

SENSITIVITY TO THE NEEDS OF THE SENIORS AND THE DIGITALIZATION OF MUNICIPALITIES

Dariusz GRABARA^{1*}, Ewa ZIEMBA², Aldona FRĄCZKIEWICZ-WRONKA³

¹ University of Economics in Katowice, Department of Business Informatics and International Accounting;
dariusz.grabara@uekat.pl, ORCID: 0000-0003-3965-9355

² University of Economics in Katowice, Department of Business Informatics and International Accounting;
ewa.ziemba@uekat.pl, ORCID: 0000-0002-1084-7497

³ University of Economics in Katowice, Department of Public Management and Social Sciences;
aldona.frackiewicz-wronka@uekat.pl, ORCID: 0000-0002-7077-1068

* Correspondence author

Purpose: The research aims to identify a relationship between the digitalization of municipalities and their sensitivity to the needs of seniors.

Design/methodology/approach: The objective of the paper has been achieved by employing a set of questions to detect seniors' needs and the level of municipalities' digitalization. The analysis was conducted using a classification tree based on the CHAID (Chi-square Automatic Interaction Detection) technique. The proposed approach allows us to identify significant digital predictors that impact the improvement of sensitivity to the needs of seniors.

Findings: Three significant factors of municipalities' digitalization in affecting sensitivity to the needs of seniors have been identified: municipalities' transparency and accountability growth through digitalization, reduction of social exclusion through digitalization, and municipal office support for digitalization.

Research limitations/implications: The main limitation of the study is a possible inconclusive understanding of digital tools and their role in dealing with seniors' problems. In future research, further development of a precise level of analyzed tools is proposed as well as additional development of the decision trees division algorithms.

Practical implications: The research highlights that municipalities' transparency and accountability growth through digitalization, reduction of social exclusion through digitalization, and municipal office support for digitalization positively affect municipalities' sensitivity to the needs of seniors.

Social implications: Growing sensitivity to the needs of seniors is a primary concern in rapidly aging societies. Research results reveal that this concern can be addressed through the digitalization of municipalities and the adoption of digital tools to reduce social exclusion. In the long term, these digital tools should enhance the quality of life for seniors.

Originality/value: The novelty of the paper lies in the establishment of a fast and significant factors detection method by employing the CHAID algorithm. Another novelty is the identification of transparency improvement of municipalities as a significant predictor in addressing the needs of seniors, observed in three out of four models. This finding is particularly relevant for municipal managers who are tasked with addressing issues related to an aging society and seniors' concerns.

Keywords: public management, municipalities, sensitivity to the needs of seniors, digitalization, CHAID algorithm.

Category of the paper: research paper.

1. Introduction

Developments in information and communication technology (ICT) have moved many forms of social life into digital space. This means that ways of solving existing social problems can be looked at from a different perspective.

One of the growing social issues – the mitigation of which is seen in the use of ICT – is the rapid growth of the 60+ means senior population in Europe. The needs of seniors in today's world are often related to health ailments (Rostgaard, 2012), but cannot be seen solely from a medical perspective. Seniors can participate in urban and rural life more than ever before thanks to digital tools and services offered by digitalization. However, this fact poses a challenge to the management of municipalities, which generates a new type of clients who, without these tools, would not be able to meet their needs in person. Thus, it establishes a link between municipalities' digitalization and the detection of the needs of seniors, which can be met with appropriate digitalization applications.

Access to the Internet and the ability to use the opportunities it offers is now no longer just a convenience in citizens' daily lives, but a prerequisite for their full participation in social, professional, and cultural life. Lack of Internet access and the ability to use it leads to digital exclusion (e-exclusion), defined in European Union documents as exclusion from functioning in the information society. This type of social exclusion and the associated information exclusion are predictors of lower quality of life and lower subjective psychological well-being. The European Commission publishes annually the results of the Digital Economy and Society Index (DESI), which tracks the progress made in EU Member States on digital competitiveness in the areas of human capital, broadband connectivity, digital integration by businesses, and digital tools in the delivery of public services (EC, 2022). Although the COVID-19 pandemic significantly accelerated the digitalization process and raised the average value of the index for Member States, the value for Poland fell slightly between 2021 and 2022 (down from 41 to 40.5pct).

