Opportunities and Challenges of Digital Transformation in the Public Sector: The Case of Ecuador

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Abstract. Electronic government has several benefits, especially in improving the provision of public services, transparency and accountability, citizen participation, efficiency and cost savings and economic development. However, there is still no extensive literature on the characteristics of e-government in developing countries. That is why the purpose of the paper is to identify the opportunities and challenges of digital transformation in the public sector of Ecuador. For this, a multidimensional theoretical framework of e-government was used that in composed for socioeconomic and political factors to identify the opportunities and challenges of a country. Bibliographic research was conducted for which secondary information was used, especially from public documents of the country and international reports. As a result, since 2000 Ecuador has started its digital Transformation until now with the implementation of a new model for the digital transformation of the country that includes the supply of digital infrastructure, as well as the digitalization of public services, promoting the access of these by creating regulatory norms that allow the development of e-government. However, despite the advances that the country has had in the public sector, there are still challenges such as improving interoperability between the different public institutions, improving the security and protection of government data, and training specialized human talent. In the same way, it is established that to have a positive impact, it is important to take into account that the successful implementation of e-government requires adequate planning, investment in technological infrastructure and the training of government personnel, as well as consideration of security issues, privacy and access to technology.

Keywords: e-government · Digital infrastructure · Digital Transformation · Public services

1 Introduction

E-government is a powerful tool to modernize and transform public administration. Electronic government, also known as e-government or digital government, refers to the use of information and communication technologies (ICTs) to improve the administration and delivery of government services to citizens, businesses, and other entities [1, 2].

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This model of government has had a boom in recent years. That is why, according to data from the International Data Corporation (IDC), by 2023, 45% of States will deploy state-of-the-art technology to process data obtained through the Internet of Things (IoT), networks or other devices [3]. The importance of e-government lies in several key aspects. First, it improves the efficiency and effectiveness of government through the automation of government processes, which leads to greater efficiency in the delivery of services and in the internal management of government [4–6]. Second, it expands government services by facilitating access to government services through digital channels, allowing citizens and businesses to access information, carry out procedures, and participate in democratic processes more conveniently and quickly [6, 7]. Third, greater transparency and accountability, since electronic government can promote government transparency and accountability by facilitating access to public information and allowing citizen participation in the supervision and evaluation of government activities, which contributes to strengthening the confidence of citizens in the government and its institutions [8]. Fourth, promotion of innovation and technological development since electronic government promotes the adoption of new technologies in the public sector, which promotes innovation and technological development in the government and in society in general, which in turn can have a positive impact on the economy, competitiveness and job creation in the ICT sector [9]. Fifth, the promotion of citizen inclusion and participation, since it promotes citizen inclusion and participation by facilitating access to government services for different segments of the population, including people with disabilities, low-income people, and residents of rural areas [10]. In addition, e-government encourage citizen participation in government decision-making through online participation tools, such as surveys, consultations, and social networks.

The Electronic Government in Ecuador has been an important initiative to modernize and improve the public administration of the country. The Ecuadorian Government during its evolution towards a digital transformation has focused on various areas, including the automation of government processes, the improvement in the provision of public services, transparency and accountability, as well as the promotion of citizen participation [11]. The main e-government initiatives implemented in Ecuador include the Electronic Government Portal, which is the main access point for online government services in Ecuador [12]. It has also implemented the Electronic Signature, which is a tool used to validate the authenticity and integrity of electronic documents. It has developed the Electronic Public Procurement Platform that allows government entities and suppliers to carry out procurement processes for goods and services electronically, which improves transparency, efficiency, and competitiveness in the public procurement process [13]. Moreover, online citizen participation has improved through various online tools such as online consultations and surveys, citizen participation platforms and social networks [14]. However, despite all this progress, several weaknesses have been identified in some sectors.

The current literature presents a large amount of research in which the benefits of using everything related to electronic government can be highlighted, especially in developed countries, there is still little research on the characteristics of electronic government in developing countries, since each country has a different context. That is why

the purpose of the research is to identify the opportunities and challenges of digital transformation in the public sector of Ecuador. The importance of this research lies in the fact that Ecuador has gone through several transitions and governments with different policies, which has created a series of interactions in everything related to the implementation of an electronic government. In the same way, a multidimensional theoretical framework of e-government composed by socioeconomic and political factors was used to identify opportunities and challenges in developing countries.

The research is organized as follows: The following section presents the characteristics of the multidimensional theoretical framework developed by Gulnoza Kuldosheva 2021 to explain opportunities and challenges in e-government for developing countries [15]. The third section identifies the opportunities and challenges of Ecuador using the multidimensional theoretical framework. The last sections discuss the case and concludes the paper.

