

Beyond e-government stages: A multi-dimensional study of digital transformation in Ecuador

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Abstract: Ecuador's digital transformation reflects notable institutional progress, though persistent structural and implementation challenges persist. Using the 2024 UN E-Government Development Index and E-Participation Index as benchmarks, this study presents an analysis of the country's evolution in digital governance, structured around five strategic dimensions: normative foundations, technological capacity, citizen participation, international integration, and implementation capacity. The findings indicate strong performance in the Online Service Index and improved EPI scores, suggesting advances in service delivery and civic engagement. Key milestones such as the Organic Law on Personal Data Protection and the establishment of the Superintendence of Personal Data Protection, have strengthened the regulatory framework. However, foundational weaknesses in telecommunications infrastructure and human capital continue to constrain progress. Implementation remains the most pressing challenge, explaining the existence of a persistent "big data gap", a deep structural disconnect between the availability of digital potential and its effective use in practice. Bridging this gap requires stronger implementation capacity, targeted infrastructure investment, and user-centered design to translate digital strategies into inclusive and participatory governance.

Keywords: Big data, Citizen participation, Data governance, Digital government, Ecuador

1. Introduction

In recent decades, digital transformation has emerged as a strategic priority for governments worldwide. Digital technologies have become instrumental not only in enhancing internal efficiency but also in promoting transparency, citizen participation, and public service delivery. This transition from conventional to digital models entails complex institutional, legal, technological, and social changes, particularly in developing countries, where infrastructure gaps, digital divides, and inadequate institutional capacity persist.

The implementation of e-government entails multiple challenges, necessitating institutional, technical, and behavioral adaptations. The "stages of growth" model developed by Layne & Lee (2001) describes this evolution through four phases, which are particularly relevant in the context of digital government: cataloguing (publishing information online), transaction (enabling digital interactions), vertical integration (connecting government levels), and horizontal integration (coordinating services across sectors). This model underlines the maturation of digital government through the escalating complexity of its services and the enhancement of inter-institutional coordination.

Building on this, Margetts & Dunleavy (2013) identify a second wave of Digital-Era Governance (DEG), which diverges from fragmented, market-oriented models of New Public Management. DEG emphasizes three fundamental shifts: organizational reintegration within governments of siloed services and data, a needs-based approach to holism, where services are designed around users rather than bureaucratic structures, and digitally driven changes, where technology reshapes institutional processes to completely embrace and imbed electronic delivery. Together, these frameworks provide a valuable perspective for evaluating Ecuador's digital transformation. They consider not only infrastructure and service expansion but also institutional coherence, user engagement, and regulatory adaptation. However, a more granular, context-sensitive approach is needed to understand how digital transformation unfolds in practice.

In line with these evolving paradigms, data-driven innovation has emerged as a critical enabler of modern digital governance. Recent public-sector strategies for Big Data emphasize its use to improve transparency, service delivery, and socio-economic development (Mahrenbach et al., 2018). These approaches require interoperable, accessible datasets and population segmentation to inform targeted interventions (Attard et al., 2015; Okwechime et al., 2021). Yet, challenges remain: implementation gaps, ethical concerns, and cybersecurity risks can undermine trust and institutional capacity if not addressed through robust data governance frameworks (Riggins & Klamm, 2017; Manzoni et al., 2022).

While data capabilities are vital, digital governance also depends on citizen-centered design and meaningful participation mechanisms. Comprehensive digital transformation demands inclusive policy frameworks, legal clarity, and the integration of user-centered design principles that enable constructive interaction between citizens and the state. As scholars note, the legitimacy and sustainability of digital government hinge on its capacity to foster participatory democracy and build public trust (Jayashree & Marthandan, 2010; David, 2018).

In Latin America, however, digital transformation often stalls due to limited technical capacity, fragmented institutions, and outdated legal frameworks (Martínez-Mosquera & Luján-Mora, 2019). These shortcomings affect both the use of Big Data and the development of participatory digital tools, reinforcing public skepticism and uneven implementation (Kim et al., 2014).

The most effective way to measure and compare digital governance across countries is through the use of international indexes, which play a central role in this process. The United Nations E-Government Development Index (EGDI), developed by UN-DESA, is the most comprehensive tool for evaluating countries' digital governance performance. Alongside the E-Participation Index (EPI),

it enables cross-national comparison by assessing government capacity in service delivery, digital infrastructure, human capital, and citizen engagement (Alshehri & Drew, 2010).

With these considerations, the aim of this paper is twofold: First, it situates Ecuador's progress within the broader landscape of digital transformation in the Americas using 2024 EGDI and EPI data as benchmarks. Second, it conducts a qualitative, context-sensitive analysis structured around five strategic dimensions: normative foundations, technological capacity, citizen participation, international integration, and implementation capacity. This multidimensional approach extends existing theoretical insights by moving beyond a focus on platform deployment and offering a cross-cutting understanding of how the persistent "big data gap" manifests across these dimensions.

The rest of the paper is organized as follows: Section 2 reviews the theoretical foundations of the E-Government Development Index (EGDI) and its key components, including the E-Participation Index (EPI). Section 3 outlines the methodology, which combines a quantitative comparison of Ecuador's EGDI/EPI evolution with the qualitative application of a five-dimensional (5-D) analytical lens. Section 4 presents the results and discussion, applying this framework to the Ecuadorian case. Finally, section 5 concludes with recommendations for advancing inclusive digital governance.

