2024, Vol. 1
https://fupress.org/journal

Determinants of Digital Transformation in Local Public Services: Evidence from Spanish Municipalities

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ARTICLE INFO

Received: 14 Mar 2024
Accepted: 21 Jun 2024

ABSTRACT

This study investigates the key factors influencing the digital transformation of public services within local governments in Spain. By analyzing 102 municipalities, the research evaluates the extent to which digital tools are integrated into public administration, focusing on transparency, citizen engagement, and online service delivery. A comprehensive content analysis of municipal websites was conducted using an adapted digital maturity index, while a dependency model identified the principal determinants driving digital advancement. Findings reveal that larger municipalities tend to have more advanced digital infrastructures and provide a broader range of e-services, including online procedures and real-time communication channels. Moreover, political variables, especially the ideology of the ruling party, significantly impact the adoption and depth of digital transformation, with progressive administrations generally showing stronger commitments to digital innovation. The study also highlights the role of citizen participation mechanisms, demonstrating that municipalities actively involving stakeholders in decision-making processes foster more dynamic and inclusive digital governance. The results underscore the need for tailored digital strategies that consider local characteristics such as population size, political leadership, and resource availability. Additionally, the research points to the importance of continuous investment in digital capacity-building and organizational change management to sustain long-term modernization efforts. This paper contributes to understanding how local governments can leverage digital technologies to enhance public service quality, transparency, and democratic participation.

Keywords: Digital Transformation, Local Government, Public Services, Citizen Engagement, Spain.

INTRODUCTION

The implementation of electronic administration systems aims to streamline and enhance the interactions and transactions between public organizations and their users, namely citizens (García-Sánchez, Rodríguez-Domínguez, & Gallego-Álvarez, 2011). This evolution typically unfolds through three distinct stages: e-government, e-governance, and e-democracy, as identified in previous studies (Riley, 2001). Mossberger, Tolbert, and Stansbury (2003) refer to the last two stages as the entrepreneurial and participatory approaches, respectively. The entrepreneurial approach focuses on offering a "flexible and convenient interface with government around the clock," enabling users to experience a "one-stop shopping" approach for information and services. Meanwhile, the participatory approach aims to engage citizens more deeply by making them more knowledgeable about governmental and political matters, leveraging the interactive nature of digital platforms for communication between elected officials and citizens, including forums, email lists, and other online discussion tools.

The adoption of these three stages of digital administration brings notable cost reductions due to the use of more efficient technologies (Kim, 2007; Tolbert, Mossberger, & McNeal, 2008), the streamlining of administrative processes (Torres, Pina, & Royo, 2005), and improvements in institutional image (Gallego-Álvarez, Rodríguez-Domínguez, & García-Sánchez, 2010). As noted by Siau and Long (2006), digital government presents an effective and efficient channel for internal government operations and external service delivery. This dual

enhancement increases transparency and fosters higher levels of public trust. Digital administration can break down traditional barriers of time and place that citizens face in their interactions with public authorities, transforming the perception of bureaucracy from a cumbersome entity into a service-oriented institution. Moreover, it empowers citizens by enabling greater participation in democratic institutions and political processes (Justice, Melitski, & Smith, 2006; Siau & Long, 2006). Consequently, governments that adopt digital administration are seen as more accessible, transparent, accountable, effective, and participative, which in turn can increase citizens' trust and improve perceptions of government responsiveness.

Various research efforts have evaluated the extent to which digital administration has developed over time (West, 2000, 2001, 2002, 2003, 2004; Caba, López, & Rodríguez, 2005; Torres et al., 2005; Torres, Pina, & Acerete, 2006). Some studies focus on the volume and format of information disclosed online, particularly regarding budgetary and financial transparency (Laswad, Fisher, & Oyelere, 2005; Cárcaba & García, 2008). Others have examined factors influencing the degree of e-government development (Siau & Long, 2006; Kim, 2007; Pina, Torres, & Royo, 2010; Tolbert et al., 2008; Gandía & Archidona, 2008). A common limitation among these studies is their narrow focus on information disclosure features and formats, neglecting the broader understanding of e-government as more than a mere reporting tool for public activities (Rodríguez-Domínguez, García-Sánchez, & Gallego-Álvarez, 2011). Furthermore, many recent studies concentrate only on the more advanced stages of e-governance and e-democracy, often overlooking the foundational e-government stage.

In contrast, this study adopts a comprehensive perspective by considering all three types of electronic administration—e-government, e-governance, and e-democracy—to identify distinct digital government styles and their determinants. The study aims to explore the explanatory factors influencing both the overall digital presence of public administration websites and the development of each stage individually. Emphasis is placed on political factors and institutional capacities, as prior research has highlighted their crucial role in the advancement of digital government. A lack of these resources presents significant barriers to effective electronic administration implementation (Tolbert et al., 2008).

