# An instrument for measuring needs of vulnerable groups in terms of digital inclusion

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***Abstract.*** *Nowadays, mostly due to the COVID-19 pandemic, digital technology and the Internet have taken a very important role and become an integral part of the life of almost every individual. What happens to those who, for any reason, are still unable to participate in a society that actively uses digital technology and the Internet, especially those who belong to vulnerable groups of the population? Numerous studies have shown that these circumstances lead to social exclusion. The aim of this paper is to present a methodology for development of an instrument for measuring needs of vulnerable groups in terms of digital inclusion. The instrument was created as a part of the project Digitalna.hr, implemented by the Croatian Digital Literacy Network. It can be used to collect data on the state of digital inclusion of vulnerable groups in a population. Such data are necessary for formulating recommendations and measures for building public policies and strategies, as well as their implementation and enforcement by regional and local government, in order to include this segment of the population in the digital society.*

**Keywords.** digital literacy, vulnerable groups, digital inclusion, digital society

## 1 Introduction

Development of digital society and promoting accessibility and use of digital technologies is a priority in almost all countries today (Lyons, Kass-Hanna, Greenlee, 2020, Lyons et al., 2019, Palmeiro, Pereda Herrero, Aires, 2019, Chetty et al., 2018, ITU, 2018 a, b, Serrano-Santoyo, Rojas-Mendizabal, 2017, Real, at al., 2015). Notwithstanding numerous attempts by public authorities, non-governmental associations, and private organisations to empower citizens and include them in the digital society, the digital gap is still present (Tomczyk et.al. 2019). Research shows that every individual cannot equally take advantage of all opportunities offered by modern digital technology. Simultaneously, it has been confirmed that digital gap does not affect only economic variables, such as income per capita and costs of access and use. It has also become a sociological problem, meaning that lack of access to digital technologies can lead to social exclusion (Helsper, 2008, Helsper, Galácz, 2009, Helsper 2012). Similar perspective can be noticed in research by Van Dyke (2020), who defines the digital gap as a social and political problem, and generally a problem of unequal distribution of goods, but not as a technological problem. He also emphasises the importance of factors, such as motivation, skills, talents, desire to use, literacy level, lack of interest, lack of literacy, difficulties with access, etc. that affect the digital exclusion. Social exclusion is partly emphasised due to digital exclusion if an individual belongs to a vulnerable group of population (Pérez-Escolar, Canet, 2022). According to Mechanic and Tanner (2007), some of the most important "sources of vulnerability" are poverty and race, lack of social networks and social support, personal and physical limitations. Thus, Lyons and Kass-Hanna (2020) assert that vulnerable society groups include, but are not limited to, the poor, women, the young, the elderly, the disabled, ethnic minorities, people living in barely accessible rural and island areas, migrants, and refugees.

Access to and use of digital technologies still represent a challenge for vulnerable groups. Even though some areas have remarkable Internet access infrastructure, large parts of population, especially those with lower socio-economical status or living in rural areas, still have a limited or no access to digital devices or platforms, or available digital services do not satisfy their accessibility needs. On the other hand, there are multiple benefits of digital technologies and services for the vulnerable groups. Various researchers identified following advantages: saving money and time, space and time flexibility while searching for information, (searching for) work from home, supporting activities important for autonomy, normal and independent life, reducing practical difficulties caused by disability, easier, safer and more open communication, networking, more possibilities for fun,

opportunities for developing new hobbies and activities, discovering new horizons of online studying, increasing accessibility and quality of health services and health information (Tirado-Morueta et al. 2021, Tsatsou 2021, a, b, Tsatsou, 2020, Alabi, Mutula, 2020, Yu et al. 2019, Matthews, Nazroo, Marshall, 2019, Betts, Hill, Gardner, 2019, Tsatsou, Higgs, Stafford, 2013).