2. The E-Government Development Index

The United Nations E-Government Development Index (EGDI), compiled by the United Nations Department of Economic and Social Affairs (UN-DESA), remains the most comprehensive instrument for evaluating e-government readiness and performance (Alshehri & Drew, 2010). The EGDI is a composite index based on the weighted average of three normalized sub-indices: the Online Service Index (OSI), the Human Capital Index (HCI), and the Telecommunications Infrastructure Index (TII).

The Telecommunications Infrastructure Index (TII) reflects the level of development of a country's telecommunication infrastructure, serving as a key indicator of its capacity to support e-government initiatives. In the 2024 EGDI, a significant revision was made to the TII: the Fixed Broadband Subscriptions indicator was removed due to increasing challenges in obtaining reliable data from Member States. In its place, a new *affordability* indicator was introduced to assess how financially accessible ICT services are for citizens, particularly in relation to income levels. This new indicator is a composite of two subindices: the cost of a mobile broadband data and voice high-consumption basket, and the cost of a fixed broadband Internet basket, both expressed as a percentage of gross national income (GNI) per capita. The TII index is now calculated as the arithmetic average of 4 indicators (Internet users per 100 inhabitants, number of mobile subscribers per 100 inhabitants, number of wireless broadband subscriptions per 100 inhabitants and affordability) (UN-DESA, 2024)

The Human Capital Index (HCI) informs about the human resource capacity to promote and use ICTs. It is the arithmetic average of 5 indicators: Adult literacy rate (%); Combined Gross enrolment ratio in primary, secondary and tertiary education (%); Estimated years of schooling (years); Mean years of schooling (years) completed by population over 25 years; in 2024, the index was further

strengthened by the inclusion of the new E-Government Literacy (EGL) subindex, which evaluates citizens' digital skills and readiness to participate in digital governance.

The Online Services Index (OSI) evaluates the progress in e-government by analyzing the scope and quality of online services and content based on five subindices: institutional framework (IF), service provision (SP), content provision (CP), technology (TEC), and e-participation (EPI). IF measures the extent to which governments have established policies, strategies, and legal frameworks to support e-government development and implementation. SP measures the level of sophistication and interactivity of online services offered by the government, based on a four-stage model of emerging, enhanced, transactional, and connected presence. CP measures the availability and accessibility of information and data on government websites, such as publications, reports, statistics, open data, etc. TEC measures the use of emerging technologies and standards to improve the delivery and quality of online services, such as mobile, cloud, social media, etc.

Finally, the E-Participation Index (EPI), incorporated into the EGDI since 2003, measures how effectively governments use digital platforms to engage citizens in policymaking, consultation, and co-production processes. It focuses on three key areas:

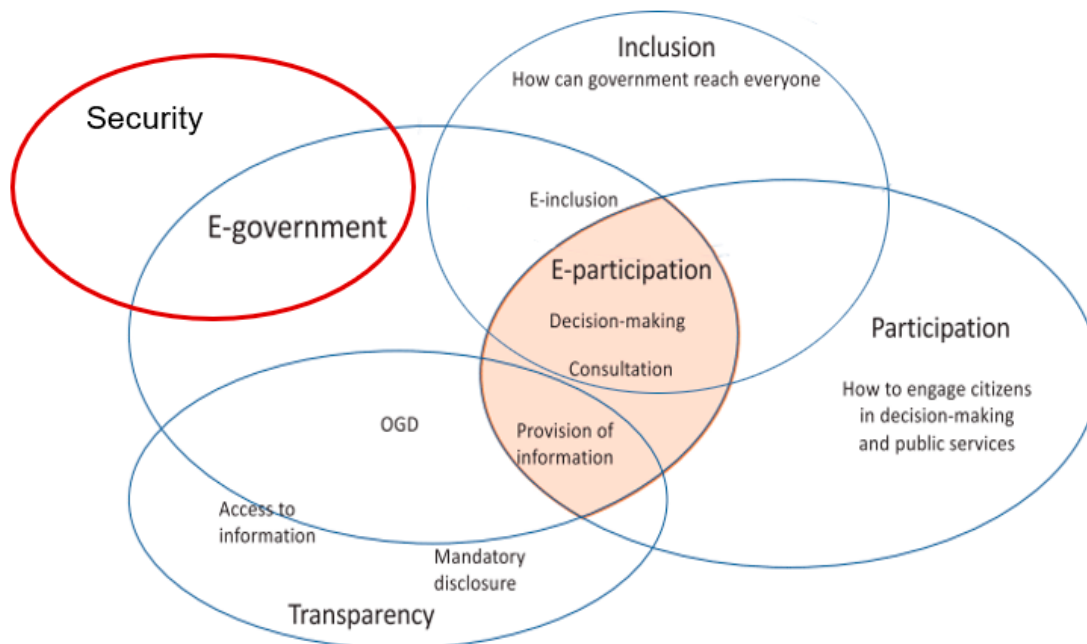
- E-information sharing, which measure participation through the use of online services that facilitate the provision of information to citizens (without or upon demand).
- E-consultation, to engage citizens to contribute and participate in deliberations on public policies and services at different stages of the process and possibly provides feedback to them.

