


Article

Citizens' Involvement in E-Government in the European Union: The Rising Importance of the Digital Skills

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Abstract: This paper studies what factors influence European citizens in their e-government adoption and use, and whether there are differences within the European Union. A binary logistic regression model has been used to determine the profile of e-government users. The article highlights especially the influence of digital skills, as an increasingly influential factor, and opens up new areas of research such as the uses of e-government depending on the population density or sociodemographic factors. Given a certain lack of e-government studies at a pan-European level, this article provides an empirical comparative analysis in the EU and provides insights into the factors influencing the behaviour of European e-citizens.

Keywords: e-government; European Union; e-citizen; digital skills; digital society; ICT adoption

1. Introduction

The introduction of information and communication technologies (ICTs) into government has significantly transformed the way public administrations interact with their citizens and has led to the development of a global phenomenon called electronic government or e-government. This is defined as the delivery of government information and services to citizens via the Internet or other digital means [1–3] and currently is a very relevant aspect of governance [4].

The e-government combines government use of ICTs with organisational change to improve its structures and functioning [5] and currently is getting a lot of interest in public administration studies [6]. This new electronic government involves technological changes but also new styles of leadership, new decision-making processes, different ways of organising and delivering services, and new concepts of citizenship [7].

A growing corpus of literature has been analysing the impact of ICTs on the public sector from multiple perspectives, as reflected in extensive bibliographical reviews and meta-analyses covering definitions, scope, methods and recommendations (e.g., [8]), citizen orientation and adoption [9,10], stage models [11], diffusion [12,13], and the quality of these services [14]. The literature is flourishing, but [15] point out in their meta-analysis of empirical e-government research that in the literature there is still a shortage of authoritative quantitative empirical approaches and the topic is still perceived as a young field of research.

The e-government is intended to offer new possibilities and advantages for various groups of stakeholders, such as government agencies (G2G), citizens (G2C), and business organisations (G2B), according to [16]. Digital interaction with citizens is a particularly complex challenge as population behaviour can vary over time [17]. Margetts and Dunleavy [18] introduced the concept of digital era governance and, proposing new challenges for public sector governance, among others, citizen-oriented

government. Recently, trying to evaluate whether e-government performance boosts citizen use, [19] argued that the effect of national e-government performance may differ among various social groups, and suggested that the moderating effects of demographic and socio-economic variables should continue to be tested in future research. There is a need to adopt a social-contextual perspective. The citizen and the digital citizen's capabilities matter.

In this context, our investigation considers the following research questions: What factors influence European citizens in their e-government adoption and use? What is the influence of digital skills in its adoption? We need to understand the impact of citizen behaviour and characteristics on e-government activities. In this sense, our contribution is mainly twofold: firstly, we develop the e-government literature through this empirical comparative analysis at the European level, increasing the understanding of the European e-citizen; secondly, we provide a theoretical contribution behind the behaviour of e-citizens in the EU, highlighting especially the influence of their digital skills, together with personal characteristics and the environment.

Furthermore, very little research delves into the spatial implications of the digital profile of European citizens, considering Europe in a comprehensive manner [20]. Comparing with other big geographies, such as Australia [21,22], Canada [23], and China [24], the shortage of studies at a pan-European level is more evident [19,25,26].

This study consists of five sections. After the introduction, Section 2 reviews the theoretical framework associated with our analysis of the e-citizen. Section 3 presents the empirical analysis and discussion concerning the behaviour of e-government users within Europe depending on their adoption levels. Finally, Sections 4 and 5 contain a discussion about the findings, the conclusions reached in the document, the limitations, and the future avenues of research.

2. Literature Review

2.1. Conceptual Models for E-Government

In the literature, there was a significant growth in the number of papers using the term e-government around 2001 [8], when two relevant pieces of research were published: Layne and Lee [27] and Fountain [28]. Since then, a large number of mechanisms and indexes have been developed to measure and compare progress with e-government [11]. The early e-government literature adopted practitioner-led models largely based on Nolan's stage growth model, hypothesising development from online information [29] and the literature is fertile in terms of models classifying e-government development into measurable stages [16,27,30,31].

In a meta-analysis, [11] reviewed and analysed twelve stage models found in the literature between 2000 and 2009. Accordingly, he defined the underlying approaches and concepts in order to identify the common frame of reference across the different models. The resulting common frame includes the stages, from a citizen perspective, consisting of interaction, transaction, participation, and involvement [11]; Janowski [32] considered that the concept evolves toward more complexity and greater contextualisation and specialisation. To this end, this author presented a four-stage evolution model comprising digitisation (technology in government), transformation (electronic government), engagement (electronic governance), and contextualisation (policy-driven electronic governance) stages. Looking for a unified view, Rana et al. [2] considered that e-government services can be broadly categorised as either informational (delivery of government information) or transactional (two-way transactions). Despite their uses, e-government maturity models acquired criticism from several researchers, as none of the models were universal. The success of e-governments should not be measured merely based on the sophistication of the technology used by the government, but instead should also consider whether or not the services offered are being used by the stakeholder [33].

With the increasing interest in the effective achievement of sustainable development goals, it is clearer that the current models do not suffice in its role in guiding the future development of e-government [34]. These authors consider, after a careful review of approximately fifty models, that,

as a finite model assumes that there is an ultimate state, its use is not appropriate in the context of continuously evolving phenomena, such as e-government. In this regard, the new model becomes a reference model rather than a concrete finite state model.

Finally, despite that the word sustainability has been loosely used to define the efficiency that a government could achieve in e-government services [35], there is a growing interest in linking the effectiveness of e-government with environmental sustainability [36], and fertile research can be found for local governments [37,38]. Estevez and Janowski [39] also emphasised the role of electronic governance for sustainable development, proposing a conceptual framework. In any case, strong theoretical studies for environmental sustainability in electronic government are still required to produce more knowledge and theories that can be generalised and utilised in different research contexts [40].

2.2. Factors for Citizens' Digital Adoption of E-Government

The literature offers helpful links between the theoretical corpus used to address the behavioural determinants associated with the adoption and use of e-government and the well-grounded theories about customer behaviour and user acceptance [41–44]. The technology acceptance model (TAM) has been subject to subsequent theoretical development [45], especially the unified theory of acceptance and use of technology (UTAUT). These theories have received substantial empirical support and, adopting this approach, significant research on e-government adoption has applied these models or combinations of them (e.g., [46–51]) to examine the factors influencing the speed of adoption of e-government systems or the reluctance of users to adopt them [2,52].

The behaviour associated with e-government services is influenced by socio-demographic characteristics, as reported in previous studies. In this sense, the extant literature provides evidence on the relationship between e-government adoption, demographics, and socio-economic variables such as age, education, income, employment status, marital status, or trust in government [53–57], but the results are not entirely conclusive. [58] recently investigated the impact of demographic factors on the adoption of e-government services. Their results indicate that gender was significant in moderating the positive impact of both perceived usefulness and perceived ease of use on the willingness to use e-government services. In this study, age and education, however, were not significant in moderating the impact of perceived usefulness and perceived ease of use on the adoption of e-government services.

According to Akman et al. [59], the use of e-government content and services is pervasive and closely linked to gender and education level. Age was found to be negatively correlated with intention to use e-government services among Jordanian citizens [60]. Szopiński and Staniewski [61] showed that there is a statistically significant relationship between the status of the respondent's residence and the propensity to use particular forms of e-government. Unemployment was negatively and significantly related to general e-government use, suggesting unemployed respondents were less likely to use e-government features [19], although they were in need of government help (e.g., job training and matching).