Solving the problem of digital gap has become a critical developmental challenge on the global level, exacerbated by the COVID-19 pandemic. Advocates of digital inclusion/e-inclusion maintain that digital gap can be completely bridged or reduced to the least possible measure by promoting and enabling digital inclusion. Digital inclusion creates many social benefits, e.g. it promotes democracy, mutual understanding, empowering of socially endangered groups, etc. (Mancinelli, 2008). According to the European consulting group, digital inclusion/e-inclusion relates to enabling participation of individuals, community and economy in all dimensions of knowledge based society that uses ICTs in a way that removes access and accessibility barriers, and takes advantage of social benefits of digital technologies and services (EC, 2006). Žajdela Hrustek (2015) proposes a definition of e-inclusion as "inclusion of individuals/groups/communities in the information society, where everyone has equal chance to access and use ICTs and Internet, with the purpose of improving quality of life and enabling active participation in creating new social and technological systems."

From the very beginning, the groups of individuals considered to have potentially higher risk to be socially and digitally excluded, such as the disabled, the elderly or women were identified as interest groups in strategies connected to the term digital inclusion/e-inclusion. The goals of further strategies were directed to the society as a whole, and all individuals who could, for any reason, be excluded from the information society, or could not completely use its advantages. Performing the process of digital inclusion/e-inclusion depends considerably on politics conducted by the government in a specific country regarding realising goals as follows: inclusion of all groups and individuals in digital society, efficient and transparent service providing to citizens, empowering people via access to all relevant information, efficient management of information for citizens, promoting awareness among citizens on the importance of inclusion in digital society, creating social and cultural consensus (Žajdela Hrustek, Šimić, Vrček, 2017, Žajdela Hrustek, Prosser, Dušak, 2016). Despite the pressing need for digital inclusion among the most vulnerable groups, there is still a lack of public awareness, a lack of mention of it in public policies, strategies, and operational plans, a lack of media and digital literacy among vulnerable groups, and a poor utilization of e-Citizen services. On the other hand, the European Union has set ambitious digital transformation goals. By 2030, 100% of key public services should be available online, 100% of citizens should have access to digital health records, 80% of citizens should be using digital ID, and at least 80% of citizens should have basic digital skills (EC, 2021). To facilitate acquiring of digital skills and improving digital literacy, the Joint Research Centre of the European Commission in 2022 has developed the digital competence framework for citizens DigComp 2.2 (Vuorikari, Kluzer, Punie, 2022).

This research was conducted as a part of the project Digitalna.hr implemented by the Croatian Digital Literacy Network. The project's major goal is to create a model for civil society activities that promote evidence-based advocacy for digital literacy. Its first objective, development of digital citizenship, required assessment of the needs of vulnerable groups of population in Croatia in terms of digital inclusion. The vulnerable groups targeted by the project were the retirees, the disabled, and the inhabitants of rural and island areas. However, search of research literature did not discover a valid and relevant instrument for measuring these needs.

The rest of the paper describes the development of the measurement instrument, data collection, and main characteristics of the targeted vulnerable groups.

# 2 Methodology of developing the measurement instrument

The development of the measurement instrument took place from February to September 2021. The first phase started by defining the research problem, questions, and objectives, and the second phase concluded with development of the measurement instrument.

## 2.1 Defining the research problem

Based on the literature referenced in the Introduction, the following difficulties faced by vulnerable groups were singled out:

- lack of access to and use of digital technologies and the Internet,
- low digital, media, and information literacy,
- poor offering of safe and accessible digital services.

Research questions and objectives were developed to support assessment of the needs of Croatia's vulnerable groups in order to address these difficulties. The research questions were:

1. Do vulnerable groups use digital technologies and the Internet?
2. How do vulnerable groups access the Internet?
3. Which obstacles to using digital technologies and the Internet do individuals in vulnerable groups face?
4. To what degree are digital public services used by vulnerable groups?

5. What is the user experience while using digital public services?
6. What is the level of media literacy of individuals in vulnerable groups?

