Zambrano-Yépez, C., Guillén-Rodríguez, Y., and Henriquez-Coronel, P. (2023). Multivariate analysis of the determinants of e-government. *Administratie si Management Public*, 40, 132-146. DOI: https://doi.org/10.24818/amp/2023.40-08

Multivariate analysis of the determinants of e-government

Claudia ZAMBRANO-YÉPEZ[1], Yaritza GUILLÉN-RODRÍGUEZ[2], Patricia HENRIQUEZ-CORONEL[3]

Abstract: This study aims to determine the correlation between four variables, gross domestic product per capita (GDP), population (Pop.), Individuals using the Internet (It.net.user) and the global innovation index (GII) regarding the development of e-government according to the E-government Development Index (EDGI). The purpose is to determine which model best predicts the behavior of the variables and to provide tools that can guide decision-making in public policy and e-government. Four hypotheses were proposed about the relationship between the variables and the E-government Development Index. The data about GDP, Pop., It.net.users, and GII for the analysis were extracted from the United Nations Department of Economic and Social Affairs, the World Bank and Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO) respectively. The database consisted of a panel of 91 countries analyzed in the time interval from 2003 to 2020, with a total of 1683 observations. A linear panel data model was used, and fixed and random effects models were estimated. The Hausman test was applied, and it was determined that the appropriate statistical model was a fixed effects model. This model was used to test the four hypotheses. All of them were accepted.

Keywords: e-government**,** E-government Development Index, predictive model.

JEL: O57; C23; H19

DOI: https://doi.org/10.24818/amp/2023.40-08

Introduction

The Covid 19 pandemic has accelerated technology adoption processes in all scenarios due to the limitations on human mobility during its confinement stage. Education, banking, commerce, and public administration have had to adopt urgent

[1] Professor PhD; Universidad Laica Eloy Alfaro de Manabí; Faculty: Economy; Ciudadela Universitaria, postal code: 130214, Manta, Ecuador, e-mail: claudia.zambrano@uleam.edu.ec; https://orcid.org/0000-0002-5786-266X

[2] Economist; External Researcher, e-mail: alexaguillen1996@gmail.com; https://orcid.org/0000-0002-4007-6451

[3] Professor PhD; Universidad Laica Eloy Alfaro de Manabí; Faculty: Economy; Ciudadela Universitaria, postal code: 130214, Manta, Ecuador, e-mail: patricia.henriquez@uleam.edu.ec; https://orcid.org/0000-0002-0468-7511

plans and measures supported by Information and Communication Technologies (ICT) to expand the supply of services and improvise new ways of working in multiple sectors (IDB, 2021; Burlaco et al., 2021). Thousands of public offices that were suddenly closed improvised the migration of face-to-face services to the digital world.

E-government, which has been promoted as a key governance indicator since the 90's, is once again under the watchful eye of citizens. "The recent global pandemic has highlighted the importance of efficient communication between the government and its citizens through online platforms. While approximately 90% of governments around the world have opened up their websites to provide government information and public services, many have been criticized for their quality issues" (Lee et al., 2021).

A comprehensive report published by the IDB (2021) on digital government during the pandemic in Latin America and the Caribbean states indicates, for example, that "20% (of users) were unable to access to some process they needed, almost always because the provider office was closed, and the service was not available online" (p. 9). This scenario reveals that public administration has many challenges ahead. The analysis of the factors affecting the development of e-government will be of relevance soon if the digital transformation of public administration is to be accelerated.

This study analyzes the influence of four determining factors (gross domestic product per capita, population, individuals using the Internet and global innovation index) on the development of e-government based on the E-government Development Index (EDGI), obtained from the United Nations Department of Economic and Social Affairs. The purpose is to determine which model best predicts the behavior of the variables, to provide tools that can guide decision-making in public policy and e-government.

1. Literature review on E-government, governance, transparency

According to Zautashvili (2017) the beginning of e-government can be traced back to the end of the 20th century, due to the low effectiveness of the state governments in developed countries, which found in the implementation of ICTs a way to address these deficiencies. E-government refers to the use of ICT in public administration (Naser & Concha, 2011) and has been used to enable interaction and communication between the government and the public (Lara et al. 2013). The development of e-government is important, not only for governmental entities (Alcaide et al., 2014) but also for professionals and researchers who focus on analyzing the improvements brought by ICT in public administration. (Alcaide et al., 2014; Wirtz & Daiser, 2018). E-government promotes a more democratic and participatory society (Silva, 2020), which contributes to the development of governmental entities and leads to improvements in the provision of services to citizens, generating positive results in terms of productivity, inclusion, reliability, and transparency. (Toro-García, et al., 2020; Moncayo, 2020)

