

HOW CAN THE DEVELOPMENT OF E-GOVERNMENT IN THE EUROPEAN UNION INCREASE? BUILDING AN EXPLANATORY STATISTICAL MODEL

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Abstract

The main premise from which we start in the construction of this article is that, in the contemporary era, the need for digitalization and facilitating access to public services has become an imperative in the vast majority of liberal-democratic states. Digitalization is an inevitable process in the natural course of the contemporary age, considering that its benefits have been more than tangible in the vast majority of cases, and e-Government is precisely a concretization of the benefits of digitalization. However, the development of e-Government is not a simple process, as it requires the presence of several factors, which this article will present, analysing their relevance. Moreover, in this article we will also note the main structural differences at European level in the implementation of e-Government: which countries have reached an advanced level of e-Government development, which countries have serious problems in developing e-Government and, above all, why these differences exist.

Keywords: e-Government, digitalization, European Union, corruption, education

Introduction

The phenomenon of digitalization is one that, especially in recent years, has become increasingly relevant, particularly in the liberal democracies of the European Union, on the premise that a digital revolution is transforming the world as we know it at unprecedented speed. The digital revolution, however, is not without its problems, especially structural ones, considering that EU officials are more than aware of the existence of several limits to digitalization, in particular those concerning the digital divide and the lack of investment dedicated to it (Negreiro and Madiega, 2019). In particular, the main focus of European officials has been on the

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digital divide, considering that there is a notable difference between internet access in urban areas and internet access in rural areas, even though there have been various attempts to reduce these differences in recent years. The digital divide, therefore, plays a particularly important role in terms of digitalization and, moreover, if we move from the rural-urban dichotomy to the European Union as a whole, we will see how the digital divide is a supra-national phenomenon, which also marks the degree of development of e-Government in the different European states.

Therefore, in order to be able to deepen the analysis in this article, it is necessary to look at the digital divide rather as a divide between the different European countries, where some countries have managed to provide the necessary infrastructure for their own citizens to enjoy digitalization (and e-Government), while others, for economic or political reasons, have remained at an early stage in this regard. Inevitably, this leads to varying degrees of e-Government implementation among EU countries, which can be seen in the E-Government Development Index (EGDI), an indicator calculated every two years by the United Nations. This indicator, however, will be discussed in detail in the next sections, when the multivariate regression equations is presented. As a prerequisite for better understanding what factors can contribute to a country's development, we must investigate what causes can increase the level of e-Government development in each European country. The need for this research stems from the fact that the contemporary era is inevitably moving towards digitalization in every area of life. Rather, today we are living through the Fourth Industrial Revolution. In this sense, the dependent variable that will be used, will be the E-Government Development Index (EGDI), stipulated by the United Nations, about which we will try to understand which are the main predictors that determine it. Subsequently, after transposing the methodology, the main focus of the present article will be directed towards an in-depth understanding of the relationship between predictors and e-Government development, in an attempt to translate the results obtained from the regression equation into everyday reality.

The need for digitalization, in this respect, is the starting point for the analysis that follows, and we should consider the following research question: what factors determine the evolution of e-Government in EU countries?

Alongside this question, we also have sub-questions such as:

Q1: What is e-Government and what does it entail?

Q2: What are the differences between government and governance?

Q3: But between e-Government and e-Governance?

Q4: What is the role of citizens in the implementation and process of e-Government?

The purpose of our article is to understand how the e-Government process works: top-down (political class to people) or bottom-up (people to political class). By pursuing this goal, we want to highlight the factors because of which e-

Government and e-Government exist. Also, we must consider the objectives of this analysis, which are:

Ob1: Analyze the score of e-Government in the countries of the European Union.

Ob2: Explore the digital divide between the European Union countries.

Ob3: Understand why e-Government differences between European Union countries exists.

As a methodology, we will undertake two linear regression equations: the first using the most recent e-Government data and its predictors (we will rely on data from 2021 and 2022), and the second will be a panel regression, where we will try to analyze the development of e-Government in the decade 2010-2020. We decided to undertake both a cross section and a panel regression because we are interested in the factors that determine e-Government in the short term (through the cross section regression) and also over a longer period, of about a decade in our case (through the panel regression). We have decided to use the data provided by the United Nations on e-Government because, even though it is provided every two years, it comes from a legitimate and globally recognized source. The paper will be structured in this way:

The first section scrutinizes the literature on governance, government, e-Governance and e-Government. In this section we observe the differences between governance and government, but also between e-Governance and e-Government.

The second section resumes the empirical approach and the data used, illustrating both the cross section regression and the panel data regression, the period of time subject of our analysis and the number of cases observed.

The third section concerns data interpretation and the descriptive side of the analysis, demonstrating how the data obtained from the regressions is strongly bond to the social reality of the European Union countries.

Considering all that has been said so far, we will start the whole analysis by introducing the field of e-Government (and, then, e-Governance).