The objectives were:

1. To develop a measurement instrument for assessing the needs of vulnerable target groups in terms of digital inclusion,
2. To conduct a survey on target groups , and
3. To draft policy recommendations for improving digital inclusion of vulnerable target groups, based on the results of empirical research and relevant literature.

## 2.2 Creating the initial item set

The initial item set was sourced from Žajdela Hrustek's (2015) research on digital inclusion. It comprised 341 items. Six team members of the working group Digital Citizens did the card sorting exercise. Evaluators assigned each item to the research question it addressed. Inter-evaluator agreement was assessed by Krippendorff's alfa (Krippendorff, 1980) using the statistical environment R (R Core Team, 2021). Only 255 items assigned by at least four evaluators to the same question were retained. Krippendorff alfa for the retained items was relatively low (0.424), however this was just the selection of the initial item set, that was further analysed for clarity and content validity.

## 2.3 Item clarity and content validity

Content validity and clarity of the selected item set were assessed using an expert group of researchers (six) and practitioners (four), as well as a small group of members of the target vulnerable groups (Milas, 2005, Tkalac Verčić et al., 2011).

Criteria for selecting the experts included competences and experience related to digital inclusion, relevant publications and projects, and teaching and training activities related to digital inclusion and vulnerable populations. Participation in the research was voluntary.

In the first step, the experts were asked to independently:

1. assess whether the items address the assigned research questions,
2. evaluate item's relevance for the assigned research question, using the four level scale: 1–Item is mandatory, 2–Item is desirable, 3–Item is not necessary, it should be removed, 0–I cannot determine the item's relevance,
3. assess the item clarity, using the three level scale: 1-Item is clear, 2-Item is neither clear nor unintelligible, 3-Item is unintelligible,
4. suggest to change an existing item, add a new item, combine or split items, or assign an item to a different research question.

This evaluation also referred to checking the grammatical and spelling accuracy, clarity, and unambiguity of the proposed items. In the follow-up, experts participated in two focus groups, one with researchers, and one with practitioners, where suggested changes and additions to the item sets were discussed, and a consensus was reached.

Content validity was assessed quantitatively using the Lawshe's Content Validity Ratio (CVR) (Lawshe, 1975). There were 158 items with CVR above the recommended treshold value. These items were used in the next stage with representatives of the target vulnerable groups.

The instrument was piloted in four small groups of participants (two to four) from target vulnerable groups. Participants for this stage of research were identified and contacted through representative associations, e.g. association of pensioners, people with disabilities, and rural inhabitants. The main objective of this stage was to make sure that items were understandable, and format of the questionnaire, in both paper and online form, was accessible to members of the target vulnerable groups. Participants were asked to fill in the questionnaire in paper or online form, and comment on all aspects of its form and content (including e.g. understandability, font size, organization, etc.).

The final measurement instrument comprised 158 items, after the phrasing of some items was modified to satisfy the needs of the target vulnerable groups. The questionnaire was organised in four subsection 1) Digital inclusion of vulnerable groups - access, use, skills, and barriers to the use of digital technologies; 2) Use of digital public services (e-Citizens) and 3) Media literacy, and 4) Demographic data.

# 3 Data collection

In order to assess the needs of target vulnerable groups in terms of digital inclusion, a survey was conducted on a snowball sample of 540 participants from Zagreb, Varaždin, and Primorsko-goranska counties, and the city of Zagreb. The snowball sampling was used, because it is particularly well suited for reaching out to hard-to reach and vulnerable groups (Ellard-Gray et al., 2015). The data collection took place from September to December 2021, when it was specially difficult to contact members of the elderly and people with disabilities, due to high COVID-19 risk and epidemiological measures. The initial set of participants for snowball sampling was identified and contacted through associations that facilitated the piloting of the instrument.

Descriptive statistics was done in IBM® SPSS® Statistics.

# 4 Results

Due to page restrictions we can present here only the most interesting results of the survey.

