

Digital literacy and the capability to manage e-government in today's Hungary

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Based on the results of a large-scale, nationwide representative omnibus survey conducted in the spring of 2023, this study examines the relationship between electronic public administration, i.e. e-government, and digital competence in Hungary today.

We compare the Digital Economy and Society Index (DESI)/Digital Decade 2030 2023 indicator and the relevant results of the 2022 national census of the Hungarian Central Statistical Office (HCSO), to produce a more sophisticated picture. All dimensions of digital inequality, the correlations between digital competence and the reasons for the low scores for digital public administration skills are made clear. Once again, it is confirmed that competency in practice brings about competence, while a lack of practice generates competence deficits.

In this study, we present a picture of the digital activity and the ability to use e-government of the Hungarian population by age group, gender, occupation and marital status, educational level and residential area at regional and county levels. The methods applied and the results of the research furnish an explanation for the reasons for the present situation of the human digital environment focusing particularly on e-government. It could be useful for further research and orientation in the wider geographical environment of Hungary, too, from the Baltic to the Balkans on the eastern edge of Central Europe.

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Background

Before carrying out the analysis of the e-government readiness of Hungarian citizens, it was necessary to survey the international literature and findings to orientate the research. These are the following items.

According to earlier studies (Egovernment Trends 2012), the reasons for the non-use of online public services by citizens centre primarily on the lack of need, the lack of trust and the lack of skills. The significance of the latter factor increases rapidly with age and signals an emerging divide. Though e-government usage by firms has increased steadily lately, the EU convergence in the rate of use can be observed for large- and medium-sized enterprises, while usage rates for small firms remain quite patchy. Therefore, the lack of skills is still an important limiting factor in small enterprises and incomplete digitalisation of public services still remains an important barrier to e-government development.

The acceleration of knowledge flow to predict the practical use of digital skills is, therefore, important. Certain variables have to be identified to be correlated for practical uses probability as a guide to their effectiveness for an e-learning assessment in e-government services. The study of the practical uses of digital skills, the applied knowledge management theory and basic statistical analyses are all needed to develop formulas for linear regression equations for practical uses of digital skills probability. The results of such investigation indicated that one of the factors for determining practical uses probability in the e-inclusion model for an e-learning course was related to knowledge flow acceleration (Vitolina–Kapenieks 2013).

The empirical study of Nam–Sayogo (2011) examines the digital divide in e-government adoption and profiles e-government users by analysing the data from randomly sampled surveys. The findings of such analyses conclude that (1) socio-demographic conditions do matter for e-government use. (2) Younger generations use e-government more than their other national counterparts. (3) The perceived usefulness of e-government contributes to the actual use of e-government. (4) The effect of trust in government on e-government adoption is indirect, through perceived usefulness, rather than directly causal, therefore, those with higher levels of trust in government overall would be more likely to perceive the value of e-government, and then those who perceive potential benefits from using e-government will adopt e-government. (5) Internet use intensity is strongly associated with e-government use intensity.

There are several ways to implement e-government digitalisation and therefore, different roles for citizens, who can be considered customers, participants and co-producers in digital government. The purpose of Simonofski et al.'s (2021) study was to identify the factors influencing the roles citizens are willing to take in digital administration. The research identified factors such as age, gender, occupation, education, digital literacy, government level and frequency of use of other e-services that influence citizens' roles. Findings list 25 relationships between the

aforementioned factors and the citizens' expected roles. The survey has identified relationships between citizens' expectations and government level, gender, age, occupation, frequency of use of other e-services and digital literacy. However, interestingly enough, no influence was found in terms of education level and working in administration. Such studies contribute to providing insights into what citizens expect from digital government and explore several relationships to be investigated in further research, aiming at policymakers in developing digital government policies that align with citizens' concrete expectations.

Today, the accessibility of websites becomes an important issue to ensure the quality of the public services offered to citizens and businesses. The purpose of the research of Osmanaj-Ruseti (2014) is to evaluate the municipal and communal websites, the e-government services' sophistication level based on self-reporting, an online survey and automated accessibility checking. The results revealed that only about one-third of the municipalities have a web presence capable of efficient e-government performance.

Liang (2018) found that in China, nearly one-third of the respondents accessed online services of city government websites and the sampled cities vary substantially in terms of e-government uptake. The results show that e-government use is primarily driven by citizens' trust in government, age, education and income, whereas political efficacy, gender, nationality, household type and occupation are not found to be significant. There is a notable digital divide in the relatively disadvantaged groups, and the government should pay particular attention to boosting e-government use among these cohorts.

Bélanger-Carter (2009) posited that technical competence alongside ethnicity, income, age and education would be major determinants of e-government usage, while gender would not be a significant factor. They surveyed a diverse group of citizens to identify those demographic characteristics that differentiate users from non-users of e-government services. They selected two of the most popular services available to all citizens in Virginia, namely, the state's online income tax payment service and the state's department of motor vehicles website, where citizens could renew their licences and pay fees. Proponents of e-government argue that online services offer constituents numerous benefits, including improved responsiveness, and address the efficiency and transparency of the public sector. Unfortunately, as a result of the digital divide, the entire population may not realise these online benefits.

When considering marginalised communities and regions, adopting mobile-based government services is an alternative solution to the challenges faced in adopting electronic government. A study by Frohlich et al. (2020) surveyed the factors of mobile-based e-government in an underdeveloped rural community in Namibia were surveyed. The results showed that security, technology trust, information and communication technologies (ICT) supporting infrastructure, usage experience, costs, awareness, the skills required to access mobile-based e-government, language

literacy, training, perceived ease of use, perceived usefulness, social influence, perceived empathy and compatibility were all critical factors in the adoption of mobile-based e-government services.

Higher-performing e-government services have been assumed to boost citizens' use of e-services. However, this proposition had never been tested. Using a survey of over 28,000 citizens across 32 European countries, Liang–Zengh (2018) examined the effect of e-government performance on citizens' e-usage. In theory, a well-designed and -maintained government website should be used more, but this theory was subsequently rejected by multi-level model estimates. They found that performance was negatively related to citizens' use of e-information and e-services, and e-participation was insignificant.

The assumption is that e-government brings mutual benefits to both citizens and public administration. It is also known that there is a gap between adopters and non-adopters of e-government services. The majority of studies explore e-government acceptance based on the entire population, while the investigation of onliners seldom takes place. Since the number of internet users is increasing steadily, a study identified the need to differentiate general internet adoption, or digital divide effects and e-government-specific divide effects (Niehaves et al. 2012). They developed a framework where the cumulative effect of e-government adoption (among all people) is split into two: the digital divide effect and the e-government divide effect (among internet users). They examined the influence of socio-demographic factors such as age, gender, income and education, and tested the framework using comprehensive survey data ($n = 1930$). Their results justified a separation of the e-government divide effect from the cumulative effect of e-government adoption because the factors influencing e-government usage among the entire population and onliners proved to be different.

Considering a very useful methodological approach to e-government research surveys, it is interesting to note the findings of an Indian experiment (Rana et al. 2017) where e-government applications continue to be a problem in both developed and developing regions. The study tested nine alternative theoretical models of technology adoption in the context of an e-government system using data collected from citizens. The analysis of the models indicates that the models' performance is not up to the expected level in terms of path coefficients, variance in behavioural intention or their fit indices. In response to the underperformance of the alternative theoretical models to explain the adoption of an e-government system, the study develops a unified model of electronic government adoption and tests it using the same data. The results indicate that the proposed research model outperforms all alternative models of technology adoption by explaining 77% of the variance in behavioural intentions, with acceptable values of fit indices and significant relationships between pairs of hypothesised factors.

Related to the abovementioned methodological experiment, there is another research approach, studying what factors influence the European citizens in their adoption and use of e-government, and whether there are differences within the European Union. A binary logistic regression model has been used to determine the profile of e-government users. Rodriguez-Hevia et al. (2020) highlights the influence of digital skills as an increasingly influential factor and opens up new areas of research such as the uses of e-government depending on the population density and other socio-demographic factors. Given a lack of e-government studies at a pan-European level, this research provides an empirical comparative analysis in the EU and thereby provides insights into the factors influencing the behaviour of European e-citizens, too.