The literature also indicates that a lack of broadband connectivity is also a limiting factor for using e-government [62,63]. Broad bandwidth and, in general, proper connectivity are critical for allowing the transmission of digital information at high bandwidths. In most rural areas, low population density and high deployment costs discourage private investments, creating a negative feedback of limited capacity, high prices, and low service demand [64]. Deploying connections in areas with low population density makes these rural areas high-cost markets with little opportunity to achieve economies of scale or obtain a return on investment [65], and makes difficult the usage of e-government. GDP per capita and ICT infrastructure are significantly associated with rising e-government maturity over time [66].

According to Bélanger and Carter [53], skills are an important determinant in the take-up of e-government, as one's ability to effectively use the Internet has a significant impact on intentions to use e-government. It has furthermore corroborated in the literature [67,68]; Mensah and Mi [58] that computer self-efficiency has a direct impact on intention to use e-government services. Less research is found about the digital competences (Digital competences cover information management, collaboration, communication and sharing, creation of content and knowledge, ethics and responsibility,

evaluation and problem solving, and technical operations related to ICTs ([69] for a systematic literature review.) of users, such as information navigation skills and mobile skills [70] or conditions that influence citizens' perceptions, trust, and risk [71]. Citizens without the appropriate skills, for instance, limit their ability to use e-government for information retrieval [72]. Lindgren et al. [73] insist in the need for new research on the actors and skills that are central for digital public encounters, since there is a gap between the actual and potential usage of e-government skills [70]. As the citizen–government interaction models are becoming more complex in the digital world (from a mere search for information to more transactional and participatory models), we can foresee that digital competencies will have a greater weight in their adoption even compared to socioeconomic factors that affect the citizen.

Consequently, we hypothesised that the digital skills and the subsequent inequalities will have stronger and more significant impacts in more complex types of interactions. This evolution is about schematising in Figure 1.

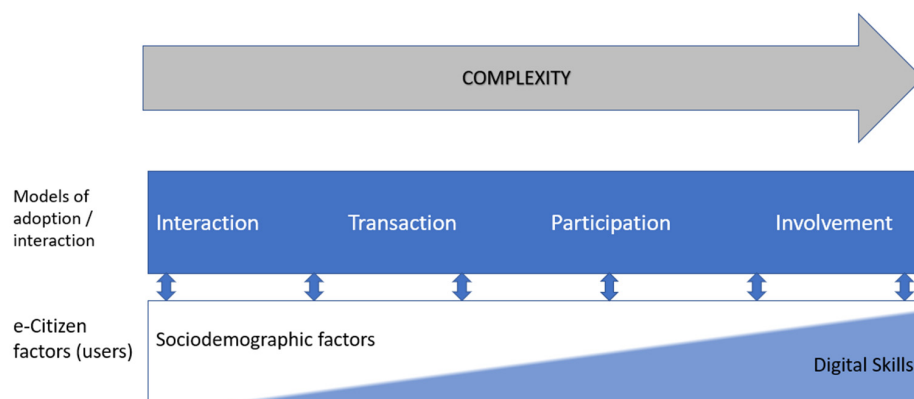


Figure 1. Growing importance of digital skills in complex models of adoption. Source: own elaboration.

Following [11], we propose a continuous evolution, not in phases, because as has been indicated, it would not properly include all the nuances of the e-government, as a continuously evolving phenomenon. In this continuum, as the complexity and interactivity of the electronic government system increases, digital skills become more relevant compared to other factors.

3. Methodology and Data

To carry out the study, we have worked with the data from the survey “EU survey on ITC usage in households and by individuals 2016” (Eurostat Model Questionnaire Version 3.1.), last wave available when closing this investigation. This survey is carried out on an annual basis.

The purpose is to study the users' characteristics who used e-government in the three months prior to conducting this survey. For this reason, we work with those individuals who have used the Internet in the last three months. This group consists of 154,149 individuals.

A binary logistic regression model has been used to determine the profile of e-government users, since it allows us to explain or predict the characteristic of a dichotomous event based on a set of variables considered as influential [74].

One of the purposes is to establish whether the user profiles are different depending on the way they make use of e-government. The uses considered are the use of e-government to find information on the website, to download forms and to deliver completed forms. In this sense, three logistic regression models have been carried out, each with a different variable to be explained, namely the three different uses indicated above: information from the website, downloading forms, and delivering completed forms. This way we can observe the evolution to more complex models of interaction with digital public services, as established in the theoretical framework.

To perform the calculations for the three regression models, SPSS v.24 has been used. To perform these logistic regressions and prevent the size of the sample affecting the statistical significance of the

variables, a 10% sample has been selected by means of simple random sampling, so 15,434 cases have been used. For the fraction of the sample with which we are working, as can be seen in Table 1, the most common use of electronic government is the search for information, with almost 59% compared to downloading forms and filing complex forms, with 34.3% and 34.6%, respectively.

Table 1. Distribution for use of e-government.

Use of E-Government	If You Use		Does Not Use	
	Frequency	Percentage	Frequency	Percentage
Website information	7839	50.8%	7592	49.2%
Download forms	5300	34.3%	10,130	65.6%
Completed forms	5182	33.6%	10,249	66.4%

Source: own research using the “European Union survey on ICT usage in households and by individuals 2016”.

The coding has been carried out by Eurostat and corresponds directly to the different uses of electronic government that have been established in the survey, where individuals had to mark whether they had used them. The data come from the survey question: “Did you contact or interact with public authorities or public services over the Internet for private purposes in the last 12 months for the following activities?”, giving the possibility of marking the three uses that they are studying (obtaining information from websites, downloading official forms, and submitting completed forms). The three dependent variables will take the value 1 if the individual has made use of e-government, and zero otherwise.

Among the multiple variables included in the survey, the variables that could explain the use of e-government are grouped into socio-demographic aspects, user digital skills, and type of Internet connection, to assess its preeminence as it has been hypothesised in the theoretical framework. The different explanatory variables and their forms are described in Table 2. In those variables where there are more than two categories, the reference category has been determined as the one with the least connection of e-government uses.

Table 2. Explanatory variables and forms.

Variables	Reference Category	Other Categories
Socio-demographic	Population density	Low density Average density High density
	Development of the region	Less developed In transition More developed
	Employment	Not in the labour force (students, retired, military service, etc.) Employee or self-employed Unemployed
	Level of education	Primary Secondary Higher
	Age	Between 25 and 44 <25 years Between 45 and 64 65 years +
	Gender	Male Female
Digital skills (*)	Information	None or basic Superior
	Communication	None or basic Superior
	Problem solving	None or basic Superior
	Software skills for content manipulation	None or basic Superior
Internet connection	Internet connection outside the home	No Yes
	Mobile broadband at home	No Yes
	Broadband Internet at home	No Yes

(*) Defined following “European Union survey on ICT usage in households and by individuals 2016” <https://ec.europa.eu/eurostat/web/digital-economy-and-society/data/database>.

The distribution of the different variables in the sample fraction is shown in Table 3.

Table 3. Distribution of socio-demographic variables by categories.

Variables	Category	Frequency	Percentage
Age	<25 years	2125	13.80%
	Between 25 and 44	5874	38.10%
	Between 45 and 64	5945	38.40%
	65 years +	1490	9.70%
Employment	Not in the labour force	4686	30.40%
	Employee or self-employed	9622	62.40%
	Unemployed	1121	7.30%
Level of education	Primary	2942	19.10%
	Secondary	7420	48.20%
	Higher	5023	32.60%
Development of the region	Less developed	5689	37.10%
	In transition	1622	10.60%
	More developed	8018	52.30%
Population density	Low density	4611	29.90%
	Average density	4869	31.50%
	High density	5954	38.60%
Gender	Male	7439	48.20%
	Female	7995	51.80%

Source: own research using the “European Union survey on ICT usage in households and by individuals 2016”. Percentages referring to valid cases.