1. Understanding the differences between (e-)Governance and (e-)Government

To begin with, we consider this definition: “E-governance involves new channels for accessing government, new styles of leadership, new methods of transacting business, and new systems for organizing and delivering information and services. Its potential for enhancing the governing process is immeasurable” (Finger and Pécoud 2003). But before providing further definitions, as there is no general consensus on what e-Governance and e-Government mean, we will further define what governance and government stand for, two concepts that may pass as synonyms, but differ in that they are a process carried out by government to manage, distribute and redistribute resources, as well as to oversee relations between individuals, communities and societies with the aim of achieving an ideal of economic, social and human development.

As definitions offered by international organizations, we can put the one given by the United Nations, for which “Governance refers to the exercise of political and administrative authority at all levels to manage a country’s affairs. It comprises the mechanisms, processes and institutions, through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. Specific reference is made to democratic governance as a process of creating and sustaining an environment for inclusive and responsive political processes and settlements. The institutional and human capacities for governance determine the way in which the effectiveness of public policies and strategies is attained, especially in service delivery” (United Nations 2012); or the one issued by the International Institute of Administrative Sciences for which “Governance refers to the process whereby elements in society wield power and authority, and influence and enact policies and decisions concerning public life, and economic and social development. Governance is a broader notion than government, whose principal elements include the constitution, legislature, executive and judiciary. Governance involves interaction between these formal institutions and those of civil society. Governance has no automatic normative connotation. However, typical criteria for assessing governance in a particular context might include the degree of legitimacy, representativeness, popular accountability and efficiency with which public affairs are conducted.” (International Institute of Administrative Sciences - IIAS 1996, as cited in: Bannister and Connolly 2012); The two terms government and governance are not differentiated by much, so some authors use the two terms synonymously or frame governance as the process of government: “Governments are specialized institutions that contribute to governance” (Saxena 2005). But some authors argue that governance encompasses not only government but also other stakeholders, working with both informal and formal institutions in the running of society and that there are different forms of governance, from market form to hierarchy (Bannister and Connolly 2012).

These definitions can be divided into 2 categories:

- Structural governance refers to its content and includes “processes, structures, lines of authority, laws, regulations, stakeholders, forms of communication and responsibilities”, those “mechanisms by which power is exercised, decisions made, policy is created or changed and its implementation achieved” (Bannister and Connolly 2012)
- Normative governance: shows what structural governance should look like and includes features such as “transparency, accountability, integrity, honesty, impartiality, efficiency and so on that governance is desired to enable, to possess or to deliver. Structural governance may be designed to support or achieve normative aims, but in itself it is about how something is done, not about whether or not the way it is done is efficient (or honest or fair). In summary, normative governance qualifies structural governance and structural governance may be,

but does not have to be, designed to deliver or support norms” (Bannister and Connolly 2012).

Thus, we can say that government is intrinsic to governance, but governance, as idealized in definitions, can lack government. Indeed, structural governance (namely the political framework within government activity takes place) is government itself.

1.1. E-Governance and E-Government

With the development of technology and the advent of the internet, many applications have been developed to connect individuals and enhance human interaction, so national governments have expanded into the electronic area, digitalizing services and interacting more with society. So, countries started to digitalize their bureaucratic services, using technology and the internet to automate (“replacing current human-executed processes which involve accepting, storing, processing, outputting or transmitting information”), informatize (“supporting current human-executed information processes”) and transform (“creating new ICT-executed information processes or supporting new human-executed information processes”) (Heeks 2001). However, quite recently, in the early 2000s, the term e-Government was predominantly used in India and is now expressed by concepts such as digitization and transformative government, and can be defined as the process by which information and telecommunication technology is embedded in public services, public administration, the democratic process and the relationship between citizens, civil society, the private sector and the State (Bannister and Connolly 2012).

There are many definitions of e-Governance, but they all revolve around information and communication technologies, among which we recall the definition proposed by UNESCO, where “The public sector’s use of Information and Communication Technologies with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective” (UNESCO, as cited in Bannister and Connolly 2012 apud) and the one offered by UNPAN where: “e-Governance can be defined as the application of ICT tools in (1) the interaction between government and citizens and businesses, and (2) in internal government operations to simplify and improve democratic governance” (Bannister and Connolly 2012 apud UNPAN). A comprehensive definition defines e-Government as „the use of information and communication technologies (ICTs) and the Internet to enhance the access to and delivery of all facets of government services and operations for the benefit of citizens, businesses, employees, and other stakeholders” (Thompson, Srivastava and Jiang 2008).

Authors in the field propose the following definitions for e-Governance: “should be seen to encompass all ICTs, but the key innovation is computer networks - from intranets to the Internet - creating a wealth of new digital connections:

Connections within government - permitting 'joined-up thinking'. Connections between government and NGOs/citizens - strengthening accountability. Connections between government and business/citizens - transforming service delivery. Connections within and between NGOs - supporting learning and concerted action. Connections within and between communities - building social and economic development" (Heeks 2001).