Most local governments in the EU have implemented official websites, making e-government a holistic access platform for modern public administration service provision. However, academic and managerial knowledge about the success of e-government remains limited. Given that citizens' needs have become a focus of interest, it is reasonable to investigate success factors from a user-oriented perspective. Existing scientific knowledge does not explain comprehensively the usage intentions of today's heterogeneous e-government city portal users. Hence, Wirtz–Kurtz (2016) conceptualise important determinants of local e-government portals identifying the key factors that determine the intention to use from a citizen's viewpoint.

One of the first and best-known surveys (van Dijk et al. 2007) argues that the potential usage of e-services in developed countries (i.e. the Netherlands) is high, however, putting services online is not enough; people have familiarised themselves with the services, including e-government, and need the skills to use them as well because there is always a gap, a digital divide in society between the actual and the potential users of e-services.

Finally, another study examined two distinct but related measures of e-government effectiveness, namely, the online service index and the e-participation index, both reported in a 2010 e-government survey conducted by the United Nations (Gulati et al. 2014). The authors analysed the impact of political structure, public sector performance and policy initiatives in relation to both indices in more than 150 countries. Their multiple regression analysis shows that there is greater e-government capability in countries that have more effective public sector governance and administration and policies that advance the development and diffusion of ICT. In addition, countries that practice effective governance and promote competition in the telecommunications sector demonstrate more extensive uptake of e-participation. These results suggest that the path to e-government requires different strategies depending on a nation's political structure and that authoritarian countries may be using e-government as well but only to maintain the status quo.

Introduction

The true measure of success of a service is if it is used. However, using it requires skills and e-services require e-skills. Several studies (Budai–Tózsza 2020, Budai et al. 2022, 2023, Budai 2022) have already examined the role of digital readiness and digital competence levels in Hungary. The need for that can be justified by surveys showing that the Eastern-Central and Eastern-European regions represent the ‘digital periphery’ of the European Union as regards digital skills (Tóth–Nagy 2023).

The research funded by grant contract TKP2021-NKTA-51 resulted in an omnibus² survey methodology. The National University of Public Service’s research on Public Governance and Innovative Public Services used an omnibus research design model to survey a sampled population between 10 February 2023 and 6 March 2023.

A representative sample of 1,000 people (N) was interviewed. During the sampling procedure, addresses and persons to be contacted were randomly selected from the official address register (sampling frame). For each sampled address, at least four additional addresses were selected and pre-scheduled, with the same demographic characteristics as the person to be contacted. A supplementary follow-up survey on digital literacy completed the fieldwork, during which a total of 50 questionnaires were collected. During the data collection process, several layers of quality assurance framed the work, with systematic, quota-based telephone verification procedures and continuous central online monitoring of the progress of the data collection and the data received. The raw empirical sample produced by the data collection was made available for analysis after appropriate coding, data cleaning according to methodological standards and, in some cases, inputting data from peripheral devices.

A total of 138 municipalities were selected for the sample, including the 23 districts of Budapest, the county seats, county towns, 37 cities and 53 villages. The resulting empirical sample database is representative of the Hungarian adult population aged 18 and over, by gender, age, educational attainment, settlement type and region.

The survey was carried out using the tablet-assisted personal interview technique with a professional data collection network with nationwide coverage, with the assistance of 156 trained interviewers, using both card and list instruments. These supporting tools made it easier for the respondent to review the scales and response categories, and for the interviewer to handle the jump instructions³ and logical relationships more quickly and without error. This meant that the recording contained

² Omnibus surveys represent quantitative marketing research where various data are collected during the same interview. Usually, multiple research clients will provide proprietary content for the survey (paying to ‘get on the omnibus’), while sharing the common demographic data collected from each respondent. An omnibus survey generally uses a stratified sample and can be conducted by email, telephone or the internet.

³ JMP = jump instruction performs an unconditional jump. Such an instruction transfers the flow of execution by changing the program counter.

fewer errors and could keep within a realistic time limit of 40–50 minutes, without subjecting the respondent to significant fatigue, which reinforced validity.

Thus, the resulting sample is representative of the adult Hungarian population aged 18 and over by sex, age, educational attainment, type of settlement and region. During data collection, multi-stage, stratified random sampling was performed. The addresses to be visited were randomly selected by the Ministry of the Interior from the addresses available based on gender and age distributions typical of the given region and type of settlement. During the fieldwork, this was followed by a special address list recording, i.e. the interviewers had to visit the specified addresses provided in the settlements. Stratified compliance and absence of bias were ensured by checking the data received during the recording and by using randomly selected surrogate addresses.

Table 1

**The relationship between the theoretical model and
the realised empirical model**

Denomination	(%)	
	Theoretical	Recorded
	sample	
Male	46.9	45.8
Female	53.1	54.1
18–39 years old	34.6	31.7
40–59 years old	33.8	35.8
60– years old	31.5	32.5
Budapest	18.5	18.2
County seat, city with county rights	20.5	20.6
Other city	32.2	31.3
Town, village	28.8	29.9

The precise matching of the proportions of the data layers was set using weight numbers in the empirical database created through the recording.

The questions regarding digital competence were based on the DigCompSat (Clifford et al. 2022) international digital competence questionnaire. However, due to the nature of the omnibus survey, the number of questions was reduced to 25, according to the 7 specifications set out below:

1. From the knowledge, ability and attitude type, we have chosen to focus only on ability (what the respondent can do).
2. It includes items from all three levels (i.e. basic, intermediate and advanced).
3. We included at least one item from each of the 21 sub-dimensions, taking into account both the Cronbach's alpha⁴ of the item and the non-responses.

⁴ Cronbach's alpha (tau- equivalent or coefficient alpha) is the reliability coefficient and a measure of the internal consistency of tests and measures.

4. We have clarified the wording in Hungarian and replaced ‘I know how to’ with the ‘I am able to’ (i.e. ‘can’) expression to prevent respondents from associating the ability with the knowledge of the ability.
5. In addition to a single question per dimension, we have included a few more questions that we think are important and interesting to measure.
6. One of the extra questions has been slightly modified in its content that read ‘I am able to apply for a job using a digital platform (e.g. filling in a form, uploading a CV and a photo)’ to read ‘I am able to manage an administrative matter using a digital platform (e.g. filling in a form, uploading documents)’.
7. We have changed the original order of the questions to make the questioning situation more fluent.

This gave us a set of 25 questions that cover *‘can’ competencies*:

1. Copy and move files (documents, images, videos) between folders, devices or in the cloud.
2. Send, forward and receive email.
3. Find a website you have visited before.
4. Manage administrative matters using a digital platform (e.g. filling out forms, uploading documents).
5. Manage texts, images and videos within a document and thereby create something new (e.g. a presentation, poster).
6. Pay for products and services when you buy them online.
7. Reduce the energy consumption of your devices (e.g. change settings, close apps, turn off Wi-Fi).
8. Create a user profile on a social network for personal or professional purposes.
9. Create and edit digital text documents (e.g. Word, OpenDocument and Google Docs).
10. Express oneself by creating digital content on the internet (e.g. blog posts, YouTube videos).
11. Take the appropriate steps (reporting, banning, etc.) when someone behaves unacceptably online.
12. Change who you share content with (e.g. friends, friends of friends, everyone).
13. Invite others and grant appropriate permissions to work together on a shared document.
14. Use the additional services of video conferencing services (e.g. moderation, video and audio recording).
15. Check that the website where you are asked to enter your personal data is safe (e.g. https pages, security logo or certificates).
16. Detect and filter if an online service offers illegal access to digital content (e.g. software, movies, music, books, TV).
17. Protect yourself and others from unsolicited advertisements and materials (e.g. spam, phishing emails).