## 4.1 Demographic data

The sample comprised 50.5% pensioners, 32% participants with some form of disability, 8.1% inhabitants of islands, and 29.8% of inhabitants of rural areas. The majority of examinees were women (63.9%). The age group 65-74 (21.5%) was the largest, while the age group 16-24 was the smallest (4.3%). Participants living in households of two adults without (28.0%) or with children (25.6%) were the majority.

The majority of participants completed secondary trade schools, lasting four years or longer (27.1%). There was a very small proportion that did not finish any school (0.2%). In their opinion and according to their assets, more than 50% of participants do not live better or worse than the most, while a small proportion (2.8%) consider themselves living better than the most.

## 4.2 Access to digital technologies and the Internet

As visible in Figure 1, the majority of participants most often access the Internet by a smartphone, a personal computer, or a laptop (over 84% combined). An e-book reader (0.20%) and a games console (0.00%) are devices the least often used to access the Internet.

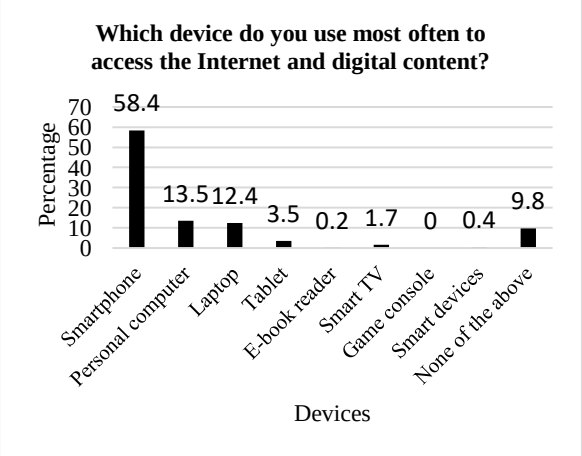


**Figure 1.** Access to digital technologies

Regarding the type of access to the Internet, the majority of participants use mobile or fixed access at home (82.2%), while the least use public places where they are charged for access and use. The results also show that 10.7% of participants do not use the Internet.

## 4.3 Reasons for use and attitudes toward digital technologies

The most important reasons why participants use or want to use digital technologies and the Internet are "better and simpler communication with family members, friends or relatives" (66.9%), "better level of information and access to desired information on various topics" (69.5%) and "greater possibilities for fun and entertainment" (39.4%), while the least said their reasons were linked to their employment. Also, 37.0% agree or agree completely that the Internet costs are "unacceptable", 36.1% are indecisive and only 26.0% disagree. Over 65% examinees agree or strongly agree that the costs of purchasing devices and equipment are too high (Figure 2). Regarding the satisfaction with the internet connection, 41.9% claim the slow Internet connection is an aggravating circumstance for quality of use, 29.5% disagree and 28.7% are indecisive.

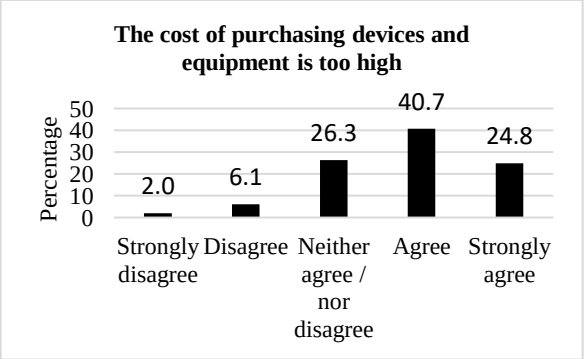


**Figure 2.** Cost of purchasing devices and equipment

Attitudes toward simplicity of using digital technologies and the Internet are positive. One fifth of participants consider using digital technologies complicated (over 20%), while more than 50% do not.