E-decision making, whereby the government involves people in decision-making and empower citizens through co-design of policies and to co-decisions processes.

To assess these areas the EPI evaluates e-government portals and other government websites for features such as participatory budgeting mechanisms; open government data, particularly across six Sustainable Development Goals-related sectors (education, employment, environment, health, justice, and social protection), co-creation and online consultations (through e-forums, e-polls, or e-questionnaires) that include vulnerable groups. While qualitative in nature, the EPI serves as an indicative tool to highlight general trends in promoting participatory and inclusive governance through digital means (UN-DESA, 2024).

Figure 1 illustrates the conceptual relationship between the EGDI, its e-participation subcomponent (EPI), and other governance dimensions.

Figure 1: The relationship between EGDI, EPI and other dimensions of governance.



Source: UN E-GOVERNMENT SURVEY (UN-DESA, 2020) and the author.

The E-government sphere represents the institutional and infrastructural capacities that enable governments to deliver public services and foster digital interaction with citizens using open government data (OGD) portals. The Participation circle sphere encompasses the broad governance domain concerned with citizen engagement in decision-making and service delivery. E-participation lies at the intersection of these two spheres, covering the three key areas prioritized by the United Nations E-Government Survey: provision of information, consultation, and decision-making. Transparency relates to access to information and mandatory disclosure as mechanisms of accountability, overlapping with e-participation through the provision of public data. Finally, Inclusion refers to how governments reach all citizens and connects to e-participation via consultation and decision-making processes that ensure responsiveness and representativeness (UN-DESA 2020). We add a new dimension, data security, which highlights the importance of data protection, privacy, and cybersecurity as foundational conditions for trust and sustainable digital governance.

The EGDI sub-indices capture these institutional and participatory dimensions of digital governance, outlining the technological, human, and interactive capacities that enable the generation and effective use of large-scale public data.

However, the EGDI presents several limitations when it comes to assessing the role of Big Data in public administration. The index is based on a relatively narrow set of indicators that may not fully capture the actual performance or impact of digital tools in shaping public policy, particularly in areas such as transparency, citizen participation, crime prevention, and the effectiveness of public and social service delivery. It also fails to address the risks and challenges associated with Big Data adoption, including concerns around privacy, security, ethics, and data quality (UN-DESA, 2022), as well as the socio-cultural differences that shape digital governance in different national contexts

(Kabbar & Dell, 2012). As a result, the index offers an incomplete picture of how governments employ digital technologies for regulation, service design, and evidence-based decision-making.

In response to these gaps, this research complements the EGDI framework with a qualitative analysis of Ecuador's digital transformation, structured around five strategic dimensions: normative foundations, technological capacity, citizen participation, international integration, and implementation capacity. This includes an examination of institutional frameworks, public policies, legal and regulatory structures, citizen engagement mechanisms, and platform effectiveness. Special attention is given to the adoption and governance of emerging technologies, particularly Big Data and Artificial Intelligence, and to Ecuador's alignment with global agendas, providing a more nuanced understanding of the country's digital ecosystem and its capacity to deliver inclusive, effective public services.

Ultimately, the study seeks to illuminate both the supply and demand dimensions of e-governance, examining not only how public institutions produce, manage, and use data, but also how citizens engage with and contribute to data-driven governance.

3. Methodology

The methodological approach of this research is twofold. First, we propose a descriptive analysis that compares the situation and evolution of Ecuador in comparison with other Latin American countries and the United States in terms of the 2024 E-Government Development Index (EGDI) and the E-Participation Index (EPI). Second, we adopt a case study approach to conduct a qualitative analysis of Ecuador's digital transformation, focusing on the social, institutional, and technological dimensions of e-government and Big Data adoption. This analysis is grounded in the content and services provided through official government platforms and explores issues of user engagement, policy implementation, and institutional capacity.

Case study methodology is particularly well-suited for exploring complex social and institutional phenomena within their real-life context, especially when the boundaries between the phenomenon and the context are not clearly defined (Merriam, 1998; Yin, 2003; Stake, 1995, 2008). This approach allows for an in-depth understanding of how digital transformation is shaped by national policies, legal frameworks, institutional capacity, and citizen engagement.

Our analysis is grounded primarily in document and content analysis of official e-government platforms, public policy documents, legislative texts, and strategic national plans. This method is widely used in e-government research to assess both the supply of digital services and the maturity of public sector innovation (Heeks & Bailur, 2007, Bannister & Connolly, 2015, Lopez-Lopez, et al. 2018). Content analysis of government websites also provides insight into transparency, service provision, and participatory mechanisms, serving as a proxy for state digital capacity and citizen access (UN-DESA, 2020).

Ecuador was selected as the case study because it exemplifies a middle-income Latin American country that has advanced significantly in digital government initiatives while still facing persistent

challenges in integrating and utilizing public sector data effectively. Recent institutional and regulatory reforms, the establishment of open data portals, and partnerships to promote the use of Big Data and AI, make Ecuador a relevant context for examining how digital government translates into effective data governance. At the same time, implementation challenges and strategic failures in interoperability, data quality, and citizen engagement reflect the broader “big data gap” that constrains evidence-based decision-making in developing contexts. Ecuador's case therefore requires a qualitative approach to move beyond formal outputs (laws, policies, platforms) and understand the deep institutional and behavioral factors (Gil-García, 2012; Scholl, 2015) that explain this persistent implementation gap.