18. Distinguish sponsored or advertised content from other content you find or receive online.
19. Use online training opportunities to develop my digital skills (e.g. video tutorials and online courses).
20. Manage or analyse data using software (e.g. sorting, filtering and calculations).
21. Recover digital information (e.g. photos and contacts) from a backup.
22. Write scripts, macros and simple stand-alone applications to automate tasks.
23. Use data management tools and organise complex information for decision-making and problem-solving.
24. Edit the configuration settings of your digital devices in the event of a technical problem.
25. Select the appropriate tool or service to perform a specific task.

In this paper, we investigate the aspect of the questionnaire item 'I can use e-government independently' in more detail, using several cross-tabulations to give nuance to the components of usage characteristics.

To determine the relevance and reliability of the above methodology, the research tool is based on the Digital Competence Framework for Citizens (DigiComp) framework developed by the European Commission to assess digital competence among citizens. DigiComp is considered both relevant and reliable as it is strongly aligned with the skills and competence individuals need to use in the daily life of today's digital society. The framework has gained international recognition; it was developed by experts in several fields and validated through long consultation and testing processes. It was aimed to be flexible and adaptable as was required in the present research questionnaire.

Regarding the psychometric issues of the research tool, the questionnaire went through a long measurement tool development process where cognitive testing was the key source of feedback for validity and response bias. Written instructions and training for the survey interviewers also took place before fieldwork. Ethical considerations and data collection integrity were also addressed.

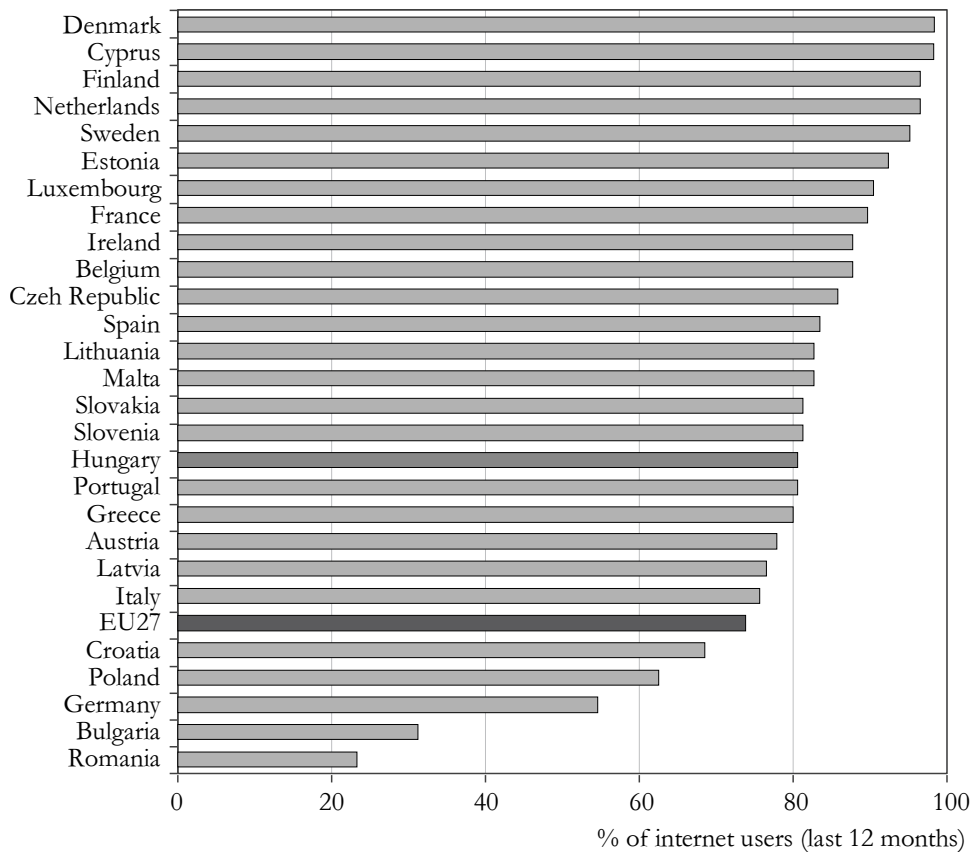
Finally, the Dunning–Kruger Effect (Cherry 2022) was likely to occur in cases of self-evaluation surveys, with the limitation of data interpretation; the present study claims that its findings are based on self-perception, not on actual skill testing which could be the objective of another study which applies the lack of ability *versus* admitting inability. However, due to the known effect directions, the lower estimates of the values obtained during the present study, even if its values are based on perception, seem to be very good for some strong statements regarding the findings on basic skills, such as one-third of the respondents being unable to email or browse on their own. If one-third admits it, then in social reality it can be an even bigger percentage of the sample.

The EU situation

The DESI (Digital Economy and Society Index), the most widely cited and benchmarked indicator measuring the digital readiness of the EU countries, and its successor, the Digital Decade 2030 Indicator Group's 2023 country report, emphasise that Hungary has untapped digital potential and that its current development is not even and proportionate. In terms of infrastructure development, it is above the EU average in many areas (thanks to the development of very high capacity/VHCN/fixed networks, the networks with data rates of 1Gb/s or more and the 5G infrastructure), but lags behind in terms of digital skills and the digitalisation of the public sector and particularly so in the private sector.

Figure 1

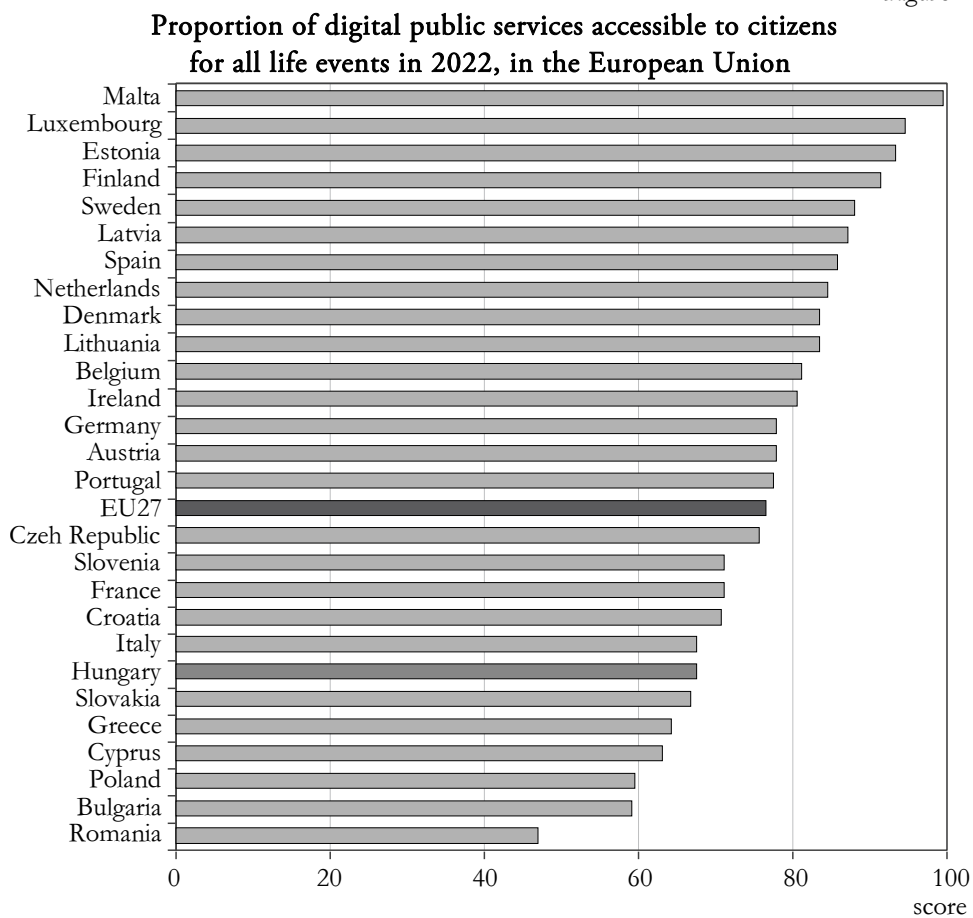
E-government users all individuals in the 16–74 age group, in the European Union



Source: EC 2024.