The empirical investigation focuses on 102 of Spain's largest local governments. Selecting municipalities from a common geographic region allows for a more homogeneous and meaningful comparative analysis. This approach also helps determine whether the determinants influencing digital administration styles align with those found in previous global comparative studies (Gallego-Álvarez et al., 2010) and whether common factors apply to the initial e-government phases. The choice of local administrations is deliberate, considering that the most frequent and impactful interactions between citizens and government occur at this level (Sandoval-Almazan & Gil-Garcia, 2012).

Findings from the study underscore that the development of digital administration is strongly associated with political characteristics and fundamental institutional capacities. However, none of the examined factors show a significant connection with the sophistication of participatory government stages, suggesting that advancing e-democracy may require additional or different conditions beyond those driving earlier stages.

This paper is structured to first review the main determinants of digital government development based on existing literature (Section 2). Section 3 outlines the research methodology, detailing the study population, variables, and statistical techniques used. Section 4 presents and discusses the analysis results. Finally, the concluding section summarizes the key insights and implications derived from the study.

DEVELOPMENT OF ELECTRONIC ADMINISTRATION AND ITS DETERMINANTS

The development of electronic administration, or e-government, is influenced by a variety of factors that can either promote or hinder its progress. Understanding these factors is crucial for governments aiming to implement and expand digital public services effectively. Generally, these factors fall into three broad categories: the internal characteristics of the public institution itself, political influences surrounding governance, and the socio-economic context of the municipality where the administration operates.

Internal Characteristics of the Public Institution

Among the internal factors, the size of the government entity and its institutional capacity have been consistently highlighted in research as key determinants affecting the adoption and success of e-government initiatives.

Size of the Public Institution

The size of a public body is often seen as a critical variable in the likelihood of e-government adoption. Larger governments typically face more complex demands and greater pressure to deliver public services efficiently. As a

result, they are more incentivized to find innovative solutions, such as implementing digital platforms, to improve communication with citizens and other government bodies (Moon & Norris, 2005; Justice et al., 2006). The rationale behind this is straightforward: the larger the population served, the greater the logistical challenges and costs associated with managing public interactions through traditional, non-digital means.

Frost and Semaer (2002) also note that larger municipalities tend to enjoy higher political visibility. This heightened attention from political actors, environmental advocacy groups, and the general public increases the pressure on these governments to adopt more transparent and accessible governance models, often facilitated by e-government tools.

Empirical studies reinforce this notion. For example, Gallego-Álvarez et al. (2010) and Navarro, Alcaraz, and Zafra (2011) found that as population size increases, so does the likelihood that local administrations will improve their online presence. Similarly, Weare, Musso, and Hale (1999) and Musso, Weare, and Hale (2000) observed that larger cities more frequently establish government websites and offer a wider range of public services online (West, 2001).

However, the relationship between government size and e-government adoption is not universally accepted. Research by Ingram (1984), Ingram and DeJong (1987), and Laswad et al. (2005) failed to find statistically significant evidence linking government size to the extent of online information disclosure.

Despite these mixed findings, the theoretical and empirical evidence tends to support the argument that larger public bodies are better positioned and more motivated to develop electronic administration capabilities. Therefore, the following hypothesis is proposed:

H1: There is a positive relationship between the size of the public institution and the development of e-government within local administrations.

Institutional Capacity

Institutional capacity refers to the resources—both financial and human—that a public body has at its disposal to implement innovations and reforms. The development of e-government is no exception, as it often requires upfront investments in technology, training, and process reengineering.

Studies have demonstrated that higher levels of government resources generally correlate with greater capacity to improve transparency and expand public service offerings through digital means. Alt, Lassen, and Rose (2006) argue that politicians' incentives to increase transparency often depend on fiscal conditions, as better budgetary results encourage administrations to enhance information disclosure.

Municipalities with larger budgets are more capable of investing in sophisticated information systems and broadening their digital services. Several studies, including those by Ingram and Dejong (1987), Evans and Patton (1987), and Laswad et al. (2005), have found evidence of this positive relationship in different countries.

However, other research provides a contrasting perspective. La Porte, Demchak, de Jong, and Friis (2002), Pina et al. (2010), and Tolbert et al. (2008) suggest that economic capacity may not directly influence e-government openness. Navarro et al. (2010) also found no significant evidence supporting the role of budget size in fostering disclosure practices at the local level.

Given this divergence, it remains important to empirically test the influence of institutional capacity on e-government development. Thus, we hypothesize:

H2: Institutional capacity positively influences the development of e-government in local administrations.

Political Factors

Political factors surrounding governance—such as the ideology of the ruling party, political stability, political strength, and rivalry—also play a significant role in shaping the adoption and scope of e-government initiatives. These elements affect government priorities, resource allocation, and the political will to pursue digital reforms.