To this end, this study applies a five-dimensional analytical lens (5-D) to capture the complexity of Ecuador’s digital transformation:

- 1) *Normative foundations*: This dimension represents the prerequisite condition for digital transformation. It encompasses the legal, institutional, and ethical frameworks that define the “rules of the game” for data governance and digital interaction. It enables Technological Capacity by establishing legal boundaries (e.g., the Personal Data Protection Law [LOPDP, 2021], which regulates the use of Big Data in the public sector) and fosters Citizen Participation by building trust through data protection and accountability mechanisms (e.g., the Superintendence of Personal Data Protection [SPDP]).
Assessment criteria: presence and coherence of legal frameworks, institutional mandates, and regulatory enforcement related to digital governance.
- 2) *Technological capacity*: This dimension focuses on the supply and strategic side of digital transformation. It examines the development of digital infrastructure, adoption of emerging technologies such as Big Data and AI, and the presence of coordinated strategies for technological innovation and social inclusion. It directly correlates with the Telecommunication Infrastructure Index (TII) and Human Capital Index (HCI) within the EGDI.
Assessment criteria: the robustness of technological infrastructure, the presence of a coherent national ICT strategy, the integration of emerging technologies, and the institutional capacity for innovation. This includes evaluating the existence of strategic planning for technology adoption and the degree to which Big Data and AI initiatives are embedded within public administration.
- 3) *Citizen participation*: This dimension represents the demand and use side of digital governance. It captures the degree to which citizens are engaged through digital platforms and participatory mechanisms. It evaluates how governments promote transparency, consultation, and co-production of public services, reflecting outcomes measured by the E-Participation Index (EPI).
Assessment criteria: existence, accessibility, and effectiveness of participatory digital platforms; diversity and inclusiveness of citizen engagement; evidence of feedback integration into decision-making.
- 4) *International integration*: This dimension captures the external drivers and standards that influence national digital transformation. It reflects how international frameworks, partnerships, and agendas shape domestic strategies and reforms.
Assessment criteria: alignment with global agendas, participation in international initiatives, and policy convergence with global digital norms.

- 5) *Implementation capacity*: This dimension functions as the connecting process or the engine that determines how well the "Rules" (Normative) are actually enforced, how well the "Strategy" (Technological) is actually built and coordinated or how the "Platforms" (Participation) are actually delivered to citizens. It assesses the effectiveness of institutional coordination, resource allocation, and operational mechanisms that sustain digital initiatives. Implementation determines whether normative commitments and technological investments are realized in practice.

Assessment criteria: inter-agency coordination, policy execution, monitoring and evaluation systems, and identification of strategic and operational gaps.

This framework builds on and complements established e-government models, such as Layne & Lee's (2001) stages of e-government and Margetts & Dunleavy's (2013) Digital-Era Governance. While these models emphasize the sequential evolution of digital service delivery and the structural reintegration of government functions, they pay less attention to the normative, participatory, and international dimensions that shape digital governance in practice.

By incorporating these additional dimensions, the proposed framework offers a multidimensional and context-sensitive perspective that integrates institutional, social, and transnational dynamics often overlooked in stage-based models. It links normative and international factors with participation and implementation, capturing not only the technical and organizational aspects of digital transformation but also the ethical, collaborative, and behavioral conditions required for sustainable data governance. In doing so, it clarifies how digital government initiatives can help bridge the "big data gap", understood as the persistent divide between data availability and its effective use for public decision-making and citizen engagement.

The UN's E-Government Development Index (EGDI) provides a complementary and standardized metric for assessing several these dynamics across countries.

4. Results and discussion

4.1. Ecuador and the EGDI

The following overview highlights recent trends in e-government development in the Americas, based on the evaluation of the EGDI from the 2024 E-Government Survey.

We use the 2024 EGDI and its sub-indices not merely as a benchmark, but as the primary quantitative evidence to directly analyze three of our framework's five dimensions (5-D): Technological Capacity (measured by the TII and HCI), Citizen Participation (measured by the EPI), and Implementation Capacity, where a high Online Service Index (OSI) score masks persistent infrastructural and participatory deficits that are rooted in the country's evolving Normative Foundations¹.

¹ The EGDI subindices do not explicitly capture the **Normative Foundations** dimension (e.g., laws, data protection, institutional trust), justifying the need to apply our five-dimensional framework to account for

To structure this analysis, we first focus on the overall EGDI performance and evolution. We then deconstruct this score by analyzing each of the three main component indices: the Telecommunication Infrastructure Index (TII), the Human Capital Index (HCI), and the Online Service Index (OSI). Finally, we examine the companion E-Participation Index (EPI), which provides specific insights into how citizens engage with digital governance. While this section is rooted in descriptive data, its purpose is to analytically benchmark Ecuador's evolution against its regional peers and diagnose the structural gaps identified in our framework.