Flores (2020) supports that e-government is expressed through the use of ICTs, leading to improvements in public management processes and in the environment ‘s preservation, since a zero-paper culture is adopted and greater use of electronic services is made. In addition, a favorable citizen attitude towards e-government strengthens the communication of public administration and builds citizens' trust through the quality of e-services. (Gracia & Ariño, 2015) contributing to the "economic and social development" of an economy. (Diéguez et al., 2015).
In this context, several studies have been conducted in relation to e-government. Lara et al. (2013) measure the development of regional e-government in five countries. They highlight accountability, which shows citizens the destination of their contributions and promotes transparency; and they also highlight political dialogue, which allows two-way communication between administrations and citizens. Even though, accountability and transparency are linked, Silva (2020) indicates that, in accountability, the government justifies itself to the citizens; and, in transparency, citizens corroborate that the information provided by the government is true. From another point of view, Silva y Heredia (2021), also state that there is a link between transparency and public management, which is reflected in an efficient, transparent and decentralized government; they also indicate that there must be a balance between technological tools that promote electronic government, as well as compliance with the Law of Transparency and Access to Public Information, in order to provide quality services to citizens and reduce corruption levels.

1.1. Determining factors in e-government development

Among the empirical studies that analyze the factors that influence the development of e-government, the work of Caba et al. (2008) stands out, which manifests that Internet access is a driver for a higher level of transparency, and the implementation of e-government systems improves accountability. On the other hand, Gonzáles-Bustamante et al. (2020) analyze the determinants of e-government in five regions of Chile, where the permanent income variables and Internet connections are statistically significant for the successful development of e-government.
According to Galíndez-Hernández and Velasco-Sánchez (2012) one of the most important factors is Internet use, because it facilitates communication and interaction between the government and its citizens. On the other hand, Wohlers (2009) assesses the state of e-government sophistication in the United States and Germany, and finds that Internet usage and population are relevant factors for e-government sophistication. Lowatcharin y Menifield (2015) based on the inference that greater Internet accessibility generates greater transparency, apply an ordered logistic model, concluding that population density is statistically related to the levels of transparency of a locality. From the point of view of Kim and Chung (2016), financial distribution contributes to the development of e-government; hence, Criado and Gil-García (2013) consider that the public administration should allocate part of its budget to acquire technological tools that facilitate public services to citizens.

According to Manoharan (2013) e-participation refers to a citizenry with higher participatory levels in decision making, which makes it one of the main initiatives of e-government that seeks to stimulate a good governance (Basu, 2004). According to Bawack et al. (2022) electronic participation has increased with the use of technological tools such as social networks and mobile devices, which according to Höffken and Streich (2013) facilitate access to public information and citizen participation. Similarly, Saif (2020) indicates that the use of mobile technologies is essential in governmental institutions, because they facilitate access to public information and allow to know the citizens requirements and suggestions; therefore, Criado and Gil-García (2013) highlight the importance of innovation in public administrations, as this implies the provision of new tools or computer applications that facilitate communication and interaction between citizens and the government.
In line with the above, the hypotheses to be evaluated in this study are as follow:

- H1: Gross Domestic Product has an impact on E-Government Development

A study conducted by Esteves (2005), analyzes the population variables, GDP, and percentage of households with internet access, to determine whether they determine the development of e-government. The results show that there is a positive relationship between e-government and GDP, given that when public entities have economic resources, it is easier for them to acquire electronic systems or tools that provide access to information to citizens. (Gómez & Montesinos , 2015)

- H2: The Population Impacts on e-Government Development

Inostroza (2015), argues that sometimes the population may lack significance when initiating e-government proposals. However, Esteves (2005) argues that the bigger the population, the greater the citizen's participation.
Along these lines, Diéguez et al. (2015) state that the population density variables, internet access and the existence of an E-Government Plan are significantly correlated with the development of e-government; therefore, "densely populated cities have on average a better performance in e-government". (p. 27).

- H3: Individuals using the Internet have an impact on the development of e-Government

From the point of view of Inostroza (2015), the implementation of new technologies contributes to the improvement of the internal processes that take place in public administration; hence, the Internet is considered a key element in this process, as it contributes to transparency, efficiency, reduction of processes and the development of citizen participation. On this hypothesis Barragán (2019) found that the use of the Internet has had a positive influence on the interactive communication of society, as well as of government leaders and public administrators, since government agencies currently make use of ICTs in public administration processes to encourage participation and interaction with citizens and thus meet their needs.
Deepak y Saji (2018) analyzed the impact of ICT investment and e-government in India and found that there is a positive relationship between ICT investment and e-government performance measures. ICT investment by developing states over the last two decades has focused on improving Internet penetration figures. Moreover,

the Covid 19 pandemic has accelerated this process as stated by the International Telecommunication Union (ITU):

The latest ITU data show that Internet adoption has accelerated during the pandemic. In 2019, 4.1 billion people (or 54% of the world's population) were using the Internet. Since then, the number of users has increased by 800 million to reach 4.9 billion people in 2021, or 63% of the population. (ITU, 2021, p. 7).