Political Ideology

Political ideology fundamentally shapes policy priorities and governance styles, which can extend to digital government initiatives. Different ideologies tend to promote different visions for city management and public service delivery (Prado-Lorenzo, García-Sánchez, & Cuadrado-Ballesteros, 2012). This diversity in political approaches makes it important to consider the governing party's ideological orientation when analyzing e-government development.

Ni and Bretschneider (2007) suggest that right-wing governments are more inclined to prioritize economic policies, including market development, inflation control, and public sector reforms such as budget discipline and privatization. In contrast, left-wing governments often emphasize social welfare policies like pensions and

healthcare.

In terms of transparency and online government presence, politicians may adjust the level of information disclosure to serve political objectives. According to Alt et al. (2006), politicians seeking to expand the public sector may increase transparency to gain voter trust and secure more resources. Ferejohn (1999) similarly argues that increasing information disclosure can be a strategy for politicians to legitimize their policies and strengthen their public support.

Since left-wing governments traditionally advocate for a larger public sector, they might be more inclined to promote transparency through e-government initiatives than conservative governments. Supporting this view, Guillamón, Ríos, and Vicente (2011) found that municipalities led by left-wing mayors were more transparent than those led by conservative ones. However, Navarro et al. (2010) found no significant relationship between political ideology and sustainability reporting in public administration.

Given these mixed results, the hypothesis is formulated as follows:

H3: Conservative political ideology in the governing party negatively correlates with the development of e-government in local administrations.

Political Stability and Strength

Political stability is a critical factor influencing whether a government can successfully implement e-government reforms. Stability provides the confidence and continuity needed to allocate resources and pursue long-term initiatives. Governments with strong electoral support are better positioned to prioritize and advance digital administration projects.

Conversely, coalition governments may face internal conflicts that reduce their capacity to implement reforms, including e-government development. Roubini and Sachs (1989a, 1989b) argue that such political fragmentation often weakens government effectiveness, hindering the advancement of budgetary reforms and digital initiatives.

Governments with insufficient electoral backing may deprioritize e-government projects due to limited political capital. Prado-Lorenzo and García-Sánchez (2009), and Prado-Lorenzo et al. (2012) emphasize that strong political leadership is essential to successfully navigate the challenges associated with implementing e-government reforms.

Therefore, we propose two hypotheses regarding political stability and strength:

H4: Political stability positively influences the development of e-government in local administrations.
H5: Political strength positively influences the development of e-government in local administrations.

Political Rivalry

Political rivalry represents the level of competition between political parties within a government's jurisdiction. Increased political competition can foster a more dynamic environment where reforms, such as e-government initiatives, are more likely to be prioritized and monitored closely.

Navarro et al. (2011) suggest that lower political rivalry correlates with less pressure on governments to improve their online presence or pursue digital reforms. Their study in Spain found a positive association between political rivalry and public administration's online presence at the regional level.

Several other studies, including Cárcaba and García (2008), Gandía and Archidona (2008), and Tolbert et al. (2008), underscore the positive influence of political rivalry on the adoption of digital government as a transparency mechanism. However, Laswad et al. (2005) found that political rivalry was not statistically significant in predicting e-government development in New Zealand's local administrations.

Given this inconsistent evidence, the hypothesis regarding political rivalry is:

H6: Political rivalry positively correlates with the development of e-government in local administrations.

Municipal Context

The external context in which a local administration operates also influences its e-government development. Economic conditions, social development, sustainability, and quality of life are significant factors that can either facilitate or constrain the implementation of digital public services.

Level of Economic Development

Economic development is often linked to greater transparency and digital government presence. Hameed (2005) and Piotrowski and Van Ryzin (2007) show that municipalities with higher economic levels tend to have more transparent financial and fiscal information online and better digital services overall.

Key variables influencing this relationship include educational attainment (Tolbert et al., 2008), service availability, and employment rates (Navarro et al., 2011). Navarro et al. (2011) argue that municipalities with higher unemployment and lower economic development face increased social needs, which can lead to greater pressure on governments to be transparent.

On the other hand, these economically disadvantaged municipalities may lack the financial and human resources necessary to develop comprehensive e-government systems (Prado-Lorenzo et al., 2012). This paradoxical situation means that while social needs encourage transparency, limited resources impede digital development.

Given this complex relationship, the hypothesis is:

H7: There is a negative relationship between the level of economic development (measured by unemployment) and the development of e-government in local administrations.

Level of Sustainability and Social Development

Municipal sustainability is frequently assessed through quality of life indicators, which reflect a stable, diverse, and skilled population (Williams, Kitchen, Randall, & Muhajarine, 2008). Quality of life and sustainability are intertwined concepts that together represent the well-being of a community (Thomas & Evans, 2010).

Research by Howley, Scott, and Redmond (2009) indicates that citizen satisfaction is higher in municipalities with better environmental quality, less noise pollution, accessible services, and good infrastructure. Since public administrations deliver many of these services, their effectiveness and efficiency—often enhanced through e-government platforms—directly impact quality of life.