4.1.1. Ecuador's overall EGDI evolution and global ranking

The 2024 E-Government Survey shows continued global progress, with many countries moving from lower to higher EGDI categories. The United States lead the Americas ranking (19th globally), followed by Uruguay (25th of 193 Member States).

Focusing on Latin America, nine countries, Uruguay, Chile, Argentina, Brazil, Peru, Costa Rica, Mexico, Ecuador and Colombia, have achieved “very high” EGDI scores (above 0.75). Only two countries, Honduras and Cuba, fall into the “medium” EGDI group (0.25–0.50), while Haiti remains in the “low” EGDI group (0.21). In this context, Ecuador is classified in the “very high” EGDI group (V1), ranking 67th globally and 9th within Latin America (see Table 1).

Table 1: EGDI Ranking in Latin America

Country	Rank 2003	EGDI 2003	Rank 2024	EGDI 2024	Group	Change
United States of America	1	0.9271	19	0.91945	(VH)	-18
Uruguay	47	0.5072	25	0.90059	(VH)	22
Chile	22	0.6711	31	0.88266	(V3)	-9
Argentina	31	0.577	42	0.85733	(V3)	-11
Canada	6	0.8064	47	0.84516	(V2)	-41
Brazil	41	0.5267	50	0.84026	(V2)	-9
Peru	53	0.463	58	0.807	(V1)	-5
Costa Rica	66	0.4267	61	0.80089	(V1)	5
Mexico	30	0.5933	65	0.78499	(V1)	-35
Ecuador	85	0.3778	67	0.77997	(V1)	18
Colombia	57	0.4434	68	0.7793	(V1)	-11
Panama	62	0.4318	79	0.72981	(HV)	-17
Paraguay	75	0.4134	80	0.72507	(HV)	-5
Dominican Republic	60	0.4375	85	0.7013	(H3)	-25
Bolivia	78	0.4108	99	0.66508	(H3)	-21
El Salvador	80	0.4093	115	0.5988	(H2)	-35
Guatemala	109	0.329	122	0.57383	(H2)	-13
Venezuela	93	0.3635	131	0.53603	(H1)	-38

this critical context. Likewise, the **International Integration** dimension is not directly measured, although it can be partially inferred from Ecuador's global and regional ranking.

Nicaragua	112	0.3238	132	0.53181	(H1)	-20
Cuba	88	0.3725	139	0.49214	(MH)	-51
Honduras	124	0.2805	142	0.48559	(M3)	-18
Haiti	174	0	186	0.21165	(L3)	-12

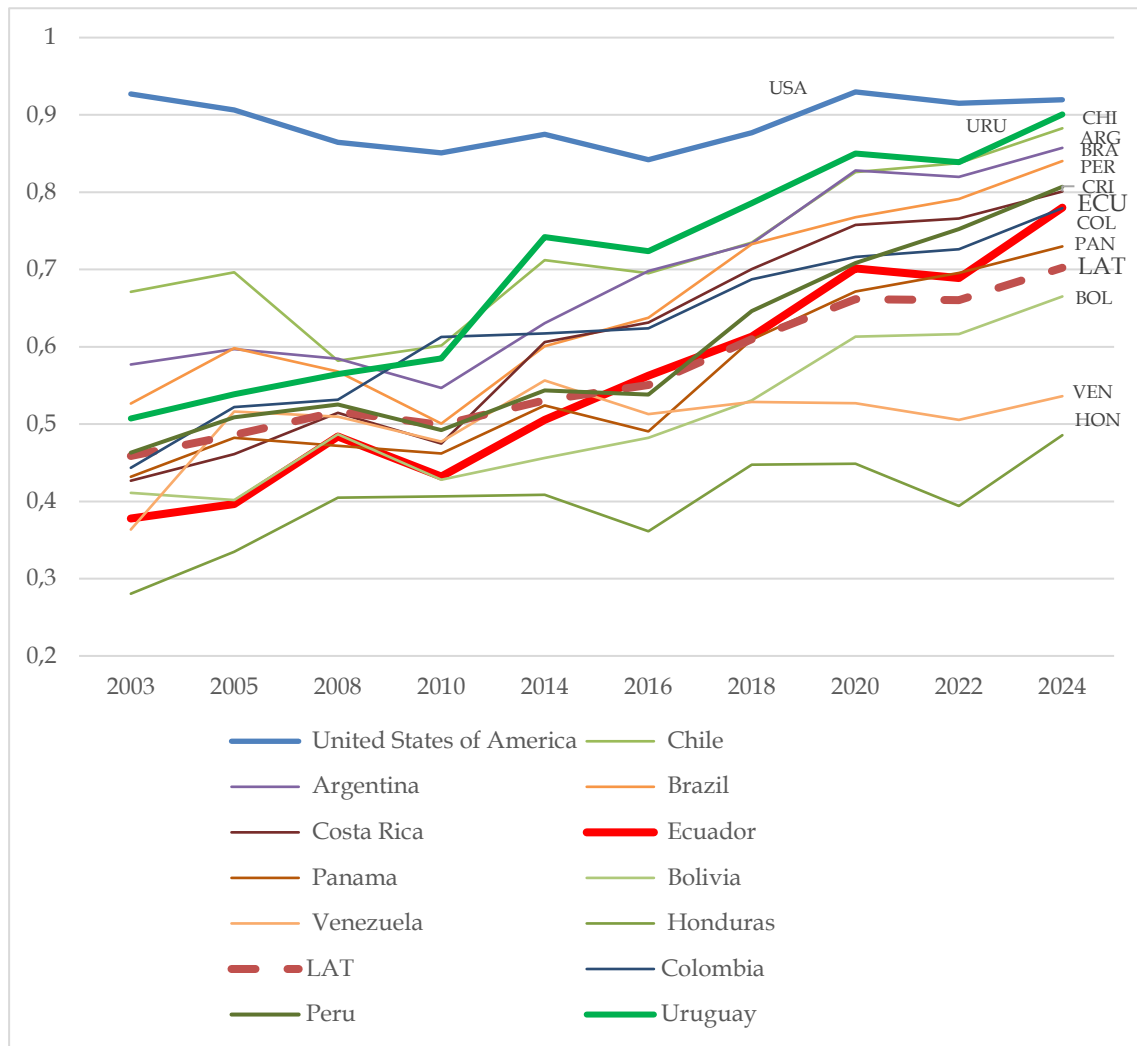
Very High : VH, V3, V2.V1. High: HV, H3, H2, H1, Middle: MH, M3. Low: LM

