.6%^{a}	25.9%^{a}	33.0%^{b}	41.0%^{a}
Inc. quar.												
I1	54.5%^{a}	40.0%^{a}	54.3%^{a}	66.2%^{ab}	23.3%^{a}	22.1%^{a}	20.0%^{a}	27.6%^{a}	13.2%^{a}	16.0%^{a}	17.1%^{a}	37.8%^{a}
I2	54.0%^{a}	48.4%^{ab}	59.2%^{ab}	63.9%^{ab}	26.4%^{ab}	24.5%^{a}	30.6%^{ab}	35.2%^{ab}	15.5%^{a}	21.2%^{a}	34.5%^{b}	42.9%^{ab}
I3	58.2%^{a}	55.0%^{b}	68.3%^{bc}	63.1%^{b}	36.3%^{bc}	32.2%^{a}	40.7%^{bc}	30.2%^{ab}	24.8%^{b}	20.6%^{a}	34.9%^{b}	41.3%^{ab}
I4	69.1%^{b}	64.2%^{c}	75.4%^{c}	75.3%^{ac}	44.1%^{c}	42.5%^{b}	47.3%^{c}	41.4%^{bc}	30.9%^{b}	36.9%^{b}	51.7%^{c}	49.0%^{ab}
I5*				81.0%^{c}				48.9%^{c}				52.5%^{b}
Age group												
16-24	72.2%^{a}	61.8%^{ab}	72.3%^{ab}	70.2%^{ab}	36.7%^{ab}	28.3%^{ab}	28.4%^{ab}	29.0%^{ab}	22.6%^{a}	21.3%^{a}	34.0%^{abc}	36.7%^{ab}
25-34	63.7%^{ab}	57.5%^{abc}	74.7%^{b}	68.9%^{ab}	42.4%^{b}	33.2%^{ab}	45.2%^{c}	35.8%^{ab}	26.8%^{a}	22.3%^{a}	41.9%^{c}	43.4%^{abc}
35-44	62.0%^{ab}	61.6%^{b}	65.4%^{ab}	77.0%^{b}	35.5%^{ab}	40.1%^{b}	41.8%^{bc}	41.7%^{b}	23.9%^{a}	34.5%^{b}	44.7%^{c}	53.3%^{c}
45-54	60.5%^{ab}	43.4%^{acd}	65.3%^{ab}	71.3%^{ab}	35.2%^{ab}	31.4%^{ab}	36.5%^{abc}	41.2%^{b}	24.8%^{a}	22.8%^{a}	37.8%^{bc}	48.0%^{bc}
55-64	53.8%^{bc}	45.1%^{cd}	57.5%^{ac}	60.3%^{ac}	26.0%^{a}	28.7%^{ab}	33.9%^{abc}	35.6%^{ab}	20.3%^{a}	22.8%^{ab}	27.4%^{ab}	33.3%^{a}
65-74	40.0%^{c}	37.0%^{d}	45.7%^{c}	49.0%^{c}	25.4%^{a}	21.8%^{a}	23.4%^{a}	23.4%^{a}	15.6%^{a}	19.7%^{ab}	20.4%^{a}	32.4%^{a}
Total	60.6%	53.7%	64.9%	67.7%	34.9%	31.2%	36.6%	36.0%	23.3%	24.9%	36.4%	42.8%

While the percentage of users 'obtaining information from websites and public sector apps' and 'downloading/printing forms from websites and public sector apps' waxed and waned in terms of age group, the percentage of users submitting completed forms using websites and public sector apps grew steadily regardless of age group, especially in relation to temporary residence permits and financial support, Slovenia's most popular online application forms during the COVID-19 crisis.
Whilst being able to complete and submit forms online is of great benefit and utility, as it enables users to prepare, sign and submit said forms, and make payments, when necessary, it is important to understand why some do not submit such forms to the public authorities, with some reasons even being positive. More than 71% of internet users that did not submit online forms in 2021 said that they did not have to submit official forms at all (Table 6, Column 1); in such cases, it is likely that public institutions gathered the necessary data for said administrative procedures, which accords with the EU's 'once-only principle (Wimmer et al., 2017).

Table 6. Reasons for not submitting online forms

	Did not have to submit at all	**No online service**	**Lack of skills and knowledge**	**Concerns about protection and security**	**Lack of e- signature or e-**	**Unwillingness to make payment online**	**Another person did it on my behalf**
Gen.							
M	72.4%	14.0%	10.3%	9,.3%	18.7%[a]	5.6%	7.5%
F	71.4%	14.3%	7.1%	7.1%	31.3%[b]	8.0%	5.4%
Inc. quar.							
I1	71.8%	5.4%	10.8%	2.7%	5.6%[a]	2.7%	37.5%
I2	77.8%	11.1%	18.5%	10.7%	32.1%[ab]	3.7%	12.5%
I3	72.7%	11.1%	2.8%	11.1%	27.8%[ab]	8.3%	37.5%
I4	75.0%	18.8%	9.4%	0.0%	21.9%[ab]	3.1%	12.5%
I5*	61.0%	16.7%	7.1%	4.8%	31.7%[b]	9.5%	0.0%
Age group							
16-24	78.3%[ab]	17.4%	4.3%	21.7%	20.8%	16.7%	4.3%
25-34	56.6%[c]	21.4%	5.4%	5.4%	28.6%	3.5%	5.4%
35-44	66.4%[bc]	10.6%	17.0%	10.6%	27.1%	4.3%	0.0%
45-54	71.7%[abc]	9.8%	7.3%	7.3%	22.0%	7.3%	7.3%
55-64	76.9%[ab]	13.5%	2.7%	5.4%	21.6%	5.4%	13.5%
65-74	85.6%[a]	7.1%	14.3%	0.0%	35.7%	7.1%	13.3%
Total	**71.9%**	**14.2%**	**8.7%**	**8.2%**	**6.4%**	**6.8%**	**6.4%**