E-governance is composed of "information technology, people, and governments" (Ramadoss și Palanisamy 2004) and means "the use of information media to increase the degree of interaction between government and society, increase the effectiveness and efficiency of administrations and aims to support and simplify governance for e-governance community comprised of citizens, civil society organizations, private companies, government lawmakers, and regulators on networks" (Ramadoss și Palanisamy 2004). We see that e-Government is thus defined to "that a process is taking place, whereas e-Government encompasses all use of digital information technology (primarily computers and networks) in the public sector" (Heeks 2006). For us, e-Government means the use of information and communication technologies to solve citizens' problems, to eliminate time and resource costs for citizens as well as for the state, to eliminate transaction costs between economic agents in the country, and to increase public participation in the process of elaborating and deciding on public policies.

Like any process, e-Government (and e-Governance) needs to set itself goals to be achieved. The first objective of e-Government is to digitalize the services offered by the state and to inform the population, and for e-Governance "the strategic objective of e-Governance is to support and simplify governance for all parties; government, citizens and businesses" and „"to enhance access to and delivery of government services to benefit citizens" (Basu 2004).

Other objectives of e-Governance are: improved government decisions; increased citizen trust in government; increased government accountability and transparency; ability to accommodate the public will in the information-age; to effectively involve stakeholders, including NGOs, business, and interested citizen in new ways of meeting public challenges (Clift 2003).

For the purpose of this paper, e-Government implies a status quo for which an e-State is necessary, which includes 3 categories:

Table 1. Representation of the E-State

E-government definition	E-administration definition	E-governance definition
Interorganizational relationships including policy coordination and policy implementation and by the delivery of services online or through other electronic means to citizens	Intraorganizational relationships or the internal and public sector management component	Facilitates the interactions between citizens, government organizations and elected officials and how the internet can improve the governing and policy making process
Developing citizen-centric programs	Strategic planning in transitioning to electronic delivery of services	How technology (particularly the web) is transforming governing process
Promotion and enhancing citizen participation	Quantifying cost-effectiveness of electronic service delivery	E-federalism: the changing relationship among the levels of government
Perfecting Online service delivery through analysis and evaluation; measuring efficiency and benchmarking against other forms of service delivery	Benchmarking and performance measurement	Social implications - the digital divides
Country Indexing (performance measurement benchmarking): portal analysis; website analysis	Human resource management issues like training and recruitment, deployment of staff and maximizing existing resources.	Administrative professionalism: e-ethics; increased transparency
		E-democracy: Enhancing citizen participation; online voting; Issues of Ethics, security and privacy; Fundraising for the e-campaign; increased transparency

Sources: United Nations, 2022

1.2. Effects of e-Government

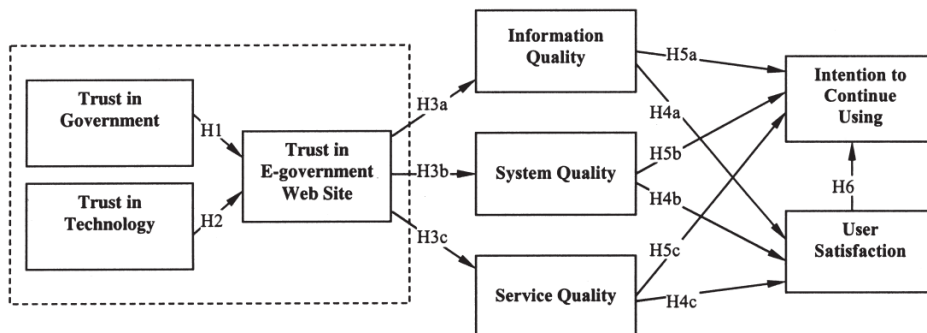
One can ask what are the consequences of e-Government for a state. According to Basu (2004), the e-Government “will generate new styles of leadership, new ways of debating and deciding strategies, new ways of transacting business, new ways of listening to citizens and communities, and new ways of organizing and delivering information” (Basu 2004). Also, e-Government is perceived as a tool by

which “citizens of a country can choose the method by which they will interact with government so that to advance democratic expression, human dignity and autonomy, support economic development and encourage the fair and efficient delivery of services” (Finger and Pécoud 2003).

Other effects of this process are trends such as e-democracy and e-citizens, or Public Net-Work which it represents “the strategic use of ICTs to better implement established public policy goals and programs through direct and diverse stakeholder involvement online” (Clift 2003). Among the consequences of e-Government we found the process of decentralization of political power because the implementation of an electronic system of government requires some decentralization of responsibilities and processes, so that governments have to comply if they want to digitize state services and develop a more friendly and easy collaboration with citizens (Basu 2004), as well as e-voting, but this is still a closed chapter for most countries with a fairly high degree of e-Government. However, we should not forget that e-Government also means other effects on the state, such as trust, which we will talk about soon, reduced state spending, quality services and time saved by citizens.