Source: 2024 United Nations E-Government Survey.

All Latin American countries have improved their EGDI scores since 2003 (Figure 2). During this period, the region has also narrowed the digital development gap with the United States, increasing from an average of 49% of the U.S. score in 2003 to 70% in 2024. Uruguay leads the region, followed closely by Chile, both demonstrating remarkable progress since 2003. Uruguay, in particular, now ranks close to the U.S. in terms of e-government development (90%).

Ecuador (represented by the red line) has shown steady and consistent growth since 2003 and from 2018, with a notable acceleration from 2018 onward. During this period, the country climbed 18 positions worldwide, surpassing the Latin American regional average. Despite a slight decrease in 2022, Ecuador demonstrated a strong recovery in 2024, reaching 79% of the U.S. EGDI score. This milestone firmly position Ecuador among the top 10 digital governance performers in the region.

Figure 2: Evolution of EGDI in Ecuador and other American Countries.



Source: 2024 United Nations E-Government Survey.

4.1.2. Snapshot and evolution: EGDI component strengths and weaknesses

A snapshot of the 2024 EGDI sub-indices (Table 2) reveals Ecuador's distinct strengths and weaknesses. The country shows an outstanding performance in service provision, ranking 2nd in the Online Service Index (OSI) and 1st in the E-Participation Index (EPI) in Latin America. This indicates significant advancements in online service quality and citizen engagement.

Conversely, the country faces critical challenges in its foundational capacities. It ranks 9th in the Human Capital Index (HCI), highlighting a persistent need for investment in digital literacy and education to fully capitalize on its advancements in e-government infrastructure and services. Most urgently, its 16th-place ranking in the Telecommunications and Infrastructure Index (TII) emphasizes a significant infrastructural deficit that hinders broader digital transformation goals.

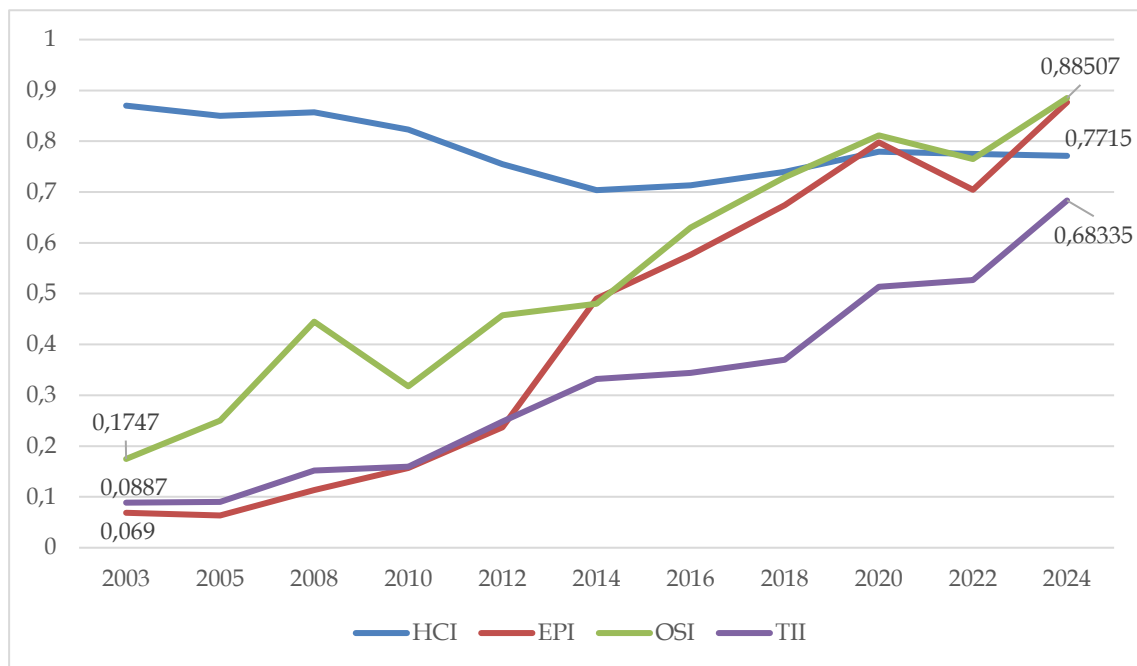
Table 2: 2024 EGDI Dimensions and regional ranking (21 American countries)