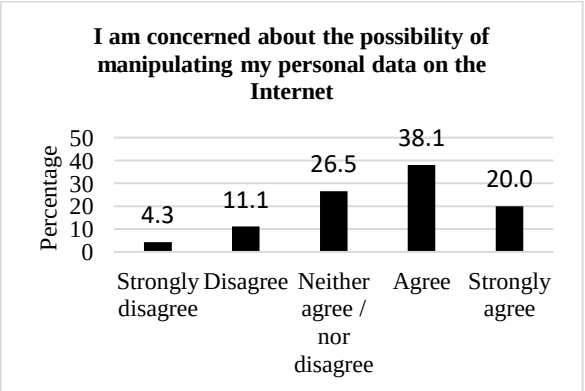


**Figure 3.** Concerns due to possibility of manipulating respondents' personal data on the Internet

Over 58% of participants are concerned about the possibility of manipulating personal data online, 26.5% are indecisive (Figure 3). Similar percentage of

participants (59.0%) express concern about privacy and confidentiality of personal data online, over 24% are indecisive and 15.0% are not concerned at all. Majority (57%) are concerned about to possible identity thefts online, over 17% are not concerned and 24% are indecisive.

## 4.4 Knowledge and skills in digital technologies

Over 27% participants agree they do not have enough knowledge and skills to use digital technologies and the Internet, 24.6% are indecisive, just over 48% disagree. Over 70% express interest in digital technologies, only 13.3% are not interested. The majority of participants (62.9%) declared having acquired digital skills on their own at home, 39.5% did it at work, individually or with the help of their colleagues. It is surprising that only 4.4% took organised and paid courses. 42% often use email for the purpose of correspondence, 22% use it sometimes, and 17.2% do not use it, because they do not think it is necessary, while only 18% help others use it. Over 49% use social networks completely on their own or they help others, 29.1% do not use social networks, and somewhat over 20% need help. 66% use or help others use Internet search engines, 13.5% do not use them, and do not consider them necessary, while 19% need help.

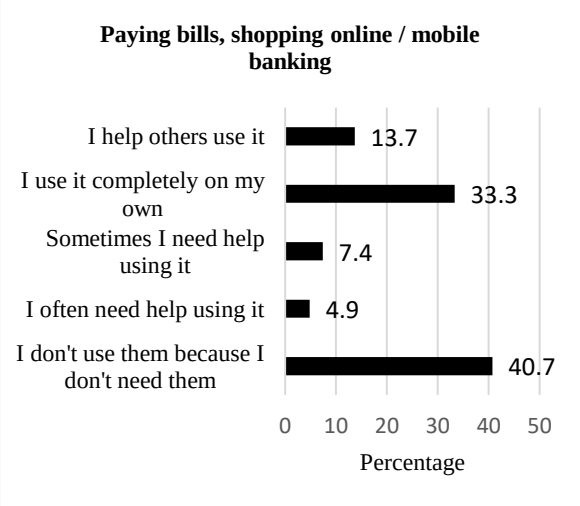


**Figure 4.** Bill payment, online shopping/mobile banking (Internet banking, web shop)

Figure 4 shows That 45.6% of participants do not use Internet for paying bills, shopping online/mobile banking or they often need help.,, 7.4% said they sometimes need help, and less than 50% stated they perform this activity on their own or help others.

## 4.5 Digital public services

Over 50% of participants said they do not use or need digital public services, while 45.9% said they use them.

From Figure 5, it is evident that 35.6% of participants do not consider the public service e-Citizen necessary, while 21.3% sometimes and often need help, and 43.2% use them on their own or help others.