- H4: The Global Innovation Index impacts e-Government Development

Zamora-Boza et al. (2018) argue that technological innovation is very important in public administration, because it facilitates interaction and participation with citizens, and also contributes to the country development. For their part, Riera-Ortiz and Páez (2010) the authors argue that all activities resulting from the implementation of ICTs are considered as an innovation, especially if they are oriented to the improvement of activities such as e-government.

2. Research methodology

2.1. Sample and data

To evaluate the hypotheses, data from the E-Government Development Index (EDGI) was used, obtained from the United Nations Department of Economic and Social Affairs (UNDESA) (United Nations, 2021). This indicator is currently measured every two years, although initially it was measured annually. The database provides information for the years 2003, 2004, 2005, 2008, 2010, 2010, 2012, 2014, 2016, 2018 and 2020.

The sources of information for the variables: Gross Domestic Product per capita, Population and People Using the Internet, provide annual data from 2003 to 2020; while the Global Innovation Index (GII) presents data only for the last seven years.

As for the countries under study, those with the most information on all variables were selected, thus obtaining a closely balanced panel of 91 countries for the period 2003-2020 with 1,638 observations.

2.2. Definition of variables

The EDGI measures the capacity of government entities to use ICTs in the process of providing public services; this measurement is performed for the 193 member countries of the United Nations. The components of this indicator are: Online Services Index, Telecommunications Infrastructure Index and Human Capital Index. (Gobierno Electrónico de Ecuador, 2021).

Gonzales-Bustamante et al. (2020) consider that income is a determining factor in the level of development of e-Government; therefore, for this study we use the Gross Domestic Product per capita in dollars at current prices, which measures the ratio of income obtained from the production of goods and services in a year and the number of inhabitants in that year, this data is obtained from the World Bank (2021). The

same authors argue that population is also a determinant of e-government; therefore, the database of the total population of the countries, issued by the World Bank (2021), is used.

According to Inostroza (2015), Internet is an important tool for government agencies worldwide, as it allows the development of participatory processes for citizens, thus promoting transparency, efficiency and reduction of processes. The study analyzes the percentage of the population that has used the Internet (via computer, cell phone, digital assistant, etc.) in the last three months, according to data from the World Bank (2021).

Innovation not only generates high-tech products but also promotes the use of ICTs. (Aguilar-Barceló & Higuera-Cota, 2019); therefore, the GII is analyzed, which provides information on the innovation capacity of the world's economies. The GII is co-published by Cornell University, INSEAD (European Institute of Business Administration), and the World Intellectual Property Organization (WIPO) - a United Nations agency; the measurement is made for 131 economies (Global Innovation Index, 2021). See Table 1.

Table 1. Description of Variables

Variable	Description	Source
EDGI	The E-Government Development Index measures the capacity of countries to use ICTs in the delivery of public services.	United Nations Department of Economic and Social Affairs
GDP	GDP per capita (US$ at current prices)	World Bank
Pop.	Total population of the countries	World Bank
It.net.user	Percentage of the population that uses the internet.	World Bank
GII	The Global Innovation Index measures technological innovation in the world's economies.	Cornell University, INSEAD and the World Intellectual Property Organization (WIPO)

Source: Author's contribution

2.3. Model Specification

The structure of the database contemplates a substantial number of individuals (countries) that are analyzed over time (2003 - 2020); therefore, a linear panel data model is used, characterized by capturing the unobservable heterogeneity of the model; by virtue of this, fixed effects and random effects models are estimated. Subsequently, the Hausman test is applied to determine the appropriate statistical model.