Country Name	TII	RK	HCI	RK	OSI	RK	EPI	RK
United States of America	0.96052	1	0.88424	2	0.91358	1	0.9452	1
Canada	0.80782	9	0.87249	4	0.85516	6	0.9178	2
Ecuador	0.68335	16	0.7715	9	0.88507	3	0.8767	3
Brazil	0.80685	3	0.80768	6	0.90631	2	0.863	4
Uruguay	0.94374	10	0.87488	3	0.88321	4	0.863	5
Chile	0.94553	2	0.84129	5	0.86119	5	0.8356	6
Peru	0.83638	7	0.7469	11	0.8377	7	0.7534	7
Colombia	0.80654	8	0.77931	8	0.7521	10	0.7397	8
Mexico	0.83101	11	0.76027	10	0.76366	9	0.7397	9
Costa Rica	0.89327	4	0.78766	7	0.72169	11	0.726	10
Dominican Republic	0.7444	14	0.7189	12	0.64047	15	0.6575	11
Argentina	0.84254	6	0.93298	1	0.79649	8	0.6301	12
Paraguay	0.79468	12	0.70932	15	0.67115	12	0.6027	13
Panama	0.8523	5	0.68663	17	0.65049	14	0.5205	14
Guatemala	0.58427	18	0.4834	21	0.65379	13	0.4658	15
Bolivia	0.7089	15	0.68765	16	0.59869	16	0.4247	16
El Salvador	0.75264	13	0.53479	19	0.50897	17	0.3836	17
Honduras	0.47992	21	0.51818	20	0.45874	18	0.3014	18
Nicaragua	0.58512	17	0.56102	18	0.44927	19	0.2329	19
Venezuela	0.53905	19	0.71149	14	0.35756	20	0.2192	20
Cuba	0.53183	20	0.71481	13	0.22982	21	0.0548	21

Source: 2024 United Nations E-Government Survey.

Figure 3 shows how the EGDI components have evolved in Ecuador since 2003, revealing a clear story of uneven progress. The Online Service Index (OSI) and the E-Participation Index (EPI) have grown remarkably, achieving high performance levels close to 0.9. In contrast, the Human Capital Index (HCI) shows a concerning downward trajectory and slow recovery, while the Telecommunications Infrastructure Index (TII) remains a persistent weak link. The composition and implications of this divergence will be analyzed in detail in the following sections.

Figure 3: Evolution of the three dimensions of the EGDI in Ecuador



Source: 2024 United Nations E-Government Survey.

4.1.3. The infrastructure bottleneck: Analyzing the TII

The TII continues to be the weakest of the three EGDI components. Ecuador has demonstrated significant progress, increasing nearly eightfold from 0.0887 in 2003 to 0.6834 in 2024 (Figure 3). Despite this advancement, the country ranks 16th in Latin America, trailing behind regional leaders such as Uruguay (0.94) and remaining 39 percentage points below the United States.

The TII is the “hardware” component of our Technological Capacity dimension. As shown in Table 2 and 3, Ecuador’s relatively low score on the TII can be attributed to several interrelated factors. The country exhibits strong mobile penetration, with 97.17 mobile subscriptions per 100 inhabitants, closely aligned with World Bank estimates of 18 million subscriptions for a population of 17.8 million (World Bank, 20252). However, internet usage lags behind, with an index value of 72.69. DataReportal (20243) estimates a higher internet penetration of 83.6% as of January 2024, representing 15.29 million users, a modest 3.9% increase from the previous year. Even more concerning is Ecuador’s performance in mobile broadband subscriptions, which stands at just 59.43 per 100 inhabitants, well below levels in countries such as Uruguay and the United States. This suggests that while mobile phone ownership is widespread, access to high-speed mobile internet remains limited.

A particularly critical factor is affordability. The cost of fixed broadband in Ecuador is nearly five times higher than in the United States, and mobile data prices are roughly three times higher when measured as a percentage of income. According to the World Bank (2022), approximately 71% of

² <https://data.worldbank.org/indicator/IT.CEL.SETS.P2?locations=EC>

³ <https://datareportal.com/reports/digital-2024-ecuador>

unconnected Ecuadorians cite high internet costs as the primary barrier. This affordability gap is central evidence of the weakness in Ecuador's Technological Capacity, disproportionately affecting rural and low-income populations (only 38% of rural households have fixed internet access, compared to a national average of 60%).

Table 2: Telecommunication Infrastructure Index (TII) and its components

Country	(TII)		Mobile cellular subscriptions per 100 inhabitants		Internet Users		Mobile Broad-band subscriptions per 100 inhabitants		Affordability			
									Price of fixed broadband		Price of mobile data	
Ecuador	0.683	71.15%	97.17	88.20%	72.69	74.84%	59.43	49.53%	4.74	474%	2.97	297.00%
Uruguay	0.944	98.25%	120	108.92%	89.87	92.53%	115.82	96.52%	2.3	230%	2.69	269.00%
USA	0.960	100%	110.17	100%	97.13	100%	120	100%	1	100%	1	100%

Source: 2024 United Nations E-Government Survey.