According to a survey by the Central Statistical Office conducted in 2019, 54.4 percent of people aged 65-74 had never used a computer, while only 37.0 percent of people in this age group used the internet, and although there was a decrease in the percentage of older people not using the internet during the COVID-19 pandemic, it is still high in Poland. According to CSO data published in 2021, this was close to 48% of people in the 65-74 age group and around 25% of those aged 55-64. Moreover, a significant proportion of older users with access to the

Internet used the Internet only to a limited extent, not coping with many new functionalities (Frączkiewicz-Wronka et al., 2023).

In the context of demographic changes taking place in Poland, characterized above all by the dynamic process of aging of the population, the problem of digital exclusion of senior citizens acquires particular importance and poses a particular challenge both for public authorities and for citizens themselves. Specific organizational, financial, and educational measures to prevent cyber-exclusion of the elderly should be taken both by central authorities and local self-government units.

Our research focuses on the role of municipalities' sensitivity to the needs of seniors. It aims at identifying the relationship between the digitalization of municipalities and their sensitivity to the needs of seniors.

The rest of the paper is structured as follows. The next section reports hypotheses developed based on the literature. Then, the methodology followed in this work is presented. In the latter two sections, the research results are reported with their discussion. The last section concludes our work.

2. Literature review

Digital technologies, especially information and communication technologies (ICTs) such as computers, smartphones, and tablets, permeate all aspects of our lives (Castells, 2010). ICT can provide significant benefits to older people and is becoming increasingly important for accessing services (for example, digital health), circulating information and building and maintaining social relationships (Tomczyk et al., 2023; Tomczyk et al., 2022). Although access to the Internet through these devices has become widespread research results show significant differences in use between age groups (Schulz et al., 2015) and some studies confirmed that older people are particularly at risk of digital exclusion (Seifert, Rössel, 2019). As numerous research findings indicate, the low use of ICT by older people is due to, among other things, the following barriers: (a) psychological because older people show higher levels of computer anxiety (Silver, 2015), frustration with user interfaces (Hussain et al., 2017), negative attitudes towards technology (Kamin, et al., 2017), concerns about online security issues, mainly with personal data (Hussain et al., 2017); (b) health-related, e.g. poor eyesight, cognitive impairment (Hussain et al., 2017); (c) socio-economic, mainly educational level and low income (Neves, Amaro, 2012); (d) resulting from insufficient interventions by public actors supporting the digital inclusion of older people (Černá, Svobodová, 2018).

The analysis and synthesis of the barriers affecting the level of digital exclusion of older people formed the basis for the formulation of a new approach identifying the barriers to digital exclusion and the role of the institutional setting in counteracting it (Rohner et al., 2020). The referenced researchers found that the use or non-use of ICT in later life is – in essence – not the result of a conscious decision or an individual learning process. It is a consequence of the activity of various agents, i.e. organizations/institutions operating within the social field in which the older person lives and of the relationship between citizens and agents/entities. From this perspective, not using the Internet in later life is not an individual process, but "co-constituted in a social field composed of actors, discourses and power relations" (Wanka, Gallistl, 2018).

The latter statement implies that how an older person uses ICT is not only the result of their individual activity or the support provided by relatives, friends, and other supportive people. Above all, it is the result of the influence of agents/entities/institutions, especially public ones involved in activities that shape the skills and opportunities to use or not use ICT in later life (Gallistl, Nimrod, 2019; Neven, Peine, 2017). Therefore, to develop a full understanding of the determinants of digital use and non-use in later life, it is necessary to consider not only the older person but also to ask what public management practices shape their attitudes towards ICT use and how these relate to daily lives of older people in the community. This means seeking answers to questions about the preparedness of municipal offices to deliver public services to citizens using the instruments of digitalization and digitization to do so and, as a consequence of this process, laying the foundations for a dialogue between citizens and public authority.