The model specification is as follow:

$$y_{it} = \alpha_i + X_{it}\beta + U_{it} \quad ; \quad i = 1, \dots, n \quad y \quad t = 1, \dots, T \tag{1}$$

Where y_{it} represents the country e-government development *i* in year *t*, α represents the intercept, X_{it} to the country explanatory variables *i* in year *t*, *β* are the coefficients of the model; and, U_{it} represents the error term of country *i* in year *t*.
Considering the study variables, it is specified as follows:

$$EDGI_{it} = \alpha_i + GDP_{it}\beta + Pobl_{it}\beta + Uso\_Int_{it}\beta + GII_{it}\beta + U_{it} \quad (2)$$

3. Research results and discussions

3.1 Univariate Analysis

Table 2 presents a summary of the five countries with the best averages, followed by the five countries with the lowest averages for each of the study variables. The averages were calculated for the 91 countries selected for the study, for the period 2003-2020.
The use of ICTs in the provision of public services promotes the development of e-government in state entities; however, there are countries with very low EDGI averages, as is the case of Ethiopia, with an average of 0.22; the opposite is the case in Denmark with an average of 0.88 (see Table 2 and Figure 1). Of the five countries with the lowest EDGI averages, most belong to the African continent, while the best scores are found in European countries, showing better development conditions.
In terms of population, the largest number of inhabitants is found in China, "one of the largest countries in the world", even though it has a minimum percentage of immigration. (Datos macro, 2021); while the least populated country is Iceland with 323,711 inhabitants. On the other hand, the highest GDP is found in Luxembourg, where tertiary sector activities (financial services and real estate) account for approximately 79.2% of national wealth (Santander Trade Markets, 2021). In Ethiopia, on the other hand, the basis of the country's economy is the agricultural sector. Regarding Internet use, Ethiopia has the lowest percentage of the population using the Internet (4.47%); while developed countries such as Ireland, Norway and Denmark have high percentages of Internet access. And as far as the GII is concerned, Switzerland presents better averages, in fact it is known for the production of various high-tech products; on the other hand, Sudan and Yemen present lower percentages.

Table 2. Univariate analysis of study variables

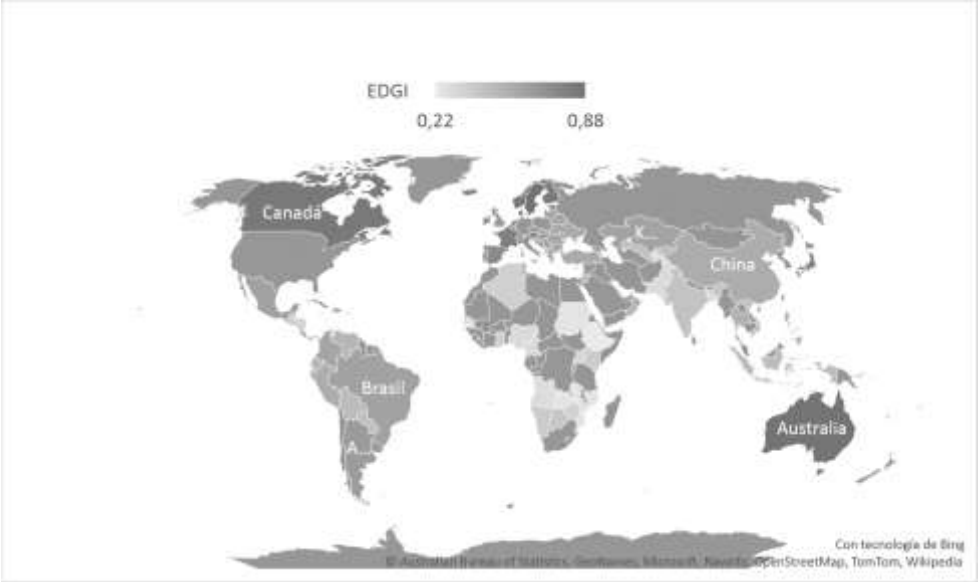
Indicator	Country	Average 2003-2020
EDGI	Denmark	0,88
	Sweden	0,87
	Australia	0,86
	Netherlands	0,85
	Norway	0,84
	…..	….
	Zambia	0,25

Indicator	Country	Average 2003-2020
	Sudan	0,25
	Yemen	0,23
	Gambia	0,22
	Ethiopia	0,22
	.....	
Population	China	1.347’557.333
	India	1.253’058.408
	Indonesia	246’911.838
	Brazil	198’001.083
	Pakistan	185’907.144
	….	
	Mauricio	1’249.640
	Bahrain	1’248.097
	Cyprus	1’116.401
	Luxembourg	532.114
	Iceland	323.771
	....	
GDP	Luxembourg	$103.044,42
	Norway	$80.345,09
	Switzerland	$76.358,73
	Qatar	$64.128,09
	Denmark	$56.614,54
	….	
	Tajikistan	$731,84
	Gambia	$713,77
	Uganda	$651,93
	Mozambique	$506,98
	Ethiopia	$471,32
	….	
Uso_Internet	Ireland	93,19
	Norway	91,05
	Denmark	90,04
	Sweden	89,35
	Netherlands	4,47
	….	
	Cameroon	8,35
	Mozambique	6,28
	Angola	6,12
	Bangladesh	5,87
	Ethiopia	4,47
	....	
	Switzerland	66,93
	Sweden	62,85
	Netherlands	61,06
	Finland	59,38

Indicator	Country	Average 2003-2020
GII	Singapore	58,84
	…..	
	Bangladesh	23,25
	Zimbabwe	22,57
	Zambia	22,30
	Yemen	16,61
	Sudan	15,83
	.....	

