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Assessment of E-Government Inclusion Policies Toward Seniors: A Framework and Case Study

Abstract

Digital exclusion of seniors covers both social and technical drivers that affect the magnitude of this phenomenon. It arises from the fear of technology, reduced manual and mental abilities, socio-economic status, and also the mismatch between the technological environment and the needs of the elderly. The consideration of the needs of seniors are mainly implemented through social policies while the provision of government services is achieved through digitization policies and procedures. Our research is addressing two objectives. The first objective is to identify the main determinants affecting the adoption of e-government and its use by seniors. The second objective is to build a research framework for assessing e-government policy for the digital inclusion of the seniors from both social and technical perspectives. This research framework is then validated based on a case study of Poland. Presented framework proves to be a useful tool to evaluate and depict the areas of improvement for a comprehensive e-government policy toward seniors' inclusion.

Keywords: digital inclusion, seniors, elders, electronic government, public policy, assessment

1. Introduction

Digital inclusion in e-government services - and the uneven access to them (called ‘digital divide’) - is a problem that has been studied extensively in recent years and decades. Data on seniors indicate that in the last ten years the percentage of the world population aged 65 and over has increased from 7.6% in 2010 to 9.1% in 2019 (OECD, 2001), and in the European Union it equals 20.5% in 2019. While the overall use of digital technologies and internet by seniors has increased from 60% (EPRS, 2015) to 89% between 2014 and 2019 (Eurostat, 2021a) still only 45% of them (aged 65-74) go online more than once a week. Numerous studies show age, education, socioeconomic status, access to technology, training and trust are important factors affecting the digital divide (Abad-Alcalá, Llorente-Barroso, Sánchez-Valle, Viñarás-Abad, & Jiménez, 2017; Botrić & Božić, 2020; Nilpong & Thanasopon, 2020; Phang et al., 2006; Rose, Holgersson, & Söderström, 2020). Digital transition of most public institutions and operations is accelerated by the coronavirus pandemic that struck the world in early 2019. Public authorities had to switch the provision of government services to the public away from the traditional to fully electronic forms. This context became particularly critical for the seniors who suffered the double hit: one of the pandemic, because with higher health risks the other being exposed to the digital divide (Ciesielska et al., 2022).

Recent research confirms the presence of a dynamic change and proactive attitude with respect to use of e-government by the elderly (Rodriguez-Hevía, Navío-Marco, & Ruiz-Gómez, 2020). However, in terms of improving the use and the penetration of the e-government services for the seniors, it is essential that a consolidated and aligned approach is adopted by public administration including complex socio-technical conditioning. Still, the literature is lacking a holistic basis for a comprehensive assessment on the level of support of e-government inclusion policies toward seniors. Based on the above motivation, our research is addressing two objectives. The first objective is to provide insights into the main determinants that need to be considered in e-government policies to support the digital inclusion of elders. For this, we adopted a mixed approach toward policy investigation regarding the senior-related context, including literature review, expert evaluation and qualitative case study methods. The socio-technical-system (STS) model was used to reach the second objective of our research - to develop the research framework for assessing e-government policy support regarding the digital inclusion of seniors. This research framework is validated based on a Polish case study. The validation of the research framework proves to be a useful tool for the assessment of public policy toward the inclusion of seniors since it incorporates both social and technical determinants reflected in the policies and clearly reveals the improvement areas.

The structure of the paper is as follows. Section 2 provides literature review on digital exclusion of seniors, use of e-government services by seniors, and e-government performance. Section 3 provides the information on the research design and methods. Section 4 presents the research framework, while Section 5 presents the results of research framework validation. Section 6 discusses the findings, and Section 7 presents concluding remarks.

2. Literature review

This section consists of three subsections. Section 2.1 presents the conceptualization of digital exclusion of seniors. Section 2.2 explores e-government performance. Section 2.3 provides the use of e-government services by seniors.

2.1. Digital exclusion of seniors

The digital divide is defined as "*the gap between individuals, households, businesses, and geographic areas at different socioeconomic levels with regards both to their opportunities to access ICTs and to their use of the internet for a wide variety of activities*" (OECD, 2001). Digital divide referring to the access to information was investigated by (DiMaggio & Powell, 1991; Gyamfi, 2005; van Dijk, 2006). Scholars distinguish 'first-level' digital divide referring to Internet use and frequency of Internet use (Bagchi, 2005; Ferro, Helbig, & Gil-Garcia, 2011; Lachman et al., 1998). The 'second-level' of digital divide pertains to technology use (Fairlie, 2005; Hubregtse, 2005), skills and literacy (Dwivedi & Lal, 2007; Liao & Chang, 2010; Moon, Park, Jung, & Choe, 2010; Shirazi, Gholami, & Añón Higón, 2009; S. Zhao & Elesh, 2007) accounting for the gaps in the first-level digital divide (Friemel, 2016). Since the studies of (Hollifield & Donnermeyer, 2003; Middleton & Chambers, 2010; Noce & McKeown, 2008), age has become an important aspect ICT use, and the digital divide become an object of wide scientific recognition (Akhter, 2003; Demunter, 2005; Friemel, 2016; Leist & Smith, 2014; Srinuan & Bohlin, 2011; Wei, 2012). Currently, with the demographic changes in developed world populations, it is predicted that elderly will be one of the major consumers of information and services (Rose et al., 2020).

Digital exclusion is a concern for the European Union institutions and the involvement of seniors is widely acknowledged within the EU policy recommendation "Bridging the digital divide in the EU" (EPRS, 2015), indicating the dimensions of inclusion as inter-country divisions (i.e., North-Western countries vs. South-Eastern countries), intra-country divisions (urban vs. rural areas), social class and - also - age. According to Eurostat (Eurostat, 2021b) the percentage of individuals using the Internet to interact with public authorities (e.g. obtaining information via websites, downloading or submitting official forms) across the 28 EU countries has only reached 64% in large cities, 54% in towns and suburbs, and 50% in rural areas. Moreover, as the literature indicates, the seniors go online at a lower rate than do younger generations (Botrić & Božić, 2020; Cáceres & Chaparro, 2017). In this regard, several digital divide related themes are mentioned in the 2020 UN e-Government Survey (United Nations, 2020), e.g., access, affordability, age, bandwidth, content, disability, education, gender, migration, location, mobile, speed and useful usage (Yera, Arbelaitz, Jauregui, & Muguerza, 2020).

Many studies search seniors' aversion toward emerging technologies (Abbey & Hyde, 2009; Beynon-Davies, 2007; de Koning & Gelderblom, 2006; Dwivedi & Lal, 2007; Flamm & Chaudhuri, 2007; Goldfarb & Prince, 2008). Several factors affect the digital divide, among them are: low income, limited education, low level of literacy, minority background, employment status, age, residential area, disability, gender, single parent, race, and social class (Helbig, Gil-García, & Ferro, 2009; Okunola, Rowley, & Johnson, 2017). A study by (Friemel, 2016) identifies the reasons for not using the Internet amongst seniors, including too complicated use, considerable learning effort required, security fears, concerns over technical difficulties, help from another person to search for information and send messages, high expenses, no support, loss of hearing and limited vision, obnoxious content, problems with memory, low credibility of the content, lack of time and dexterity, etc. A study by (Rose et al., 2020) points out how education can improve the digital inclusion for the seniors, finding the main causes of digital exclusion are 1) fear which is primarily associated with a lack of the knowledge and experience, 2) the feeling of being too old to absorb new digital technologies, and 3) the negative attitudes about these technologies. However, recent findings suggest that digital skills (rather than access and socioeconomic status) are important factors of the digital divide (Ebbers, Jansen, & van Deursen, 2016; Rodriguez-Hevía et al., 2020).

2.2. E-government performance

E-government has long ago proved to support building public value (OECD, 2003). Despite wide e-government benefits, most governments face the challenge of assessing its effectiveness and measuring the quality of service. Regarding performance, scholars point to identifying e-government indicators of various levels of e-government maturity (James & Petersen, 2018; Ojo, Janowski, & Estevez, 2005; Arayankalam,

Khan, & Krishnan, 2021) propose eleven indicators of e-government readiness. The role of website functionality of e-government services has been emphasized by (Cegarra-Navarro, Pachon, & Cegarra, 2012; Nimrod, 2011; Zheng, 2017) while (Van Der Merwe & Bekker, 2003) present website evaluation criteria. Many studies address the correlation between trust and citizen satisfaction, or citizen trust in government (Morgeson, Vanamburg, & Mithas, 2011; Arayankalam, Khan, & Krishnan, 2021). It is evident that e-government can increase process-based trust by improving interactions with citizens and perception of responsiveness (Janowski, 2015; Venkatesh, Thong, Chan, & Hu, 2016; Xie, Song, Peng, & Shabbir, 2017).

Four citizen-centric models for measuring e-government performance exists (Sigwejo & Pather, 2016), namely: (1) web-based e-government services - models focused on performance evaluation (Wang, Bretschneider, & Gant, 2005) with particular attention to security and privacy, usability, content, services, citizen participation, and features; openness and trust in e-government systems (Middleton & Chambers, 2010); (2) e-government services - models that enable evaluation of a) tools for measuring development; portal characteristics, and problems encountered while using the portal (Magoutas & Mentzas, 2009), b) quality of services in terms of reliability, efficiency, citizen support, and trust (Papadomichelaki & Mentzas, 2012); and c) identification of party, political ideology, trust and expectations (Morgeson, 2012); (3) e-government: models taking into account e-government maturity level, e-government stakeholders, and assessment dimensions (Esteves & Joseph, 2008), and developing criteria of assessment for an effective, adaptable, and reflective evaluation of e-government systems from the citizens' perspective: technical issues (performance, accessibility), as well as economic and social issues (Alshawi & Alalwany, 2009); (4) public value-models to identify critical factors of public value creation (Deng, Karunasena, & Xu, 2018). However, it is pointed that (1) there are too many measurement instruments regarding e-government that (2) do not reflect a holistic approach toward the measurement itself, (3) existing measurement instruments lack the framework depicting the relationships between the indicators and the use of resources, and (4) there is no theoretical framework for measuring the impact of e-government (Peters, Janssen, & van Engers, 2004; Sigwejo & Pather, 2016).