Some studies confirmed that the digitalization of municipalities is positively associated with the level of e-participation (Ziemba, Grabara, 2023; Stratu-Strelet et al., 2021). Therefore, it can be assumed that the digitalization of municipalities can also affect municipalities' sensitivity to the needs of seniors. E-participation pertains to the utilization of ICT to engage citizens, also seniors in public policy and decision-making processes, as well as designing and delivering e-government services in a manner that is participatory, inclusive, and deliberative (UN, 2018). It comprises a wide range of components including e-information, e-consultation, e-decision-making, e-petition, e-referendum, e-lobbying, e-voting, as well as e-design and e-creation (Roztock et al., 2022; UN, 2018). Furthermore, e-participation is driven by ICT adoption in municipalities (Ziemba, Grabara, 2023) and is shaped by various technological, economic, cultural, and management factors (Ziemba, 2021). These factors influence the digitalization strategy of municipalities, which, among others, includes electronic government development, improving the quality of ICT infrastructure, enhancing transparency and accountability through ICT, optimizing the efficiency and effectiveness of municipalities' processes and communication through ICT, reducing social and cultural exclusion through ICT, and promoting democratic public decision-making through ICT.

At the same time, it should be emphasized that equally important, if not more so, for the successful adoption of ICT in municipalities and the digital inclusion of older people, are the conditions highlighted by the Venkatesh team in their research (Venkatesh et al., 2003) in formulating the so-called Unified Theory of Acceptance and Use of Technology (UTAUT). The original and extended UTAUT models have been used to examine technology acceptance in various sectors, including e-government (Gupta et al., 2008; Chan et al., 2010) and healthcare (Chang et al., 2007), which is particularly important for the municipality's sensitivity to the needs of seniors. Four factors play a key role in this theory, directly influencing the intention to use and, consequently, behavior. These factors are performance expectancy, effort expectancy, social influence, and facilitating conditions.

3. Research questions and hypotheses

3.1. Research questions development

Based on the literature the following survey questions were indicated:

- four questions detecting municipalities' sensitivity to the needs of seniors (Table 1); and
- 13 questions detecting the digitalization of municipalities divided into two groups: digitalization strategy and the usage of digital tools in municipality offices (Table 2).

Table 1.

Questions aimed at detecting municipalities' sensitivity to the needs of seniors

Question number	Question	Literature source
109	Your municipality office has prepared and conducted special training on the use of digital tools for seniors	Wanka, Gallistl (2018) Gallistl, Nimrod (2019); Neven, Peine (2017)
110	In your municipality office, there is an employee/department responsible for collecting information from various public entities about the issues faced by seniors in using electronically provided services	
111	Other public or social organizations in your municipality have raised funds to purchase and donate notebooks and/or computers to seniors	
112	Other public or social organizations in your municipality have raised funds for training in strengthening digital skills among seniors	

Source: own work.

Table 2.*Questions aimed at detecting the digitization of municipalities' digitalization*

Question type	Question number	Question	Literature source
Digitalization strategy	V97	There is an information strategy in your municipality embracing the adoption of digital tools for building and improving electronic government	Ziemba (2021)
	V99	No technological barriers are limiting the use of digital tools in your municipality office	
	V102	The transparency and accountability of your municipality office have increased through digitalization	
	V103	Processes and procedures as well as communication, cooperation, and networking within your municipality office and with other offices have been automated and improved through digitalization	
	V105	Social exclusion of residents based on age, education, place of residence, or disability, the causes of which lay in limited and impeded participation/participation in social or collective life and limited or impeded access to public services and social institutions, have reduced through digitalization	
	v106	The participation of residents in public consultations and democratic public decision-making has increased, as well as cooperation, communication, partnerships, and networks with residents have developed	
Digital tools usage	V65	You perform your municipality tasks faster by using digital tools	Venkatesh et al. (2003)
	V66	The use of digital tools is necessary for the effective resolution of residents' issues	
	V67	The use of digital tools increases residents' satisfaction with your services	
	V70	A large number of employees in your municipality office use digital tools in their daily work	
	V73	Using digital tools is easy and hassle-free for you	
	V76	You have been provided with the resources necessary to use digital tools (software and hardware)	
	V78	Your municipality office supports (e.g., through training) the use of digital tools by employees in their interactions with residents	

Source: own work

3.2. Research hypotheses development

Based on the developed survey questions, the following hypotheses have been formulated and categorized into partial hypotheses:

H1: Digitalization strategy and the usage of digital tools in the municipality affect the digital training of the seniors.