3.1. Results of the Estimation for the Use of E-Government to Obtain Information from Websites

In this case, the dependent variable in the logistic regression is the use of e-government for obtaining information from the websites of public bodies. A total of 50.8% of individuals in the sample fraction have declared that they have used electronic government to search for information on websites, compared to 49.2% who have not used it. It is a dichotomous variable that takes the value one if the individual has used this service in the three months prior to the survey date, and zero otherwise. We have worked with 15,227 valid cases with goodness of fit measures of 27.4% for Cox and Snell’s R-square, 36.6% for Nagelkerke’s R-square, and Hosmer and Lemeshow values of 0.289. With this model, it is possible to correctly classify 72.9% of the total number of cases, correctly classifying 82% of the users who use e-government to obtain information, and 62% of those who do not.

As can be seen in Table 4, the socio-demographic variables are significant except for the category of average density, unemployed, and secondary education.

Digital skills in communication are not statistically significant and this is also the case for the unemployed category.

In terms of population density, it should be noted that for individuals who live in regions of high population density, the probability of using e-government is almost 13% lower compared to those who live in low-population regions. However, moving from areas of low population density to those of average population density leads to the probability of using websites being 1.1 times higher.

In relation to age, for individuals over 65 years of age, the probability of using government websites to obtain information is 1.73 higher compared to those aged between 25 and 44 years. For higher education levels, the probability of this use of e-government is 1.7 times higher, values equivalent to the age increase indicated above.

Connecting to the Internet at home or outside the home also increases this probability, with the fact of connecting outside the home having a greater weight in the probability.

In terms of gender, being a woman is an influential variable regarding the search for information, but the probability for men is not very different.

Table 4. Results of the logistic regression for the search for information in e-government websites.

	Exp(B)	95% C.I. Para EXP(B)		p-Value
		Inferior	Superior	
Population density				
Low density *				0.000
Average density (1)	1.100	1.002	1.208	0.044
High density (2)	0.875	0.795	0.964	0.007
Development of the region				
Less developed *				0.000
In transition (1)	1.188	1.041	1.356	0.011
More developed (2)	1.359	1.251	1.477	0.000
Employment				
Not in the labour force *				0.001
Employee or self-employed (1)	1.213	1.094	1.345	0.000
Unemployed (2)	1.144	0.969	1.350	0.112
Level of education				
Primary *				0.000
Secondary (1)	1.146	1.029	1.276	0.013
Higher (2)	1.713	1.516	1.935	0.000
Age				
Between 25 and 44 *				0.000
<25 years (1)	0.623	0.545	0.712	0.000
Between 45 and 64 years (2)	1.424	1.301	1.558	0.000
65 years + (3)	1.730	1.467	2.040	0.000
Gender				
Man *				
Woman (1)	1.088	1.008	1.174	0.029
Digital skills: Information				
None or basic*				
Superior (1)	16.525	13.846	19.722	0.000
Digital skills: Communication				
None or basic *				
Superior (1)	1.073	0.978	1.177	0.134
Digital skills: Problem solving				
None or basic *				
Superior (1)	1.951	1.782	2.136	0.000
Digital skills: Software				
None or basic *				
Superior (1)	1.564	1.435	1.705	0.000
Internet connection				
Internet connection outside the home (yes)	1.293	1.179	1.418	0.000
Mobile broadband (yes)	1.140	1.053	1.233	0.001
Internet broadband at home (yes)	1.166	1.041	1.306	0.008
Constant	0.015			0.000
Number of cases	15.227			
Cox and Snell's pseudo R ²	0.274			
Nakelkerke's pseudo R ²	0.366			
Cut-off point	0.5			
% of cases correctly classified	72			
Hosmer and Lemeshow test	0.289			

* Reference category. Source: own research using the "European Union survey on ICT usage in households and by individuals 2016".

3.2. Results of the Estimation for the Use of E-Government to Download Forms

The dependent variable in the logistic regression is the use of e-government to download forms. This variable takes the value one when the individual has used this service in the three months prior to the survey date, and zero otherwise. A total of 34.3% of the individuals in the sample fraction have downloaded official forms compared to 65.6% who stated that they have not made this use of electronic government. We have worked with 15,276 valid cases with goodness of fit measures of 22% for Cox and Snell's R-square, 30.6% for Nagelkerke's R-square, and Hosmer and Lemeshow values of 0.412. With this model, it is possible to correctly classify 73% of the total number of cases, correctly classifying 52.2% of the users who use e-government to download forms, and 83.6% of those who do not. The results are shown in Table 5.

Table 5. Results of the logistic regression for the downloading of forms.

	Exp(B)	95% C.I. Para EXP(B)		p Value
		Lower	Superior	
Population density				
Low density *				0.000
Average density (1)	1.102	1.002	1.212	0.044
High density (2)	0.846	0.766	0.936	0.001
Development of the region				
Less developed *				0.000
In transition (1)	1.377	1.202	1.577	0.000
More developed (2)	1.695	1.555	1.847	0.000
Employment				
Not in the labour force *				0.015
Employee or self-employed (1)	1.168	1.047	1.302	0.005
Unemployed (2)	1.194	1.000	1.426	0.050
Level of education				
Primary *				0.000
Secondary (1)	1.308	1.160	1.474	0.000
Higher (2)	2.168	1.906	2.466	0.000
Age				
Between 25 and 44 *				0.000
<25 years (1)	0.609	0.528	0.702	0.000
Between 45 and 64 years (2)	1.315	1.202	1.438	0.000
65 years + (3)	1.414	1.192	1.676	0.000
Gender				
Man *				
Woman (1)	0.939	0.869	1.014	0.109
Digital skills: Information				
None or basic *				
Superior (1)	6.037	5.003	7.285	0.000
Digital skills: Communication				
None or basic *				
Superior (1)	1.303	1.183	1.435	0.000
Digital skills: Problem solving				
None or basic *				
Superior (1)	1.960	1.776	2.163	0.000
Digital skills: Software				
None or basic *				
Superior (1)	1.998	1.833	2.177	0.000

Table 5. Cont.

	Exp(B)	95% C.I. Para EXP(B)		p Value
		Lower	Superior	
Internet connection				
Internet connection outside the home (yes)	1.286	1.167	1.417	0.000
Mobile broadband (yes)	1.202	1.109	1.301	0.000
Internet broadband at home (yes)	1.343	1.189	1.518	0.000
Constant	0.009			0.000
Number of cases	15.276			
Cox and Snell's pseudo R ²	0.221			
Nakelkerke's pseudo R ²	0.306			
Cut-off point	0.5			
% of cases correctly classified	73			
Hosmer and Lemeshow test	0.412			

* Reference category. Source: own research using the "European Union survey on ICT usage in households and by individuals 2016".

As in the previous regression, the unemployed category remains statistically insignificant and the sex variable joins this, so being male or female does not influence the downloading of documents on government websites.

In terms of population density, as in the previous case, moving from a low to a high density level means that the probability is reduced by 16.4%, while moving from a low to a medium density does result in an increase in the probability, compared to the decrease seen for areas of greater density.

In regions with the greatest economic development, the probability of downloading forms is 1.6 times higher than compared to those that are less developed.

At higher levels of education, the probability of this use of e-government is doubled and it decreases by 40% for those under 25 years of age.