As a result of extensive literature analysis, 27 e-government performance determinants were extracted and grouped into ten categories. The methodology used for conducting the literature review is presented in section 3. Following 10 categories of e-government performance determinants are identified: (1) *Accessibility and Compliance* - a category ensuring that citizens are able to access online services (Kearns, 2004; Rose et al., 2020; Sigwejo & Pather, 2016); (2) *Security and Privacy* - a category allowing citizens to distinguish between trustworthy and untrustworthy services and information, and ensuring secure access (Bélanger & Carter, 2008; Das, 1987; Deng et al., 2018; Gomez & Gould, 2010; Pieri & Diamantinir, 2010); (3) *Personalized information and services* - the category easing citizens to search for the relevant e-services (Alshawi & Alalwany, 2009; Papadomichelaki & Mentzas, 2012; Reilly, Horan, Johnston, Stanley-Smith, & Colm Butler, 2003); (4) S*ervice performance* - the category related to information about the progress of a service once requested and feedback such as "your request was received and will be processed within 14 days" (Gauld, Goldfinch, & Horsburgh, 2010; Rose et al., 2020); (5) *Ease of use* - the category related to the user interface and experience and, a 'one-stop portal' (AlAwadhi & Morris, 2009; Bigdeli, Kamal, Cesare, Kamal, & Cesare, 2013; Davis, Bagozzi, & Warshaw, 1989; Deng et al., 2018; T. H. Y. Ma & Zaphiris, 2003; West, 2015); (6) *Transactions* - the category related to providing possibility for citizens to carry out the transactions with e-government services e.g. paying taxes online (Deng et al., 2018; Sakowicz, 2001); (7) *Benefits* - the category that e-government benefits are communicated to the citizens (AlAwadhi & Morris, 2009; Orviska & Hudson, 2009; Peter & Valkenburg, 2006; Phang et al., 2006; Tien & Fu, 2008; Waycott, Bennett, Kennedy, Dalgarno, & Gray, 2010); (8) *Education for e-government* - the category that provides opportunities to acquire new knowledge and the training programs on engagement with e-government (Rose et al., 2020); (9) *Awareness* - the category related to building awareness on the e-government services amongst the citizens (AlAwadhi & Morris, 2009; Baker & Bellordre, 2004; J B Lee & Porumbescu, 2019; Lim, Abdullah, & Chan, 2016; Pieri & Diamantinir, 2010); (10) *Individualism & collectivism* - the category that provides citizens' preferred means of accessing services (AlAwadhi & Morris, 2009; Ayouby, Croteau, & Raymond, 2012; Bagchi, 2005; Beynon-Davies & Hill, 2007; Chen, Lin, & Lai, 2010; Hubregtse, 2005; Mwim & Kritzinger, 2016; Srite, Thatcher, & Galy, 2008). Detailed description of the categories and the determinants provides Appendix A.

2.3. The use of electronic government services by seniors

The role of information and communication technologies in the delivery of the government services is well established in the body of literature (Gil-Garcia, Helbig, & Ojo, 2014; Janowski, 2015; Taylor, Lips, & Organ, 2007; Yang, Pardo, & Wu, 2014). The concept of e-government is also widely interpreted, and overall pertains towards using ICT in the provision of e-government services in support of government business processes, citizen engagement, accountability and transparency (Dawes, Gregg, & Agouris, 2004; Kim & Lee, 2012), thereby improving the conditions for social development. Despite the wide recognition, scholars identify challenges to the diffusion (Anthopoulos, Siozos, Nanopoulos, & Tsoukalas, 2006; J. Bertot, Estevez, & Janowski, 2016; Dwivedi, Weerakkody, & Janssen, 2012; Ferro & Sorrentino, 2010; Heeks, 2005) and e-government acceptance (De Róiste, 2013; Hofmann, Räckers, & Becker, 2012). Recent studies indicate that both the government's capacity and performance are significant determinants of the perceived usefulness of the e-government services (Mensah, 2020). Thus, e-government policy ought to consider citizen satisfaction as well as benefits from using e-government services (L. Ma & Zheng, 2018). Furthermore, the inclusion of the elderly, particularly those living in under-populated areas, should be taken into account as recommendations for policy (Botrić & Božić, 2020; Pontones-Rosa, Pérez-Morote, & Santos-Peñalver, 2021).

Elders are frequent users of social services related to the human life-cycle such as claiming and managing pensions, health insurance benefits, and the decline in physical mobility (Hong & Choi, 2020). The individual level, young age, higher education, a high social status, and living in an urban area were positively associated with a high probability of using internet-based health and social services (Fox & Connolly, 2018; Merkel & Hess, 2020). Although approximately four out of ten older adults are not aware of e-government services, age is a critical factor associated with their use (Hong & Choi, 2020). Recent study indicates that elders are leading in e-government use for information search via government websites (Botrić & Božić, 2020). Thus, still the perceived usefulness or perceived value of e-government use is key to increase its adoption, and to be reflected in the service design (Nam & Sayogo, 2011). Regarding e-government in the European context, it is proven that completeness of information, tailored communication, navigation, ease of understanding, multimedia, trust and response time (Nilpong & Thanasopon, 2020) are more important than the accessibility of its services for senior citizens (Abad-Alcalá et al., 2017).

Since the global tendency to use the "mobile-first" approach in design is widespread, the use of m-government among elders is the focus of a study by (Conci, Pianesi, & Zancanaro, 2009; Khan, 2016; Molnár & Kő, 2020). Mobile systems are better accepted by the elderly compared to traditional electronic services (Klier, Klier, Schäfer-siebert, & Sigler, 2020; Molnár & Kő, 2020). A study by (Ko, Molnar, & Matyus, 2019) draws attention to the perceived security and perceived usability of an application for seniors.

Several studies point to user interaction design for the elderly (Ko et al., 2019; Nacheva & Bakaev, 2020). According to Nielsen (Kane, 2019), user interface elements are more difficult for users with declining motor skills, particularly in touch interfaces. A general consensus that usability and acceptance are important factors exists in the literature (Hung, Chen, Yang, & Deng, 2013; W. A. Rogers & Fisk, 2010), and has been investigated through the unified theory of acceptance and use of technology (UTAUT) to explain internet acceptance and use by the elderly (Björn Niehaves & Plattfaut, 2014; Vassilakopoulou & Hustad, 2021). A study by (Phang et al., 2006) shows that seniors' use of e-government services is driven by their perceived usefulness, perceived ease of use, as well as the perception of internet safety.

Other studies concentrate on the engagement of seniors regarding e-government. A study by (J. C. Bertot, Jaeger, & McClure, 2008) revealed that government agencies do not systematically ask users for feedback on designed e-government services and resources. However, recent analyses tend to understand digital inclusion as a ladder of participation, a continuum of different gradations of access and use rather than a binary divide between haves and have-nots (Livingstone & Helsper, 2007; Rose et al., 2020). Lack of engagement can be a result of either involuntary exclusion or personal choice (Eynon & Helsper, 2011), caused by motivational and psychological factors (cognitive, emotional, and behavioural factors) (Abad-Alcalá et al., 2017). Nevertheless, the potential benefits of integrating older people into digital societies and e-government services can be vast, including reduced social isolation, increased IT-enabled communication with friends and family, active participation in a e-health system (Björn Niehaves & Plattfaut, 2014), long-term independence, and improved cognitive abilities (Vassilakopoulou & Hustad, 2021). Finally, scholars underline the importance of training the elderly in the use and acceptance of e-government (Hong & Choi, 2020; Jae Bok Lee & Porumbescu, 2019;

Rose et al., 2020). At the country level, the proportion of elderly people who participated in any training activity is positively associated with the proportion of elderly people using these services (Botrić & Božić, 2020). Literature serves a list of specific digital competencies for senior citizen inclusion derived from real-life situations of this particular community (Rose et al., 2020).

Some recent examples investigate the digital divide affecting seniors in relation to the health crisis caused by COVID-19 (Blažič & Blažič, 2020; Merkel & Hess, 2020; Saibene, Assale, & Giltri, 2020; Van Jaarsveld, 2020; Vigouroux et al., 2021). A study by (Bakshi & Bhattacharyya, 2021) indicates the perceived isolation of the elders during the health crisis caused by COVID-19 and points to concerns on cybersecurity, unclear technical instructions, and lack of a supportive learning environment as the blockers of active use of ICT by seniors. The study by (Ciesielska et al., 2022) provides guidelines for e-government policy to counteract side effects of e-governance for the national immunization program toward seniors.

As a result of extensive literature analysis of use of electronic government services by seniors, ten categories of e-government performance determinants were contextualized toward seniors' needs. The methodology used for conducting the contextualization is presented in section 3. Detailed description of the contextualized determinants of e-government performance for the policy of seniors' inclusion provides Appendix B.

3. Research Design and Method

This section consists of the following: Section 3.1 presents research questions. Section 3.2 provides the description of the research approach. Section 3.3 describes the strategy of research framework development. Section 3.4 introduces the process of research framework validation.

3.1. Research questions

The analysis of the collected literature revealed that there is a wide range of publications (1) addressing the need to include seniors in e-government and investigating factors influencing seniors' positive perception of e-government; and at the same time, (2) actively developing the framework for measuring e-government efficiency in increasing user satisfaction, increasing trust in government, and reducing the digital divide. Our analysis also revealed that there is an important gap in research on how e-government policies deal with overcoming the exclusion of the elderly population, and what criteria should be considered when developing a senior-oriented e-government strategy. Our research seeks to fill these gaps by addressing two objectives. The first objective is to identify the main determinants affecting the adoption of e-government and its use by seniors. The second objective is to build a research framework for assessing e-government policy for the digital inclusion of the seniors from both social and technical perspectives. To this end, we formulated four research questions (R) to guide this study:

R1: How the determinants of the social conditioning dimension for seniors are ensured in e-government policies?

R2: How the determinants of the e-government platform dimension for seniors are ensured in e-government policies?

R3: How the determinants of the e-government technology dimension for seniors are ensured in e-government policies?

R4: How the determinants of the e-government processes dimension for seniors are ensured in e-government policies for seniors?

3.2. Research design

This study adopts a triangulation approach. *First*, a literature review is conducted to extract the determinants of e-government use by the seniors. The literature review addresses three issues, namely seniors' digital exclusion (Section 2.1), e-government performance (Section 2.2) and the use of electronic government by seniors (Section 2.3). *Secondly*, expert evaluation is used (1) to build a research framework that considers the assessment of e-government policies in context of that senior's needs from both social and technical perspectives; and (2) to explore the content of existing e-government policies to validate the research framework. Four experts - three academics and one practitioner - were engaged as experts in this study. *Third*, a qualitative case study approach (Eisenhardt, 1989; Yin, 2003) is adopted to validate the research framework. The steps of the research design are presented in Figure 1.