Therefore, municipalities with higher sustainability levels are more likely to invest in and benefit from e-government development. Consequently, the following hypothesis is posed:

H8: A municipality's degree of sustainability has a positive effect on the advancement of e-government within local administrations.

METHODOLOGY

Population and Sample

In order to achieve the objectives established, we have chosen Spanish local governments as our population target. The choice of the local sphere in a specific country allows us to obtain a higher volume of data, which is also more homogeneous, compared to an analysis of municipalities from different countries.

Furthermore, the high number of Spanish municipalities and their disparity as regards size required us to establish some criteria for selecting the sample, population size being the most appropriate (Navarro et al., 2010). We therefore selected the largest municipalities, according to the definition contained in article 121 of Act 7/1985, for the Regulation of Local Municipalities, modified by Act 57/2003, incorporating measures to modernize local government. These municipalities have a population of over 250,000 inhabitants or are capitals of provinces. They must promote local sustainability and implement interactive technologies that encourage citizen participation and information transparency. Furthermore, the same law considers municipalities with over 75,000 inhabitants as large population ones if they show specific economic, social, historical or cultural circumstances.

Following these criteria, and according to the latest statistics on the populations of Spanish municipalities (available at 10/01/2010; http://www.ine.es), the final sample comprises 102 municipalities with the population distribution displayed in **Figure 1**.

Dependent Variable

According to García-Sánchez et al. (2011), e-government is the first stage of electronic administration and involves a net presence of the public administration on the Internet. The second stage, e-governance, would lead to online services provision. In the final stage, the electronic administration will provide comprehensive citizen-participation: e-democracy.

The informative index was devised after analyzing some studies of the disclosure of online information in the public sphere (e.g. Rodríguez-Domínguez, Gallego-Álvarez, & García-Sánchez, 2009a), citizen participation in sustainability matters and overall government.

The result of this process is a survey made up of 72 items grouped into three sections: a) E-Government (46

items), b) E-Governance (17 items), and c) E-Democracy (12 items). **Figure 2** reflects the content of each block.

MUNICIPALITIES	POPULATION	MUNICIPALITIES	POPULATION
Madrid	3273049	Mataró	122905
Barcelona	1619337	Parla	120182
Valencia	809267	Santa Coloma de Gramenet	120060
Sevilla	704198	Torrejón de Ardoz	118441
Zaragoza	675121	Jaén	116790
Málaga	568507	Algeciras	116417
Murcia	441345	Alcobendas	110080
Palma	404681	Ourense	108673
Palmas de Gran Canaria (Las)	383308	Reus	106622
Bilbao	353187	Torrevieja	101091
Alicante/Alacant	334418	Telde	100900
Córdoba	328547	Barakaldo	99321
Valladolid	315522	Lugo	97635
Vigo	297124	San Fernando	96689
Gijón	277198	Girona	96236
Hospitalet de Llobregat (L')	258642	Santiago de Compostela	94824
Coruña (A)	246047	Cáceres	94179
Granada	239154	Lorca	92694
Vitoria-Gasteiz	238247	Coslada	91218
Elche/Elx	230822	Talavera de la Reina	88986
Oviedo	225155	Puerto de Santa María (El)	88503
Santa Cruz de Tenerife	222643	Rozas de Madrid (Las)	88065
Badalona	218886	Cornellà de Llobregat	87240
Cartagena	214165	Orihuela	87113
Terrassa	212724	Roquetas de Mar	85808
Jerez de la Frontera	208896	Ejido (El)	85389
Sabadell	207338	Avilés	84202
Móstoles	206015	Guadalajara	83789
Alcalá de Henares	204120	Pozuelo de Alarcón	82804
Fuenlabrada	198973	Toledo	82489
Pamplona/Iruña	197488	Sant Boi de Llobregat	82411
Almería	190013	Palencia	82169
Leganés	187227	Pontevedra	81981
Donostia-San Sebastián	185506	Sant Cugat del Vallès	81745
Santander	181589	Getxo	80277
Castellón de la Plana	180690	Torrent	79843
Burgos	178574	Gandia	79430
Albacete	170475	Arona	79377
Getafe	169130	Chiclana de la Frontera	78591
Alcorcón	168299	San Sebastián de los Reyes	78157
Salamanca	154462	Mijas	76362
Logroño	152650	Manresa	76209
San Cristóbal de La Laguna	152222	Vélez-Málaga	75623
Badajoz	150376	Ciudad Real	74345
Huelva	149310	Zamora	65998
Tarragona	140184	Ávila	58245
Lleida	137387	Cuenca	56189
Marbella	136322	Segovia	55748
León	134012	Huesca	52347
Cádiz	125826	Soria	39838
Dos Hermanas	125086	Teruel	35241