H1.1: Digitalization strategy in the municipality affects the digital training of the seniors.

H1.2: The usage of digital tools in the municipality affects the digital training of the seniors.

H2: Digitalization strategy and the usage of digital tools in the municipality affect access to information about seniors' problems in using the municipality services provided electronically.

H2.1: Digitalization strategy in the municipality affects access to information about seniors' problems in using the municipality services provided electronically.

H2.2: The usage of digital tools in the municipality affects access to information about seniors' problems in using the municipality services provided electronically.

H3: Digitalization strategy and the usage of digital tools in the municipality affect acquiring funds to purchase and donate notebooks and/or computers to seniors.

H3.1: Digitalization strategy in the municipality affects acquiring funds to purchase and donate notebooks and/or computers to seniors.

H3.2: The usage of digital tools in the municipality affects acquiring funds to purchase and donate notebooks and/or computers to seniors.

H4: Digitalization strategy and the usage of digital tools in the municipality affect acquiring funds for training in strengthening digital skills among seniors.

H4.1: Digitalization strategy in the municipality affects acquiring funds for training in strengthening digital skills among seniors.

H4.2: The usage of digital tools in the municipality affects acquiring funds for training in strengthening digital skills among seniors.

All the explanations' predictors were assumed to be included in a set of explanations factors per each question detecting the sensitivity of the needs of seniors. If at least one predictor has been found significant the specific hypothesis was confirmed. However, if no partial hypothesis of the main hypothesis (H1, H2, H3, or H4) was found significant then the main hypothesis was also found insignificant. Lastly, if only one of the specific hypotheses of the main hypothesis was found significant then the main hypothesis was found only partially confirmed.

4. Material and methods

4.1. Research instrument and data collection

This study is a part of od study on 'The digital economy' - a model approach to supporting the inclusion of cyber-excluded older people in the use of social services provided in a post-pandemic world by public management entities using ICT (2022_2023). Research has been conducted in the form of a questionnaire. The Likert-scale instrument – a survey questionnaire – was employed in this study. The scale's assessment was: 5 – strongly agree, 4 – rather agree, 3 – neither agree nor disagree, 2 – rather disagree, and 1 – strongly disagree. The task of respondents was to answer the question listed in Tables 1 and 2.

LimeSurvey software was used to implement the survey questionnaire. The sample was created based on data obtained from the Public Information Bulletin, which included a list of all local government entities in Poland. To ensure that the sample was representative and that all types of entities were represented, stratified random sampling was used. The differentiating feature of local government units was their membership in a NUTS macro-region. Individual strata had an even allocation to ensure that macro-regions could be compared with each other. Each stratum had a structure corresponding to the differentiation of institutions in terms of their type (urban municipality office, urban-rural municipality office, rural municipality office). As of 1 January 2023, the administrative division of Poland comprised – 2 477 local government units on the gminas level, including 302 municipal, 677 rural-municipal, and 1498 rural). To draw the units for the survey, an algorithm drawing numbers without repetition created in an Excel spreadsheet was used. The operator of the local government units was submitted to the CATI studio and totaled 1,500 records. The data were collected between December 6, 2022, and December 21, 2022. A response ratio of approximately 25% was achieved, meaning that approximately one in four or one in five questionnaire interviews was successful. In the end, 357 local government units were surveyed. The average time taken to complete one questionnaire interview was 57 minutes,

4.2. Data analysis

To assess the importance of the factors affecting the sensitivity to the needs of seniors, the classification tree (also named decision tree) model Chi-square Automatic Interaction Detection (CHAID) was chosen. CHAID is widely used in surveys about cities and sustainability (Ferreira et al., 2022), enterprises leadership studies (Milanović and Stamenković, 2016) or marketing research (McCarty, Hastak, 2007), and thus it is useful for analyzing categorical variables and identifying underlying relationships. CHAID is an extension of the chi-square test of independence for AID (Automatic Interaction Detection) and can handle both categorical and continuous target variables. One of the key advantages of CHAID is that it is capable of splitting the set of observations using the most significant predictor. The method is partitioning the data into subsets that best describe the dependent variable. Subsets are mutually exclusive and exhaustive (Kass, 1980). The procedure is based on the method of recursive partitioning. The process of partitioning is shown on the tree, which is in the basic graph with the tree structure (Walesiak, Gatnar, 2009).