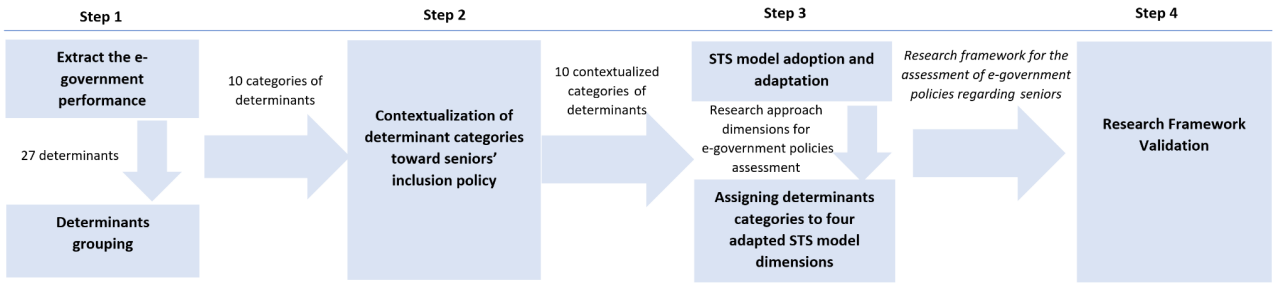

Figure 1. The steps of the research design. Source: Own elaboration

3.2. Research approach

Government capacity is understood as the ability of public institutions to formulate and effectively implement public policies (Kaufmann, Kraay, & Mastruzzi, 2011). Therefore, developing proper policies to encourage computer and Internet use among older adults is crucial to prevent their exclusion from society and to enhance their quality of life (Birnie & Horvath, 2002; Boz & Karatas, 2015). Adapting the results of research by (Meijer & Bolívar, 2016; Pereira, Ginner, Rinnerbauer, & Parycek, 2017), it can be argued that when developing e-government policies, the focus should be on understanding how governments can use ICT to improve the quality and efficiency of their internal operations and the public service delivery. It is generally accepted that both use and willingness to use e-government services are inextricably linked to the concept of diffusion of innovation (DOI) (E. Rogers, 2003) and are an important subject of e-government research. Most often, these issues are addressed by researchers using both DOI and the Technology Acceptance Model (TAM) (Davis, 1989; Moore & Benbasat, 1991; Mustonen-Ollila & Lyytinen, 2003; Gilbert, Balestrini, & Littleboy, 2004).

Many studies suggest considering e-government as a socio-technical system (Alalwan & Thomas, 2011; Chemisto & Rivett, 2018; Pereira et al., 2017; Zarei, Hosseini-Shoar, Isfandyari-Moghaddam, & Hassanzadeh, 2018). The concept is based on the Social-Technical-System (STS) model (Bostrom & Heinen, 1977), in which organizations are divided into two complementary systems: social systems and technical systems. Social systems comprise structures and actors, while technical systems consist of technology and tasks. Actors, according to the STS theory, are "*people but with* [their] *qualification*" (Leavitt, 2013, p. 2977); structures comprise "*systems of communication, systems of authority (or other roles), and systems of work flow*" (Leavitt, 2013); tasks relate to "*the production of [...] services, including the large [...] number of meaningful subtasks that may exist in complex organizations*" (Leavitt, 2013); technology relates to "*direct problem-solving inventions like [...] techniques or computers*" including programs (Dremel, 2017; Leavitt, 2013). STS theory has proven to be a valuable lens for (1) analysing the interrelationship of social and technical system components (Dremel, 2017), and (2) modelling innovation in government from a holistic perspective (Maria A. Wimmer, Codagnone, & Ma, 2007). In this study we adopt the STS model as a research approach. This approach focuses on the use of ICT (technology) to improve the quality and efficiency of government services delivery (tasks) by building the seniors-centric (actors) conditioning (structures) for maximum adoption and use of these services. Four main dimensions of the STS model were introduced, namely: (1) Social Conditioning and E-government Platform for *Social* system, and (2) E-government Technology and E-government Processes for Technical system (Figure 2).

For the social system, *Social conditioning* reflects the specificities of the seniors as the e-government stakeholders, namely: (i) their cultural (feelings of collectivism, excessive gullibility or fears) and educational (digital skills) heritage, (ii) physical and mental peculiarities (vision, motor skills, and coordination disabilities), (iii) localization (urban, rural, large cities), social and economic status (loneliness, social isolation, low financial security). These social determinants allow contextualizing the STS elements by taking into account the needs and expectations of seniors in the development of the adaptive features of the e-service (tasks), its specific technical support (technology) and the way it is organized and regulated (structures). The *E-government platform* dimension supports those aspects of the functioning of the whole e-government system that ensure the process for managing and regulating all services (tasks) in order to build an elderly-centric digital environment. Focusing primarily on the needs of stakeholders (seniors), management and regulation should take into account the specificity of each of the e-services provided, as well as technical constraints and opportunities (Meijer & Bolívar, 2016; Sigwejo & Pather, 2016).

For the technical system, *E-government technology* ensures performance, as well as the quality and efficiency of the main functional features of e-government. It aims at shaping seniors' satisfaction with the technical aspects of the e-services provided, changing the patterns of their social conditions, and depending on the spectrum and methods of organization and service provision, as well as management and regulation (tasks and structures). The *E-government processes* dimension should ensure maximum adaptability of both the forms, and a list of services (tasks) to the needs of seniors. Moreover, the possibility of high-quality customization of the e-services directly depends on (i) the technical capabilities of the system (technology) and is also supported and ensured by (ii) relevant regulation and e-government management (structures) (Pereira et al., 2017; Sigwejo & Pather, 2016).

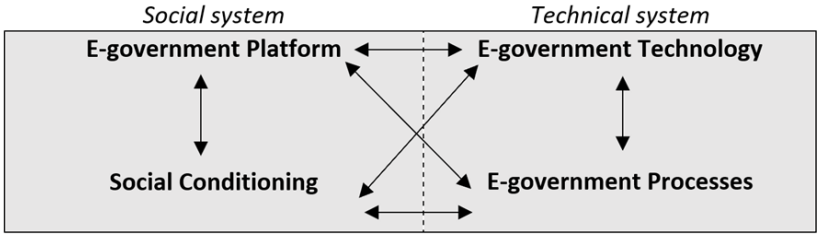

Figure 2. Research approach dimensions of e-government policies assessment. Source: own elaboration based on (Bostrom & Heinen, 1977).

3.3. Research framework development

We used the disciplined process proposed by (Webster & Watson, 2002) to methodologically analyse and synthesize relevant literature. Keyword searches in Scopus, IEEE and ACM databases with following forward and backward citations were performed. First, to build the database of extant literature, four sets of a complex search query of criteria were used: (1) ("seniors" OR "elders") AND ("e-government" OR "digital government") AND ("services"); (2) ("seniors" OR "elders") AND ("e-government" OR "digital government") AND ("inclusion"); (3) ("seniors" OR "elders") AND ("e-government" OR "digital government") AND ("exclusion"); (4) ("e-government" OR "digital government") AND ("evaluation" OR "assessing" OR "effectiveness"). The search resulted in 138 results. Duplicates were then removed, and non-English positions were excluded. Second, eligible publications were identified by abstracts screening. In this way, 52 full texts were evaluated. We adopted a snowballing approach to enhance the search results. Finally, 87 papers were under evaluation in the research framework.

The main purpose of developing the research framework is to introduce a tool that allows (1) to organize knowledge about ensuring (presence in the legislative government document) of the seniors' interests and needs in e-government policies. This knowledge emerges from the case study; (2) to conduct a qualitative assessment of elderly-centred support within e-government policies; and (3) to facilitate learning from such case study and to apply the findings in the context of the selected country.

Thus, to develop the research framework, the four steps were followed. *Step 1*: Three independent experts iteratively reviewed and coded the collected literature to (i) extract the determinants (evaluation criteria), affecting e-government use; and (ii) group them into categories (step 1, Figure 1). The identified categories coincide with the e-government evaluation dimensions proposed in (Alalwan & Thomas, 2011; Alshawi & Alalwany, 2009; Sigwejo & Pather, 2016). *Step 2:* Three independent experts reviewed and coded the collected literature to contextualize the determinant categories from the perspective of both the object of the research framework - assessment of e-government policies, and the context of this assessment - the senior's needs (step 2, Figure 1). Contextualization, missing in the literature, was additionally provided by the experts. *Step 3:* Four dimensions of the e-government policies assessment framework were adapted from the selected literature. Then, the developed determinant categories were assigned to adapted STS model dimensions. In our study, we assumed equal importance of all determinant categories included in the research framework (step 3, Figure 1). Consistency of the expert evaluation is ensured by implementing the following research approach: (1) a first version of the analysis results is built by three experts independently; (2) the experts discuss the validity of the results obtained and identify discrepancies and mismatches; (3) the three experts analyze the identify discrepancies and mismatches independently and refine their results; (4) a second round of expert discussion is organized, to find maximum consistency between the results obtained by the three experts

independently; and (5) a consensus is reached on the final results approved by all three experts. The outcome of the research framework development is presented in Section 4.

3.4. Research framework validation

A qualitative, case study-based approach was used to validate the developed research framework (Eisenhardt, 1989).. The research framework was experimentally used to evaluate e-government policies that support digital inclusion of seniors in Poland. Three experts are asked to validate the framework on the case study basis. The composition of the experts is as follows: Expert 1 is an official from the Ministry of Family and Social Welfare, responsible for the creation and implementation of policies towards seniors. Experts 2 and 3 are researchers in the field of e-government, whereas Expert 2 has a background of social sciences which includes law, while Expert 3 has a background of information sciences.

The validation process was carried out as follows. *First*, the existing legal acts that comprise the entire policy of e-government for seniors were identified and collected. *Second*, three independent experts conducted an in-depth reading and coding of a set of official documents to identify facts to confirm or refute e-government policy support for specific determinants of the research framework. *Third*, to assess the level at which determinants are covered by e-government policies for seniors (hereinafter - Level) the 5-point scale of measurement is applied. The scale of measurement was adopted and adapted from the Process Maturity Framework (Humphrey, 1988) and includes the levels: (1) *Initial* - the e-government inclusion policy toward seniors does not exist; (2) *Requested* - the e-government inclusion policy toward seniors is recognized; (3) *Defined* - the e-government inclusion policy toward seniors is defined but the responsible agency is not assigned; (4) *Institutionalized* - the e-government inclusion policy toward seniors is defined, implemented and the responsible agency is assigned; (5) *Optimized* - the e-government inclusion policy toward seniors is defined and the responsible agency is assigned, and the implementation is systematically improved. Finally, for research framework validation results interpretation, the experts' assessments (1) are averaged (for each determinant, category and dimension), and then (2) levels' labels are assigned to them in accordance with the round half up rule applied to average score.

4. Research framework

This section aims to build the research framework to evaluate e-government policies regarding counteracting the senior's digital exclusion. According to the research design (steps 1-3, Figure 1), 27 e-government performance determinants from collected literature were (1) extracted and grouped into ten categories (Appendix A); (2) contextualized to seniors' inclusion needs (Appendix B); and (3) assigned to four adapted STS model dimensions, namely: social conditioning, e-government platform, e-government technology, and e-government processes (Figure 2). The research framework for e-government policies assessment regarding seniors is presented in Table 1.

The research framework for supporting *e-government social conditioning* assumes that e-government policies reflect the following social background of seniors: (1) *SC1. Individualism or collectivism*. A study (Zhao et al., 2014) found that individualism is the best predictor of e-government development and good acceptance. It is specific to seniors who want to communicate face-to-face with government employees, considering that the relationship with the government should be live and tangible and that human judgement is necessary to solve all problems (Abad-Alcalá et al., 2017; AlAwadhi & Morris, 2009; Malodia, Dhir, Mishra, & Bhatti, 2021). So, it is recommended to consider a hybrid approach toward e-government services, ICT and human support; (2) *SC2. Awareness*: lack of awareness of the benefits associated with the use of ICT, and as a result - ignorance/unwillingness to learn about the potential opportunities associated with the use of e-government services; very often it relates to the fear of change, uncomfortable working with unfamiliar devices and tools (Hong & Choi, 2020; Morris & Venkatesh, 2000; Björn Niehaves & Becker, 2008); (3) *SC3. Education for e-government*: the objectively formed low levels of digital literacy of elderly causes discomfort and insecurity; the emergence of technical problems that are difficult to solve for seniors (Botrić & Božić, 2020); and as a result, a persistent unwillingness (and inability) to be an equal participant in e-government activities (Becker, Niehaves, Bergener, & Räckers, 2008). Proper education for e-government is impossible without joint public and private efforts to organize the training for older people (Alalwan & Thomas, 2011; Ali et al., 2021; Hong & Choi, 2020; J B Lee & Porumbescu, 2019; Rose et al., 2020).