Source: Author's contribution

Figure 1. E-government index of the countries under study



Source: Base on Australian Bureau of Statistics

For the calculation of the bivariate correlation, the natural logarithm of the variables Pop. and GDP is used. Table 3 shows the results between the study variables. Focusing on the EDGI, it is observed that it correlates positively and significantly with GDP, It.net.user and GII, that an increase in any of these variables would contribute to the development of e-Government; and, significantly negative with Pop., which implies that the greater the population growth, the higher the demand for online services that are not being met. As for Pob., it correlates negatively and significantly with GDP, It.net.user and GII. Regarding GDP, it is positively and significantly correlated with It.net.user and GII; while It.net.user is significantly and positively correlated with GII and GDP.

Table 3. Correlation Matrix

	EDGI	Pop.	GDP	It.net.user	GII
EDGI	1,0000				
Pop.	-0,1921 (0,0000)***	1,0000			
GDP	0,8273 (0,0000)***	-0,2351 (0,0000)***	1,0000		
It.net.user	0,8466 (0,0000)***	-0,1971 (0,0000)***	0,8412 (0,0000)***	1,0000	
GII	0,7775 (0,0000)***	-0,2191 (0,0000)***	0,8080 (0,0000)***	0,7079 (0,0000)***	1,0000

Significance: *** (1%); ** (5%); * (10%)

Source: Author's contribution using STATA

3.2. Multivariate Analysis

Table 4 shows the results obtained with the estimation of the proposed models, allowing us to know the regressor variables that explain the EDGI in the countries under study. It can be seen that the Pop., variable is only significant and with a positive coefficient in the fixed effects model, with a confidence level of 90%, which indicates that an increase in population contributes 0.25 points to the development of the EDGI; while the GDP variable is significant with a positive coefficient in the Fixed and Random Effects model with a confidence level of 90% in both cases; that is, an increase in GDP increases the EDGI.

The variable It.net.user is significant with positive coefficients in the three models presented, with a confidence level of 99%; therefore, when the population that uses the Internet increases by 1%, the EDGI will also increase.

Finally, the GII is significant in all models and shows a positive coefficient in the random effects model and the OLS (Ordinary Least Squares) clustering model with a reliability level of 99%, which indicates that an increase of one point in the GII will cause an increase in the EDGI; the opposite case is evident in the fixed effects model, given that an increase in innovation will reduce E-Government by 0.03%, with a reliability level of 90%.

Table 4. Model estimation

Variables	Model EF	Model EA	Model MCO
Pop.	,2581392*	-,0008151	-,0016462
GDP	,0440333*	,0183144*	,0046697
It.net.user	,033645***	,0043159***	,0039912***
GII	-,0037294*	,004295***	,0067086***
Constant	-4,094857	,0329645	,1015338

Significance: *** (0,01); ** (0,05); * (0,10)

Source: Author's contribution using STATA

Table 5 shows the Hausman test, which allows us to determine the consistency of the models proposed. It can be seen that the chi-square probability (P>chi2) is equal to zero; therefore, under the premise that the probability is below the significance level (0.05), the null hypothesis (difference in non-systematic coefficients) is rejected and the alternative hypothesis is accepted, with a reliability level of 95%; that is, the ideal model for the present study is the fixed effects model.

Table 5. Hausman Test

	---- Coefficients ---			
	(b)	**(B)**	**(b-B)**	**Sqrt(diag(V_b-V_B))**
	fe	**re**	**Difference**	**S.E.**
Pop.	,2581392	-,0008151	,2589543	,1467089
GDP	,0440333	,0183144	,0257189	,02366
It.net.user	,0033645	,0043159	-,0009514	,0003224
GII	-,0037294	,004295	-,0080244	,0017694

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic
Chi2(4) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
= 35,25
= 0,0000