2 Multidimensional Framework of E-government for Developing Countries

In 2021, Gulnoza Kuldosheva developed a multifunctional theoretical framework to explain how e-government works for developing countries, which is presented at Fig. 1 [15].

2.1 Socio-economic Component

This component has a first phase that is an analysis of the stages that a government has had to go through on its way to digital transformation, which lays the foundations for projects related to electronic government that a government can implement. The second phase for this component are the current status of projects on electronic government. To analyze the projects, it is necessary to explore the institutionality of a government, the technological infrastructure component and the quality of the services offered by an electronic government.

Institutionality
Institutionality has to do with the governance that is exercised through public and private organizations, and society in general, in charge of carrying out activities of design, formulation, implementation, regulation, and control in an impartial, transparent, objective, and Non-partisan of government policies, no transient political influences. Accompanied by a regulation that complies with and enforces national policy and that only makes decisions that fall within its scope of legal competence, independent and capable of applying the general policies of the government. It is very important to promote the transversally of this process of change, which can be achieved by generating regulations that create the necessary governance conditions [16].

Infrastructure
Understood as the physical and non-physical medium through which one has access to information and communication, which is considered the variable that determines and

sizes the digital divide in a country. In this sense, access to ICTs and information must consider, among others, three dimensions such as geographic access, economic access and socio-cultural access. This section includes the internet coverage that a country has, the number of platforms that it has to provide different public services, the number of people with internet access and with access to a mobile phone and internet technology infrastructure [17].

Services
This dimension is defined by the products, services, applications and digital content that the government can offer and demand. Government products and services are tied to the type of technology used to deliver services, applications, and digital content. In this dimension, it is important to identify all the public services that a government can offer through different platforms. They are usually interactive portals where information is collected from a user and then distributed to different government departments to make decisions about a specific area. The quality of these public services that a government offers may depend on factors such as the lack of qualified personnel in the government or the lack of promotion of the services to the community [18].

2.2 Political Factors

Transparency and Citizen Participation
One of the theories of electronic government is that it seeks to promote citizen participation in decision-making and in the provision of government services. This theory holds that technology can facilitate meaningful citizen participation in public policymaking, accountability, and government oversight. Electronic government seeks to empower citizens and promote transparency and collaboration in public management. That is why in democratic countries one of the duties of the State is to inform citizens of its management and work on Digital Transformation initiatives [19]. For this reason, information on the progress and execution of each of the actions that are articulated need to be available to citizens through official government channels. The published information serves so that each actor knows about the management of public institutions.

Electronic government can facilitate citizen participation and collaboration in the development of public policies through digital platforms that allow consultation, dialogue, and feedback from citizens [5, 6]. This can contribute to greater inclusion and representativeness in government decision-making and strengthen participatory democracy.