Analysis was provided using MS Excel 2021 (Microsoft) software for data gathering and statistical computation was carried out using SPSS v.28 (IBM, Predictive Solutions).

5. Results

5.1. Respondents profile

A total of 357 respondents completed the questionnaire. Basic descriptions of the analyzed municipality offices are provided in Table 3.

Table 3.
Description of the surveyed municipal offices

Element		Frequency	Percentage	Cumulative percentage
Municipality office type	Rural	177	49.6%	49.6%
	Rural-municipal	104	29.1%	78.7%
	Municipal	76	21.3%	100.0%
	Total	357	100.0%	
Turnout in recent local elections by respondent	Low	136	38.1%	38.1%
	High	221	61.9%	100.0%
	Total	357	100.0%	

Source: own work.

5.2. Models summary

The results of the summary models are presented in Table 4, whereas the classification trees are provided in Figures 1 – 4. The procedure provided four classification trees. For models with variables V109, V110, and V112 there was only one significant predictor found per each model, i.e., V102, V105, and V102 respectively. Only in model V111 there were two significant predictors, i.e., V102 and V78.

Overall, the percentage of correctly predicted observations was found to be more than 40% for each model with a maximum of 48.7% for model V111, and a minimum of 41.2% for the least correctly predicted model V109.

Table 4.
Classification models summary

Element description	Model results			
	V109	V110	V111	V112
Dependent Variable	V102	V105	V102, V78	V102
Independent Variables Included in the Model	V102	V105	V102, V78	V102
Number of Nodes	3	3	5	3
Number of Terminal Nodes	2	2	3	2
Depth	1	1	2	1
Overall Percent Correctly Predicted Observations	41.20%	46.80%	44.30%	48.70%

Source: own work.

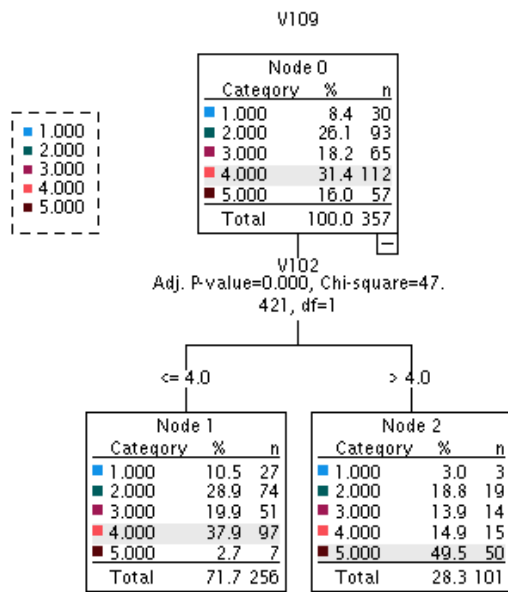


Figure 1. Model V109 classification tree.
Source: own work.

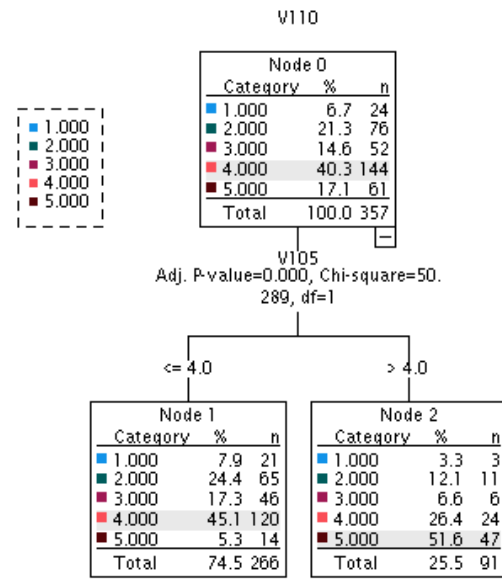


Figure 2. Model V110 classification tree.
Source: own work.