The majority of internet users i.e. 81.02% aged 16–74, have used an e-government service (via a website or mobile device) in Hungary, which is above the EU average of 74%. In addition, access to health records (thanks to the EESZT⁵ or Health Window) is another indicator that shows above the EU average values in the digitisation of public service packages.

Figure 2



Source: EC 2024.

Hungary is in the bottom quarter of the ranking for services accessible for all life situations, with a score of 67.87%, which is almost 10 percentage points behind the EU average (77.03%). There is also a significant gap (nearly 8 percentage points) with the EU average in terms of digital public services for businesses, pre-filled digital forms (i.e. in improving interoperability, the service aspect of not having to provide

⁵ EESZT = Elektronikus Egészségügyi Szolgáltatási Tér (e-Health Service Platform).

information that is already available to the office) and in the mobile-friendly character of services.

Table 2

**Digital decade 2023: the evolution of digital public services indicators
in Hungary and the EU average**

	Hungary			EU	
	DESI 2021	DESI 2022	DESI 2023	DESI 2023	2030 target
4a1 e-government users % internet users	NA	NA	81 (2022)	74 (2022)	
4a2 Digital public services for citizens score (0 to 100)	NA	64 (2021)	68 (2022)	77 (2022)	100
4a3 Digital public services for businesses score (0 to 100)	NA	74 (2021)	76 (2022)	84 (2022)	100
4a4 Pre-filled forms score (0 to 100)	NA	60 (2021)	60 (2022)	68 (2022)	
4a5 Transparency of service delivery, design and personal data score (0 to 100)	NA	50 (2021)	57 (2022)	65 (2022)	
4a6 User support score (0 to 100)	NA	67 (2021)	69 (2022)	84 (2022)	
4a7 Mobile friendliness score (0 to 100)	NA	84 (2021)	85 (2022)	93 (2022)	
4b1 Access to e-health records score (0 to 100)	NA	NA	80 (2022)	72 (2022)	100

Source: EC 2024.

There is a significant gap (15 percentage points) in user support for services.

A focused, regional comparison of other international e-government indicators for 2021 showed that there has been some improvement in the area of e-government, which is important for competitiveness, but Hungary still ranks in a low position among relevant indicators. This highlights the important practical challenge that despite significant investment in the digitisation of public services, Hungary's relative position has not yet improved significantly. This is partly because Hungary is not the only country investing in ICT; others may be investing more or more efficiently (Bojtor–Bozsó 2021).

In December 2022, the Government of Hungary adopted the National Digital Citizenship Programme, which aims to develop user-friendly and user-centric services based on open data and cloud-based technologies (the strategy is the first to embrace the principle of *'mobile first'*, i.e. services optimised primarily for mobile devices, delivered through mobile applications). The impact of the implementation of these strategic objectives has not been observable yet, since the launch of the developments has been planned for 2023, but infrastructure and service development alone will not be sufficient to increase usage rates. Developing relevant digital skills is inevitably required for substantial growth in usage rates.

Status of digital competence in the previous measurements

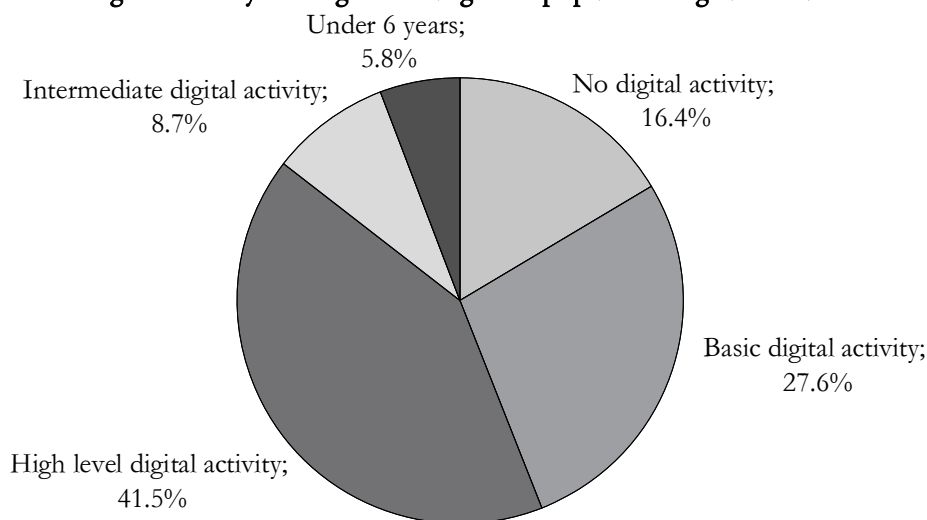
The HCSO Census 2022 (HCSO 2022), which made online completion the default for the first time, revealed that 16.4% of the population does not engage in any digital activity. The HCSO has set up different categories of digital skills competence for those aged 6 and over:

- does not engage in digital activities,
- performs basic digital activities,
- engages in intermediate digital activities,
- engages in high-level digital activities.

To determine the level of proficiency, the performance of digital activities was tested. Eight groups of activities, from browsing the internet and searching for information to programming were ranked in proportion to the level of proficiency.

Figure 3

Digital activity among the Hungarian population aged 6 and over

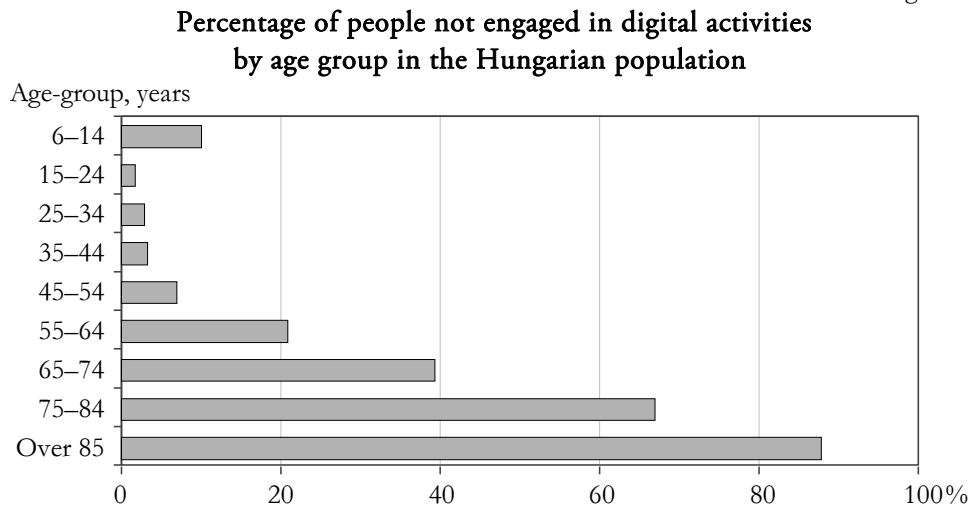


Source: authors' own editing, based on HCSO (2022) data.

Since the data visualised in Figure 3 were taken from the database of the HCSO, they were available only in aggregated distributions and not in the original raw database which makes us unable to perform statistical tests regarding which socio-demographic variables are associated with which levels of ICT proficiency.