Connecting to the Internet at home and mobile broadband also increases the probability. The highest score is presented by accessing e-government using Internet broadband at home.

3.3. Results of the Estimation for the Use of E-Government for the Delivery of Completed Forms

The dependent variable in the logistic regression is the use of e-government to deliver completed forms. This variable takes the value one when the individual has used this service in the three months prior to the survey date, and zero otherwise. The percentage of citizens who submitted complete forms online is 33.6% in the fraction of the sample who declared that they have used electronic government to submit completed forms, compared to 66.4% who have not completed this procedure electronically. We have worked with 15,227 valid cases with goodness of fit measures of 19% for Cox and Snell's R-square, 26% for Nagelkerke's R-square, and Hosmer and Lemeshow values of 0.109. With this model, it is possible to correctly classify 72.7% of the total number of cases, correctly classifying 47% of the users who use e-government to download forms, and 86% of those who do not (Table 6).

In this case, the variables that are not statistically significant are sex, the average population density category, being unemployed, and having secondary education.

Having higher levels of education compared to primary school studies makes it 1.9 times more likely that people will deliver forms electronically.

Regarding Internet connections, both outside the main residence and inside it, the probability increases compared to not using these connections. Here, being connected to the Internet outside the home results in a probability 1.5 higher than that for delivering forms over the Internet among those who have not connected in this way.

Table 6. Results of the logistic regression for the delivery of completed forms.

	Exp(B)	95% C.I. for		p Value
		Lower	Superior	
Population density				
Low density *				0.000
Average density (1)	0.968	0.882	1.063	0.499
High density (2)	0.722	0.654	0.798	0.000
Development of the region				
Less developed *				0.000
In transition (1)	1.230	1.076	1.406	0.002
More developed (2)	1.411	1.296	1.535	0.000
Employment				
Not in the labour force *				0.000
Employee or self-employed (1)	1.299	1.166	1.447	0.000
Unemployed (2)	1.162	0.974	1.386	0.095
Level of education				
Primary*				0.000
Secondary (1)	1.118	0.994	1.257	0.062
Higher (2)	1.871	1.650	2.121	0.000
Age				
Between 25 and 44 *				0.000
<25 years (1)	0.551	0.477	0.635	0.000
Between 45 and 64 years (2)	1.335	1.223	1.458	0.000
65 years + (3)	1.625	1.375	1.920	0.000
Gender				
Man *				
Woman (1)	0.971	0.900	1.048	0.455
Digital skills: Information				
None or basic *				
Superior (1)	3.083	2.647	3.591	0.000
Digital skills: Communication				
None or basic *				
Superior (1)	1.395	1.269	1.533	0.000
Digital skills: Problem solving				
None or basic *				
Superior (1)	2.147	1.946	2.368	0.000
Digital skills: Software				
None or basic *				
Superior (1)	1.710	1.570	1.862	0.000
Internet connection				
Internet connection outside the home (yes)	1.474	1.340	1.623	0.000
Mobile broadband (yes)	1.084	1.002	1.173	0.044
Internet broadband at home (yes)	1.164	1.035	1.310	0.012
Constant	0.023			0.000
Number of cases	15277			
Cox and Snell's pseudo R ²	0.188			
Nakelkerke's pseudo R ²	0.261			
Cut-off point	0.5			
% of cases correctly classified	72.7			
Hosmer and Lemeshow test	0.109			

* Reference category. Source: own research using the "European Union survey on ICT usage in households and by individuals 2016".

4. Discussion

Comparing the results of the logistic regression carried out for each of the uses of e-government analysed, Table 7 shows both the effects it has on the probability of performing this use as well as the importance of the weights of each of the explanatory variables on the dependent variable. The variables included in these comparisons are those that are statistically significant in all or some of the categories considered.

Table 7. Comparison of the results of the logistic regression for each use of e-government.

	Website Information		Download Forms		Completed Forms	
	Exp(B)	Rank *	Exp(B)	Rank	Exp(B)	Rank
Population density						
Low density *						
Medium Density (1)	1.100	11th	1.102	11th		
High density (2)	0.875		0.846		0.722	11th
Development of the region						
Less developed *						
In transition (1)	1.188		1.377		1.230	
More developed (2)	1.359	6th	1.695	5th	1.411	7th
Employment						
Not in the labour force *						
Employee or self-employed (1)	1.213	8th	1.168	10th	1.299	8th
Unemployed (2)					1.162	
Level of education						
Primary *						
Secondary (1)	1.146		1.308			
Higher (2)	1.713	4th	2.168	2nd	1.871	3rd
Age						
Between 25 and 44 *						
<25 years (1)	0.623		0.609		0.551	
Between 45 and 64 years (2)	1.424		1.315		1.335	
65 years + (3)	1.730	3rd	1.414	6th	1.625	5th
Gender						
Man *						
Woman (1)	1.088					
Digital skills: Information						
None or basic *						
Superior (1)	16.525	1st	6.037	1st	3.083	1st
Digital skills: Communication						
None or basic *						
Superior (1)			1.303		1.395	
Digital skills: Problem solving						
None or basic *						
Superior (1)	1.951	2nd	1.960	4th	2.147	2nd
Digital skills: Software						
None or basic *						
Superior (1)	1.564	5th	1.998	3rd	1.710	4th
Internet connection						
Internet connection outside the home (1)	1.293	7th	1.286	8th	1.474	6th
Mobile broadband (1)	1.140	10th	1.202	9th	1.084	10th
Broadband Internet at home (1)	1.166	9th	1.343	7th	1.164	9th

Notes: (blank) statistically insignificant. * For variables with several statistically significant categories, the variable with the highest odd ratio was taken. Order of the weights only for the categories of the variables with the highest odd ratio.

When obtaining information from websites for e-government, individuals who have a superior skill level in the search for information are 16 times more likely to search government websites than those with a basic skill level or no skills at all. Those who have a superior level of problem solving

skills are twice as likely to use government websites to search for information, while software skills make them 1.56 times more likely to do this. In terms of e-government to download forms, this use is higher if people have superior digital skill levels as opposed to having no skills or basic levels. In this case, the variable with the greatest influence compared to its corresponding reference category for downloading forms is to have a superior level of digital skills in the search for information, since those individuals who possess it are six times more likely to make this use than those who have no skills or a basic level. Continuing with digital skills, the rest of the probabilities increase as the skill level grows, so having a superior level of digital skills in software or problem solving means that the probability of downloading documents is practically twice as high as it is for those who do not have any skills or basic skills in this regard. Finally, obtaining a superior skill level in information triples the probability of delivering completed forms on government websites. When delivering completed forms, it is the variable with the greatest influence compared to having no skills or basic skills, while with problem solving the probability is doubled and for software skills it is multiplied by 1.7.

A ranking has been established for the weight of each explanatory variable in the increase in the probability of the different uses of e-government being studied. This weight is understood as those variables with more variability (distance) with respect to the reference category. That is to say, they lead to a greater increase in the probability with respect to the different uses of e-government. For those variables that have more than one category, only the one with the highest odd ratio EXP (B) has been selected.

The variable that leads to the greatest increase in the probability of carrying out the three uses is having a superior skill level in the search for information, but it can be seen that it becomes more complicated depending on the use, with the marginal value decreasing from 16.5 in the first regression to 3.08 in the third. The other digital skills also show high figures in the three uses of e-government, being among the top five except in the case of communication skills. In this sense, the problem solving skill exceeds the ability to use software for handling content in the search for information and in the delivery of completed forms, but it should be noted that, for the use of downloading forms, the increase in probability with respect to the reference category is very similar for the problem solving skill and the software skill, although the weight moves to fourth position.