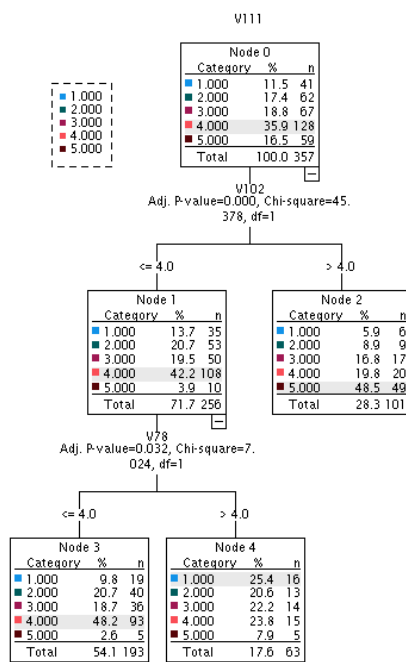


Figure 3. Model V111 classification tree.
Source: own work.

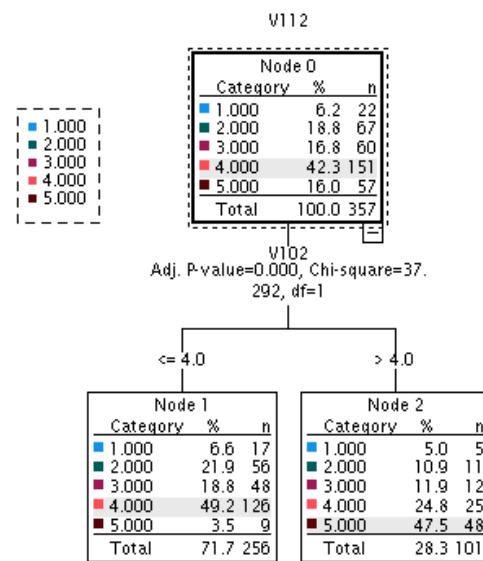


Figure 4. Model V112 classification tree.
Source: own work.

6. Discussion

The discussion was carried out for each model and the similarities and differences between the models.

6.1. Model V109

Hypothesis H1 was related to the preparation and conduction of training by municipal offices on the usage of digital tools for seniors. In the procedure, only predictor V102 was found significant in providing classification. Predictor V102 is related to the improvement of transparency and accountability of municipality offices through digitalization. Thus, could be concluded that H1 is only supported partially and only the digitalization strategy in municipality offices affects the sensitivity to the needs of the seniors (H1.1), whereas the usage of digital tools in municipality offices does not affect such sensitivity (H1.2). Thus, H1 is only partially supported by hypothesis H1.1.

It is observable that accountable organizations in the seniors' healthcare sector provide teaming strategies in all care settings (Gorbenko et al., 2016). Kane and Cutler (2015) argued that greater consumer transparency fueled the progress of attending to seniors' needs. **In the study, progress is represented by digitalization and thus, also could lead to the conclusion that the better transparency level and more accountability are provided through digitalization usage, the more training capability of the office is aimed at seniors' needs.**

6.2. Model V110

Hypothesis H2 was associated with municipal employees' access to information about seniors' problems in using the municipality services provided electronically. In the procedure, predictor V105 was found significant in providing classification. The model results exhibit the same behavior as model V109, with only one significant predictor. Thus, could be concluded that H1 is only partially supported and states that digitalization strategy in municipality offices affects the sensitivity to the needs of seniors (H2.1), while the usage of digital tools in municipality offices does not affect such sensitivity (H2.2). However, in model V110, the most important is a reduction of social exclusion (V105).