Table 1. Research Framework for E-government Policies Assessment Regarding Seniors

Social system	*Social Conditioning of Seniors*	*E-government Platform*
	SC1: Individualism or collectivism category SC1_1: policy includes hybrid approach toward e-government services, ICT and human support. SC1_2: individual encouragement to use e-government services in face-to-face contact with the office SC1_3: taking into account the specificities of cultural groups and orientations in e-government policies SC1_4: policies take into account the needs of lonely and isolated seniors in terms their integration into the society SC1_5: e-government policy increase seniors' quality of life in terms of self-efficiency and sense of self-control **SC2: Awareness** SC2_1: the policy includes awareness building of e-government services for seniors SC2_2: e-government policy facilitates 'seniors' profile' building in e-services **SC3: Education for e-government** SC3_1: e-government policy includes training programs development SC3_2: the policy considers the process of 'onboarding' with technology and e-government services for the seniors, e.g. through instructional films, wizards, help pages or human assistants. SC3_3: e-government encourage public and private e-services providers to training for seniors	**PL1: Security & Privacy** PL1_1: e-government policy ensures data security and privacy policy PL1_2: e-government policy mitigates lack of trust by simultaneous provision of high quality and secure services PL1_3: e-government policy safeguards the risks of relying on unknown third parties **PL2: Personalized information & services** PL2_1: e-government platforms design enables seniors to personalize information and services according to their needs PLP2_2: e-government platforms provide qualitative information (accessible, accurate, timely, relevant, understandable, detailed, clear, limited as to the number of questions). PL2_3: e-government platform provides tailored communication between senior and website administrator **PL3: Benefits** PL3_1: e-government policy is informing on benefits of e-services use (time and money savings, reduced social isolation, increased IT-enabled communication with friends and family) PL3_2: e-government policy is informing on benefits of e-health use (active participation in a computerized healthcare system)
Technical system	*E-government Technology*	*E-government Processes*
	Tech1: Accessibility & inclusiveness Tech1_1: e-government policy includes various access to e-government services through Website, m-government, and landline telephony Tech1_2: e-government service can be accessed using legacy (old-fashioned) devices Tech1_3: e-government provides easy access to popular services among seniors such as: claiming and managing pensions, health insurance benefits, e-health services Tech1_4: policy supports provision of ICT infrastructure for e-health services Tech1_5: e-government policy provides Internet coverage in urban, rural regions, and large cities **Tech2: Service Performance** Tech2_1: e-government policy includes and monitor measures on time spent to complete the task; response time; non-limited session times Tech2_2: designing a one-stop portal to provide integrated administration of all government e-services Tech2_3: e-government policy address system interoperability issues through system integration and information sharing between functional units and government agencies ensuring the Once Only Principle **Tech3: Ease of use** Tech3_1: interface provides language translation of the content Tech3_2: e-government policy includes WCAG guidelines Tech3_3: e-government policy support e-services design including UX for seniors Tech3_4: e-government service design includes minimizing of codes, usernames, and passwords that have to be used Tech3_5: computing support to limit computer anxiety is provided next to e-government services	**EPR: Transactions** PR1: e-government policies provide transactional processes that involve seniors online monetary transactions such as, paying taxes, utility bills, and vehicle registration PR2: e-health is supported by e-commerce transactional processes (medicine purchase, medical examinations fee) PR3: e-government policy includes a complaint process for e-services PR4: e-government policies include support of intangible online processes by tangible proof of evidence (documents)

The *e-government platform support* in our framework presupposes that e-government policies should ensure the following objectives: (1) *PL1. Security & Privacy*: creating of the most favourable security and privacy conditions - first of all at the legislative and regulatory level, and then - implemented as technical solutions (Ko et al., 2019). Due to the specifics of the elderly, their prejudice regarding online space and increased fear of the possibility of fraud, abuse, etc. require particularly close attention to these issues when developing e-government services (AlAwadhi & Morris, 2009; Deng et al., 2018; Parent et al., 2005; West, 2015); (2) *PL2. Personalized information & services*: enabling seniors to personalize information and services according to their own needs and circumstances and facilitating access to frequently used online services and records (Reilly et al., 2003); providing accessible, accurate, timely, relevant and understandable information (Papadomichelaki & Mentzas, 2012), with tailored level of detail and contextualization for the needs of different populations. Such a solution could be tailored communication between seniors and website administrators (Nilpong & Thanasopon, 2020); providing messages with less content and short processes (Abad-Alcalá et al., 2017); (3) *PL3. Benefits*: providing the most beneficial types of e-services for seniors (Nam & Sayogo, 2011), outweighing the usefulness received from their traditional form (Phang et al., 2006). Like routine medical issues such as checkups, blood tests, and other geriatric-related issues (Mizrachi, Shahrabani, Nachmani, & Hornik, 2020) (AlAwadhi & Morris, 2009; Morris & Venkatesh, 2000; Björn Niehaves & Becker, 2008; Phang et al., 2006), reduction of social isolation, increased communication with friends and family via IT, active participation in e-health (Bjoern Niehaves & Plattfaut, 2010).

The *e-government technology support* presupposes that e-government policies should enable: (1) *Tech1. Accessibility & inclusiveness:* Accessibility and inclusiveness of ICT infrastructure, including Internet penetration (especially for cities, suburbs, and rural areas); ensuring the accessibility to social services such as claiming and managing pensions, health insurance benefits (Bélanger & Carter, 2008; Phang et al., 2006; Siren & Knudsen, 2017; Hong & Choi, 2020); language translation of the content (AlAwadhi & Morris, 2009); m-government use (Conci et al., 2009; Khan, 2016; Ko et al., 2019; Leist & Smith, 2014; Molnar, 2014; Righi, Sayago, & Blat, 2011); and providing access for using e-government service on legacy devices. (2) *Tech2. Service Performance*: relevant e-government performance, including minimising time spent on task (AlAwadhi & Morris, 2009) and response time (Nilpong & Thanasopon, 2020); solving the problems with limited session times (Abad-Alcalá et al., 2017); optimizing number of transitions between services (Alalwan & Thomas, 2011) and addressing system interoperability issues through government agencies ensuring the Once Only Principle (M.A. Wimmer et al., 2020) and designing a one-stop portal to provide integrated administration of all government e-services (Hangen & Kubicek, 2000); (3) *Tech3. Ease of use*: is the principle of minimum effort in using a given e-government system (Alawadhi & Scholl, 2016; Davis et al., 1989; Hung et al., 2013; Molnar, 2014; Nacheva & Bakaev, 2020; W. A. Rogers & Fisk, 2010). Thus, e-government policies should be able to ensure: flexible access features for people with disabilities, (AlAwadhi & Morris, 2009; Martin, Gregor, & Hart, 2004); seniors preferences for fewer menu sections, larger fonts, and contrasting colours in the design of the government websites (Abad-Alcalá et al., 2017); reduction the difficulty of recognizing the details (Martin et al., 2004); seniors' fear the excessive number of codes, usernames, and passwords (Abad-Alcalá et al., 2017); computer anxiety and computing support are prerequisites to perceived ease of use (Phang et al., 2006).

The *e-government processes support* in our research framework presupposes that e-government policies ensure technical provision and support for core e-government processes (Sakowicz, 2001), such as *PR. Transactions*: transactional processes that involve seniors online monetary transactions such as paying taxes, utility bills, and vehicle registration (Deng et al., 2018), given that older internet users express concern about the difficulty of the use of digital documents for potential complaints (Abad-Alcalá et al., 2017).

5. Research framework validation

According to the proposed research methodology (Step 4, Figure 1), a case study approach was applied to validate the research framework. During the validation of the research framework, qualitative assessment of e-government policies supporting the digital inclusion of seniors in Poland was carried out.

Poland is a country in Central Europe, with a population of 37 million people. It is a medium-sized country the GDP per capita PPP of $34 216, it is similar to other countries in the region (Slovakia, Lithuania, Hungary), other middle-income European countries (Portugal, Cyprus, Italy) or some small but well-developed Latin America countries (Puerto Rico, Panama, Aruba). In the Russell Index, run by Financial Times and New York

Stock Exchange, Poland advanced to become a developed country in 2018 (Clifford Chance, 2018). Poland's position in the EGDI ("United Nations," 2021) is characterized by a steady progress in the last ten years in both the score and position. Poland has moved up 9 positions in the index since 2018 and is currently (2020) ranked 24th with a score of 0.8531, significantly above the global average.

Digitization in Poland was formally initiated in 2002 by appointing digitization as the area of government responsibility. In 2011, the Ministry of Administration and Digitization gave a new policy framework to digitization activities through becoming more citizen-centric and an evolution towards digitization was initiated. Significant stages of e-government development in Poland, described in chronological order, are presented in Figure 3.

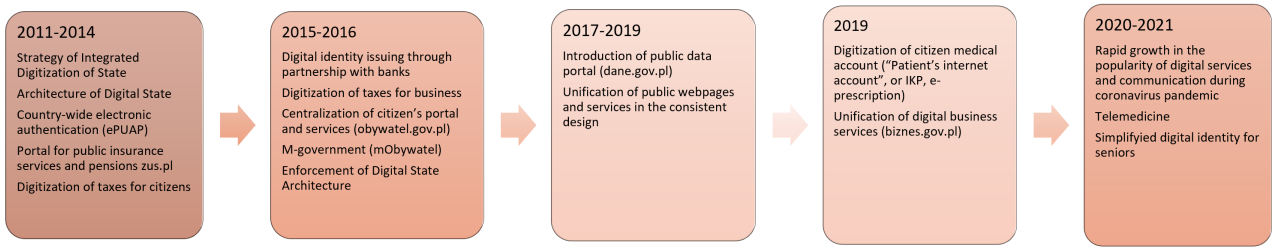

Figure 3. Steps of Polish e-government development. Source: Own elaboration

Like many other countries with an ageing population, Poland is facing challenges arising from the demographic structure of its population. Two types of demographic phenomena are ongoing in Poland. On the one hand, in 2016 the Total Fertility Rate (TFR) was 1.36, and on the other hand, people over 65 constitute more than 18% of the population. Together with the co-occurring phenomenon of life extension (for women 81.9 years, for men 73.9), these indices prove that the process of generation replacement is disturbed (Główny Urząd Statystyczny, 2020). Therefore, Poland should pay particular care in bringing seniors closer to digital technologies and digital government.