Source: Author's contribution using STATA

Given that the Hausman test indicates that the ideal model is the fixed effects model, the results in Table 4 are analyzed to corroborate the hypotheses proposed. With respect to the Pop. variable, it is positively and significantly correlated with the EDGI, which corroborates hypothesis H2, since it is shown that an increase in population would contribute in the increase of EDGI, as supported by Inostroza (2015), Esteves (2005) and Diéguez et al. (2015). Regarding GDP, it shows positive and significant, confirming H1; so that the budget contributes to the development of e-Government, coinciding with studies by Esteves (2005) and Gómez (2013). The variable It.net.user, is shown significant and positive with a reliability level of 99%, ratifying what is argued by Galíndez-Hernández and Velasco-Sánchez (2012), who consider the use of internet as the most important variable for the successful development of E-Government, coinciding with the findings of Caba et al. (2008), Wohlers (2009), Inostroza (2015) and Barragán (2019), which leads to confirm H3. Finally, the GII variable is shown to be significant, but with a negative coefficient; contrasting with Riera-Ortiz and Páez (2010) and Zamora-Boza et al. (2018) who state that innovation through the provision of tools and computer systems facilitates interaction and participation with citizens; therefore, H4 is not accepted. It is necessary to deepen studies of the relationship of the innovation index and/or sub-indexes and their relationship with E-Government.

4. Conclusions

The Covid 19 pandemic has highlighted the need to deepen e-government public policies. More than 20 years of global initiatives in this area have allowed administrations to expand and strengthen its services, but the challenges of the pandemic revealed that there are still many government services to be digitally transformed, that the user experience is not always satisfactory and that new forms of work are added that require more training of officials, in addition to the digital gaps that may have widened between some countries and others.

Public policies should be designed based on relevant information and regression modeling studies can provide results that become tools for action. The predictive models evaluated in this study analyze those factors that are determinant for the development of e-government and that condition the results obtained by the countries when evaluating the EDGI. This research conducted univariate and multivariate analyses, evaluating three explanatory models for the development of the EDGI: fixed effects, random effects and OLS. The model that best represents the relationship between variables is the fixed effects model, as shown by the Hausman test.

The results allow us to conclude that three of the four variables analyzed (GDP, Population, and Internet Use) have an influence on the EDGI taken as an indicator of a country's degree of e-government development. Countries with higher GDP and that represents higher numbers of individuals using the Internet mean better EDGI indices. As for the capacity for innovation expressed in the GII and the EDGI, the relationship has a negative coefficient, and no influence can be determined. This study analyzed the global innovation index; future research could deepen the analysis of the sub-indices, since the global index evaluates two groups of input and output indicators, so that an exhaustive analysis of these indicators could shed light on the behavior of the Innovation variable with respect to the EDGI.

Conflict of Interest Statement

There is no conflict of interest**.**

Acknowledgment

All authors have contributed significantly to improve the work and approved the revised and edited version for publication.

References

Aguilar, L. (2007). El aporte de la Política Pública y de la Nueva Gestión Pública a la gobernanza. *Revista del CLAD Reforma y Democracia*, 5-32. https://www.redalyc.org/pdf/3575/357533693001.pdf

Aguilar-Barceló, J., Higuera-Cota, F. (2019). Los retos en la gestión de la innovación para América Latina y el Caribe: un análisis de eficiencia. *Revista de la CEPAL*(127). https://repositorio.cepal.org/bitstream/handle/11362/44570/1/RVE127_Aguilar.pdf

Alcaide, L., Rodríguez, M., and Garde, R. (2014). Estudio cienciométrico de la investigación en transparencia informativa, participación ciudadana y prestación de servicios públicos mediante la implementación del e-Gobierno. *Revista de Contabilidad, 17*(2), 130. doi:https://doi.org/10.1016/j.rcsar.2014.05.001

Banco Mundial. (21 de Julio de 2021). PIB per cápita (US$ a precios actuales): https://datos.bancomundial.org/indicador/ny.gdp.pcap.cd

Banco Mundial. (21 de Julio de 2021). Población, total: https://datos.bancomundial.org/indicador/SP.POP.TOTL

Banco Mundial. (21 de Julio de 2021). Personas que usan Internet (% de la población): https://datos.bancomundial.org/indicador/IT.NET.USER.ZS

Barragán, X. (2019). *Factores de incidencia del gobierno electrónico en los procesos de transparencia y participación ciudadana en la gestión pública local del Ecuador.* Universidad Andina Simón Bolívar, Quito. https://repositorio.uasb.edu.ec/bitstream/10644/7416/1/TD135-DA-Barragan-Factores.pdf

Basu, S. (2004). E-government and developing countries: An overview. *International Review of Law Computers & Technology*, 109-132. doi:10.1080/13600860410001674779