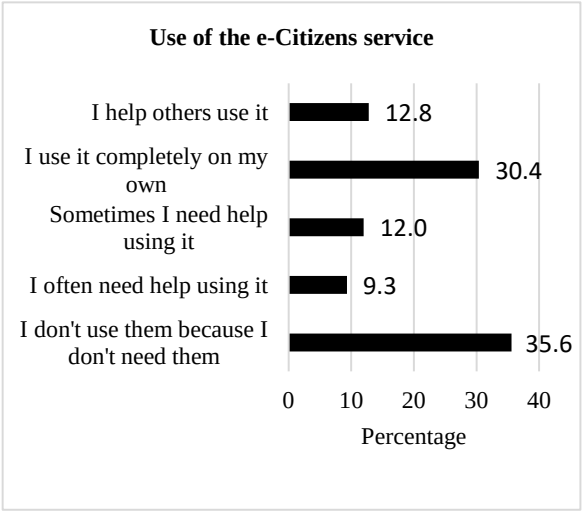


**Figure 5.** Use of the e-Citizens service

As a reason not to use digital services, the majority said they "do not have enough knowledge and skills", followed by "someone else did it for me" and they "have not got enough information on services that can be used online", while the smallest percentage claimed they "do not know of online public services (e-Citizen)". Among the participants who identified themselves as users of digital public services, 36.7% stated that they used digital public services of downloading official forms (via portal e-Citizen) and 33.7% downloaded certificates and statements from official records (COVID-19 certificate, certificates of no criminal record/residence/whereabouts), 23.9% used them to order health services and acquire information (via email or portal e-citizen), 4.3% used them to borrow digital books. When it comes to the user experience when using digital public services, the results show that more than 43% of respondents declared that the e-Citizens services are simple to use, and more than 50% of them agree with the statements that the e-Citizens services are fully adapted in such a way that all the desired information can be easily accessed and that they have no trouble performing all or most of the required steps during use.

## 4.6 Media Literacy

Related to the area Media Literacy, 65.2% participants agreed they easily find necessary information online, 20.9% were indecisive, and 13.9% disagreed. More than 47% of participants disagreed with the claim "I

check information online in order to shape my political attitudes.", 30% were indecisive, and 22.4% agreed. More than 20% of participants agreed they check information online in order to shape their life attitudes, 47% disagreed, while 31.4% did not respond. As presented in Figure 6, less than half of examinees (44.4%) check the credibility of information found online, 27.6% did not express their attitude, while the remaining 28% do not check it. Over 61% confirmed that they "critically consider the accuracy of information prior to sharing them in order to avoid spreading false news", 20.2% did not respond, while more than 18% disagreed.

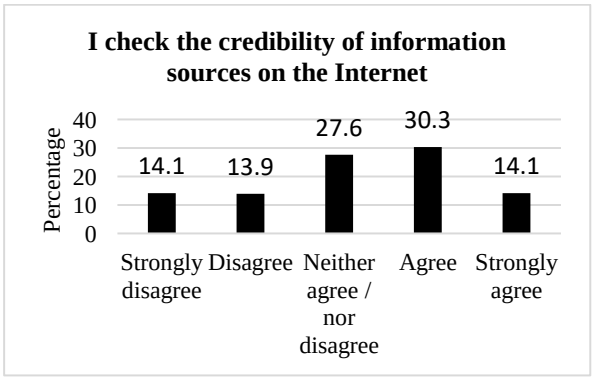


**Figure 6.** Checking the credibility of information found online

Over 47% agreed they know how to share and comment an online article posted on social networks, 18.3% were indecisive, and 33% disagreed.

Over 32% agreed with the statement "I know how to subscribe to and pay for online services (e.g. music service, e-books, etc.)", 50% disagreed, and 17.8% did not respond. Majority of examinees are aware their online activities are being watched, since more than 63% agreed with the claim "I know my online activities are being watched and analysed for the purpose of adjusting advertising messages.", 18.9% were indecisive, and 17.8% disagreed.

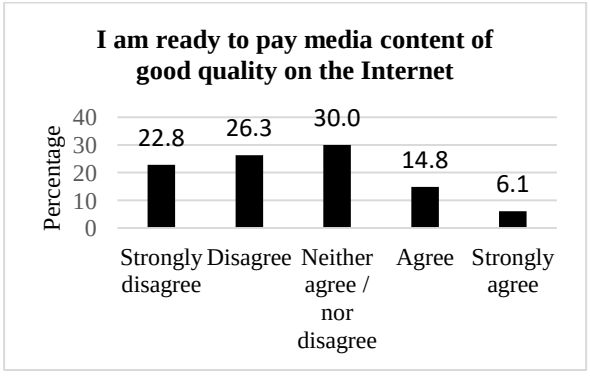


**Figure 7.** Willingness for payment media content of good quality on the Internet

Only 20.9% of participants are ready to pay for online media content of good quality, 30% did not provide their opinion, while over 49% disagreed. Related to data protection, 60.8% agreed they "know that protection of personal data and Internet privacy are regulated by General Data Protection Regulation in European Union (GDPR)", 23.3% did not express their opinion, while only 15.9% disagreed.