The framework is validated against the current legal acts of Poland, defining the State' s duties and responsibilities with respect to the formulation and execution of senorial policies. The analysis is based on the following legal acts: The Act of Accessibility of Public Administration Websites and Mobile Applications (Sejm, 2019); Program of the Integrated Digitization of the State (Ministerstwo Cyfryzacji, 2019); Social Policy for the Elderly 2030. Security - Participation - Solidarity (Rada Ministrów, 2018); The Architecture of Digital Government (Ministerstwo Cyfryzacji, 2021); Multi-annual Programme for Elderly People "Active+" for 2021-2025 (Rada Ministrów, 2021); The Act amending the Act on the Information System in Health care and certain other acts (Sejm, 2015); The Act on Informatization of Activities performed by Entities Executing Public Tasks (Sejm, 2005); Telecommunication Law (Sejm, 2004); The Act on Provision of Electronic Services (Sejm, 2002); The Balanced Development Strategy for Rural Areas, Farming and Fishing (Rada Ministrów, 2019).

To confirm the significance of the results, the following statistics for expert's evaluation sample are presented: (i) the average normalized standard deviation (ANSD) for the entire sample is 0.21; (ii) the ranges of ANSD for each e-government performance determinants is [0; 0.59]; (iii) the Cronbach alpha reliability coefficient is 0.72. General conclusions from the validation process of the framework are: (1) The 5-point scale for measurement the level of e-government performance determinants are covered by e-government policies is well understood and consistently applied; (2) The consistency of the assessment (Cronbach alpha) is quite high, which indicates the judgement and justification given by the experts seem to be well-founded; (3) Three determinants assessed by experts as unclear or not well-defined were explained during the survey and then refined for final framework version; (4) For such framework using experts should be required to provide practices justifying their assessment, for an individual country assessment such examples ("proofs of practice"). The results of research framework validation are presented in the sections 5.1.-5.4.

5.1. Social conditioning of seniors

In the social conditioning of seniors' domain, ten determinants were evaluated (Table 2). Three determinants are rated as *Requested* comprising: SC1_4, SC1_5, and SC3_3. In these policy areas public administration see the room for improvement or formulate general policy objectives, but their proof of practice is not yet visible. Particularly, policies take into account the needs of lonely and isolated seniors in terms of their integration into

the society. There is an overall direction in (Rada Ministrów, 2018), and Active+ Programme (Rada Ministrów, 2021) but proof of e-government practice is not identified (SC1_4 and SC1_5). There are policies that define educational measures available to seniors. These policies define bi-directional measures, i.e., training seniors on digital technologies, but also training entrepreneurs on the needs of seniors. However, the analysis shows that there are no specific laws or policy guidelines targeting the use of activation methods in the education of seniors. (SC3_3).

There are three determinants at the *Defined* level: SC1_1, SC1_2, and SC1_3. According to the assessment: e-government is the primary mode of service delivery with human support in place. However, policies do not provide specific guidelines, only broad goals (SC1_1). There is broadly addressed encouragement to use e-government services through media. However, in face-to-face contact with the office, no such regulation or a proof of application exists (SC1_2). The policy indicates the diversity of social groups and the need to adapt digital services to their diverse needs, with a particular focus on the Catholic Church (SC1_3).

At the *Institutionalised* level also there are three determinants, namely SC2_1, SC2_2, and SC3_2. Social policy attaches great importance to awareness-building among seniors, with particular emphasis on the availability and accessibility of e-government services (Rada Ministrów, 2019). The social policy in Poland distinguishes age groups in terms of internet penetration and actively supports and encourages seniors to use the web. The policy promotes the perception of technology as a factor for the well-being of seniors. It also stimulates seniors to reach out to these services by offering them advertisements and promotional material in the media - such as television or newspapers (SC2_1). E-government policy facilitates 'seniors' profile' building it into e-services. It is visible both in policy documentation and implementation. Among the tools designed for seniors, the senior.gov.pl portal is the most recognisable and promoted by the government. The portal brings information on documents and actions for seniors (e.g., general policy on seniors, i.e., SP), safety, events and supporting programmes. The website is hosted and administered by the Ministry of Family and Social Policy. Official government media support the policy of inclusion, including encouraging the use of e-government services. The Social Policy contains a framework for building awareness of seniors - addressing the objective as "*Improving [...] digital accessibility of public institutions"*. Social Policy includes a chapter on the digital divide, digital inclusion and overcoming it (Rada Ministrów, 2018 pp. 11,40) (SC2_2). The policy considers the process of 'onboarding' with technology and e-government services for the seniors, e.g., through instructional films, wizards, help pages or human assistants. Both social policies and institutions support this determinant. There is also proof-of-evidence that these policies are implemented and reviewed according to the experiences from applications.

Only the determinant rated as meeting the highest *Optimized* level of maturity of the process is SC3_1 e-government policy includes training programmes development. Education for e-government indicates that social policy supports preparing seniors to use e-government services - through encouragement, and active training (Rada Ministrów, 2018, p. 40,52).

Table 2. The results of assessment of the e-government policies toward Social conditioning of seniors in Poland

Determinant	Level	Average Score
SC1_4: policies take into account the needs of lonely and isolated seniors in terms their integration into the society	Requested	2.00
SC1_5: e-government policy increase seniors' quality of life in terms of self-efficiency and sense of self-control		
SC3_3: e-government encourage public and private e-services providers to training for seniors		
SC1_1: policy includes hybrid approach toward e-government services, ICT and human support	Defined	2.78
SC1_2: individual encouragement to use e-government services in face-to-face contact with the office		
SC1_3: taking into account the specificities of cultural groups and orientations in e-government policies		
SC2_1: the policy includes awareness building of e-government services for seniors	Institutionalized	4.00
SC2_2: e-government policy facilitates 'seniors' profile' building in e-services		
SC3_2: the policy considers the process of 'onboarding' with technology and e-government services for the seniors, e.g., through instructional films, wizards, help pages or human assistants		
SC3_1: e-government policy includes training programs development	Optimized	5.00

5.2. E-Government platform

In the E-government Platforms of seniors' domain, eight determinants were evaluated (Table 3). One determinant is rated as *Initial* comprising: PL2_1: e-government platforms design enables seniors to personalize information and services according to their needs.

Six determinants are rated as *Requested* comprising: PL1_2, PL1_3, PL2_2, PL2_3 and PL3_2. These policy areas are a required improvement and are mostly characterized by the presence of the defined general policy objectives p.e. EP1_3 is noted in (Rada Ministrów, 2018, pp. 34, 49), but no practice proof exists. On the other hand, the expert noticed that although it is not mandated in the policy, a practical application of some determinant exists p.e. the portal tailored to seniors-(Senior+(PL2_3). E-health in Poland is highly regulated and pandemic accelerated e-health implementation to the general public. Despite seniors being able to access e-health and all its facilities, no proof of evidence exists showing that the benefits of e-health services are communicated sufficiently to seniors. So, there is a practical deployment e.g. the patient.gov.pl portal and the "Internet Patient Account" with all treatments, tests, procedures and prescriptions of the past, but the benefits are not communicated (EP3_2).

Two determinants are assessed as *Defined*, namely PL1_1 and PL3_1. Security & Privacy determinant is considered against the background of the Polish and European legal system. Since Poland is a member of the European Union, the General Data Privacy Protection (GDPR) act directly affects all Polish citizens. The Ombudsman actively represents the interests of seniors, dealing with trust and trust breach (fraud). The privacy policy is a part of the digitization policy (Ministerstwo Cyfryzacji, 2019, pp. 7, 34). The policy document mentions restrictions for seniors (Rada Ministrów, 2018, pp. 34, 37) by "*promoting social inclusion of seniors, in particular those who remain at home, through the use of the internet and information technology to access cultural goods, entertainment, education and communication and increasing trust in technology and tools*". E-government policy is informing on the benefits of e-services use, particularly regarding introduction of queuing systems and communicating benefits to the elders (PL3_1). Yet, the experts failed to identify proof of evidence regarding other benefits of e-government services communicating to the seniors.

Table 3. The results of assessment of the policies toward E-government Platforms for seniors in Poland

Determinant	Level	Average Score
PL2_1: e-government platforms design enables seniors to personalize information and services according to their needs	Initial	1.00
PL1_2: e-government policy mitigates lack of trust by simultaneous provision of high quality and secure services	Requested	2.00
PL1_3: e-government policy safeguards the risks of relying on unknown third parties		
PL2_2: e-government platforms provide qualitative information (accessible, accurate, timely, relevant, understandable, detailed, clear, limited as to the number of questions).		
PL2_3: e-government platform provides tailored communication between senior and website administrator		
PL3_2: e-government policy is informing on benefits of e-health use (active participation in a computerized healthcare system)		
PL1_1: e-government policy ensures data security and privacy policy	Defined	3.17
PL3_1: e-government policy is informing on benefits of e-services use (time and money savings, reduced social isolation, increased IT-enabled communication with friends and family)		

5.3. E-Government technology

In the E-government Technology of seniors' domain, thirteen determinants were evaluated (Table 4). At the *Initial* level Tech2_1: e-government policy includes and monitors measures on time spent to complete the task; response time; non-limited session times. There are no institutional or factual signs of this being implemented.

Three determinants are rated as *Requested,* comprising: Tech3_1, Tech3_4, Tech3_5. The e-government services are provided only in Polish except those rare pieces of information that are directly aimed at foreigners e.g., visa or residence permit (ET3_1). Regarding e-government service design includes minimizing of codes, usernames, and passwords that have to be used, the item is institutionalized in policy documents in the form of the rule of a single-sign-on (Ministerstwo Cyfryzacji, 2019, p.41) and implemented for existing e-government services across all government agencies via ePUAP platform (ET_4). Regarding provision of accompanying computing support to limit computer anxiety the policy requires "[...] *to perform comparative analyses and benchmarking, to identify best practices, and to undertake improvements. The system will provide*

the framework for continuous services improvement". However, this applies to future services and there is no material proof that this practice is actually implemented.

Two determinants were assessed as *Defined*, namely Tech1_3 and Tech1_5. Regarding providing easy accessible services popular among seniors, the Polish elderly can access all of these via the e-health portal pacjent.gov.pl and the social insurance (ZUS). It is both institutionalized and implemented e-government practice. The provision of internet access in urban, rural and large cities (Tech1_5) is embedded in the (Rada Ministrów, 2019), which includes upgrading rural connections to fibre optic and mobile connections to LTE and 5G.

There are four determinants at the *Institutionalized* level, namely Tech1_1, Tech1_2, Tech3_2 and Tech3_3. For Tech1_1, the Digitisation Policy implies access through main channels (internet, mobile internet, personal and telephone) and proposes a single window for this purpose. It enforces data consistency and a feedback loop. The application is accessed using legacy devices (Tech1_2). The policy incorporates WCAG guidelines at level AA for all public administration services, including for senior citizens (Tech3_2). While support of e-service design towards seniors (including UX) comes from policy documents. E-government services adapt to the needs of seniors by allowing an increase of the font size or changing colours to the contrasting set. Accessibility specialists monitor and review the use of e-services by seniors (Tech3_3).