For all uses, as the level of education increases, the probability of being a user of e-government increases. Having secondary education influences the use except when delivering completed documents. In the case of downloading documents, higher education levels double the probability of this use of the Internet compared to primary education. Education is one of the variables that are within the top five positions in the established ranking, being the fourth for the use of electronic government in information and for the download of documents and delivery of complete forms, reaches the second and third position, respectively. Age is another of the influential variables when it comes to using e-government. Individuals who are 65 years of age or older see their probabilities increased, compared to the reference category, for the respective uses by values that range from 1.4 times (download forms) to almost 1.8 times (search for information). For the use of searching for government information, this category occupies third place in the ranking of the weights of all variables. In the case of users under 25 years of age, the probabilities decrease by between 38% (delivery of forms) and 54% (downloading of forms). For the delivery of completed forms, age reaches fifth place in importance, and for the downloading of forms, it reaches sixth place. The results are consistent with previous studies, such as [75] that found that age along with gender and education were significant in influencing citizens' intentions to adopt and use e-government services (in the United Kingdom).

Living in more developed regions similarly increases the use of e-government in all regions, although for the downloading of documents, it is within the five with the highest weight, but for the rest of the uses, it is positioned in sixth and seventh. The same happens with employment status, which has a similar increase in the three uses, moving to unremarkable places in the classification. Therefore, being an employee or self-employed leads to similar probability increases in the three uses and the unemployed category only influences the delivery of completed forms.

There are no significant differences in terms of the sex variable in relation to the use for forms, both downloading and delivering these, and only in the case of information search is this variable statistically significant, but with a low impact on the increase in probability and occupying values that are distant in terms of the importance of the weights of the variables.

The type of Internet connection of the users increases the probability of the three uses in a similar way, with connection outside the home generally occupying a higher position in terms of weights.

Regarding the population density where the habitual place of residence is found, the average density affects the search for information and the downloading of forms, but with a very low probability increase compared to low-density regions. This is the variable that for all uses occupies last place in the classification. However, for the delivery of completed forms, only high density has an influence. For all the uses of e-government, in the three cases analysed there is a reduction in probability for high-density regions, of between 28% (delivery of forms) and 13% (search for information on government websites). The low influence of population density is consistent with the fact that very low populated parts of the EU, such as Estonia and Scandinavia, are leading the process of digitalisation of public services. There are also opposite examples, such as the Netherlands. The results open a clear area of future research to delve into this question.

5. Conclusions

This research area undoubtedly was, and still is, timely and fascinating: it is a well-known fact that the way the public sector relates to citizens has undergone a drastic transformation since the 1980s with the arrival of information and communication technologies (ICTs), and especially since the late 1990s with the advent of the Internet. Quantitative empirical e-government research still reflects a growing, open-ended field that provides many opportunities for investigation [9,15].

The results highlight the importance of the four digital skills analysed in all types of e-government usage. Having performed previous e-government activities (simpler ones, such as obtaining information) is the most important factor. Our results are in line with other models on e-service adoption developed by [76], which stress the importance of learning and previous visits for further usage. E-government is becoming mandatory in many countries, as part of the transformation of public services, and citizens are thus forced to interact with the government using these applications [77–79], so the development of digital skills is increasingly important.

The study has highlighted the differences in behavioural patterns in Europe according to economic development. This leads to an interesting reflection: a degree of divergence in behaviour can be found at the EU level, conducting, therefore, inequalities among citizens. This fact may point to a certain digital divide within the EU as far as e-government services are concerned. There is a need to focus the attention of the EU authorities and policymakers to avoid the degree of economic development of the regions influencing the degree to which e-government services are used, resulting in inequalities between European citizens. Now in Europe, the beginning of the EU programming period 2021–2027 represents a good opportunity to delve into the territorial cohesion policies, and particularly in the field of digital public policies. If utilised properly, these digital tools can improve services to citizens, smooth administrative processes, and enhance democracy [80], avoiding any kind of digital divide.

Age, connectivity, and especially acquiring digital skills are all factors that have effects that vary from one use of e-government to another. It has been pointed out that senior citizens have received little attention in the e-government literature and that different generations of e-citizens behave in different ways [81], provoking a digital divide. This could be also related to an impairment in the cognitive, sensory, and motor functions of older people that may make IT use difficult and limit computer literacy (skills) in relation to digital services [82]. The increasing interest in e-government use by elderly people is a relevant finding, since little research has been done into the growing adoption of digital services by the senior market in Europe [83]. Our results confirm the changing trend: among senior citizens, there is a dynamic of change and a proactive attitude with respect to the use of e-government, recently

observed [84,85]. Additionally, it seems that minor training has a positive effect on digital inclusion for elderly citizens and that the effects seem more or less permanent also from a longer perspective [82].

In the study of the digital divide, recent conceptualisations appear to be moving away from a traditional emphasis on the technological gap, and particularly, the connectivity gap ([86], for a systematic literature review). During the first decade of the twenty-first century, the preliminary understanding of the “digital divide” concept evolved to include users’ skills and usage gaps. All groups must be supported in their transition to the world or digital. The rhetoric of “digital natives”, far from being useful, is often a distraction to understanding the challenges in a networked world [87].

The e-government and digital divide research are intrinsically intertwined as e-government policies can be both impeded by and exacerbate the digital divide [70,88]. However, though many citizens have access to the Internet, this does not automatically mean a high uptake of e-government use. Our findings, similar to [70], indicate that instead of an access divide, a skills divide is much more relevant. Digital literacy appears to be the most critical factor for e-government uptake as a whole. As argued by [89], digital literacy policies seem to be really cost-effective initiatives for increasing the uptake of e-governmental services, taking into consideration not only their pervasiveness in all types of interactions. Educational programmes will be necessary [90], and taking a more decided citizen-centric approach is required to increase uptake of e-government [91], as these digital technologies create environments that affect the citizens using them [92].

Inequalities in digital skills will not automatically disappear in the future, even in countries with high Internet diffusion levels, unless clearly targeted interventions are implemented [93]. The results invite one to suggest to institutions and policy makers a greater effort to consider a sociodemographic perspective, adopt a target groups strategy (for example, promoting training, and support for elderly people and other digitally vulnerable groups, as suggested by [94]), or go further with the mere technological skills, for example, encouraging the practice of problem solving or critical thinking. It is recommended to enhance skills related to critical thought, skills in the cognitive and ethical areas, and also the productive skills to promote a critical approach to media production, sharing, and consumption [92,95,96]. On the other hand, the influence of population density, linking e-government to population concentration, is an interesting topic for further investigation.

Our study is one of the first to conduct a pan-European analysis using the most recent data, as this survey wave has recently become available, distancing itself from previous research mainly focused on certain countries or cities. It is an approach that enables us to have a comprehensive overview of the situation for the EU as a whole.

This exploratory work has several limitations, most of which arise from the survey design, incorporating a large number of dichotomous variables. The available data available are from 2016, which is in itself a limitation, because more recent data were not yet available that could give a more accurate and updated view. Work has not been done at the country level but rather in distinguishing less developed, in transition, and more developed regions, introducing the degree of development as one of the variables of the analysis. This may be a limitation of the study, if interest is focused on countries. Another limitation of our research is that we do not propose a specific model, but rather focus specifically on the particular aspect of the evolving role of digital skills, along with other socioeconomic factors. In any case, given the importance of interaction with public administrations in the digital context, which becomes mandatory in several countries, our findings add value in the dissemination of these services. The article also contributes to the academic literature on a question that is very important for EU policies: it opens up an approach that is more ambitious, from a geographical viewpoint, and links the question to regional development and population density, which is an original contribution that deserves to be investigated in future research.