# 5 Discussion and conclusions

This paper presented methodology for developing an instrument for measuring needs of vulnerable groups in terms of digital inclusion, focusing on access to the Internet, digital competences, and usage of e-services. The proposed methodology ensures content validity of the instrument in relation to the goals defined by the project, and accessibility and understandability of the questionnaire by the target population.

Results of the survey with 540 participants illustrate the use of the instrument. To the best of authors' knowledge, there is no comparable study with similar target group(s) and a questionnaire. Results of the survey provided answers to research questions. They show that vulnerable groups do use digital technologies and the Internet, only 10.7% declared not using the Internet at all. Vulnerable groups most often access the Internet by mobile connection (using a smartphone) or fixed connection at home. Cost of access and devices, slow Internet connection, and concerns regarding privacy and identity theft were the most significant obstacles to using digital technologies and the Internet. More than 50% of participants do not use digital public services at all, or do not think they need them. Related to Media Literacy, 65.2% participants easily find necessary information online. Less than half of participants (44.4%) check the credibility of information found online. Over 61% critically consider the accuracy of information prior to sharing them in order to avoid spreading false news. However, only 20.9% of participants are ready to pay for online media content of good quality.

The presented research results can be of great help to the creators of policy and strategy at the local and the national level, because they provide insight into a broad spectrum of aspects of digital inclusion of vulnerable groups. Recommendations that could be derived from these results are that the first goal of a strategy should be to raise public awareness about the need for digital inclusion of vulnerable groups in the context of the digital transformation of public administration, and the gradual migration of public services to the Internet. Traditional media, which are still the main source of information for senior citizens who do not use the Internet, should play an important role in information campaigns. Digital inclusion strategies and operational plans should envisage the development of digital inclusion centres in which citizens, who do not know or cannot use online

services, can receive assistance, advice, and basic training. The existing network of public libraries could partly ensure the needed infrastructure. By providing additional services for the development of digital and media literacy, libraries could also increase their own sustainability in the 21st century. Citizens' associations that bring together and provide services to senior citizens and people with disabilities should be assisted in building capacity to provide digital literacy services to their members. Digital Competence Framework for Citizens (DigComp) could be used as a reference document for the development of training content. This would simplify the exchange of best practices between Croatian and European digital literacy training providers. Digital inclusion strategies and operational plans should ensure resources for the training of trainers who will be conducting training for vulnerable groups. Intergenerational learning, organized within the civic education of high school students, should be considered as an option to increase digital literacy of elderly. The implementation of the strategies should be evaluated on a regular basis, in order to achieve the EU's digital transformation goals by 2030.

The main limitation of this research is the use of snowball sampling in a limited number of Croatian counties. This limits generalizability of results to the national level. While the choice of counties included in the survey was dictated by the project goals, the snowball sampling, even though a non-probabilistic method, was a method of choice, due to the fact that target vulnerable groups are hard-to reach, and may not be willing to participate in the research, unless contacted by a person of trust. This was particularly relevant, since the survey was conducted during the period of high COVID-19 incidence.

Future research could extend the survey to include other counties in the Republic of Croatia. Further data analyses will include break-down by vulnerable group and county, as well as multivariate analyses. Finally, results will be used to formulate policy recommendations at the local, regional and national levels.

It is important to note that the developed measurement instrument can be used not only in Croatia, but also in other countries at both national and regional levels.

## Acknowledgments

This work has been fully supported by European Social Fund (ESF) under the project “Digitalna.hr”, implemented by the Croatian Digital Literacy Network (UP.04.2.1.06).

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