While this aspect underlies all governance, e-Governance has brought into question the concept of good Governance which is an exercise of economic, political, and administrative authority to better manage affairs of a country at all levels. It is not difficult for people in developed countries to imagine a situation in which all interaction with “government can be done through one counter 24 hours a day, 7 days a week, without waiting in lines” (Basu 2004), which clearly shows what e-Government would mean.

Figure 1. Explanatory model of trust in the process of digitalization



Sources: Teo et al., 2008

Despite the enthusiasm created around this concept, its application is delayed either by the ability of governments to implement these projects and achieve certain objectives, or by citizens for whom the use of public administration websites is either not easy or the interaction is unsatisfactory, and according to theories that there are two cases of users, “initial usage and continued usage”, which states that in most

cases after initial usage of e-Government Web sites, many users revert to traditional ways for acquiring information and services, such as telephone inquiry, personal visits, and so forth” (Thompson, Srivastava and Jiang 2008). According to these users, the reasons for not continuing with online services are due to the lack of quality of the system in providing information and services. Another reason for avoiding the use of digital government websites is the lack of trust citizens have in government and technology to ensure the security of data and transactions.

The need for e-Government has many reasons, ranging from those for better, innovative government, increased democracy, participation, accountability and political transparency (government effectiveness reasons) to those for government efficiency (faster government, faster access to more public services, greater public access to public documents and budget, as well as the availability of continuous interaction with the public administration) and reduction of costs of the bureaucratic apparatus (economic reasons). In addition to these reasons, the pursuit for e-Government has emerged with the development of technology, with the increase in the number of internet users and the digitalization of many human activities. Also, with the increasing mobility of people, even within the European Union, the states had to implement e-Government, so that citizens can get their necessary documents in digital format and also work with other institutions online, having considerable time and mobility advantages.

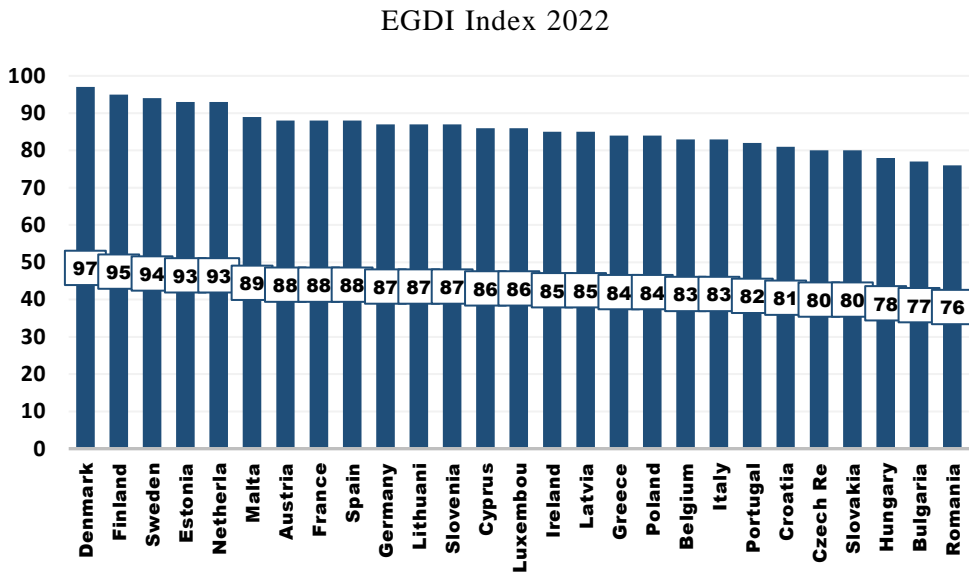
2. Data and methodology

As mentioned above, the dependent variable that we will use in the first regression equation (as in the second one) is the score obtained by each European Union country in terms of the degree of development of e-Government, in the EGDI (E-Government Development Index). This indicator, which is composed of three other indicators (Online Service Index, Telecommunication Infrastructure Index and Human Capital Index) (United Nations 2023) gives a score from 0 to 100 for each country of the world, as shown in Figure 2.

Figure 2 shows that Romania ranks at the “bottom” of the EGDI ranking (with a score of 76 out of 100), while Denmark is the country at the top, with a score of 97/100. Based on this ranking, we set out to stipulate a multivariate regression equation, from which we retain the importance of corruption’s levels in defining the degree of development of e-Government. This characteristic shows us that in countries where corruption plays an important role in defining public policies, the development of e-Government will be poor. This is possible because in a country where we have a higher score in the corruption index elaborated by the Global Talent Competitiveness Index, de facto, corruption is mitigated (for example, Denmark has a score of 100.00 and ranks 1st, while Greece has a score of 47.95 and ranks 49th). So, we note that a first explanatory variable is corruption, obtained in our case from the Global Talent Competitiveness Index for the year 2021 (INSEAD, Accenture and

Portulans Institute 2021). The scores range from 39.73 (Romania, Bulgaria and Hungary) to 100.00 (Denmark). The higher the score, the less corruption problems the country has (the countries analyzed were all the 27 European Union countries).