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References

1. Yadav, J.; Saini, A.K.; Yadav, A.K. Measuring citizens engagement in e-Government projects—Indian perspective. *J. Stat. Manag. Syst.* **2019**, *22*, 327–346. [\[CrossRef\]](#)
2. Rana, N.P.; Dwivedi, Y.K.; Lal, B.; Williams, M.D.; Clement, M. Citizens' adoption of an electronic government system: Towards a unified view. *Inf. Syst. Front.* **2015**, *19*, 549–568. [\[CrossRef\]](#)
3. West, D.M. E-Government and the Transformation of Service Delivery and Citizen Attitudes. *Public Adm. Rev.* **2004**, *64*, 15–27. [\[CrossRef\]](#)
4. Morgeson, F.V.; VanAmburg, D.; Mithas, S. Misplaced Trust? Exploring the Structure of the E-Government-Citizen Trust Relationship. *J. Public Adm. Res. Theory* **2010**, *21*, 257–283. [\[CrossRef\]](#)
5. Field, T.; Muller, E.; Lau, E.; Gadriot-Renard, H.; Vergez, C. Government Flagship Report “The E-Government Imperative”. *OECD J. Budg.* **2003**, *3*, 61–96.
6. Twizeyimana, J.D.; Andersson, A. The public value of E-Government—A literature review. *Gov. Inf. Q.* **2019**, *36*, 167–178. [\[CrossRef\]](#)
7. Gil-Garcia, J.R.; Dawes, S.S.; Pardo, T.A. Digital government and public management research: Finding the crossroads. *Public Manag. Rev.* **2017**, *20*, 633–646. [\[CrossRef\]](#)
8. Madsen, C.Ø.; Berger, J.B.; Phythian, M. The Development in Leading e-Government Articles 2001-2010: Definitions, Perspectives, Scope, Research Philosophies, Methods and Recommendations: An Update of Heeks and Bailur. In *Proceedings of the Lecture Notes in Computer Science*; Springer Science and Business Media LLC: Berlin, Germany, 2014; Volume 8653, pp. 17–34.
9. Rana, N.P.; Dwivedi, Y.K.; Williams, M.D. A meta-analysis of existing research on citizen adoption of e-government. *Inf. Syst. Front.* **2013**, *17*, 547–563. [\[CrossRef\]](#)
10. Brainard, L.A.; McNutt, J.G. Virtual Government—Citizen Relations. *Adm. Soc.* **2010**, *42*, 836–858. [\[CrossRef\]](#)
11. Lee, J. 10year retrospect on stage models of e-Government: A qualitative meta-synthesis. *Gov. Inf. Q.* **2010**, *27*, 220–230. [\[CrossRef\]](#)
12. Zhang, H.; Xu, X.; Xiao, J. Diffusion of e-government: A literature review and directions for future directions. *Gov. Inf. Q.* **2014**, *31*, 631–636. [\[CrossRef\]](#)
13. Dixon, B.E. Towards e-government 2.0: An assessment of where e-government 2.0 is and where it is headed. *Public Adm. Manag.* **2010**, *15*, 418–454.
14. Sá, F.; Rocha, A.; Cota, M.P. From the quality of traditional services to the quality of local e-Government online services: A literature review. *Gov. Inf. Q.* **2016**, *33*, 149–160. [\[CrossRef\]](#)
15. Wirtz, B.W.; Daiser, P. A meta-analysis of empirical e-government research and its future research implications. *Int. Rev. Adm. Sci.* **2016**, *84*, 144–163. [\[CrossRef\]](#)
16. Moon, M.J.; Lee, J.; Roh, C.-Y. The Evolution of Internal IT Applications and e-Government Studies in Public Administration. *Adm. Soc.* **2012**, *46*, 3–36. [\[CrossRef\]](#)
17. Wirtz, B.W.; Kurtz, O.T. Determinants of Citizen Usage Intentions in e-Government: An Empirical Analysis. *Public Organ. Rev.* **2016**, *17*, 353–372. [\[CrossRef\]](#)
18. Margetts, H.; Dunleavy, P. The second wave of digital-era governance: A quasi-paradigm for government on the Web. *Philos. Trans. R. Soc. A: Math. Phys. Eng. Sci.* **2013**, *371*, 20120382. [\[CrossRef\]](#)
19. Ma, L.; Zheng, Y. Does e-government performance actually boost citizen use? Evidence from European countries. *Public Manag. Rev.* **2017**, *20*, 1513–1532. [\[CrossRef\]](#)
20. Centeno, C.; Van Bavel, R.; Burgelman, J.-C. A Prospective View of e-Government in the European Union. *Electron. J. e-Gov.* **2005**, *3*, 59–66.
21. Fan, Q. A Longitudinal Evaluation of E-Government at the Local Level in Greater Western Sydney (GWS) Australia. *Int. J. Public Adm.* **2017**, *41*, 13–21. [\[CrossRef\]](#)
22. Gauld, R.; Goldfinch, S.; Horsburgh, S. Do they want it? Do they use it? The ‘Demand-Side’ of e-Government in Australia and New Zealand. *Gov. Inf. Q.* **2010**, *27*, 177–186. [\[CrossRef\]](#)
23. Reddick, C.G.; Turner, M. Channel choice and public service delivery in Canada: Comparing e-government to traditional service delivery. *Gov. Inf. Q.* **2012**, *29*, 1–11. [\[CrossRef\]](#)