Three determinants are rated as the highest *Optimized* maturity level, namely Tech1_4, Tech2_2 and Tech2_3. For Tech1_4, Poland has adopted a package of laws regulating e-health. Policies are implemented and systematically improved. Elderly citizens access e-government services via a central portal (obywatel.gov.pl) (Tech2_2). Such a service is both institutionalized in policy documents and implemented. Concerning Tech2_3: The e-government policy addresses the issue of system interoperability by integrating systems and exchanging information between functional units and government agencies ensuring the "Once Only" principle. This principle is indeed institutionalized in the policy, but its implementation is limited. When using other public portals, e.g., the tax system, the same information (e.g., a person's home address) must be provided separately.

Table 4. The results of assessment of the policies toward E-government Technology for seniors in Poland

Determinant	Level	Average Score
Tech2_1: e-government policy includes and monitor measures on time spent to complete the task; response time; non-limited session times	Initial	1.00
Tech3_1: interface provides language translation of the content	Requested	1.89
Tech3_4: e-government service design includes minimizing of codes, usernames, and passwords that have to be used		
Tech3_5: computing support to limit computer anxiety is provided next to e-government services		
Tech1_3: e-government provides easy access to popular services among seniors such as: claiming and managing pensions, health insurance benefits, e-health services	Defined	3.00
Tech1_5: e-government policy provides Internet coverage in urban, rural regions, and large cities		
Tech1_1: E-government policy includes various access to e-government services through Website, m-government, and landline telephony	Institutionalized	4.08
Tech1_2: the e-government service can be accessed using legacy (old-fashioned) devices		
Tech3_2: e-government policy includes WCAG guidelines		
Tech3_3: e-government policy support e-services design including UX for seniors		
Tech1_4: policy supports provision of ICT infrastructure for e-health services	Optimized	4.72
Tech2_2: designing a one-stop portal to provide integrated administration of all government e-services		
Tech2_3: e-government policy address system interoperability issues through system integration and information sharing between functional units and government agencies ensuring the Once Only Principle		

5.4. E-Government process

Four determinants were assessed in the domain Senior Citizens' e-government process (Table 5). Only two determinants were assessed as *Defined*, namely PR2 and PR4. For PR2 e-health is supported by e-commerce transaction processes (purchase of medicines, payment for medical examinations). Although a wide range of e-health is provided by Polish e-health services, it does not include transactional processes. For PR4: The e-government policy includes support of intangible online processes by tangible evidence (documents). This is

one of the assumptions of the digitisation policy document, but also in the practice of ePUAP implementation - proof of service is part of every correspondence between a citizen and an office and vice versa.

At the *Institutionalised* level, only one PR3 determinant is assigned. E-government policies provide transactional processes that include seniors' online monetary transactions such as paying taxes, utility bills and vehicle registration. For most services, this is possible at the central level, while at the local level, most services are provided in a way that is specific to a particular application.

The only determinant assessed as meeting the highest *Optimized* level of the process maturity is PR3: e-government policy includes a complaint process for e-services. A number of regulatory acts define complaint processes for telecommunications, health, legal, administrative services. They do not specifically refer to electronic forms; however, a complaint (grievance) is one form of letter that can be sent using the e-government services platform (ePUAP).

Table 5. The results of assessment of the policies toward E-government process for seniors in Poland

Determinant	Level	Average Score
PR2: e-health is supported by e-commerce transactional processes (medicine purchase, medical examinations fee)	Defined	3.17
PR4: e-government policies include support of intangible online processes by tangible proof of evidence (documents)		
PR3: e-government policy includes a complaint process for e-services	Institutionalized	4.00
PR1: e-government policies provide transactional processes that involve seniors online monetary transactions such as, paying taxes, utility bills, and vehicle registration	Optimized	5.00

6. Discussion of findings

The main purpose of this study was to identify the main determinants affecting e-government adoption and use by seniors and to use them to build the research framework for assessing the e-government policy support regarding counteracting the senior's digital exclusion. A literature review regarding the digital exclusion of seniors, electronic government use by seniors and e-government performance was conducted. Consequently, based on the literature review and expert evaluation the research framework for policy assessment regarding senior inclusion was developed. The proposed research framework allowed us to systematize knowledge about ensuring the interests and needs of seniors in Polish e-government policies. This knowledge makes it possible to qualitatively assess the situation in Poland both in terms of the level of senior inclusion support, as well as the deeper analysis of the content of the policies themselves. The results of the use of research frameworks open up opportunities for learning lessons about the current situation in the country. We discuss the main findings and contribution regarding our research framework validity and the results of using the case study as a validation of research framework applicability.

Responding to R1, our research contributes to a *better understanding of how the determinants of the social conditioning dimension for seniors are ensured in e-government policies*. Among three determinants affecting social conditioning for seniors only SC1: Individualism and collectivism, characterizes a Requested level of policy assessment. This determinant requires the development of a specific set of instruments for gradual seniors' seniors by developing mixed forms of e-services provision (human vs. digital) (AlAwadhi & Morris, 2009) and encouraging the use of e-government services after face-to-face contact. Social conditioning determinants included in the research framework are mentioned as crucial in the existing literature, most often in the context of e-government acceptance among elderly citizens (Niehaves & Plattfaut, 2010; Phang et al., 2006; Niehaves et al., 2008). Educating seniors on e-government (SC3) is assessed as an Institutionalized level. Following (Rose et al., 2020) e-government policy should involve seniors to use e-government services through the various incentive tools that are typical and available for this age group, such as TV ads, radio ads, newspaper ads, and then additionally, web ads and social media. The policy should also recommend that the elderly be encouraged to use e-government by participating in different types of social communities (both internet and other types of communities more familiar to seniors) (Nimrod, 2011). This falls in line with (Abad-Alcalá et al., 2017; Zhao et al., 2014; AlAwadhi & Morris, 2009). In the field of social determinants, building awareness among seniors about the benefits of e-government services and taking into consideration seniors' profile in the provided services is assessed at the Institutionalised level. This supports the arguments (Hong & Choi, 2020; Morris & Venkatesh, 2000; Björn Niehaves & Becker, 2008) about the high importance for awareness of seniors regarding e-government services, that should be directly articulated in not only the

objectives of policies in general, but also through regulations or relevant ordinances. Building such awareness is of particular importance in e-health, where seniors largely depend on the use of digital services (Ciesielska et al., 2022). Thus, our first contribution is to adapt the wide range of social conditioning determinants presented in previous studies to the context of seniors' e-government inclusion through the development of specific seniors-cantered policies. Following (Becker et al., 2008; Bélanger & Carter, 2008; Hong & Choi, 2020; Morris & Venkatesh, 2000; Phang et al., 2006; Siren & Knudsen, 2017) this study points out that social conditioning strongly depends on national regulatory activities, widely addressing demographic challenges of nations, and adjustment to public organization operationalization during the pandemic.

Responding to R2, our research is contributing to a *better understanding of how the determinants of the e-government platform dimension for seniors are ensured in e-government policies*. The two determinants demonstrated a *Requested* level of e-government maturity. EP1: Security and privacy in the context of taking into account the special attitudes of older people towards their own safety, as well as their particular distrust of the implementation of various types of activity in the internet space (Deng et al., 2018). According to numerous studies (Alawadhi & Scholl, 2016; Parent et al., 2005; West, 2015), it is the security and privacy conditions that increase the confidence of older people in using electronic applications, as well as in government in general. Therefore, this aspect should be a priority in further improving e-government policies for older people. As the validation shows, the introduction of EP2: Personalized Information and Services determinant in Polish e-government policy is aimed at improving the quality of interaction between seniors and e-services, primarily through quick access to relevant information and providing the history of all transactions. This aspect has been highlighted in numerous publications as a top priority in increasing the attractiveness of public e-service use (Morris & Venkatesh, 2000; Niehaves et al., 2008). An important direction for further improving e-government policy should be to empower older people to keep up with the outside world, receive a variety of information from the many available sources, and, among other things, reduce feelings of loneliness and social isolation through, for example, the ability to receive individual support and communication with the website administrator (Heo et al., 2015). The validation of our framework demonstrated a *Defined* level of support for EP3: Benefits determinant, according to our assessment, the Polish e-government places great emphasis on educating the elderly about the possibilities of using e-government and maximizing the contextualization of the existing e-services benefits. This coincides with (Nam & Sayogo, 2011) opinion that the perceived usefulness or perceived value of using e-government is the key to increasing their acceptance.

Responding to R3, this research provides information on *how the determinants of the e-government technology dimension for seniors are ensured in e-government policies*. Two determinants ET1 and ET2 have been assessed at the *Institutionalized* level of policy support. Regarding ET1: Accessibility and inclusiveness determinant, the research framework validation results support the study of (Bélanger & Carter, 2008; Phang et al., 2006; Siren & Knudsen, 2017) indicating inclusiveness as a major social policy objective regarding this social group. The results of the assessment reveal that despite national policies providing service performance measures, they are not addressed to current e-government services. This is contrary to (Abad-Alcalá et al., 2017; Nilpong & Thanasopon, 2020; Rose et al., 2020) that recommend service performance measurement of e-government services (ET2). In line with (Molnar, 2014; Nacheva & Bakaev, 2020; W. A. Rogers & Fisk, 2010), national policies are expected to include the issue of the limited ability of seniors to actively use the e-government, which results in WCAG guidelines adoption among every level of government and public agencies. Case study analysis points to the existence of legal guidelines toward ease of use (ET3) directed to Polish governments supporting (Abad-Alcalá et al., 2017; Nacheva & Bakaev, 2020), its implementation relies on the governmental maturity level toward citizen-centric service design (*Defined* level).

Addressing R4 "*How the determinants of the e-government processes dimension for seniors are ensured in e-government policies for seniors*?" this paper's contribution highlights the assessment of e-democracy processes and transaction processes regarding e-government services for seniors. Conversely, the study indicates *Institutionalized* level of policy support toward transactional e-government processes, falling in line with (Abad-Alcalá et al., 2017). The research framework validation regarding e-government processes has proven itself as a useful research tool.

To summarize, E-government policy in Poland toward seniors can be described as follows: (1) five out of ten e-government performance determinants (50%) are characterized by the e-government inclusion policy toward seniors that is defined, implemented, and has responsible agencies assigned (Institutionalized level), but

requires the introduction of mechanisms for systematic quality improvement. These determinants are: Awareness, Education for e-government, Accessibility & Inclusiveness, Service Performance, and Transactions; (2) two determinants (20%) demonstrate the clarity of defined processes of the e-government inclusion policy toward seniors (Defined level). These e-government inclusion policies *require* to assign the institutions, organisations and agencies and their responsibility for the subsequent implementation and assurance of the quality of e-government inclusion policy toward seniors. The determinants are: Benefits (E-government Platform dimension) and Ease of use (E-government Technology dimension); (3) three determinants (30%) demonstrate the level of e-government recognition of seniors inclusion problem (Requested level), but *require* careful definition of specific processes and responsible agencies for e-government policy implementation and systematic quality improvement. These determinants are: Personalized information & services and Security & Privacy (E-government Platform dimension), and Individualism or collectivism (Social conditioning of seniors' dimension). Figure 4 presents the results of a qualitative assessment of Polish e-government policy regarding counteraction of the seniors' digital exclusion (aggregated by dimensions). The detailed summary of assessment of the e-government inclusion policy in Poland is presented in Appendix C. This summary of the research could serve as a checklist to raise awareness among public managers of what has been implemented already, as well as on what to do in the future to offer inclusive e-government to seniors.