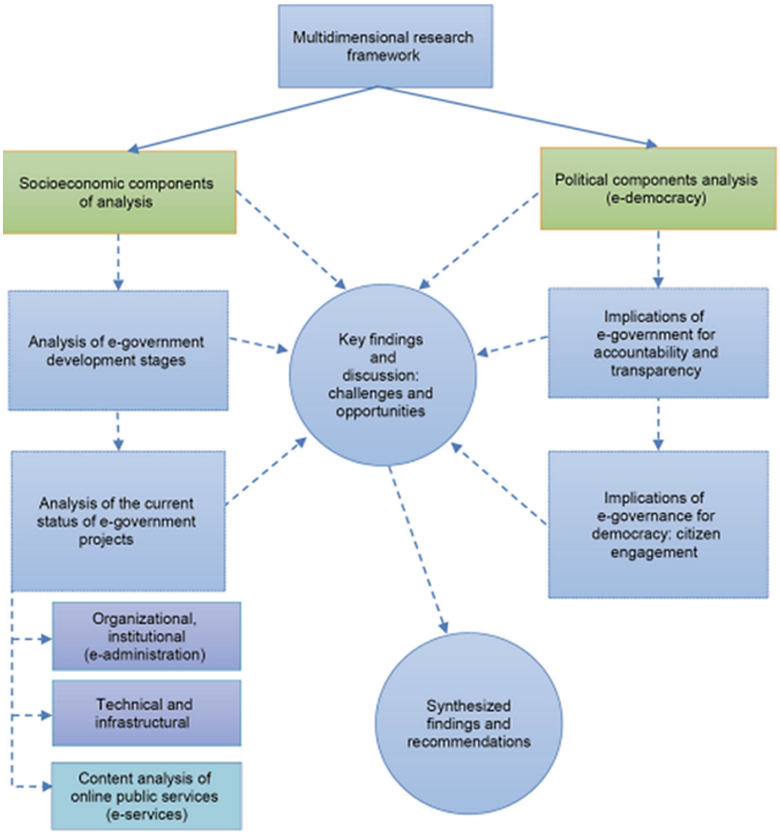

Fig. 1. Multidimensional Framework of e-government for developing countries

3 Opportunities and Challenges for E-government in Ecuador

3.1 Socio-economic Analysis

Analysis of E-government Development Stages in Ecuador

The development of the Electronic Government of Ecuador began in year 2000, when the first National Plan for the Development of Telecommunications was published, whose main purpose was the dissemination of the internet at the national level. From there, the Ecuadorian Government has undertaken with initiatives, plans and strategies, to include information and communication technologies at the State level. Precisely in this year, in accordance with Resolution No. 380-17-CONATEL-2000, universal access to telecommunications services was declared as State policy [20]. Since then, the country has been implementing different public policies towards the transformation of a digital government. A good evidence to demonstrate the progress of electronic government in the country was the United Nations Electronic Government Development Index (EGDI), which measures topics such as online services, telecommunications infrastructure and human capital. In 2018 Ecuador was ranked 84 out of 193 countries with an index

of 0.613, evidencing constant growth and placing it with this result above the world and regional average [11]. Ecuador has also shown progress year after year, that can be observed through the 2018 E-GOVERNMENT SURVEY where it rated Ecuador with an index of 0.37, a value that doubles the result obtained in 2010 [11]. For this, the Ecuadorian government has worked on several initiatives for the creation of public policy and improvement of services with the participation of citizens, among which stand out the current National Development Plan 2017–2021, the Organic Code of the Social Economy of Knowledge; and the simplification of procedures through citizen proposals through the Tramiton.to platform. These results were possible thanks to the establishment and implementation of instruments with a single vision, aligned with national objectives and articulation with different actors.

In 2021, Ecuador presented its first Digital Agenda as a public policy instrument that included the priorities of various sectors and identified joint actions to promote the digital transformation of the country, focused on a comprehensive mode [21].

Below are the main events in the country in its process towards the digital transformation of the Government [22] (Table 1).

Table 1. Phases of E-government in Ecuador

Year	Event
2000	National Development Plan declares universal access to telecommunications systems as a public policy
2001	The Connectivity Commission is created
2003	National Program for Electronic Government and the Information Society
2005	Action Plan 2005–2010 of the National Agenda for Connectivity
2008	The use of free Software is used as a public policy
2011	Creation of the Information Technology Secretary
2012	Implementation of the software platform called "Government Services Bus (BSG)"
2013	Creation of the Secretary of Electronic Government
2014	Creation of the first National Electronic Government Plan 2014–2017
2018	Regulatory improvement and administrative simplification are declared as State policy
2021	First Digital Agenda of Ecuador 2021–2022 was created and implemented

Institutionality

Among the institutions that lead the digital transformation of the country is the Presidency of the Republic, which dictates the guidelines and policies at the national level, the Ministry of Telecommunications and the Information Society, and the different Ministries that are the ones that make up the Central Public Administration and the Other State powers and provincial, local and parish GAD who collaborate and coordinate with the different Ministries [23]. Figure 2 presents the structure of the main actors in the Digital Transformation of the Ecuadorian Government.

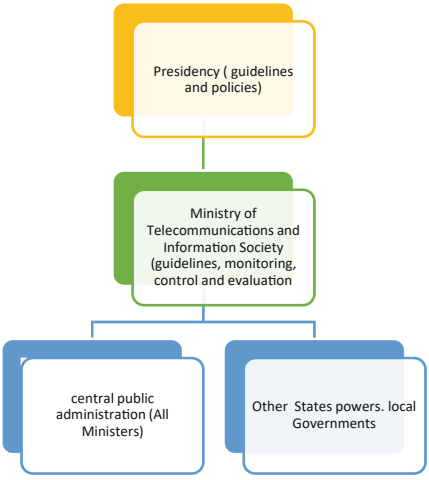

Fig. 2. Multidimensional Framework of e-government for developing countries

The Ministry of Telecommunications and the Information Society has the competence to exercise the rectory, issue and implement policies, guidelines and regulations aimed at the Digital Transformation of the country [24]. These policies, guidelines, and regulations should focus on the use and appropriation of ICTs in the health, education, productivity, labor, tourism, and agriculture sectors, in coordination with the governing bodies of these sectors. To establish the Governance of the Digital Transformation Agenda, the competent entities permanently analyze the need to create or modify the different legal, juridical and strategic instruments for a correct execution of the Agenda within their sectors and institutions. In this sense, the mentioned actors work based on the following regulations that are presented in Table 2, which in turn are aligned with Ecuador's Plan for the Creation of Opportunities 2021–2025, and the United Nations 2030 agenda and the 17 Sustainable Development Goals SDGs.