Figure 2. The E-Government Development Index for each European Union country - 2022 data



Source: authors' representation based on United Nations, E-Government Development Index (EGDI): 2022 Annual Report

The second variable we retain, according to its influence on the dependent variable, is “Individuals with basic or above basic overall digital skills”, indicating that e-Government development is also correlated with the skills individuals have in the digital field. This variable was obtained from the Eurostat indicator for the 27 countries of the European Union (year 2021), being calculated in percentages ranging from 27.87% of the population (Romania) to 79.18% of the population (Finland) (Eurostat 2022). We, then, find two other fundamental variables: Expenditure in education (as GDP total) and Open Data Policy Framework. The first one tells us about the relationship between education and e-Government, while the second one tells us that in order to have a certain degree of e-Government development, it is necessary to have a well-established legal framework by “opening up public data”. Expenditure in education (as GDP total), as “Individuals with basic or above basic overall digital skills”, was obtained from the Eurostat indicator, for the year 2021, regarding all the 27 European Union countries. The range was from 3.00% (Ireland) to 6.70% (Sweden) (Eurostat, Eurostat 2022). Open Data Policy Framework, on the other hand, is a variable obtained from the composite indicator

Digital Economy and Society Index (DESI), calculated by the European Commission. As in the previous cases, the year observed was 2021, for all the 27 European Union countries, and the range was from 150.00 (Luxembourg) to 275.00 (Cyprus, Denmark, Estonia, Ireland, Italy, Poland and Spain) (European Commission 2022). Considering all the characteristics mentioned above, we can retain the following cross section regression:

Table 2. OLS regression estimation of the e-Government drivers

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.
		B	Std. Error	Beta	t	
1	(Constant)	53.899	4.748		11.352	0.000
	Open Data Policy Framework	0.034	0.015	0.214	2.274	0.033
	Corruption score (GTCI)	0.160	0.037	0.570	4.275	0.000
	Expenditure in education (% GDP)	1.465	0.670	0.229	2.185	0.040
	Individuals with basic or above basic overall digital skills	0.104	0.058	0.230	1.803	0.085

Sources: own elaboration

Table 3. Summary statistics of the observed variables

	EGDI Index 2022	Individuals with basic or above basic overall digital skills	Open Data Policy Framework	Corruption score (GTCI)	Expenditure in education (as GDP total)
N	Valid	27	27	27	27
	Missing	0	0	0	0
Mean	85.7778	56.2941	240.9259	66.6656	4.9815
Median	86.0000	55.3100	250.0000	61.6400	5.0000
Std. Deviation	5.45142	12.10434	34.64204	19.46113	0.85216
Minimum	76.00	27.82	150.00	39.73	3.00
Maximum	97.00	79.18	275.00	100.00	6.70

Sources: own elaboration

Next, we investigate the value of R^2 , which is particularly important to explain the capacity of the explanatory variable to explain the dependent variable variation. De facto, it is the value of R^2 that shows us the proportions in which the variance of the dependent variable can be explained by the variance of the independent variables.

Table 4. Post estimation statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.899 ^a	,808	,773	2,59846	2,050

Sources: own elaboration

The value of R² indicates that 80.8% of the variance of e-Government development, in the different EU countries, can be predicted from the variance of the variables Corruption score (GTIC), Individuals with basic or above basic overall digital skills, Expenditure in education (as GDP total) and Open Data Policy Framework. The rest of the variance of the dependent variable will be predicted by other variables. Considering this, we will note the following equation:

E-government development = 53.899 + 0.570**Corruption score* + 0.230**Individuals with basic or above basic overall digital skills* + 0.229**Expenditure in education (as GDP total)* + 0.214**Open Data Policy Framework*.

Regarding the correlations between e-Government development and each variable, we note that the variable with the strongest correlation is the Corruption score, followed by Individuals with basic or above overall digital skills, Expenditure in education (as GDP total) and Open Data Policy Framework. Corruption has a strong positive correlation, Individuals with basic or above overall digital skills a medium positive correlation, education (as GDP total) a weak positive correlation and Open Data Policy Framework a very weak positive correlation. These correlations show us that the greatest impact, in the development of e-Government, is given by a very careful control of the corruption phenomenon, by the authorities. We retain the following:

Table 5. Correlations between e-Government development and predictors

	e-Government development
Corruption score	0.675
Individuals with basic or above overall digital skills	0.493
Expenditure in education (as GDP total)	0.330
Open Data Policy Framework	0.047