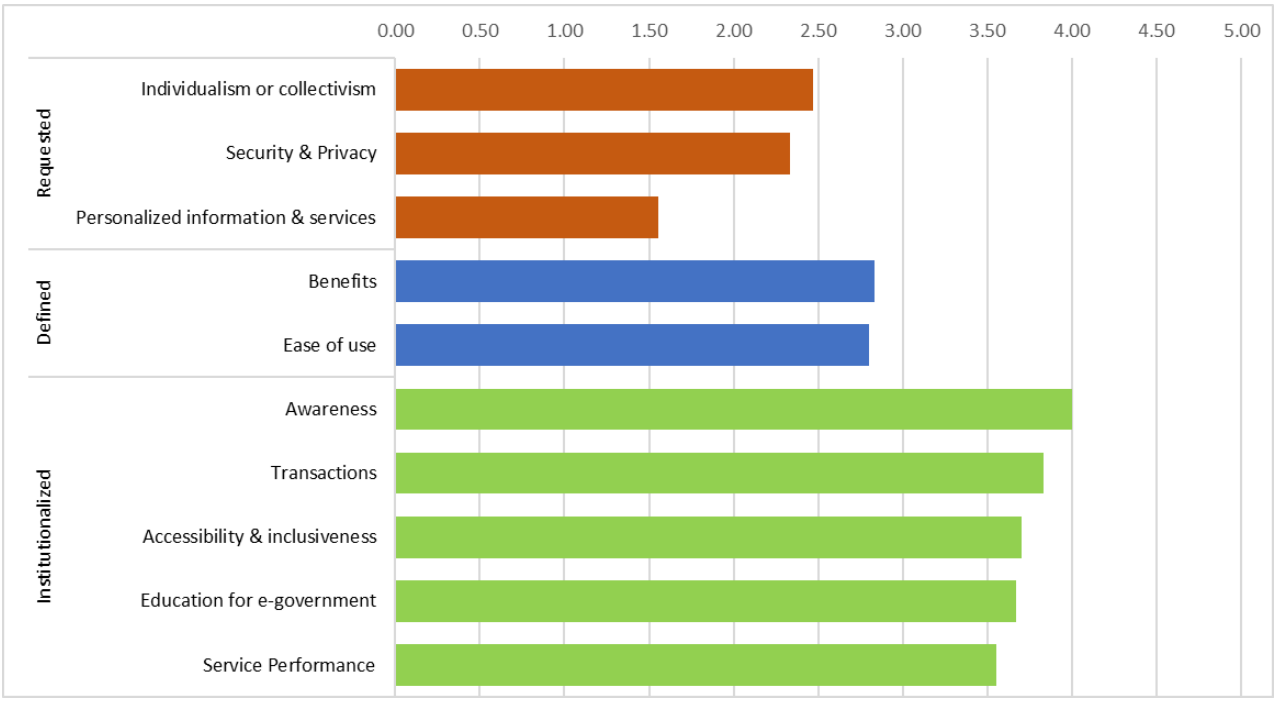

Figure 4. The results of the assessment of e-government inclusion policy in Poland. Source: Own elaboration

7. Conclusions

The issue of digital inclusion of seniors becomes a relevant aspect in social policy formation and is expected to become more prominent over time given the increasing life expectancy as well as declining birth rates and the lack of generational substitution, particularly in the developed nations. The inclusion of seniors gained particular attention in the ongoing Covid-19 pandemic emphasizing the vital role of e-government in servicing the health of citizens and tackling the adverse effects of digital exclusion (Ciesielska et al., 2022). Thus, appropriate regulations to include seniors in e-government policies are justified for research purposes. In this paper, the main determinants affecting the seniors' involvement in e-government use were analysed.

The focus of our research is on those aspects of mitigating seniors' digital exclusion which can and should be tackled by developing context-specific e-government policies. The main *theoretical* contribution of our research is the elaboration of the research framework, which allows us to: (1) collect and structure knowledge on the provision of e-government policies for the interests and needs of seniors; (2) deliver a qualitative assessment on the level of e-government support towards older people; (3) integrate results of analysis for the formulation of learning outcomes. Counteracting digital exclusion presents a challenging objective for every

government worldwide and therefore requires adopting a holistic view in defining and implementing public policy objectives. A *practical* contribution of our study is the identification of both regulatory gaps not covered by public policy regulations as well as the practical gaps arising from administrative inaction in a particular context. Governments can evaluate comprehensiveness in national, regional, or local policy statements to provide immediate and holistic public policies towards seniors. This practical contribution is backed by the validation of the research framework by the Polish case study.

Two conclusions can be drawn from research framework validation. *Firstly*, in some cases, there is a real practice, though no clear legislation or policy supports it. The main achievements of e-government in Poland - such as personal profile (ePUAP), e-health services (IKP) or the integration of services with online banking - are clearly grounded in legislation and are provided centrally. However, with regard to services provided by local administrations, areas of improvement were identified, in particular with regard to the depth of the e-services catalogue as well as the support of services by e-commerce transactions. *Secondly*, with regard to existing policies aimed at seniors, the formulation of an adequate national policy and the support for its implementation by dedicated programmes are positive phenomena. As the policy indicates itself, the implementation involves many institutional partners and the guidelines execution occurs with close inter-departmental cooperation, particularly between the Ministry of Family and Social Policy and Ministry of Digitisation, but also between the regional centres, national insurance and others. In this regard, the policy recommendations are positive. However, with regard to e-government policy implementation, an integrated, multi-departmental collaboration strategy is missing, as well as a definition of the extent of e-government support for the implementation of social policies. We indicate a need for strategic alignment between e-government services and social policy delivery supporting agencies' performance and interagency data and information exchange.

The research framework has *limitations* that need to be articulated. To provide a better assessment, the research framework should be enriched by (1) prioritising the e-government policy dimension and (2) assessing the evidence of practice. E-government policy evaluation should be carried out in interdisciplinary teams including experts from social sciences, law and computer science. In addition, study could be strengthened by increasing the number of experts involved both in the development (improvement) of the research framework, and especially in the process of assessment of e-government inclusion policy for case study selected for framework evaluation. Moreover, our study assumed that all research framework determinants categories have equal importance to increase the senior's involvement in e-government use.

Future studies may focus on introducing the determinant's weighting coefficients obtained through an expert evaluation. Another potential stream of research could be the analysis of social policy and e-government strategic alignment regarding seniors and other vulnerable groups. Such research may significantly contribute to e-government provision to vulnerable groups as well as counteracting the digital divide by bringing technology to the seniors within their institutional and family-related ecosystem.

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Appendix A

Determinants of e-government performance

Determinant Category	Determinants of performance	Supporting references
Accessibility & inclusiveness	– website compliance with accessibility standards; – e-government services for socially disadvantaged groups; – availability in native languages, provision of appropriate content for ethnic minorities; – the availability of kiosks; – enabling infrastructure such as ICT infrastructure, including Internet penetration, multichannel delivery and accessibility; – lack of society information readiness is an initiator for many e-government projects not only in developed countries but also developing nations.	(Kearns, 2004; Rose et al., 2020; Sigwejo & Pather, 2016)
Security & Privacy	– trustworthiness of transactions online; – security policy statements online, and the credibility of the information disseminated; – trust in the Internet Privacy policy statements online, and the credibility of the information disseminated.	(Bélanger & Carter, 2008; Das, 1987; Deng et al., 2018; Gomez & Gould, 2010; Pieri & Diamantinir, 2010; Segovia, Jennex, & Beatty, 2009; van Dijk, 2006)
Personalised information & services	– degree to which it can enable citizens to personalize information and services according to their own needs and circumstances, and by how fast it can facilitate access to frequently used services and an online record of the citizen's previous dealings with government; – accuracy, timeliness, relevance, understandability, the level of details of information; – openness and transparency of information provided through the e-government application.	(Alshawi & Alalwany, 2009; Papadomichelaki & Mentzas, 2012; Reilly et al., 2003)
Service Performance	– assessing the transaction between the citizen, the task the citizen is attempting to complete, and the government's Web site regarding the information task; – responses to citizens' inquiries, automatic responses to online submissions, ability to make inquiries online, ability to trace the applications, citizens charters online.	(Gauld et al., 2010; Rose et al., 2020)
Ease of use	– perceived ease of use; – user friendliness, support for novice users, common look and feel of public websites, frequently asked questions, site map, concise websites addresses, links to other websites, navigation tools, the support navigation to be able to access information and availability in the website correctly and quickly; – effective and efficient user interface that is inclusive of more people in more situations and can achieve user satisfaction; – accessibility rate, interface effectiveness that satisfies the users' needs; – one-stop government is to eliminate the multi-level bureaucratic processes and raise the efficiency of the organization.	(Affisco & Soliman, 2006; AlAwadhi & Morris, 2009; Bigdeli et al., 2013; Davis et al., 1989; Deng et al., 2018; Kubicek & Martin, 2016; T. H. Y. Ma & Zaphiris, 2003; West, 2015)
Transactions	– Transaction management in the e-government ecosystem such as, paying taxes, utility bills, and vehicle registration.	(Deng et al., 2018; Sakowicz, 2001)

Determinant Category	Determinants of performance	Supporting references
Benefits	– Money saving; – Time saving.	(Alawadhi & Scholl, 2016; Orviska & Hudson, 2009; Peter & Valkenburg, 2006; Phang et al., 2006; Tien & Fu, 2008; Waycott et al., 2010)
Education for e-government	– Training, ICT resources, e-content, and resources for distance learning	(Ebbers et al., 2016; Lim et al., 2016; Rodriguez-Hevía et al., 2020; Rose et al., 2020)
Awareness	– The lack of familiarity with IT and lack of awareness.	(AlAwadhi & Morris, 2009; Baker & Bellordre, 2004; J B Lee & Porumbescu, 2019; Pieri & Diamantinir, 2010)
Individualism & collectivism	– The dominant affect the culture individualism support e-government adoption; – Once face-to-face contact is reduced, the uncertainty of many people when it comes to adopting e-government is increased; – E-government should reflect the individual and cultural heritage, the religion and culture could be obsolete against e-government adoption.	(AlAwadhi & Morris, 2009; Ayouby et al., 2012; Bagchi, 2005; Beynon-Davies & Hill, 2007; Chen et al., 2010; Hubregtse, 2005; Klimaszewski & Nyce, 2009; Mwim & Kritzinger, 2016; Srite et al., 2008; Malodia, Dhir, Mishra, & Bhatti, 2021)