Figure 1. Sample

A) E-GOVERNMENT

General information

Municipality's Strategic Planning or Local Agenda 21 Planning
Political composition of the elected positions on the Town Council
Information about the different Boards and their functions
Basic information about decentralized bodies

Economic, environmental and social information

Surplus or deficit per inhabitant
Tax autonomy
Tax revenues per inhabitant
Public spending per inhabitant
Public investment per inhabitant
Average period of payment to providers and debtors
Average period of collection
Amount of municipality's public debt
Historical trend of the municipality's public debt
Debt ratio per inhabitant
Efficiency and efficacy indicators
Annual reports of the Town Council (Balance Sheet, Income Statement, Budgetary Cash Report, Notes)
Municipality's budget
Claims to the budget
Modifications in budget approved by the Council
Interim reports about the budget
Budgets of the decentralized organizations
External Auditor reports
Spending on and investments in the environment
Environmental impact of municipal products and services
Promotion of efficient products and services as regards energy consumption or based on renewable energies
Effect of the environmental practices on energy consumption
Direct consumption of energy derived from primary sources
Consumption of intermediate energy
Activities pursuing energy saving
Sources of water collection and volume of water collected
Percentage of water recycled and re-used in the municipality
Information about spilling and waste waters in the municipality
Updated information about air and noise pollution in different areas of the municipality
Spending on social programs
Public announcement of aid and subsidies
Aid and subsidies for NGOs, Neighborhood associations, Cultural institutions, etc.
Number of requests, claims, etc. solved by silence procedure
List and amounts paid to the most important minor providers of the town council
List and amounts paid to the most important investment providers of the town council
List and monetary amounts of the projects and building works financed by the Central State
Monetary import of the projects and building works already paid by the Central State
Firms contracted to undertake the projects and building works financed by the Central State
Good Governance or Ethics Code of the Town Council
Public Declaration of Properties and Activities on behalf of Town Council's members
Salaries of the Mayor and other Council members
Political positions in municipal management and the salaries involved

E-GOVERNANCE

Administrative paperwork, proceedings, licenses online
Online tracking of the processing of administration procedures and incidences

Municipal services provided and information about their monitoring
Taxes
Problems and incidences in municipal services
Public employment demand of the Town Council
List of jobs in the Town Council
List of jobs in the decentralized organizations
Information about staff selection processes
Composition and convening of hiring boards
Investments put out to tender: official announcements
Investments put out to tender: decisions and projects presented
Agendas from the day before municipal plenary sessions
Minutes of the Town Council meetings
Agreements of the Town Council meetings
Agreements of the Governing Boards
Municipal regulation

E-DEMOCRACY

Help button (demos, etc.)
Web map / Table of Contents
Internal search engine
Staff directory
Newsletters
Norms about citizen participation
Local boards for promoting citizen participation
Composition and workings of District Boards
Channels for citizens' participation regarding strategic issues
Mechanisms for suggestions and citizen participation in drawing up local budgets
Discussion Fora on the local website
Suggestions and Complaints box

Figure 2. Information Index

The information contained in this index was obtained through a content analysis of the town councils' websites during May and June 2011. Content analysis is one of the principal techniques used to study the information provided online and is based on checking the presence / absence of a set of sections on the website, typically using binary values (1: presence of the information sought; 0: absence of the information sought). We subsequently aggregated them without considering a potential weighting of the items, in order to avoid the arbitrariness inherent to the use of weighted indexes.

Independent Variables

In **Table 1**, the variables proposed to test the hypotheses are explained.

The information necessary to create the variables proposed was obtained from the websites of the Spanish Ministry of the Interior, equivalent to the US Justice Department, the Spanish Ministry of Economics and the Spanish Statistics Office.

Table 1. Independent Variables

Variable	Definition	Hypothesis	Expected sign
Internal features of the public body			
Size	Size of the public body, measured by the number of inhabitants in the municipality	H1	+
Budget	Institutional capacity represented by the budgetary spending per inhabitant	H2	+
Political factors			
Conserv	Binary variable that takes the value 1 if the political tendency of governing party is conservative, and 0 otherwise	H3	-
Dfavotes	Numerical variable that proxies for the popularity of the	H4	+

Variable	Definition	Hypothesis	Expected sign
	party in office using the difference in percentage of votes with respect to the second most-voted party.		
Strength	Numerical variable that reflects the local government's level of political strength. To represent this strength, we use a Herfindahl index which ranges between 0 (maximum fragmentation) and 1 (maximum strength). Maximum fragmentation implies the existence of one town councilor from each party, whereas maximum strength would mean that all the councilors belong to the same political party.	H5	+
Parties	Political rivalry measured by the number of political parties taking part in general elections	H6	+
Municipal context			
Economic level	Numerical variable that reflects the level of local economic development measured by the municipality's unemployment rate		-
Social level	Numerical variable representing the level of local sustainability measured by the municipality's score in the MERCO ranking of quality of life (http://www.merco.es)		+