Sources: own elaboration

If we want to apply the regression model obtained from the previous analysis, we obtain the results displayed in Appendix I. In this Appendix we see how, after applying the linear regression equation, the top three positions remained the same, with Denmark, Finland and Sweden consolidating their own hegemony in terms of e-Government development. Bulgaria and Romania also remained “stuck” at the bottom of the ranking, with the gap between these two becoming even wider, to Romania’s disadvantage. A major surprise was the spectacular performance of Ireland, which gained 11 places. We believe that such a development is a more

realistic reflection of the contemporary situation, given that Ireland is one of the favourite countries of technology giants such as Google and Facebook. On the other hand, we also find the failure of Malta after applying the regression, which managed to lose 17 positions. The predictor that played the biggest role in this failure concerns corruption, where the small Mediterranean island did not score very well (52.05 out of 100). The major focus of this comparison, however, will be on the variation of positions between the two rankings, as we will see in Table 6.

Table 6. Descriptive statistics for the scores predicted and for the position variations on Table 5

Position variations		Score predicted by the model
N	Valid	27
	Missing	0
Mean		3.1852
Median		2.0000
Std. Deviation		3.90303
Range		17.00
Minimum		0.00
Maximum		17.00
		157.5448
		155.0300
		15.05361
		67.92
		118.99
		186.91

Sources: own elaboration

2.1. Panel data regression regarding the development of e-Government

As mentioned in the introduction of the article, we will also perform a panel regression analysis based on data from 2010-2020 (the EGDI is calculated every two years, so we will consider: 2010, 2012, 2014, 2016, 2018 and 2020), testing different independent variables. In this respect, the corruption score (calculated under GTCI standards) and the percentage of GDP allocated to education will be kept, but we will introduce other variables such as Internet Usage (obtained from Eurostat)¹ and Government Spending (one of the variables of the Economic Freedom Index).

In the following, we will deal with the descriptive side of these relationships (regarding the first regression) to better understand the set of correlations. Considering this, the first relationship we will discuss is that between e-Government development and corruption. In this regard, The Institut Européen d'Administration des Affaires (INSEAD), the institution that produces The Global Competitiveness Index report, defines the indicator that measures corruption as the "Corruption Perceptions Index" and understands it as "aggregating data from a number of different sources that provide the perceptions of business people and country experts on the level of corruption in the public sector" (INSEAD; Accenture; Portulans

¹ We have to mention that no data were available for France in 2020, an average between 2019 and 2021 data being required

Institute 2021), but this data is made up of experts' and business people's perceptions of how the public sector is viewed in the country. Scores range from 0 (very corrupt) to 100 (no corruption). We believe that the issue of corruption influences the level of e-Government because transparency, public accountability and political participation do not exist where e-Government is not implemented.

When we talk about "individuals with basic or above overall digital skills", we can consider as a theoretical premise the definition Eurostat gives about this variable, quoting: "The indicator is useful to describe general digital literacy and skills in using the internet over time. Aspects of accuracy, reliability, timeliness and comparability for the general population are covered satisfactory" (Eurostat 2021). We can see, from what European officials say, that this statistical variable represents the percentage of citizens in the European Union who are familiar with new technologies. Regarding the percentage of Gross Domestic Product allocated to the education system, we believe that the causal link between this predictor and the development of e-Government lies both in the training of well-prepared generations in line with market requirements and in equipping educational establishments with computer systems and funding higher education whose specializations are computer science and technology. Moreover, even universities could benefit substantially if the percentage of Gross Domestic Product allocated to education was higher, directing academic research also towards the study of new forms of e-Government, to be subsequently implemented by governments.

Another defining element in increasing the development of e-Government is the existence of a well-established legal framework for Open Data. The independent variable was provided by the European Commission, through the famous Digital Economy and Society Index (DESI), which analyses the digital performance of European countries. Among the variables of this indicator, the "Open Data Legal Framework" is also a predictor for the development of e-Government. What does Open Data mean, however, and especially this variable "Open Data Legal Framework"? First of all, we will state that Open Data is more than just an abstract concept, but even an international endeavor, considering that The Open Government Partnership/OGP is an initiative launched by eight founding countries (South Africa, Brazil, Indonesia, the Philippines, the United Kingdom, Mexico, Norway and the United States) at the United Nations General Assembly on 20 September 2011, with the aim of promoting open, transparent and participatory government. In the introductory session of this initiative, the US President of those years, Barack Obama, himself spoke, saying: "We are committed to being more transparent at every level, because more information about government work should be open, timely and free to the people. We need to engage more citizens in decision making, because that makes government more efficient and responsive. We are committed to implementing the highest standards of integrity, because those in power must serve the people, not themselves. And we are committed to expanding access to technology, because in this digital age, access to information is a universal right"

(U.S. Under Secretary for Civilian Security, Democracy and Human Rights 2011). In analyzing this, it is easy to see how having a legal framework that facilitates access to public data, can play a fundamental role in expanding e-Government.