Appendix B

Contextualization of the determinants of e-government performance for the policy of seniors' inclusion

Determinant Category	Contextualization of the Determinants for Seniors
Accessibility and inclusiveness	– inclusiveness of ICT infrastructure (Bélanger & Carter, 2008) – government Web site visitors are more exposed to the digital divide (Botrić & Božić, 2020; Thomas & Streib, 2003) – accessibility to social services such as claiming and managing pensions, health insurance benefits (Bélanger & Carter, 2008; Hong & Choi, 2020; Phang et al., 2006; Siren & Knudsen, 2017) – language translation of the content (AlAwadhi & Morris, 2009) – to provide ICT infrastructure for e-health services (Ali et al., 2021) – m-government use is similar to e-government use on stationary computers (Conci et al., 2009; Khan, 2016; Ko et al., 2019; Leist & Smith, 2014; Molnar, 2014; Righi, Sayago, & Blat, 2011) – Internet coverage (urban, rural regions, and large cities) (Bélanger & Carter, 2008) – due to the physical and mental limitations of seniors (sight, motorism, coordination) some of the applications, forms and procedures may be harder to achieve and supported by special funding (the experts) – the e-government service can be accessed using legacy devices (the experts)
Security & Privacy	– seniors expect to ensure data security and privacy policy (AlAwadhi & Morris, 2009; Parent, Vandebeek, & Gemino, 2005; West, 2015) – security and privacy influence the degree of confidence being online (AlAwadhi & Morris, 2009) – trust is facilitated by the quality of service, and perceived security (Ko et al., 2019) – to provide and increase confidence and greater control over using traditional services in case of unexpected situations (the experts). – seniors too easily trust third party persons without verifying the information (the experts)
Personalized information & services	– the degree to which the system can enable seniors to personalize information and services according to their needs (AlAwadhi & Morris, 2009; Reilly et al., 2003) – providing accessible, accurate, timely, relevant and understandable information (Papadomichelaki & Mentzas, 2012) – tailored communication between senior and website administrator (Nilpong & Thanasopon, 2020) – senior prefer clear messages with less content and streamlined processes that do not involve many steps or questions (Abad-Alcalá et al., 2017) – seniors need to keep up with the external world where news sources are diverse and often online (Rose et al., 2020)
Service Performance	– the time spent to complete the task (AlAwadhi & Morris, 2009) – response time (Nilpong & Thanasopon, 2020) – limited session times (Abad-Alcalá, Llorente-Barroso, Sánchez-Valle, Viñarás-Abad, & Jiménez, 2017) – seniors forced to be involved in e-government service use (Rose et al., 2020) – older adults are social, but less well versed in the use of new technologies, and internet browsing, and mostly prefer face to face interactions or the classic channel on landline telephony instead of mobile phones (Choudrie, Zamani, & Obuekwe, 2021) – minimize the number of transitions between services (Alalwan & Thomas, 2011) – address system interoperability issues through system integration and information sharing between functional units and government agencies ensuring the Once Only Principle (M.A. Wimmer, Neuroni, & Frecè, 2020) – designing a one-stop portal to provide integrated administration of all government e-services (Hangen & Kubicek, 2000)

Determinant Category	Contextualization of the Determinants for Seniors
Ease of use	– principle of minimum effort in using a given e-government system (AlAwadhi & Morris, 2009; Davis et al., 1989) – use intention is driven by their perceived usefulness and perceived ease of use of the service (Phang et al., 2006) – the perceived ease of use is usually declining with increasing age. Seniors have significantly lower internet skills than younger generations (Hung et al., 2013; Molnar, 2014; Nacheva & Bakaev, 2020; W. A. Rogers & Fisk, 2010) – difficulties in recognizing details especially if they are presented on a computer screen (Martin, Gregor, & Hart, 2004) – seniors prefer fewer menu sections, large fonts, and contrasting colours in the design of the public administration websites (Abad-Alcalá et al., 2017) – seniors fear the superabundance of codes, usernames, and passwords that have to be used (Abad-Alcalá et al., 2017) – seniors have problems understanding complex new processes (AlAwadhi & Morris, 2009; Björn Niehaves & Becker, 2008) – user interface elements are more difficult for users with declining motor skills, particularly on touch interfaces (Kane, 2019; Tomczyk, 2014) – computer anxiety and computing support are antecedents of perceived ease of use (Phang et al., 2006) – informing citizens, participating in online discussions, and ability to post a topic for public discussions online (Deng, H., Karunasena, K. and Xu, W. , 2018; Sakowicz's, 2006) – "look and feel" is a highly contextual (including, generational) category. As the user (or persona, in terms of UX design) is different, the "orientation", "friendliness" or FAQs need to be adjusted (the experts). – it is especially difficult for seniors to find various services on different sites and in different applications (the experts)
Transactions	– transactional processes that involve seniors online monetary transactions such as, paying taxes, utility bills, and vehicle registration (Deng et al., 2018) – seniors are encouraged to use e-commerce as a supplement or alternative to traditional commerce (the expert). – older Internet users express fear of the intangibility of digital documents in the event of possible complaints (Abad-Alcalá et al., 2017)
Benefits	– the time and money savings received by seniors (AlAwadhi & Morris, 2009) – seniors do not seem to see any specific potential benefits, even though older people clearly do have routine medical issues such as checkups, blood tests, and other geriatric-related issues (Mizrachi, Shahrabani, Nachmani, & Hornik, 2020) – perceived usefulness or perceived value of e-government use is key to increase its adoption (Nam & Sayogo, 2011) – the benefits can be vast, including reduced social isolation, increased IT-enabled communication with friends and family, active participation in a computerized healthcare system (Bjoern Niehaves & Plattfaut, 2010) – resource savings and self-actualization determine senior citizens' usefulness perception (Phang et al., 2006)
Awareness	– older people are lacking the awareness of advantages related to ICT usage because they are easily satisfied with their current possibilities and cannot imagine how ICT could improve their lives (Hong & Choi, 2020; Morris & Venkatesh, 2000; Björn Niehaves & Becker, 2008) – e-government services lack "seniors' profile", e.g. the subset relevant for seniors (the experts)
Education for e-government	– number of available courses and training programs (Alalwan & Thomas, 2011; Holgersson & Ellgren, 2020; Hong & Choi, 2020; J B Lee & Porumbescu, 2019; Rose et al., 2020) – participation in the training is positively associated with the proportion of elderly people using these services (Botrić & Božić, 2020) – public and private efforts should be made to the training. (Ali et al., 2021)

Determinant Category	Contextualization of the Determinants for Seniors
Individualism / collectivism	– individualism is the best predictor of e-government development and good acceptance (F. Zhao, Collier, & Deng, 2014) – lack of engagement can be caused by motivational and psychological factors (cognitive, emotional, and behavioural factors) used (Abad-Alcalá et al., 2017) – computer and Internet use can improve the quality of life of the elderly by decreasing their loneliness and social isolation, providing social support and leisure activities, enhancing their self-efficiency and perception of self- control, and integrating them into society (Birnie & Horvath, 2002; Boz & Karatas, 2015; Heo, Chun, Lee, Lee, & Kim, 2015) – seniors belonging to a particular cultural group and orientation may have a peculiar perception of ICT that may cause them to easily adopt new technologies resulting in either increasing or reducing the rate of ICT dissemination (Malodia, Dhir, Mishra, & Bhatti, 2021) – hybrid approach toward e-government services, ICT and human support (the experts) – seniors can be encouraged to use e-government services after face-to-face contact (the experts)

Appendix C

Summary of the assessment of e-government inclusion policy in Poland

Determininants	*Level at which determinants are covered by e-government policies for seniors*				
	Initial	**Requested**	**Defined**	**Institutionalized**	**Optimized**
	e-government inclusion policy toward seniors does not exist	e-government inclusion policy toward seniors is recognized	e-government inclusion policy toward seniors is defined but the responsible agency is not assigned	e-government inclusion policy toward seniors is defined, implemented and the responsible agency is assigned	e-government inclusion policy toward seniors is defined and the responsible agency is assigned, and the implementation is systematically improved
EP2_1: e-government platforms design enable seniors to personalize information and services according to their needs ET2_1: e-government policy includes and monitor measures on time spent to complete the task; response time; non-limited session times	+				
SC1_4: policies take into account the needs of lonely and isolated seniors in terms their integration into the society SC1_5: e-government policy increase seniors' quality of life in terms of self-efficiency and sense of self-control SC3_3: e-government encourage public and private e-services providers to training for seniors EP1_2: e-government policy mitigate lack of trust by simultaneous provision of high quality and secure services EP1_3: e-government policy safeguards the risks of relying on unknown third parties EP2_2: e-government platforms provide qualitative information (accessible, accurate, timely, relevant, understandable, detailed, clear, limited as to the number of questions) EP2 3: e-government platform provides tailored communication between senior and website administrator EP3_2: e-government policy is informing on benefits of eHealth use (active participation in a computerized healthcare system) ET3 1: interface provides language translation of the content ET 4: e-government service design includes minimizing of codes, usernames, and passwords that have to be used ET_5: computing support to limit computer anxiety is provided next to e-government services		+	**DEFINING REQUIREMENTS, COMPETENCES, RESOURCES**		
SC1_1: policy includes hybrid approach toward e-government services, ICT and human support SC1_2: individual encouragement to use e-government services in face-to-face contact with the office SC1_3: taking into account the specificities of cultural groups and orientations in e-government policies EP1_1: e-government policy ensures data security and privacy policy EP3_1: e-government policy is informing on benefits of e-services use (time and money savings, reduced social isolation, increased IT-enabled communication with friends and family) ET1_4: e-government provides easy access to popular services among seniors such as: claiming and managing pensions, health insurance benefits, eHealth services ET1_6: e-government policy provides Internet coverage in urban, rural regions, and large cities EPR1_2: eHealth is supported by e-commerce transactional processes (medicine purchase, medical examinations fee) EPR1_4: e-government policies include support of intangible online processes by tangible proof of evidence (documents)			+		
SC2_1: the policy includes awareness building of e-government services for seniors SC2_2: e-government policy facilitate 'seniors' profile' building in e-services SC3_2: the policy considers the process of 'onboarding' with technology and e-government services for the seniors, e.g. through instructional films, wizards, help pages or human assistants ET1 2: E-government policy includes various access to e-government services through Website, m-government, and landline telephony ET1_3: the e-government service can be accessed using legacy (old-fashioned) devices ET3_2: e-government policy includes WCAG guidelines ET3_3: e-government policy support e-services design including UX for seniors EPR1_3: e-government policy includes a complaint process for e-services			**STRIVING TO IMPROVE PROCESSES AND SERVICES**	+	
SC3_1: e-government policy includes training programs development ET1_5: policy supports provision of ICT infrastructure for eHealth services ET2_2: designing a one-stop portal to provide integrated administration of all government e-services ET2_3: e-government policy address system interoperability issues through system integration and information sharing between functional units and government agencies ensuring the Once Only Principle EPR1_1: e-government policies provide transactional processes that involve seniors online monetary transactions such as, paying taxes, utility bills, and vehicle registration					+