Bawack, R., Kala, J., Fosso, S., and Fobang, A. (2022). E-Participation in Developing Countries: The Case of the National Social Insurance Fund in Cameroon. En (Eds.) (Ed.), *Research Anthology on Citizen Engagement and Activism for Social Change* (págs. 826-847). IGI Global. doi:10.4018/978-1-6684-3706-3.ch044

Caba, C., Rodríguez, M., and López, A. (2008). e-Government process and incentives for online public financial information. *Online Information Review, 32*(3), 379-400. doi:https://doi.org/10.1108/14684520810889682

Cendrós, J., Durante, C., and Fermín, J. (2004). Factores estratégicos para desarrollar el gobierno electrónico en las Alcaldías de Venezuela. *Revista de Ciencias Humanas y Sociales*. http://ve.scielo.org/scielo.php?script=sci_arttext&pid=S1012-15872004000300009

Criado, J., Gil-García, J. (2013). Gobierno electrónico, gestión y políticas públicas: Estado actual y tendencias futuras en América Latina. *Gestión y Política Pública*, 3-48. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-10792013000400001

Datos macro. (2021). China: Economía y demografía: https://datosmacro.expansion.com/paises/china

Diéguez, G., Gasparín, J., Sánchez, J., and Schejtman, L. (2015). *Escenarios y perspectivas del gobierno electrónico en América Latina y el Caribe.* CIPPEC (Centro de Implementación de Políticas Públicas para la Equidad y el Crecimineto), Programa de Gestión Pública Área de Estado y Gobierno, Buenos Aires. https://www.cippec.org/wp-content/uploads/2017/03/1225.pdf

Esteves, J. (2005). Análisis del Desarrollo del Gobierno Electrónico Municipal en España. *IE Working Paper*. http://www.elmayorportaldegerencia.com/Libros/Gobierno%20Electronico/[PD]%20Libros%20-%20Analisis%20del%20desarrollo%20del%20gobierno%20electronico%20mundial.pdf

Flores, Y. (2020). Representaciones Sociales del Gobierno Electrónico. *Revista de Investigaciones de la Escuela de Posgrado, 9*(3), 1705-1717. doi:http://dx.doi.org/10.26788/riepg.2020.3.185

Galíndez-Hernández, C., Velasco-Sánchez, E. (2012). E-Government for Transparency in Mexico: Advances and Limits in Promoting Open Government and Citizen Engagement. En A. Manoharan, & M. Holzer (Edits.), *E-Governance and Civic*

Engagement: Factors and Determinants of E-Democracy (págs. 48-71). IGI Global. doi:10.4018/978-1-61350-083-5

Global Innovation Index. (21 de Julio de 2021). Analysis. Explore the interactive database of the gii 2021 indicators. https://www.globalinnovationindex.org/analysis-indicator

Gobierno Electrónico de Ecuador. (2021). Glosario PNGE. https://www.gobiernoelectronico.gob.ec/glosario-pnge/#

Gómez , M., Montesinos, V. (2015). Gobierno electrónico y transparencia financiera y presupuestal de los departamentos en Colombia. *Revista Venezolana De Gerencia, 19*(68), 686. doi:https://doi.org/10.37960/revista.v19i68.19126

Gómez, M. (2013). *La reforma de la Gestión Pública en Latinoamérica: su impacto en la transparencia y la divulgación de la información financiera.* Valencia: Universidad de Valencia. https://roderic.uv.es/bitstream/handle/10550/31691/Tesis%20Doctoral%20Final%20%28versi%c3%b3n%20impresi%c3%b3n%29.pdf?sequence=1&isAllowed=y

Gonzáles-Bustamante, B., Carvajal, A., and González, A. (2020). Determinantes del gobierno electrónico en las municipalidades. Evidencia del caso chileno. *Gestión y Política Pública*. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-10792020000100097

Gracia, B., Ariño, C. (2015). Reconstrucción de la confianza pública en las administraciones públicas a travésde acciones de gobierno electrónico. *Revista Española de Investigación de Marketing ESIC, 19*(1), 1-11. doi:https://doi.org/10.1016/j.reimke.2014.07.001

Höffken, S., Streich, B. (2013). Mobile Participation: Citizen Engagement in Urban Planning via Smartphones. 199-225. doi:10.4018/978-1-4666-4169-3.ch011

Inostroza, N. (2015). Índice de Participación Electrónica Municipal: Gobierno Electrónico Local en la Región Metropolitana. *Revista Búsquedas Políticas*. https://repositorio.uahurtado.cl/bitstream/handle/11242/6787/V04N01_pp_113-135_Inostroza.pdf?sequence=1&isAllowed=y