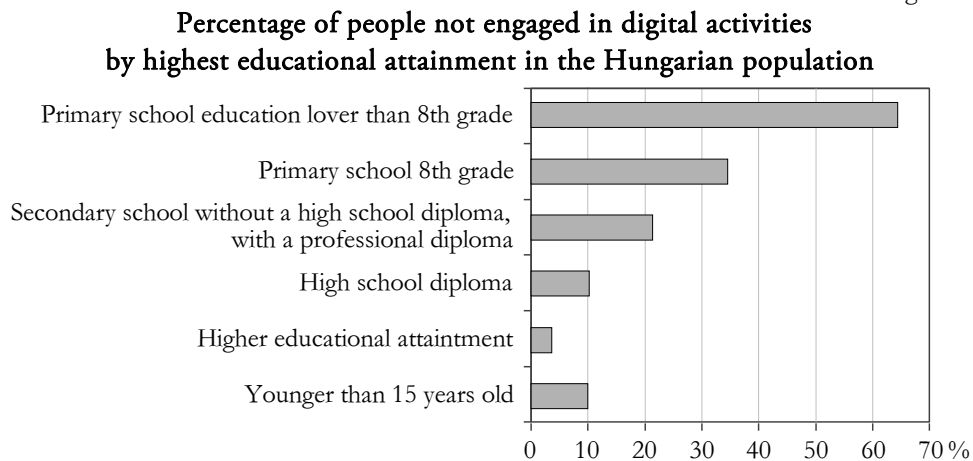
According to the 2022 Census of the HCSO, only 8.69% of the population is engaged in high-level digital activities and 41.49% in medium-level digital activities. Together, these two groups reflect substantial digital usage, indicating that around half of the population can be considered digital citizens.

Figure 4



The HCSO has also highlighted the age gradient, with the proportion of people not engaged in any digital activity increasing in the age deciles surveyed, with nearly two-thirds of people aged 75 and over and almost 88% of people aged 85 and over not engaged in any digital activity. For the under-55s, however, these rates are strictly single digits, affecting minor segments of the population.

Figure 5

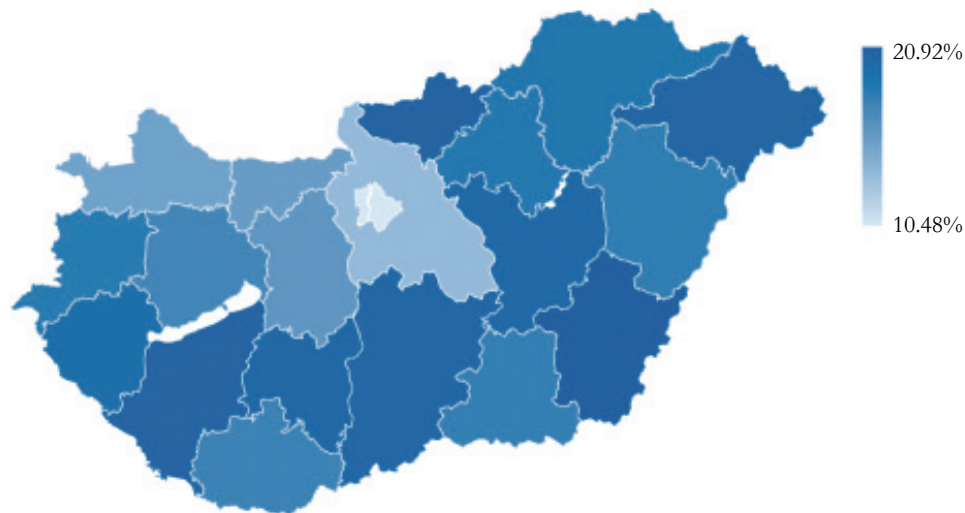


In terms of educational attainment, nearly two-thirds of the respondents who have not completed the eighth grade of primary school (early school leavers) do not engage in digital activities, while one-third of those who have completed the eighth grade do.

There is a strong correlation with increasing levels of educational attainment in terms of digital activity. Only 3.7% of those with a diploma or degree do not engage in digital activities.

Figure 6

Share of the Hungarian population not engaged in digital activities, by county



Source: authors' own editing, based on HCSO (2022) data.

The usual patterns can be seen in the geographical breakdown. The national average is pulled up by the Central Hungary Region. Budapest is not only the clear leader in terms of the low number of people not engaged in digital activities (10.48%), but also in terms of the proportion of people engaged in high-level activities. Owing to the proximity of the capital city's urban sprawl, even Pest County around Budapest is well above the performance of the other counties. At the same time, municipalities have emerged (e.g. Sénye, Bakonykút and Balatonhenye) where digital nomads have started to compensate for the digital illiterates, thus raising the average of their respective municipalities. Similar trends can be traced when the public service indicators of economic competitiveness are surveyed (Szabó 2019).

Digital competence and digital administrative literacy in the latest survey

Our survey confirmed previous trends that, in general, size determines administrative capacity (the larger the municipality, the better the administrative capacity of its residents), however, in the case of Budapest, we are seeing more and more extremes, which worsens the overall performance. This is the reason why the average proportion of independent users of e-government in the county capitals is almost

2 percentage points higher than in the capital. It is also clear that the rationale for the helpdesk service is not an issue for municipalities, where only 45.2% of the population can manage their affairs on digital platforms.

Figure 7

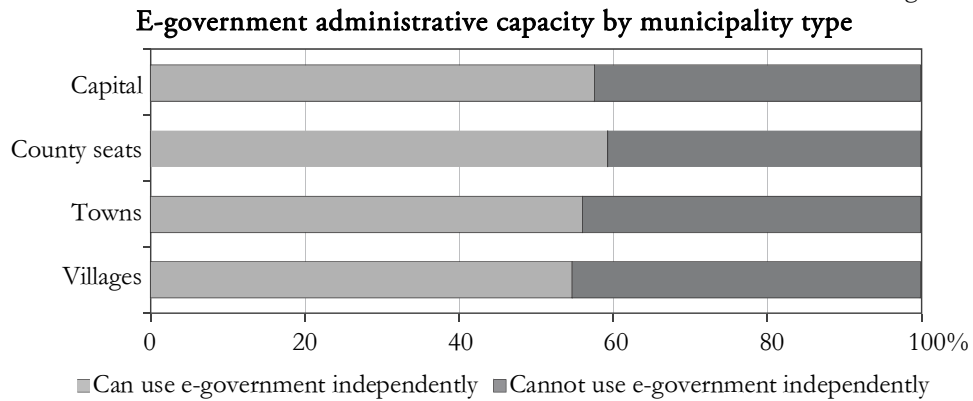
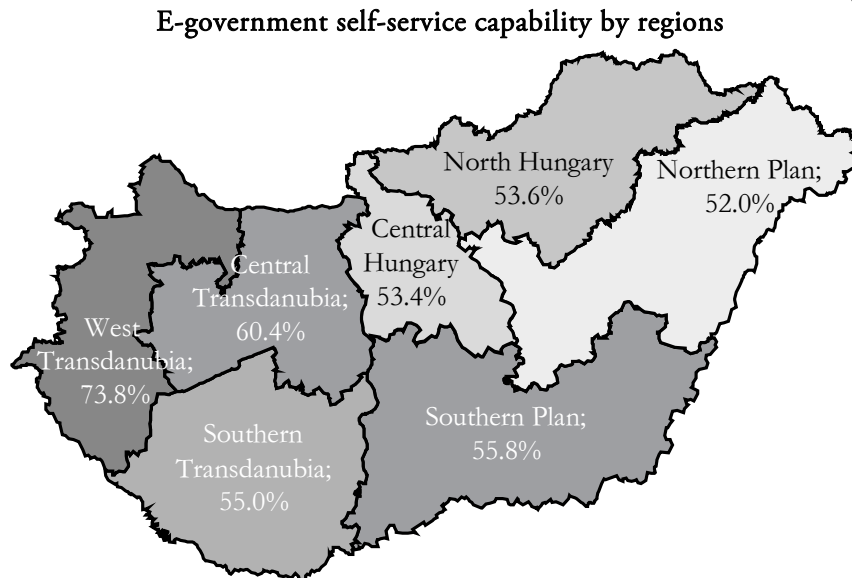