24. Liu, H. The embedding convergence of smart cities and tourism internet of things in China: An advance perspective. *Adv. Hosp. Tour. Res.* **2014**, *2*, 54–69.
25. Chadwick, A.; May, C. Interaction between States and Citizens in the Age of the Internet: “e-Government” in the United States, Britain, and the European Union. *Governance* **2003**, *16*, 271–300. [[CrossRef](#)]
26. Warf, B. Geographies of e-Government in Europe. *Int. J. E-Planning Res.* **2018**, *7*, 61–77. [[CrossRef](#)]
27. Layne, K.; Lee, J. Developing fully functional E-government: A four stage model. *Gov. Inf. Q.* **2001**, *18*, 122–136. [[CrossRef](#)]
28. Hoetker, G.; Fountain, J.E. Building the Virtual State: Information Technology and Institutional Change. *Acad. Manag. Rev.* **2002**, *27*, 619. [[CrossRef](#)]
29. Tassabehji, R.; Hackney, R.; Popovič, A. Emergent digital era governance: Enacting the role of the ‘institutional entrepreneur’ in transformational change. In *Government Information Quarterly*; Elsevier: Amsterdam, The Netherlands, 2016; Volume 33, pp. 223–236. [[CrossRef](#)]
30. Hiller, J.; Bélanger, F. Privacy strategies for electronic government. *E-Government* **2001**, *200*, 162–198.
31. Coursey, D.; Norris, D.F. Models of E-Government: Are They Correct? An Empirical Assessment. *Public Adm. Rev.* **2008**, *68*, 523–536. [[CrossRef](#)]
32. Janowski, T. Digital government evolution: From transformation to contextualization. *Gov. Inf. Q.* **2015**, *32*, 221–236. [[CrossRef](#)]
33. Joshi, P.R.; Islam, S. E-Government Maturity Model for Sustainable E-Government Services from the Perspective of Developing Countries. *Sustainability* **2018**, *10*, 1882. [[CrossRef](#)]
34. Lee, J.; Kim, B.J.; Park, S.; Park, S.; Oh, K. Proposing a Value-Based Digital Government Model: Toward Broadening Sustainability and Public Participation. *Sustainability* **2018**, *10*, 3078. [[CrossRef](#)]
35. Gibreel, O.; Hong, A. A Holistic Analysis Approach to Social, Technical, and Socio-Technical Aspect of E-Government Development. *Sustainability* **2017**, *9*, 2181. [[CrossRef](#)]
36. Lee, Y.B. Exploring the Relationship between E-Government Development and Environmental Sustainability: A Study of Small Island Developing States. *Sustainability* **2017**, *9*, 732. [[CrossRef](#)]
37. Navarro-Galera, A.; Ruiz-Lozano, M.; Valencia, P.T.; Ríos-Berjillos, A.D.L. Promoting Sustainability Transparency in European Local Governments: An Empirical Analysis Based on Administrative Cultures. *Sustainability* **2017**, *9*, 432. [[CrossRef](#)]
38. Navarro-Galera, A.; Alcaraz-Quiles, F.J.; Ortiz-Rodríguez, D. Enhancing Sustainability Transparency in Local Governments—An Empirical Research in Europe. *Sustainability* **2018**, *10*, 2161. [[CrossRef](#)]
39. Estevez, E.; Janowski, T. Electronic Governance for Sustainable Development—Conceptual framework and state of research. *Gov. Inf. Q.* **2013**, *30*, S94–S109. [[CrossRef](#)]
40. Sapraz, M.; Han, S. A Review of electronic government for environmental sustainability. In Proceedings of the Pacific Asia Conference on Information Systems (PACIS), Xi’an, China, 8–12 July 2019; p. 155.
41. Fishbein, M.; Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*; Addison-Wesley: Boston, MA, USA, 1975.
42. Ajzen, I.; Joyce, N.; Sheikh, S.; Cote, N.G. Knowledge and the Prediction of Behavior: The Role of Information Accuracy in the Theory of Planned Behavior. *Basic Appl. Soc. Psychol.* **2011**, *33*, 101–117. [[CrossRef](#)]
43. Rogers, E.M. Diffusion of Innovations: Modifications of a Model for Telecommunications. In *Die Diffusion von Innovationen in der Telekommunikation*; Springer Science and Business Media LLC: Berlin, Germany, 1995; pp. 25–38.
44. Davis, F.D. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Q.* **1989**, *13*, 319. [[CrossRef](#)]
45. Venkatesh, V.; Davis, F.D. A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Manag. Sci.* **2000**, *46*, 186–204. [[CrossRef](#)]
46. Hung, S.-Y.; Tang, K.-Z.; Chang, C.-M.; Ke, C.-D. User acceptance of intergovernmental services: An example of electronic document management system. *Gov. Inf. Q.* **2009**, *26*, 387–397. [[CrossRef](#)]
47. Lee, J.; Rao, H.R. Task complexity and different decision criteria for online service acceptance: A comparison of two e-government compliance service domains. *Decis. Support Syst.* **2009**, *47*, 424–435. [[CrossRef](#)]
48. Chakraborty, A.; Ghosh, S.; Mukhopadhyay, P.; Dinara, S.M.; Bag, A.; Mahata, M.K.; Kumar, R.; Das, S.; Sanjay, J.; Majumdar, S.; et al. Trapping effect analysis of AlGaIn/InGaIn/GaN Heterostructure by conductance frequency measurement. *MRS Proc. XXXIII* **2014**, *33*, 81–87.

49. Lu, C.-T.; Huang, S.-Y.; Lo, P.-Y. An empirical study of on-line tax filing acceptance model: Integrating TAM and TPB. *Acad. J.* **2010**, *4*, 800–810.
50. Schaupp, L.C.; Carter, L.; McBride, M.E. E-file adoption: A study of U.S. taxpayers' intentions. *Comput. Hum. Behav.* **2010**, *26*, 636–644. [[CrossRef](#)]
51. Shareef, M.A.; Kumar, V.; Kumar, U.; Dwivedi, Y.K. Factors affecting citizen adoption of transactional electronic government. *J. Enterp. Inf. Manag.* **2014**, *27*, 385–401. [[CrossRef](#)]
52. Dwivedi, Y.K.; Rana, N.P.; Jeyaraj, A.; Clement, M.; Williams, M.D. Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a Revised Theoretical Model. *Inf. Syst. Front.* **2017**, *21*, 719–734. [[CrossRef](#)]
53. Bélanger, F.; Carter, L. The impact of the digital divide on e-government use. *Commun. ACM* **2009**, *52*, 132–135. [[CrossRef](#)]
54. Colesca, S.E.; Dobrica, L. Adoption and use of E-Government services: The case of Romania. *J. Appl. Res. Technol.* **2008**, *6*, 204–217. [[CrossRef](#)]
55. Gupta, K.P.; Singh, S.; Bhaskar, P. Citizen adoption of e-government: A literature review and conceptual framework. *Electron. Gov. Int. J.* **2016**, *12*, 160. [[CrossRef](#)]
56. Hung, S.-Y.; Chang, C.-M.; Yu, T.-J. Determinants of user acceptance of the e-Government services: The case of online tax filing and payment system. *Gov. Inf. Q.* **2006**, *23*, 97–122. [[CrossRef](#)]
57. Reddick, C.G. Citizen interaction with e-government: From the streets to servers? *Gov. Inf. Q.* **2005**, *22*, 38–57. [[CrossRef](#)]
58. Mensah, I.K.; Mi, J. Computer Self-Efficacy and e-Government Service Adoption: The Moderating Role of Age as a Demographic Factor. *Int. J. Public Adm.* **2017**, *42*, 158–167. [[CrossRef](#)]
59. Akman, I.; Yazici, A.; Mishra, A.; Arifoglu, A. E-Government: A global view and an empirical evaluation of some attributes of citizens. *Gov. Inf. Q.* **2005**, *22*, 239–257. [[CrossRef](#)]
60. Al-Jamal, N.Q.; Abu-Shanab, E.A. E-Government Adoption in Jordan: The Influence of Age. In *The 7th International Conference on Information Technology*; ResearchGate: Berlin, Germany, 2015; pp. 345–350.
61. Szopiński, T.; Staniewski, M.W. Manifestations of e-government usage in post-communist European countries. *Internet Res.* **2017**, *27*, 199–210. [[CrossRef](#)]
62. Dwivedi, Y.K.; Williams, M.D. Demographic influence on UK citizens' e-government adoption. *Electron. Gov. Int. J.* **2008**, *5*, 261. [[CrossRef](#)]
63. Rana, N.P.; Dwivedi, Y.K.; Williams, M.D. E-government adoption research: An analysis of the employee's perspective. *Int. J. Bus. Inf. Syst.* **2013**, *14*, 414. [[CrossRef](#)]
64. Pereira, J.P.R. Broadband Access and Digital Divide. In *Proceedings of the Advances in Intelligent Systems and Computing*; Springer Science and Business Media LLC: Berlin, Germany, 2016; Volume 445, pp. 363–368.
65. Saleemink, K.; Strijker, D.; Bosworth, G. Rural development in the digital age: A systematic literature review on unequal ICT availability, adoption, and use in rural areas. *J. Rural. Stud.* **2017**, *54*, 360–371. [[CrossRef](#)]
66. Das, A.; Singh, H.; Joseph, D. A longitudinal study of e-government maturity. *Inf. Manag.* **2017**, *54*, 415–426. [[CrossRef](#)]
67. Wang, Y.-S. The adoption of electronic tax filing systems: An empirical study. *Gov. Inf. Q.* **2003**, *20*, 333–352. [[CrossRef](#)]
68. Wangpipatwong, S.; Chutimaskul, W.; Papasratorn, B. Understanding Citizen's Continuance Intention to Use e-Government Website: A Composite View of Technology Acceptance Model and Computer Self-Efficacy. *Electron. J. E-Gov.* **2008**, *6*, 55–64.
69. Van Laar, E.; Van Deursen, A.J.A.M.; Van Dijk, J.A.; De Haan, J. The relation between 21st-century skills and digital skills: A systematic literature review. *Comput. Hum. Behav.* **2017**, *72*, 577–588. [[CrossRef](#)]
70. Ebberts, W.E.; Jansen, M.G.; Van Deursen, A.J.A.M. Impact of the digital divide on e-government: Expanding from channel choice to channel usage. *Gov. Inf. Q.* **2016**, *33*, 685–692. [[CrossRef](#)]
71. Garín-Muñoz, T.; López, R.; Perez-Amaral, T.; Herguera, I.; Valarezo, A. Models for individual adoption of eCommerce, eBanking and eGovernment in Spain. *Telecommun. Policy* **2019**, *43*, 100–111. [[CrossRef](#)]
72. Reddick, C.; Anthopoulos, L. Interactions with e-government, new digital media and traditional channel choices: Citizen-initiated factors. *Transform. Gov. People Process. Policy* **2014**, *8*, 398–419. [[CrossRef](#)]
73. Lindgren, I.; Madsen, C. Østergaard; Hofmann, S.; Melin, U. Close encounters of the digital kind: A research agenda for the digitalization of public services. *Gov. Inf. Q.* **2019**, *36*, 427–436. [[CrossRef](#)]