The findings are in line with other studies. Johnson et al. (2018) reported that sociodemographic factors have no impact on complex care for older adults, however, they admitted that they cannot see the whole perspective. In the light of other studies like Schwitter et al. (2012), social exclusion, however, is significant. This conclusion is also true for the digital exclusion of seniors as shown by Ciesielska et al. (2022). Those findings are also corroborated by the presented study. **The model not only confirms the common sense notion of providing special care by employees for marginalized seniors but also emphasizes that this is the sole and most crucial aspect of delivering digitalization services to seniors.**

6.3. Model V111

Hypothesis H3 was related to acquiring funds from public or social organizations to purchase and donate notebooks and/or computers to seniors. In the procedure, predictors V102 and V78 were found significant. While V102 is related to the transparency and accountability of municipality offices, predictor V78 is associated with the support of municipality offices (e.g., through training) for employees to use digital tools in their interactions with residents. Thus, it can be concluded that H3.1 and H3.2 are supported, and finally H3 is also supported.

The findings are in line with other studies. Rostgaard (2012) argued that the complexity inherent in providing home help for seniors necessitates political and administrative transparency in allocating funds for healthcare. **Even if in the presented study the most important is to get proper notebooks and/or computers by the seniors it is a help for seniors. However, it also generates the need for transparency. It is in line with the idea of using different available funding methods by seniors. To get funds, the training of the employees (and in a more particular sense training personnel in helping seniors to get the funds) is especially important.**

6.4. Model V112

Hypothesis H4 was related to acquiring funds for training in strengthening digital skills among seniors. In the procedure, only predictor V102 was found significant. This is the same predictor as in model V109. Once again, the improvement of transparency and accountability of municipality offices through digitalization is the most important factor for attending to seniors' needs. Thus, H4 is only partially supported by hypothesis H4.1

The findings are in line with other studies. Arroyo-Menéndez et al. (Arroyo-Menéndez et al., 2022) argued that digital skills stay in relationship with the income of the seniors, and thus in the presented study, the connection is also found. **However, fund spending on the skills rising should be provided transparently. It could be also perceived in the context that the more transparent spending, the more organizations join digital skills improvement programs for seniors.**

6.5. Model summary

A summary of hypotheses verification is presented in Table 5.

Table 5.
Summary of hypotheses verification

Hypothesis	Supported?	Partial hypothesis	Supported?
H1	Partially	H1.1	Yes
		H1.2	No
H2	Partially	H1.1	Yes
		H1.2	No
H3	Yes	H1.1	Yes
		H1.2	Yes
H4	Partially	H1.1	Yes
		H1.2	No

Source: own work.

While only one hypothesis (H3) was found to be fully supported, no hypothesis was not backed at all by the results. From this perspective, it may be concluded that digitalization affects all kinds of seniors and municipality office interactions. Thus, through digitalization, the overall quality of life of the seniors may be increased and municipality offices are much more sensitive to the needs of seniors.

7. Conclusions

Digitalization is affecting every aspect of people's life. However, it is little known how digital technology affects the intersection of the municipality offices and life of the seniors who happen to be simultaneously the most resistant to technology group of society in general. Existing models pointing to computer anxiety as preventing further its acceptance and digital exclusion such as those developed by Phang et al. (2006) confirm it. The presented study contributes to the development of theory by introducing models of decision trees to find significant factors related to the digitalization of municipalities that affect municipality sensitivity to the needs of seniors.

From a practical point of view, the research directs practitioners responsible for carrying the needs of seniors to particular solutions. In the context of predictor V78 managers or employees responsible for digitalization should take special care in providing enough support for digitalization introduction when dealing with seniors, while legal and social welfare departments should concentrate on digital tools related to transparency and accountability of the municipality offices (predictor V102), and social exclusion (predictor V105).

Although the study has been provided on a wider sample of offices, there are some limitations. The first limitation is the understanding of the role of digital tools and situations by the respondents. The interdisciplinary character of research includes knowledge from the digitalization field and familiarity with the needs of seniors, which can be difficult in achieving. The problem is shown in not as high efficiency of prediction of decision trees. However, the weaker performance pertains only to negative answers. Thus, in future research,

it is proposed to pay special attention to further help available for respondents who have no experience in one of the fields. The second concern is a further expansion for the usage of the decision trees to consider additional algorithms of dataset division.

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