Technology and Infrastructure

By 2020, 53.2% of households in Ecuador had Internet access, rural coverage was 34.7% of households and the proportion of people who used Smartphones was 81.8% [25]. Another data that stands out is the percentage of households in Ecuador that have access to fixed Internet, which is 45.50%. Regarding the Internet Access Service - IAS, as of June 2022 the national density per household represented 54.64%, with more than 2.59 million accounts. Of the national total, 68.32% corresponds to fiber optic connections. In the same way, until July 2022, 15,639 WIFI points were reported, distributed in 126 cities of the country, that is, 57% of cities have WIFI points installed [25].

However, the fact that progress has been made in the implementation of technological infrastructure in the country, Ecuador is still vulnerable to cyber threats. For example, according to the Global Cybersecurity Index (GCI), issued by the ITU, published in

Table 2. Normative for E-government in Ecuador.

Laws and Programs
Constitution of the Republic of Ecuador
Telecommunications Organic Law
Organic Law on Data and Civil Identity Management
Organic Law for the Optimization and Efficiency of Administrative Procedures
Executive Decrees
Digital Transformation Policy
Information Society Plan - Digital Transformation
Electronic Government Plan
Telecommunications and Information Technology Plan

2020, the country is ranked 119 out of 182, being one of the countries with the highest vulnerabilities worldwide [25].

Services

In 2018 The Ecuadorian Government promoted the implementation of online services in its different Ministries. For example, in this year, 130 public institutions that belongs to central government had a web portal and official social networks and the 80% of these Institutions have a web portal with accessibility features. This institutions, 9% have mobile applications that allow citizen procedures to be carried out. In addition, there were 12.5 thousand officials who used electronic signatures to issue official communications through the "Quipux Document Management System", signing around 4.2 million documents, generating savings of 1.9 million dollars per Costs associated with printing documents [25]. In the same way, by the year 2020, 75% of Ecuadorians had access to electronic financial products and services, and 90% of this group had carried out electronic transactions in international portals. On the other hand, in Jan 2022 the e-Government index was 0.70 [26].

However, despite all this progress, the use of the digital channels of the Central Government Institutions is not distributed equally since there is a direct relationship with the socioeconomic and educational level. This means that not everyone can access the benefits provided by the State, aggravating social inequalities. Likewise, despite the potential that online procedures have in terms of reducing time, costs and limiting corruption, only 21.4% of central government procedures can be started online and 11% can be completed online [25]. This added to the fact that many public services that have been implemented online have lacked a prior analysis to simplify it. This lack of understanding and improvement of the process behind the implemented system often makes the automated public service even more cumbersome than the original manual version. For example, there are the procedures of the Ecuadorian Institute of Intellectual Property -IEPI- and the form of assets of the Comptroller's Office.

Another problem has arisen in the interoperability of State Institutions. For example, 65 local governments use information that resides in databases of other Central Government institutions to provide services to citizens, however, there are still a large number of local governments that still do not have these services for which continues to request copies of documents from citizens such as identity cards for the different procedures.

Digital Talent

This pillar refers to people as the fundamental factor of digital transformation, which seeks to strengthen basic skills in digital technologies in the entire population and encourage the development of new skills, as well as technical and professional skills in these technologies. Currently, it is no longer enough to equip the new generations with a fixed set of skills or knowledge, it will be necessary for them to develop a wide variety of skills and abilities to adapt to change. Leaving in evidence, the need to have a vision at the country level, to promote digital talent permanently, in which people acquire new and more relevant skills throughout their lives.

However, currently it has been detected that there is insufficient specialized human resources in the development of systems, databases, process automation tools and project management in relation to the scale of operations of the institution [27].

3.2 Political Analysis

Transparency

Regarding transparency in relation to the publication of information for citizens, according to a report issued by the Ombudsman's Office in January 2020, more than 97% of the institutions that belongs to the Central Government, publish their activities through institutional web portals, in compliance with article 7 of the Organic Law on Transparency and Access to Public Information, LOTAIP14. For this, the National Government has promoted the implementation of online services. On the other hand, there is the Open Data Inventory (ODI), an organization that evaluates the coverage and openness of official statistics through open data. In the 2016 index, Ecuador ranked 31 out of 173 countries, being the leader in South America with a score of 56 [25].