Table 7. The correlation matrix for all the variables

Variable/ Probability	EGDI	CORRUPTION	GOV SPEND	GDP/EDU	INTERNET USAGE
EGDI	1.000				
CORRUPTION	0.637	1.000			
GOV SPEND	-0.381	-0.420	1.000		
GDP/EDU	0.296	0.543	-0.440	1.000	
INTERNET USAGE	0.795	0.727	-0.257	0.374	1.000

Source: authors' representation

Then, performing both a random and a fixed analysis, we note the following:

Table 8. Panel data regression estimation of e-Government (2010-2020)

Variables	Model 1		Model 2		Model 3		Model 4	
	Fixed effects	Random effects	Fixed effects	Random effects	Fixed effects	Random effects	Fixed effects	Random effects
Observations	162	162	162	162	162	162	162	162
Countries	27	27	27	27	27	27	27	27
GDP/EDU	-0.329 (1.076)	-0.833 (0.717)	-	-	-0.447 (1.076)	-0.952 (0.707)	-0.430 (1.081)	-0.466 (0.739)
INTERNET USAGE	0.717*** (0.046)	0.660*** (0.042)	0.721*** (0.043)	0.667*** (0.041)	0.695*** (0.044)	0.655*** (0.036)	0.705*** (0.046)	0.656*** (0.043)
CORRUPTIO N	-0.159 (0.115)	-0.033 (0.059)	-0.162 (0.114)	-0.060 (0.054)	-	-	-0.154 (0.116)	-0.003 (0.061)
GOV SPEND	-0.071 (0.043)	- (0.032)	-0.072* (0.043)	- (0.032)	-0.069 (0.043)	-0.087** (0.034)	-	-
CONSTANT	35.184** *	34.976** *	33.351** *	31.610** *	27.219** *	33.483** *	33.547** *	27.875** *
ADJ R ²	0.8168	0.6640	0.8181	0.6633	0.8156	0.6668	0.8145	0.6516

Notes: Standard errors are mentioned in parenthesis., Significance levels are *** for 1%, ** for 5% and * for 10%.

Sources: own elaboration

We can see that the most statistically relevant model is model number 1, which includes Internet Usage and Government Spending with considerable significance levels. In this sense, subjecting the model to the Hausman test we have:

Table 9. Results for the Hausman Test

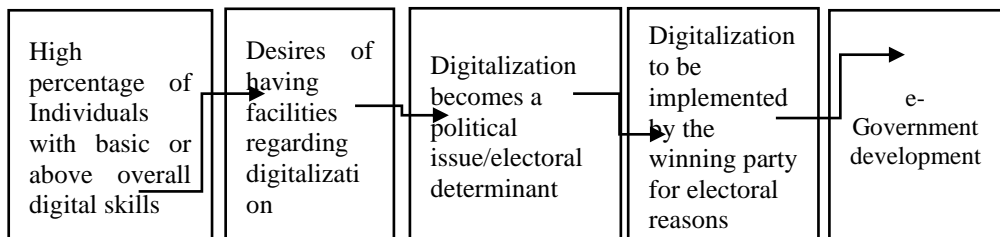
Correlated Random Effects - Hausman Test			
Equation: Model			
Test cross-section random effects			
Test summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	17.916053	4	0.0013

Notes: The probability being 0.0013, fixed effects specification is preferred the random effects
 Source: authors' representation

3. A qualitative approach regarding the relation between e-Government development and its predictors

Observing the probability level obtained in the Hausman test, we consider the equation with the fixed effects as rather appropriate for our analysis. In this respect, it is more than fundamental to understand that in the model number 1, with fixed effects, we have only one statistically significant variable (“Individuals - internet use”). The exact definition of such variable is, de facto, indicating the percentage of the population using the internet (Eurostat, ICT usage in households and by individuals 2023). The years analysed, as previously mentioned, were 2010, 2012, 2014, 2016, 2018 and 2020, for all 27 EU countries. Both the correlation and the significance of this variable are statistically relevant, suggesting that, a perpetual and very common use of the Internet among society, may prompt authorities to implement e-Government policies, considering the need for digitization in societies where the percentage of people using the Internet daily is very high. Corruption and education do not show significant results, while, even if to a very small extent, government spending could have some influence on e-Government implementation.

Figure 3. Causal-descriptive representation of the correlation between Individuals with basic or above overall digital skills and e-Government development



Sources: own elaboration

It is easy to understand, in this respect, that in countries where we have a high number of citizens who know how to use technological tools, we will inevitably have a higher demand for digitalization. In this sense, by becoming a political issue,

digitalization goes beyond the social desideratum and translates into concrete policies, raising the EGDI score. A correlation between these two variables, however, was to be expected, given that it is hard to conceive a digitalized country where citizens are ‘digitally illiterate’. Moreover, this correlation also underlines the concept of the “digital divide between European countries”, presented at the beginning of this article. To better understand this link between the digital skills of European citizens and the development of e-Government, we propose this causal chain.