Model of Explanatory Analysis

In order to detect the factors behind the development of digital government in municipalities, we use dependency models. Hence, from the variables selected to test the hypotheses proposed in Section 2, we have defined the following model (1), in which the level of development in digital government in Spanish local administrations is determined by the institutional features and the municipalities' policies, as well as certain factors from the municipal context.

$$Digital\text{-}government = f(Municipal\ context, Internal\ features\ of\ the\ public\ body, Political\ factors) \quad (1)$$

The model (1) can be empirically estimated through model (2):

$$Digital\text{-}government_i = \beta_0 + \sum^{2}_{i=1} \partial_i IF_i + \sum^{4}_{i=1} \Omega_i PF_i + \sum^{2}_{i=1} \rho MC_i + \varepsilon \quad (2)$$

where,

IF is the set of variables reflecting the internal features of the public body,

PF represents the political factors,

MC contains the variables linked to the municipal context.

Model (2) has been checked empirically through multiple linear regression. The dependent variable is defined from the overall index of development of the digital administration, as well as the different levels of development in each typology: e-government, e-governance and e-democracy.

RESULTS

Descriptive Analysis

Table 2 synthesizes the descriptive statistics for the whole set and for each typology of development in the electronic public administration. As can be observed, the Spanish municipalities' websites display 44 items on average (59 per cent out of the items analyzed), with a dispersion of 13 items, leading to an interval of 31 to 57 items.

As for the level of development of e-government in the municipality (46 items), the mean information issued is 54.53 per cent of the items considered (approximately, 25), within an interval of 17 to 33 items. This interval comprises 37 to 72 per cent of the items included in this group.

The average level of development concerning e-governance topics comprises the 64.70 per cent of the items studied (11 out of 17 items), with a variability of 4 items. Regarding the items considered under the label of e-democracy, the Spanish municipalities exhibit 8 of the 12 items (67 per cent), ranging from 5 to 11 items.

Table 2. Descriptive Statistics

	Minimum	Maximum	Mean	Standard Deviation
GLOBAL	18.01	65.04	44.1941	12.92265
E-GOVERNMENT	9.00	39.01	25.0657	7.99048
E-GOVERNANCE	4.01	17.01	11.0371	3.83634
E-DEMOCRACY	1.01	12.02	8.0913	2.81904

Explanatory Analysis

Table 3 displays the descriptive statistics for the explanatory variables in model (2).

Table 3. Descriptive Statistics

	Mean	Standard deviation
ECONOMIC LEVEL	7.9701	2.03140
SOCIAL LEVEL	39.6494	22.88344
SIZE	214734.6569	363867.08509
BUDGET	1100.2958	260.93811
SUSTAINABILITY	39.6494	22.88344
PARTIES	9.3247	3.95847
STRENGTH	0.5036	0.08242
DFAVOTES	0.3338	0.08174

Table 4 contains the correlations among the variables proposed. CONSERV shows the highest correlation with the dependent variable (-0.257), and is negative. It can likewise be seen that there are no high correlations among the control and independent variables that could lead to multicollinearity problems.

Table 4. Correlations

	TOTAL	SIZE	ECONOMIC	CONSERV	PARTIES	STRENGTH	DFAVOTES	BUDGET
SIZE	0.187							
ECONOMIC	-0.093	-0.107						
CONSERV	-0.257*	0.077	-0.004					
PARTIES	0.126	0.187	0.056	-0.062				
STRENGTH	-0.154	0.056	0.234*	0.329**	-0.015			
DFAVOTES	-0.047	-0.069	0.098	0.385**	-0.291*	-0.061		
BUDGET	-0.105	-0.038	-0.054	-0.048	0.020	-0.040	-0.187	
SOCIAL	-0.117	-0.399**	0.298**	-0.150	-0.324**	-0.036	-0.063	0.080

** Correlation significant at 0.01

* Correlation significant at 0.05

The results derived from estimating the explanatory models are reflected in **Table 5**. The explanatory power of these models (R2) ranges from 9 per cent to 25 per cent for different confidence levels. More specifically, the models with lower predictive capacity (not significant from the statistical perspective) are those explaining the development of e-democracy. In contrast, the model of the overall information index has an explanatory capacity of 22 percent, followed by the model devoted to explaining the economic, social and environmental information overall (25 per cent). The model addressing the development of e-governance has a predictive capacity of 13 per cent, for a confidence level of 90 per cent.