Kim, P., Chung, C.-S. (2016). Una revisión histórica del desarrollo del gobierno electrónico en Corea del Sur. *Gestión y política pública, 25*(2), 627-662. http://www.scielo.org.mx/scielo.php?pid=S1405-10792016000200627&script=sci_arttext

Lara, M., Pina, V., and Torres, L. (2013). El gobierno electrónico y la rendición de cuentas en la administración regional y estatal. *Gestión y Política Pública*. http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-10792013000400004

Lee, T., Lee-Geiller, S., and Byung-Kwan, L. (2021). A validation of the modified democratic e-governance website evaluation model. *Government Information Quarterly, 38*(4). doi:https://doi.org/10.1016/j.giq.2021.101616

Lowatcharin, G., Menifield, C. (2015). Determinants of Internet-enabled Transparency at the Local Level: A Study of Midwestern County Web Sites. *States and Local Government Review, 47*(2), 102-115. doi:https://doi.org/10.1177/0160323X15593384

Manoharan, A. (2013). A Three Dimensional Assessment of U.S. County e-Government. *State and Local Government Review, 45*(3), 153-162. doi:https://doi.org/10.1177/0160323X13494858

Moncayo, G. (2020). Neoinstitucionalismo, transparencia y Gobierno electrónico: Calidad de vida en Bogotá y otras ciudades colombianas. *Revista Sarance*(45), 118-142. doi:https://doi.org/10.51306/ioasarance.2020.045.08

Naser, A., Concha, G. (2011). *El gobierno electrónico en la gestión pública.* Santiago de Chile: Naciones Unidas. https://www.cepal.org/sites/default/files/publication/files/7330/S1100145_es.pdf

Organización para la Cooperación y el Desarrollo Económico. (2021). Mejores políticas para una vida mejor. https://www.oecd.org/acerca/

Riera-Ortiz, A., Páez, Á. (2010). Innovación, Burocracia y Gobierno Electrónico en la Administración Pública. *Hologramática, 2*(12), 25-42. http://www.cienciared.com.ar/ra/usr/3/895/hologramatica_n12vol2pp25_42.pdf

Saif, N. (2020). Introduction to the critical success factors of E-government adoption of the utilization of emerging smart cities technologies. En (Eds.) (Ed.), *Solving Urban Infrastructure Problems Using Smart City Technologies* (1 ed., págs. 3-15). Elsevier. doi:10.1016/B978-0-12-816816-5.00001-2

Santander Trade Markets. (2021). Analizar mercados. https://santandertrade.com/es/portal/analizar-mercados/luxemburgo/economia

Silva, A. (2020). *El Gobierno Electrónico en el Municipio de Quito y la percepción sobre la transparencia.* Universidad Tecnológica Israel, Quito. http://repositorio.uisrael.edu.ec/bitstream/47000/2524/1/UISRAEL-EC-MASTER-ADMP-378.242-2020-026.pdf

Silva, D., Heredia, F. (2021). Gobierno Electrónico y Transparencia en la municipalidad distrital de la Victoria. *Revista Ingeniería: Ciencia, Tecnología e Innovación, 8*(1), 179-194. http://revistas.uss.edu.pe/index.php/ING/article/view/1549/2233

Toro-García, A., Gutiérrez-Vargas, C., and Correa-Ortiz, L. (2020). Estrategia de gobierno digital para la construcción de Estados más transparentes y proactivos. *Trilogía Ciencia Tecnología Sociedad, 12*(22), 71-102. doi:https://doi.org/10.22430/21457778.1235

United Nations. (21 de Julio de 2021). Índice de Desarrollo de Gobierno Electrónico. https://maintenance.un.org/

Wirtz, B., Daiser, P. (2018). A meta-analysis of empirical e-government research and its future research implications. *International Review of Administrative Sciences., 84*(1), 144-163. doi:https://doi.org/10.1177/0020852315599047

Wohlers, T. (2009). The Digital World of Local Government: A Comparative Analysis of the United States and Germany. *Journal of Information Technology & Politics, 6*(2), 111-126. doi:https://doi.org/10.1080/19331680902821593

Zamora-Boza, C., Arrobo-Cedeño, N., and Cornejo-Marcos, G. (2018). El Gobierno Electrónico en Ecuador: la innovación en la administración pública. *Espacios, 39*(06), 15. https://www.revistaespacios.com/a18v39n06/a18v39n06p15.pdf

Zautashvili, D. (2017). E-government Maturity Model by Growth Level of E-services Delivery. *Journal of Technical Science & Technologies*, 17. https://www.researchgate.net/publication/334084763_E-government_Maturity_Model_by_Growth_Level_of_E-services_Delivery