Figure 8

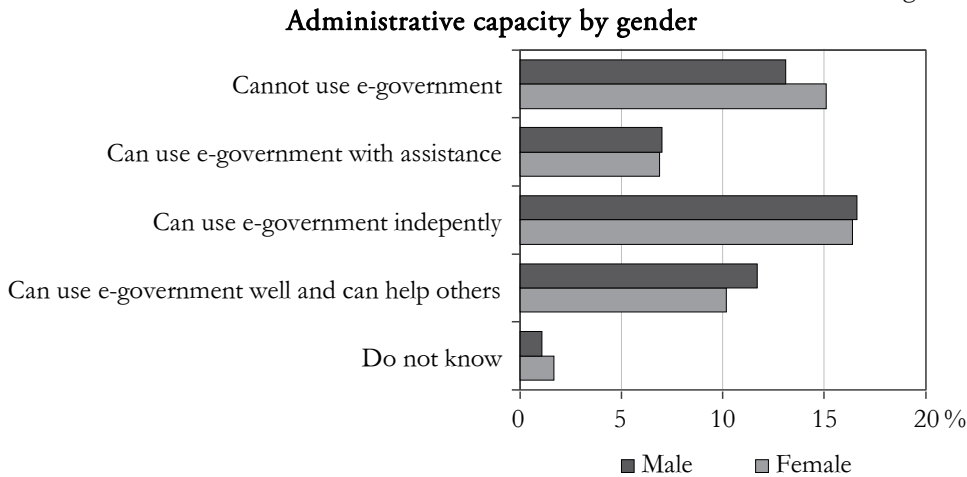


We can also see an east–west divide, with the eastern regions performing significantly worse than the western regions. If we add to this the results by municipality type, we again find small municipalities in the North-Hungarian Region of Hungary, where digital competence (and thus administrative capacity) is spectacularly lower than among the western areas.

The capital city–Lake Velence Region–Lake Balaton Uplands and the Győr–Sopron axis are highlighted, which consist of the most developed municipalities in Hungary. The population growth of these municipalities is also the most intensive in

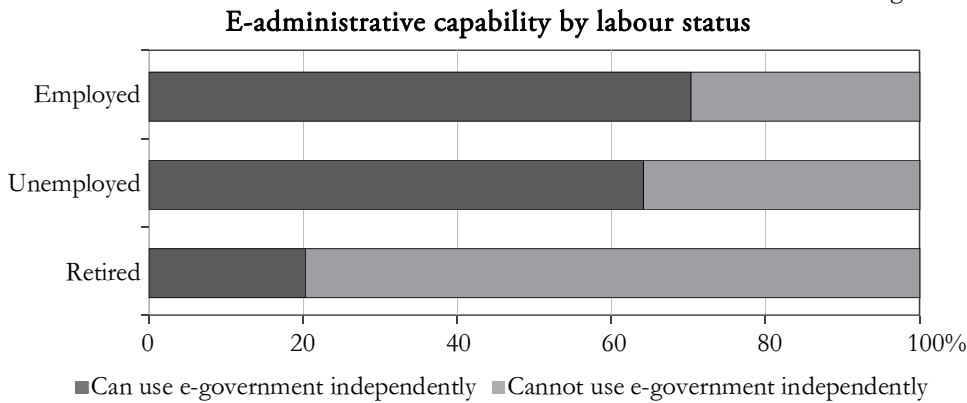
the country, and this emerging super conglomerate is beginning to concentrate the country's digital knowledge.

Figure 9



Overall, 43.3% of the respondents say they cannot use and manage digital public administration independently. This compares to 41.4% for men and 45.2% for women, meaning that men are, albeit marginally, more confident than women in this area.

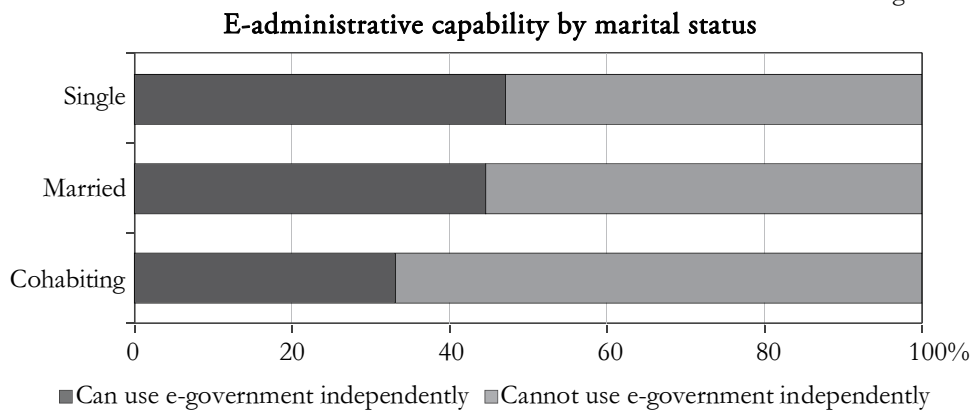
Figure 10



There seems to be a significant correlation between working status and digital literacy. Reviewing retiree status shows that 4 out of 5 retired people are not able to manage their digital affairs. In addition, 67.5% of the retired respondents are not able to do so even with assistance, i.e. they lack even minimal skills. This is almost the opposite for those with an active working status: 42.6% are able to use digital platforms on their own and 27.7% with some assistance and only nearly a third of them are not independent in this aspect. Roughly half of the retired citizens are also

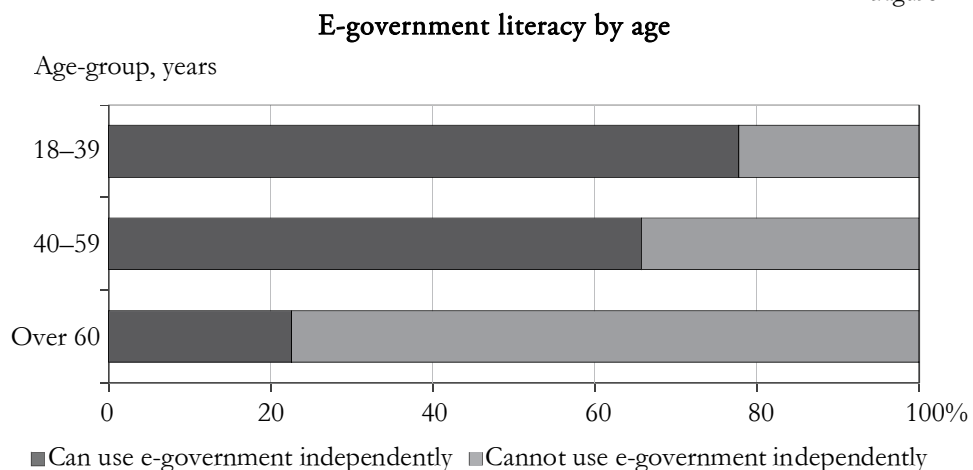
not able to manage and use digital platforms at all, while the other half of them feel able to do so, but with help. Among the inactive, unemployed stratum, the number of respondents who cannot manage to use digital platforms without help is particularly high: one in four inactive, unemployed respondents (24.4%) do not know how to manage an administrative matter in the digital space, and a further 11% can only use it with help.

Figure 11



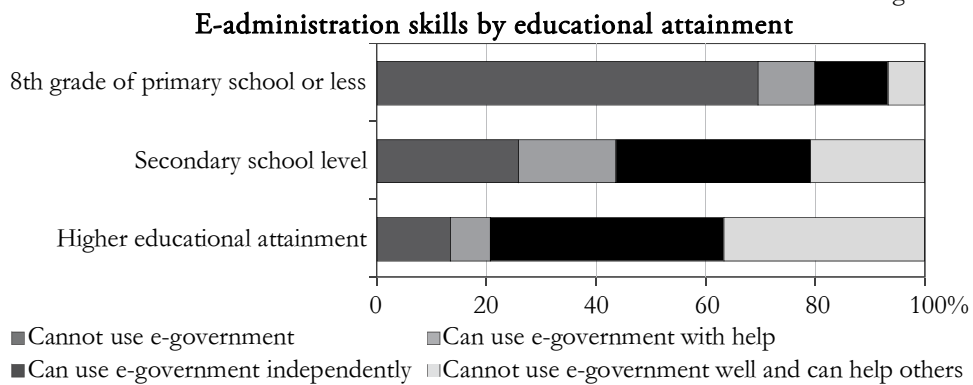
Single people are the least autonomous in the digital space. Of the 46.9% of non-autonomous users, 35.4% are those who cannot manage digital platforms even with help. An interesting relationship can be seen in terms of the preparedness of those in a relationship. Those in a cohabiting relationship tend to score better than those in a married relationship. We hypothesise that the reason for this may be that cohabitation is popular among younger generations, so the impact of age is evidenced in the improved skill levels.