Table 5. Factors Explaining the Development of Electronic Administration

Dependent variable	**GLOBAL**			**E-government**			**E-governance**			**E-democracy**		
	Beta	*t*	*Sig.*	*Beta*	*t*	*Sig.*	*Beta*	*t*	*Sig.*	*Beta*	*t*	*Sig.*
(Intercept)		4.03	0.00		4.27	0.00		2.74	0,01		2.53	0.01
SIZE	**0.41**	**2.57**	**0.01**	**0.41**	**2.65**	**0.01**	**0.32**	**1.92**	**0.06**	0.27	1.55	0.13
BUDGET	-0.13	-1.16	0.25	-0.16	-1.45	0.15	-0.09	-0.76	0.45	-0.03	-0.22	0.83
CONSERV	**-0.30**	**-2.27**	**0.03**	**-0.33**	**-2.59**	**0.01**	**-0.24**	**-1.70**	**0.09**	-0.11	-0.77	0.45
PARTIES	-0.14	-0.88	0.38	-0.19	-1.21	0.23	-0.08	-0.45	0.66	-0.01	-0.04	0.97
STRENGTH	-0.13	-1.05	0.30	-0.14	-1.20	0.24	-0.07	-0.55	0.59	-0.09	-0.66	0.51
DFAVOTES	-0.02	-0.16	0.87	-0.05	-0.34	0.73	0.05	0.37	0.71	-0.04	-0.28	0.78
Contextual variables												
ECONOMIC LEVEL	-0.03	-0.25	0.80	-0.01	-0.4	0.96	-0.07	-0.47	0.63	-0.05	-0.33	0.73
SOCIAL LEVEL	-0.07	-0.52	0.60	0.04	0.03	0.97	-0.08	-0.57	0.56	-0.21	-1.55	0.12
	R^2	**0.22**		**R^2**	**0.25**		**R^2**	**0.13**		R^2	0.09	
	F	**2.95**	**(0.01)**	**F**	**3.50**	**(0.00)**	**F**	**1.57**	**(0.10)**	F	1.03	(0.41)

The statistically significant values are stressed in bold.

Size, size of the local administration.

Budget, institutional capacity.

Conserv, the governing party in the municipality has a conservative ideology.

Parties, political rivalry. *Strength*, electoral strength of the governing party.

Dfavotes, popularity of the party in power.

Considered overall, all the variables have a negative effect, except for the size of the public body, which positively affects the development of the local government's presence on the Internet.

In regard to the models explaining the overall information index, e-government and e-governance, two out of eight explanatory variables turn out to be statistically significant: SIZE and CONSERVATIVE. On the other hand, none of the variables proposed seem to be relevant in explaining the level of development in participatory digital government (e-democracy).

The variable SIZE shows a positive effect for a confidence level of 99 per cent in the two first models of analyses, and for a confidence level of 90 percent in the model explaining e-governance. The size of the public body—or, more specifically, the population—has been taken as a measure of the level of complexity of the public administration and the government, which can be considered to be one of the internal factors underlying the activities of the public manager (Cárcaba & García, 2008). Population can be taken as an indicator of the overall level of resources as well as the degree of professionalization and specialization of the civil servants. Thus, the most populated countries will tend to have larger organizations and greater levels of financial and human resources.

At the same time, they will exhibit incentives to adopt measures of e-government as tools to manage the practical challenges and the high costs of communicating effectively with different agents and public bodies (Justice et al., 2006). Also, these large municipalities show a higher political visibility; in this sense, Frost and Seamer (2002) emphasize the role played by political visibility as a driver for implementing new reforms and achieving organizational legitimacy.

Nevertheless, previous literature has not reached conclusive evidence as regards this influence. While Ingram (1984), Ingram and DeJong (1987) and Laswad et al. (2005) do not find a statistically significant association, Evans and Patton (1987), Serrano-Cinca, Rueda-Tomás, and Portillo-Tarragona (2008) and Gallego-Álvarez et al. (2010) obtain evidence for a direct relationship.

Likewise, the binary variable CONSERV, which identifies a conservative ideology in the governing party, has a negative effect for a level of confidence of 95 per cent. This result is in line with the positive influence of the Socialist Party observed in Spain for Cárcaba and García (2008) although Gallego-Álvarez et al. (2010) found a null impact in the worldwide comparison of local digital administration development.

Political ideology identifies the behavior of parties based on the idea that the political trend of the governing party can have an impact on digital government. Governments with a right-wing ideology are likely to carry out

programs or activities of a notably economic nature and introduce public sector reforms, whereas those that have other types of ideologies more often concentrate on social policies and may show a lower interest in technological advances and, by extension, in digital government. In this study we have obtained a negative impact of conservative ideologies on e-government and e-governance development for Spanish local administrations. This result may suggest that right-wing ideologies try to undertake management reforms different from those relating to electronic issues.

In relation to the other institutional capacity variables, the results show that although digital government requires the building of a technical and administrative infrastructure that will permit its development, these resources are not strongly joined to the budget of the public body. In this sense, Pina et al. (2010), Gandía and Archidona (2008) and Tolbert et al. (2008) do not detect a statistically significant association between budgetary incomes or spending per capita and the likelihood of developing digital government, although Gallego-Álvarez et al. (2010), by means of a a worldwide municipal analysis, find that this factor is very important for the transactional and participatory development of electronic administrations.