74. López-Roldán, P.; Fachelli, S. *Metodología de la Investigación Social Cuantitativa*; Universitat Autònoma de Barcelona: Barcelona, Spain, 2015.
75. Williams, M.; Dwivedi, Y.; Williams, M.D.; Dwivedi, Y.K. The Influence of Demographic Variables on Citizens' Adoption of E-Government. *Int. J. Electron. Gov. Res.* **2007**, *309*, 261–274.
76. Gursoy, D.; McCleary, K.W. AN INTEGRATIVE MODEL OF TOURISTS' INFORMATION SEARCH BEHAVIOR. *Ann. Tour. Res.* **2004**, *31*, 353–373. [[CrossRef](#)]
77. Irani, Z.; Weerakkody, V.; Kamal, M.; Hindi, N.M.; Osman, I.H.; Anouze, A.L.; El-Haddadeh, R.; Lee, H.; Osmani, M.; Al-Ayoubi, B. An analysis of methodologies utilised in e-government research. *J. Enterp. Inf. Manag.* **2012**, *25*, 298–313. [[CrossRef](#)]
78. Janssen, M.; Rana, N.P.; Slade, E.; Dwivedi, Y.K. Trustworthiness of digital government services: Deriving a comprehensive theory through interpretive structural modelling. *Public Manag. Rev.* **2017**, *20*, 647–671. [[CrossRef](#)]
79. Alkraiiji, A.I. An examination of citizen satisfaction with mandatory e-government services: Comparison of two information systems success models. *Transform. Gov. People Process. Policy* **2020**. [[CrossRef](#)]
80. Brewer, G.A.; Neubauer, B.J.; Geiselhart, K. Designing and Implementing E-Government Systems. *Adm. Soc.* **2006**, *38*, 472–499. [[CrossRef](#)]
81. Sourbati, M. 'It could be useful, but not for me at the moment': Older people, internet access and e-public service provision. *New Media Soc.* **2009**, *11*, 1083–1100. [[CrossRef](#)]
82. Holgersson, J.; Söderström, E.; Rose, J. Digital Inclusion for Elderly Citizens for a Sustainable Society. In *Research-in-Progress Papers*; Association for Information Systems: Atlanta, GA, USA, 2019.
83. Ruiz-Gómez, L.M.; Navío-Marco, J.; Rodríguez-Heví, L.F. Dynamics of digital tourism's consumers in the EU. *Inf. Technol. Tour.* **2018**, *20*, 59–81. [[CrossRef](#)]
84. Abad-Alcalá, L.; Llorente-Barroso, C.; Valle, M.S.; Abad, M.V.; Jiménez, M.P. Electronic government and online tasks: Towards the autonomy and empowerment of senior citizens. *El Prof. Inf.* **2017**, *26*, 34. [[CrossRef](#)]
85. Flowers-Henderson, R. Access and Use of E-Government Public Services Amongst Older Adults. Ph.D. Thesis, Walden University, Minneapolis, MN, USA, 2019.
86. Acharya, B.B. Conceptual Evolution of the Digital Divide: A Systematic Review of the Literature. *J. Russ. Media J. Stud.* **2017**, *1*, 41–74.
87. Boyd, D. *It's Complicated: The Social Lives of Networked Teens*; Yale University Press: London, UK, 2015; p. 281. ISBN 978-0-300-19900-0. Available online: <https://journals.openedition.org/lectures/17628> (accessed on 20 August 2020).
88. Zhao, F.; Collier, A.; Deng, H. A multidimensional and integrative approach to study global digital divide and e-government development. *Inf. Technol. People* **2014**, *27*, 38–62. [[CrossRef](#)]
89. Dodel, M.; Aguirre, F. Digital inequalities' impact on progressive stages of e-government development. In *Proceedings of the 11th International Conference on Information Processing in Sensor Networks-IPSN '12*; Association for Computing Machinery (ACM): New York, NY, USA, 2018; pp. 459–463.
90. Davison, R.M.; Wagner, C.; Ma, L.C. From government to e-government: A transition model. *Inf. Technol. People* **2005**, *18*, 280–299. [[CrossRef](#)]
91. Zhao, F.; Scavarda, A.J.; Waxin, M.-F. Key issues and challenges in e-government development. *Inf. Technol. People* **2012**, *25*, 395–422. [[CrossRef](#)]
92. Scolari, C.A. Los ecos e McLuhan: Ecología de los medios, semiótica e interfaces. *Palabra Clave-Rev. Commun.* **2015**, *18*, 1023–1056. [[CrossRef](#)]
93. Andreasson, K. *Digital Divides: The New Challenges and Opportunities of E-Inclusion*; Routledge: London, UK, 2015. Available online: https://books.google.es/books?hl=es&lr=&id=9Z4XBgAAQBAJ&oi=fnd&pg=PA125&dq=39.%09Helsper,+E.J.%3B+Van+Deursen,+A.J.A.M.+Digital+skills+in+Europe:+Research+and+policy.+Digit.+Divid.+New+Chall.+Oppor.+E-Incl.+2015,+195,+125.&ots=J7k20bL6XM&sig=Dlf_jXSSCxUDD (accessed on 20 August 2020).
94. Myeong, S.; Kwon, Y.; Seo, H. Sustainable E-Governance: The Relationship among Trust, Digital Divide, and E-Government. *Sustainability* **2014**, *6*, 6049–6069. [[CrossRef](#)]

95. Scolari, C.A. *Adolescentes, Medios de Comunicación y Culturas Colaborativas. Aprovechando las Competencias Transmedia de los Jóvenes en el aula*; Universitat Pompeu Fabra: Barcelona, Spain, 2018.
96. Scolari, C.A. Introduction: From media literacy to transmedia literacy. *Teens Media Collab. Cult. Exploit. Teens' Transmedia Ski. Classr.* **2018**, *1*, 12–20. Available online: https://scholar.google.com/scholar?hl=es&as_sdt=0%2C5&q=Introduction%3A+From+media+literacy+to+transmedia+literacy.&btnG= (accessed on 20 August 2020).



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