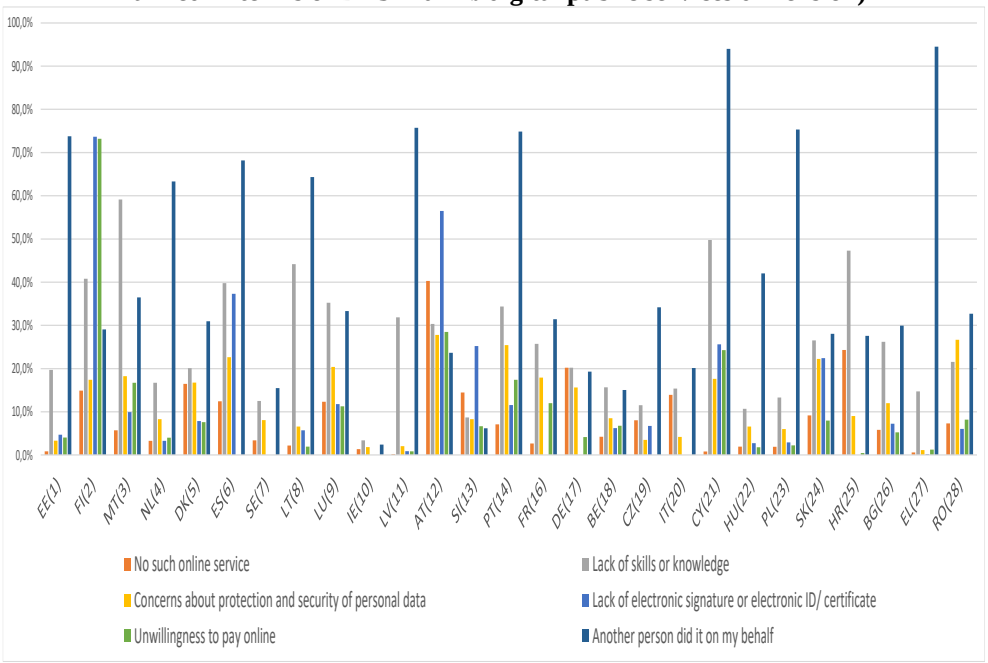
On the other hand, those who had to submit forms (N=219) reported that their biggest obstacle in doing so was that online services to do so did not exist, indicating an

opportunity for public institutions to transactionally implement and/or upgrade their online service offer.

In terms of group differences, statistical significance testing was virtually impossible because of the low number of people, less than five, in individual groups. In relation to age, the youngest groups were more concerned with personal data protection and security, evidencing the need for Slovenia's public authorities to enable and promote online service security and e-government education.

Similar issues are detected in other EU Member States regarding DESI's digital public services dimension (Figure 3) even though they have different issues to tackle; in some cases, even the top and the lowest ranked countries exhibit similarity. In the top-ranking EU Member State Estonia, where 99% of public authority services are available online (Pätsch, 2021), some citizens primarily get others to submit online forms on their behalf because they lack the requisite skills and knowledge, as is the case in third-ranking Malta. Although Finland, ranking second, does provide a citizen certificate in the personal identity card (Digital and Population Data Services Agency, 2022), some users find the lack of it still to be an issue. In general, digital illiteracy is an important impact factor, especially when online service is enhanced and interactive (Dodel and Aguirre, 2018).

Figure 3. Reasons for not submitting online forms to public institutions (countries ranked in terms of DESI 2021's digital public services dimension)



5. Conclusions

As stated by Mergel et al. (2019), digital transformation necessitates continuous process, service, and product adjustment to optimally satisfy the external need, one of the most important being end-user needs, in our case Slovenia's citizens. Satisfying such need should in all likelihood result in improved relationships between a nation's citizens and its public administration, increase satisfaction, positively transform public administration culture and better engender DT, but it is ICT availability and use, digital skill adoption and motivation pursuant to expected benefits that are crucial to success. By measuring these factors in all of its Member States, the European Union proactively evidences the importance it places on its strategic digital society goals.

Slovenia was once one of the more successful EU Member States in relation to e-government development, but according to DESI and the eGovernment Benchmark, it has fallen to just above the EU average in recent years. And this came as a shock when online public service provision gained momentum at the beginning and throughout the COVID-19 crisis. Using 2018-2021 data gathered by the Slovenian Statistical Office, we detected increasing use of the internet and online services by Slovenia's citizens, including e-banking, e-shopping, and e-government, especially significant positive change in terms of ICT use. Even though ICT use is increasing in all age and income groups, it does not necessarily mean that all of Slovenia's populace is sufficiently ICT-literate to optimally benefit from ICT in the many different aspects of their lives.

Our results evidence that online presence and online service usage increased for all age groups regardless of gender, positively correlating with increased use of online public services, and that the COVID-19 crisis forced Slovenia's citizens to move online and finally take advantage of the online services offered by the public sector. Analyses, such as ours, better enable policymakers to detect demographic group shortcomings and appropriately target remedial policy and action, including developing and implementing DT policies to tackle current and future wicked problems. The data are freely available upon request from Eurostat, so EU Member States are able to do a similar analysis to address their own paradigm.

Technological advance is constant and perpetual and primarily impacts the private sector, enabling the development of new innovative services (Vial, 2019), which then leads to citizens demanding the same from the public sector, so governments should best develop and offer public services in a similar fashion, using similar tools to provide better ICT based public service (Mergel et al., 2019). Building on the experience and appropriate data-based planning and decision-making is of paramount importance if we are to be best prepared for the next crisis.

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