Citizen Participation

Ecuador has important advances in citizen participation and government transparency by electronic means. For example, in 2022, the United Nations Organization issued the results of the Electronic Participation Index in the ease of access to information provided by the government to citizens, Ecuador got a score of 70%. Related to the involvement of citizens in the contribution and deliberation on public policy and services, Ecuador got a score of 78.3% in this criterion and finally in citizen co-participation in the joint design of policies and services, with a score of 54.6%. For this, the Ecuadorian government has worked on various initiatives to create public policy and improve services with the

participation of citizens, among which the current National Development Plan stands out; the Organic Code of the Social Knowledge Economy; and the simplification of procedures through citizen proposals through the Tramiton.to platform. Digital media have also been implemented that allow citizen interaction with the State.

However, one of the challenges to improve citizen participation in electronic government is to improve knowledge about the usefulness of the information that is generated and presented on the different pages of Government Institutions. This is because of there is still a lack of knowledge regarding the economic benefit and social and political impact that its exploitation can generate. In addition, there are 20% of State institutional portals that do not have web accessibility features, which represents an access barrier for people with disabilities [28].

Another of the great challenges in increasing participatory democracy in the country. Although the results of the United Nations and the systems implemented by the government show progress on this issue, it is still an uncommon practice for government institutions to take advantage of these digital tools for the generation of public policy or improvement of services.

4 Discussion

Ecuador has made very significant progress in the implementation of an electronic government, especially at the level of regulations and application of technological infrastructure. However, there are still very big challenges such as improving the interoperability of the different public institutions and improving the knowledge of the population in the use of public services, the training of human talent specialized in the technical part for the design and implementation of electronic government and the vulnerability of public systems since the country is still vulnerable to cyber threats [6, 29].

Regarding the multidimensional framework used to identify the opportunities and challenges for developing countries, it can be pointed out that although there are many similarities with the dimensions of this framework, there are also differences such as in the dimension of socio-economic factors, especially in the projects of electronic government for Ecuador. For example, the multidimensional framework points out that there are three sub-dimensions such as the institutional part, the technical and infrastructure part, and the quality of the electronic services. However, in Ecuador according to the model of the Ecuador's Digital Transformation Agenda 2022–2025, a new dimension is established, which is "digital talent and training", which is one of the main measures to promote adaptation to the effects of digital transformation on employment, since it makes it easier for servers to public whose roles are affected by this process take on new tasks. Table 3 presents the main opportunities and challenge of each dimensions analyzed, both in socioeconomic and political factors.

Table 3. Opportunities and Challenges for E-government in Ecuador

Dimensions	Opportunities	Challenges
Socioeconomic factors		
Institutional Dimension	Regulations that establish the development of electronic government	Improve interoperability between public institutions
Technological Dimension	Mass use of ICT access by mobile phones	Vulnerability for cyber threats
Public service quality dimension	Increased access to automated public services	Lack of knowledge of the population about the existence of digital platforms for public procedures
Digital talent	Rapid development of technological innovation	Deficit of qualified human talent
Political factors		
Transparency	Online service mechanisms to meet citizen needs	Limited Organizational integration
Citizen Participation	Growing interest of citizens for new spaces for participation	Lack of Knowledge of the population about the existence of web pages of public institutions

5 Conclusion

Electronic government is important because it improves government efficiency, broadens access to government services, promotes transparency and accountability, fosters technological innovation, and promotes citizen inclusion and participation. It is a powerful tool to modernize and transform public administration, improve the quality of government services and strengthen the relationship between government and citizens [29]. Electronic Government in Ecuador has had a significant impact in improving government efficiency, infrastructure, transparency and citizen participation in decision-making. However, it also faces challenges in terms of expansion of technological infrastructure, training of specialized personnel, coordination of interoperability of different ministries and raising awareness of the population about the use of online services. In its process of continuing to advance its digital agenda, the country needs to continue working directly together with existing elements that include national and international laws, plans, guidelines and regulations that seek to align the government with the different efforts and existing regulatory reality. The fundamental basis for creating a model that helps the organization of Electronic Government in Ecuador must understand how key regulations such as the Constitution of Ecuador, the National Development Plan, strategies and indicators of the United Nations Organization are related. The Government of Ecuador must continue to work in an organized way, investing in technological infrastructure and the training of government personnel, as well as considering issues

of security, privacy and access to technology in order to modernize and improve public administration in the country.

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