Regarding other political factors, several authors hold that a high degree of political rivalry can create a favorable environment for technological reforms (Tolbert et al., 2008), given that there may be a continuous monitoring of public management which may benefit from the use of new technologies. However, previous literature has shown mixed results concerning this factor. On the one hand, Cárcaba and García (2008), Gandía and Archidona (2008) and Tolbert et al. (2008) highlight the positive influence of political rivalry on the use of digital government; on the other hand, Laswad et al. (2005), Gallego-Álvarez et al. (2010), as well as this paper, conclude that it is not a statistically significant factor.

CONCLUSION

In the current era of public administration reforms aimed at enhancing efficiency and effectiveness, the development of electronic government (e-government) has emerged as a key focus. E-government encompasses a broad range of initiatives centered on increasing the digital presence of public administrations. These initiatives include everything from making information available online to creating new channels for interaction between citizens, politicians, and public managers, as well as providing public services through digital platforms. Academic literature generally classifies the evolution of e-government into three stages: e-government, e-governance, and e-democracy.

Much of the previous research has concentrated on assessing the extent to which digital administration has progressed, often by examining the volume and format of financial and budgetary information disclosed online, alongside factors influencing e-government adoption. However, these studies often fall short in capturing the diverse styles or approaches to digital government, particularly at the local level. Additionally, they frequently overlook the broader range of drivers that influence the overall development and implementation of e-government initiatives.

To address these gaps, this study sought to identify distinct stages in digital government development and explore the key factors that explain the extent of public administrations' online presence, both overall and at each specific stage. The analysis focused on three main categories of explanatory variables: municipal context, institutional characteristics, and political factors.

The empirical analysis was conducted on a sample of 102 Spanish local governments, using a content analysis of their official websites. The study first developed an information index based on a survey comprising 75 items, organized into three sections aligned with the previously identified stages of e-government development. Using this index, a descriptive analysis was performed alongside advanced statistical techniques such as BIPLOT and cluster analysis. A regression model was then applied to assess the impact of various factors on the development of e-government.

Results from the descriptive analysis revealed that, on average, Spanish municipal websites included 44 out of the 75 surveyed items, representing 59% coverage in the overall index. When examining the stages individually, municipalities displayed 54.3% of the items associated with the first stage (e-government), 64.7% of the items linked to the second stage (e-governance), and 67% of the items for the third stage (e-democracy). This trend suggests that Spanish municipalities are increasingly adopting advanced digital government practices, with notable progress especially in the more participatory and governance-oriented stages.

The regression analysis highlighted two critical determinants of e-government development: the size of the municipality and the political ideology of the governing party. Larger municipalities tend to have greater political visibility and face more pressure to enhance public management, which drives them to invest in digital

government initiatives. Additionally, their more complex public service demands and greater availability of financial and human resources make them better positioned to adopt these technologies. Regarding political ideology, left-wing parties showed a stronger inclination to promote and intensify e-government practices, whereas conservative parties appeared to focus on other types of management reforms less centered on digital innovation.

Interestingly, other factors such as economic and social development indicators, as well as political stability and strength, were not found to be significant determinants in advancing e-government levels in this study. This finding suggests that political will and institutional capacity related to municipality size may be more influential drivers than socioeconomic conditions or political continuity.

LIMITATIONS AND FUTURE DIRECTIONS

While this study provides valuable insights into the development of e-government in Spanish municipalities, it also has certain limitations. First, the research focuses solely on local governments within a specific country, which may limit the generalizability of the findings to other national contexts with different political, social, or institutional environments. Future studies could benefit from cross-national comparative analyses to explore whether these determinants hold true in diverse settings.

Second, the study relies heavily on content analysis of websites, which, while informative, may not fully capture the actual quality or effectiveness of digital services provided to citizens. Future research could integrate citizen satisfaction surveys, usage data, and qualitative assessments to provide a more holistic understanding of the impact of e-government.

Third, the study's focus on political ideology as a determinant invites further exploration into the nuanced ways in which political agendas shape e-government beyond the traditional left-right spectrum. Investigating the role of other political variables, such as party leadership styles, electoral competitiveness, or public opinion pressures, could deepen understanding of political influences on digital government.

Finally, technological advancements and changing citizen expectations continue to evolve rapidly. Future research should consider how emerging technologies—such as artificial intelligence, blockchain, and mobile platforms—affect the progression of e-government and how local administrations can adapt to maintain effective digital services.

In conclusion, this study underscores the growing importance of e-government in local public administrations and highlights key institutional and political factors influencing its development. However, expanding the scope of analysis and integrating new data sources and perspectives will be crucial for advancing knowledge in this field and supporting the continued modernization of public services.

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