Figure 12



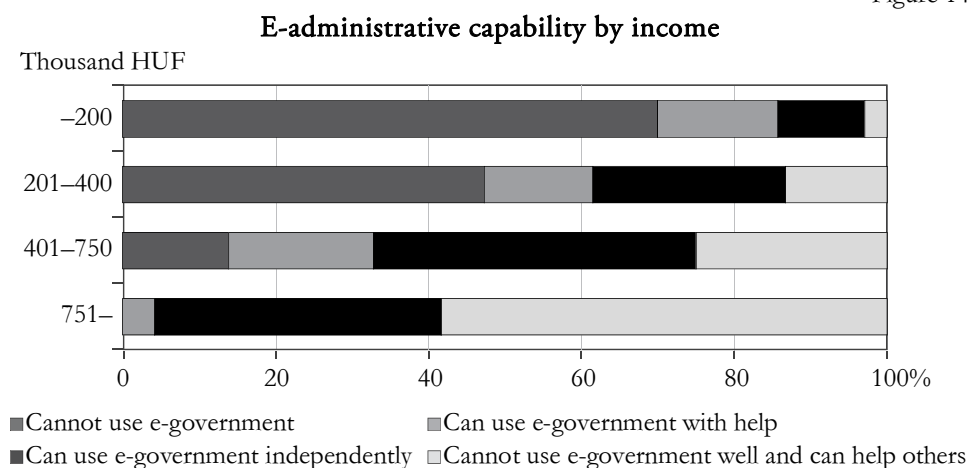
As expected, the age survey reveals the disconnection of the older generation. Of people aged 60 and over, 77.4% are unable to manage their administrative affairs in the digital space and 63.7% are unable to do so even with assistance. The same situation more than halves in the next age band (40–59 years old), with only a quarter (18.2%) of the older respondents managing their digital affairs without help. The figures fall further in the youngest age group, where only one in 10 respondents (9.5%) are so unskilled that they cannot even participate in administrative tasks with help. This rate is close to the school drop-out rate, although this relationship has not been tested, so we can only assume a stochastic relationship.

Figure 13



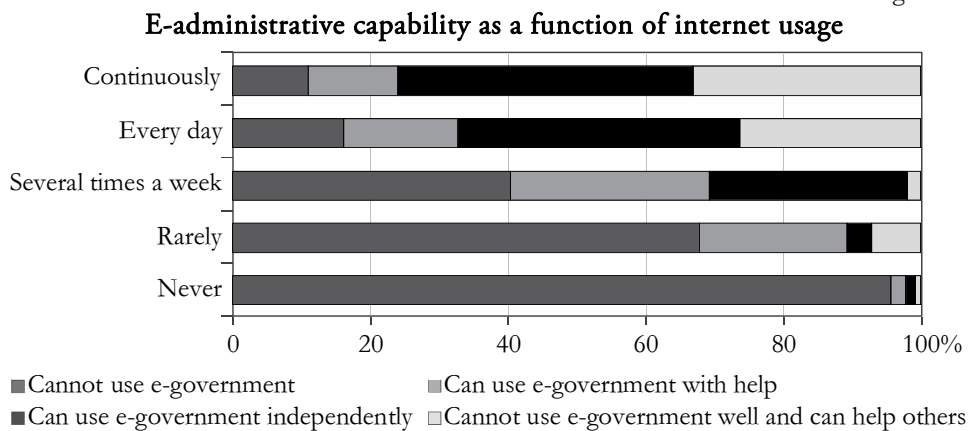
The former assumption is reinforced by the fact that 80% of those with eighth-grade primary education or less are not able to manage their affairs in the digital space. This figure is halved at the next (secondary) level of education (43.8%) and further halved for those with tertiary or higher education (21%). The significant correlation is another argument for extending the school leaving age.

Figure 14



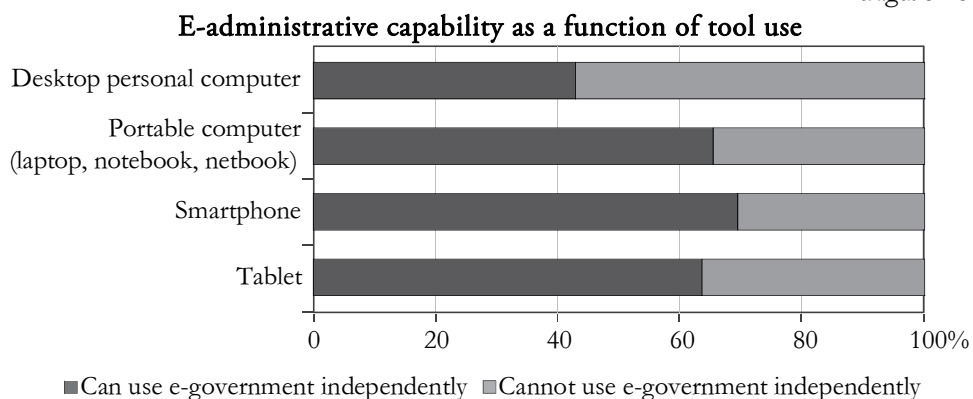
We can also see a significant correlation between income levels and digital literacy. While the lowest income brackets have over 85% non-autonomous users, the highest income brackets have over 95% autonomous users, and no non-autonomous respondents. In the two middle-income bands, we see a one-third/two-thirds ratio of independent and dependent users. The tipping point is seen at the 400,000 HUF salary level, which is above the 2023 Hungarian average net income. Below this income level, two-thirds consider themselves dependent users, and above this level, two-thirds consider themselves independent users.

Figure 15



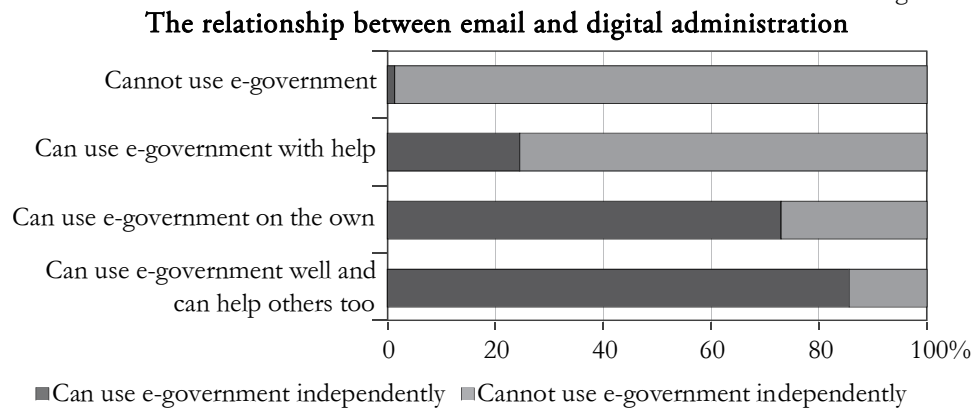
The frequency of internet use also shows a significant correlation with the ability to use e-government. It can be predicted that those who do not use the internet will not be able to participate in e-government (98.6%). The same proportion is 88.9% for those who use the internet less than weekly. The proportion of independent users is 30% for those who use the internet at least weekly and 67.2% for daily users. At the same time, this layer increases by a further 10% for regular users: 76.1% of heavy users are able to carry out digital transactions in the digital space.