Conclusions

The whole process of this work has helped us to reach some important conclusions. First, we have noticed that the famous concept of the “digital divide” is not only a national concept, highlighting the differences between rural and urban areas in terms of technological expansion, but also one with an important international nuance, including European Union countries. The digital divide, especially in terms of e-Government, can be caused by different factors and circumstances and, as we have seen in this analysis, these factors include corruption, the digital skills of European citizens, the percentage of Gross Domestic Product allocated to education or even the efforts of authorities to extend the liberalization of public data.

Beyond these, to answer our research question, we used regression analysis for which we obtained that our chosen predictors influence the EGDI score, in two sets of analysis, simple and panel, but we saw that it is not only the decisions of political elites that determine the change in e-Government scores, but also citizens, who use the internet, have skills in using information and telecommunication technologies and thus can participate in the decision making and public policy making process. However, the involvement of citizens in the process of creating an ‘E-state’ depends on their trust in either technology or the political class. On the other hand, the decisions of the elites influence both e-Government and e-Governance, with the political class being the architect of both processes, where government denotes an organization, the structure of the state and its institutional framework, and governance denotes an active process involving several stakeholders as well as society as a whole, respecting governance.

E-government suggests the digitalization as part of its work to facilitate access to services and information for citizens and other stakeholders, and e-Government means the use of the internet to increase public participation in decision-making and public policy-making, which brings us to the role of citizens in e-Government. They need to be an active part in decisions, as well as becoming e-citizens to participate in what is called E-democracy, a concept that we find among authors in the field, and that emerged with e-Government, as well as with the development of digital social networks where political elites propagate messages. As a conclusion, an e-

citizen uses the internet, is skilled in the use of information and telecommunications technologies and is involved in the process of government.

The aim of the article was achieved by carrying out the two regression analyses, the one with classical data and the one with panel data, representing the data of the 27 Member States of the European Union. In terms of indicators, we used: EGDI, Perceived Corruption, Individuals with Basic or Advanced Digital Skills, Public Expenditure on Education (%GDP) and Open Data Framework, and for the panel data the indicators: Perceived Corruption, Public Expenditure on Education (%GDP), Individuals - Internet use and Government Spending.

For objective 1 of our paper, i.e., the analysis of the e-Government score among EU member countries, we used data from the United Nations E-Government Development Index which incorporates access to the internet and to public services through tele-infrastructure and education.

In order to achieve objective 2, i.e., to explore the digital divide between the European Union countries, we used different databases such as Eurostat or the Corruption Perception Index to understand what are the main causes of this digital divide: education, abilities to utilize the internet and government corruption.

Objective number 3 was achieved by creating two regression models, the first with simple data and the other with panel data. The first regression showed that around 80% of the variation in the EGDI can be determined by our chosen predictor variables. The regression with panel data has shown how the massive use of the Internet by citizens can increase governments' willingness to implement e-Government (being a human necessity), while government spending, aligned with market demands, can also play a fundamental role.

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APPENDIX I

E-Government in the EGDI Index compared with E-Government predicted by the regression model

Country	EGDI score	Score predicted by the model	Variations between the original EGDI score and the score predicted by the model
Denmark	97 (1 st)	186,91 (1 st)	0
Finland	95 (2 nd)	178,36 (2 nd)	0
Sweden	94 (3 rd)	177,82 (3 rd)	0
Ireland	85 (15 th)	174,15 (4 th)	+11
Estonia	93 (5 th)	173,91 (5 th)	0
Germany	87 (10 th)	171,50 (6 th)	+4
France	88 (7 th)	169,28 (7 th)	0
Austria	88 (8 th)	167,51 (8 th)	0
Netherlands	93 (4 th)	167,27 (9 th)	-5
Spain	88 (9 th)	165,26 (10 th)	-1
Cyprus	86 (13 th)	158,35 (11 th)	+2
Slovenia	87 (12 th)	157,40 (12 th)	0
Poland	84 (17 th)	155,76 (13 th)	+4
Belgium	83 (19 th)	155,03 (14 th)	+5
Czech Republic	80 (23 rd)	154,89 (15 th)	+8
Lithuania	87 (11 th)	154,87 (16 th)	-5
Portugal	82 (21 st)	153,88 (17 th)	+4
Italy	83 (20 th)	153,84 (18 th)	+2
Luxembourg	86 (14 th)	152,50 (19 th)	-5
Latvia	85 (16 th)	151,02 (20 th)	-4
Greece	84 (18 th)	147,74 (21 st)	-3
Slovakia	80 (24 th)	145,49 (22 nd)	+2
Malta	89 (6 th)	143,85 (23 rd)	-17
Hungary	78 (25 th)	142,48 (24 th)	+1
Croatia	81 (22 nd)	140,66 (25 th)	-3
Bulgaria	77 (26 th)	134,99 (26 th)	0
Romania	76 (27 th)	118,99 (27 th)	0

Sources: own elaboration