Figure 16



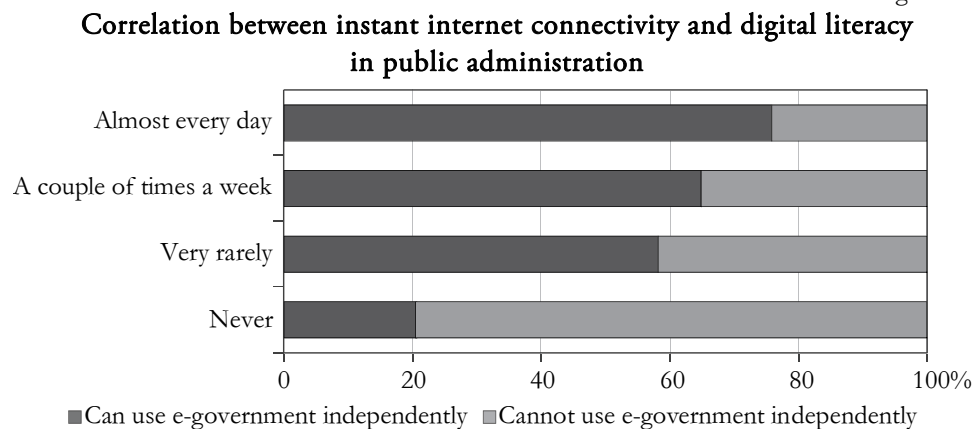
The device used to access the internet also plays a decisive role: while 69.5% of smartphone users, 65.4% of laptop and notebook users and 63.6% of tablet users are able to do so, only 42.9% of PC users are able to do so.

Figure 17



Several significant correlations are found between computer activities and e-government digital literacy. Those who find it difficult to send and receive emails are more or less guaranteed (98.6%) not to be able to use digital administration, while 85.5% of those who are confident in emailing will also show autonomy and independence in the use of digital government.

Figure 18



The less often people use instant messaging, the less likely they are to be able to use digital administrative services on their own. While 75.9% of daily chat users are able to use digital administration, only 20.7% of those who never use instant messaging are. Similar proportions can be observed for the frequency of visits to social networking sites, such as Facebook and X (72.4% and 34.4%). However, there

is no such correlation between regular consumption of online learning content and digital literacy in e-administration.

The regular use of a computer as a work tool, connected to the internet, also determines digital literacy in e-administration. 80.4% of those who use a computer with internet access for work are able to manage their affairs digitally on their own, while only 48.8% of those whose work does not require internet access are able to manage digital administration. A similar correlation can be seen for online shopping, public utilities and e-banking.

As we address increasingly complex activities, we see higher and higher scores among experienced and confident users in both areas. In other words, the more difficult a digital activity is and the more often users do it, the more likely they will be able to perform digital public administration tasks.

Conclusion

We still seem to be lagging far behind the EU average in digital competence, which is fundamental to the ability to carry out digital administration and access public services. The multiple dimensions of digital inequality (age, education, employment, marital status, etc.) remain well-defined, and if amassed, can create a downwards-pulling environment, further undermining any catching-up opportunities. Competencies acquired in the digital space mutually reinforce one another, and the more complex they are, the more they guarantee competence in other areas, such as the capability of accessing digital public administration.

Those who do not participate in the digital ecosystem are falling behind in the labour market, their mobility is declining and their generally poorer living conditions are worsening.

According to the CEDEFOP study, the social and economic costs of the development of low-skilled adults:

- Increases the employability and income of individuals and the productivity of the economy as a whole.
- Increases tax revenue and reduces public spending, due to better productivity and economic growth.
- Increases commitment to healthy lifestyles and social participation and reduces crime.
- Increases confidence, social engagement and inclusion.
- Results in a more educated and competent population, which becomes more open to innovation and stimulates innovation and technological development (CEDEFOP 2017).

To this, we can add:

- The more digitally literate the users are, the more secure they are when using technology.

- Digitalisation does not create or improve social inclusion by itself but assists by creating the social, political and economic conditions that can improve equal opportunities and people's situations.
- Many platforms are also community-building (e.g. learning communities).
- Last but not least, digital literacy is the key to the widespread use of digital public services.

The above points justify our proposals that current policies should put more emphasis on formal, informal and non-formal ICT education in schools and beyond, on digital facilitation centres, on support for voluntary public and private sector initiatives (corporate social responsibility, public social responsibility), on targeted (possibly intergenerational) catch-up programmes and intensive participation in the EU programmes, such as CodeWeek, All Digital, the European Solidarity Corps, the Digital Skills Accelerator, the Digital Skills Map and the ySkills Project. The demand for an ever stronger emphasis on IT education is further confirmed by those surveys revealing the strong correlation between social innovation and the digital economy (Nagy–Veresné Somosi 2022), and that of economic performance and digital skills (Tran et al. 2023).

It is worth juxtaposing the findings of the above Hungarian research with global trends in similar cultural and geographic regions like the Baltic states, Poland, Czechia and some of the Balkan countries. The digital divide includes inequalities in access to and use of ICT, which lead to inequalities in access to knowledge, employment opportunities, health care and other areas (Tomczyk et al. 2023), therefore, the Hungarian situation is not unique but similar to that of the surrounding countries of Eastern-Central Europe.

Future approaches

For the further examination of the connection and relationship between digital literacy and e-government capability, some authors' approaches and points should be noted. They might be worth considering when planning the next research steps in this field.

There is a study (Fan 2022) exploring how e-government efficiency influences users' subjective well-being, using trust as a covert stimulus with the capacity to alter individuals' overt behaviour (utilisation). Covert and overt stimuli act as significant factors influencing the relationship between citizens and the online environment, moderated by socio-demographic characteristics. Using the situation–organism–behaviour–consequence theory, the study proposes a model consisting of online environment e-government efficiency (the situation) influencing trust development (the organism), which, in turn, influences utilisation (the behaviour), generating an impact on an individual's subjective well-being (the consequence). According to the pilot, the results will, presumably, reveal that the correlation between e-government

efficiency and trust is positive and strong, the correlation between trust and utilisation is positive and moderate and the correlation between utilisation and subjective well-being is positive and very strong. Stepwise regression analysis will reveal that the control variables affect the relationship between e-government efficiency and trust. This study develops theoretical concepts of e-government use and how it affects citizens by indicating the psychological and behavioural situations as antecedents and mediators influencing their subjective well-being.

Contact restrictions caused by the Covid-19 pandemic have accelerated the digital transformation of public administration in most countries and increased the social digital divide as well. Therefore, the training of citizens in digital competence is one of the main challenges of the knowledge society. A mixed-methods systematic review protocol study by Morte-Nadal–Navarro (2022) aims to synthesise quantitative and qualitative findings about the conditioning factors of digital inclusion, in a multi-dimensional perspective, related to the education, healthcare and welfare sectors and the political actions involved to improve the digital competencies of citizenship for allowing and enhancing their interactions with these online public services. Quantitative, qualitative and mixed-methods studies are included in this approach. Data items can be extracted and coded in a standardised format. A convergent segregated approach to synthesis and integration can be used. Presumably, the results will be of interest to educational policymakers who want to take into account citizens' digital skills in the design of online services and lifelong learning programmes.

Finally, there is yet another approach to e-government capability worth mentioning and considering its application in the future focusing on economic invention. This study by Sharma et al. (2022) aims to encourage the intention among small investment start-ups to adopt independent digitalisation with e-governance. The study also analysed their intention by testing the significance of the benefits associated with the digital platforms of e-governance. In addition, it analysed the moderating effect of digital support and awareness on digital adoption. The study's findings can help governments draft policies to address the factors that positively impact the perceived value of digital adoption by developing a digital support system and further scaling up digital literacy, especially for start-ups. Overall, the study's findings can help the government understand the present status of start-ups' digitalisation growth along with e-governance systems.

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