Data from the Telecommunications Regulatory and Control Agency (ARCOTEL), further highlights these structural disparities. While mobile lines have expanded steadily from 13.8 million in 2015 to 17.5 million in 2022, reaching a density of 97.2%, fixed-line usage has declined sharply. Landlines fell from 2.5 million (15.4% density) in 2015 to just 1.6 million (9.1% density) in 2022, with 59% of these concentrated in the provinces of Pichincha and Guayas. In terms of fixed internet services, access is predominantly delivered via optical fiber (73%), followed by coaxial cable (16.5%), reaching an estimated 14.97% of the population, or 2.68 million people. Again, Pichincha and Guayas dominate, accounting for 29.4% and 28.8% of all fixed internet accounts, respectively. Meanwhile, mobile internet service density reached 59.5% by the end of 2022, with 10.7 million active subscriptions (ARCOTEL, 2023).

These results demonstrate that, while Ecuador has made incremental improvements in its telecommunication infrastructure, these efforts remain insufficient to support an inclusive digital transformation. To improve its TII performance and foster equitable digital access, the country must prioritize investments not only in infrastructure expansion but also in affordability reform, rural connectivity, and regional equity.

4.1.4. The human capital paradox: Lagging education, advancing literacy

The Human Capital Index (HCI), the “human” component of our Technological Capacity dimension, reveals a troubling trajectory. Ecuador experienced a steady decline from a strong baseline of 0.87 in 2003, to 0.70 by 2014, with only a modest recovery to 0.77 by 2024, still falling short of its 2003 levels. This places the country 9th in the Americas and approximately 17 percentage points behind Argentina. The downward trend highlights persistent structural challenges in education and workforce development, and evidence the requirement for increased investment in education and digital skills, which are essential for inclusive e-government adoption. The UN-DESA 2020 Survey attributes part of this stagnation to limited infrastructure and insufficient investment in targeted capacity-building.

As observed in Table 4, when compared to the benchmark USA and regional leader Uruguay, Ecuador shows significant gaps. Its Mean Years of Schooling is only 64.23% of the U.S. level, close to Uruguay (65.69%), the Latin American leader. Its gross enrollment ratio (89.5%), is significantly below that of Uruguay (103.1%) and the U.S. (100%). These educational gaps limit the development of human capital, which directly affects digital readiness and e-participation (Rodríguez-Hevía et al., 2020 and Morte-Nadal & Esteban-Navarrom, 2022). As Drew (2011) notes, such disparities can deepen the digital divide, creating a societal gap between those equipped to benefit from e-government services and those who are left behind. These low scores in schooling are clear proof that the human capital required for digital transformation remains underdeveloped.

However, the 2024 inclusion of the E-Government Literacy (EGL) component within the HCI framework is likely to have encouraged Ecuador to advance digital literacy initiatives. Its index value (0.7778) is 127.3% above that of USA. This suggests that while formal education lags, recent targeted digital literacy initiatives may be highly effective. These efforts are essential to enable citizens to navigate and utilize online services, thereby strengthening public participation.

Table 3: Human Capital Index (HCI) and its components (Index value and % with respect to USA)

	HCI		Adult Literacy (%)		Gross Enrollment Ratio		Expected Year of Schooling		Mean Year of Schooling		E-Government Literacy	
	Index value	%	UNESCO	UNESCO	UNESCO	UNESCO	UNDP (HDI)	UNESCO	UNESCO	EGDI	EGDI	
	Index value	%	Index value	%	Index value	%	Index value	%	Index value	%	Index value	%
Ecuador	0.772	87.3%	93.95	94.9%	86.8	89.5%	14.86	90.5%	8.8	64.23%	0.7778	127.3%
Uruguay	0.875	98.9%	98.77	99.8%	100	103.1%	17.35	105.7%	9	65.69%	0.9333	152.7%
USA	0.884	100%	99	100%	96.96	100%	16.41	100%	13.7	100%	0.6111	100%

Source: 2024 United Nations E-Government Survey.

4.1.5. Service success and participation paradox: Analyzing OSI and EPI

Ecuador's high performance in the Online Service Index (OSI), which evaluates the availability, quality, and technological sophistication of government digital services, is a notable strength. The OSI has grown more than fivefold, from 0.17 in 2003 to 0.885 in 2024 (Figure 3), a level comparable to Uruguay (0.883) and slightly below the USA (0.914) (Table 5). This shows an impressive development in the use of ICT for public service delivery (UN-DESA, 2020).

Ecuador performed strongly across the some OSI subcomponents: Content Provision (CP), Service Provision (SP), and Technology (TEC), reaching 100% of the U.S. benchmark. However, the country still lags behind Uruguay in CP and TEC, suggesting room for enhancement.

The E-Participation Index (EPI) is the primary metric for our Citizen Participation dimension. Ecuador's high overall rank (3rd in the Americas) reflects commendable progress in citizen engagement and participatory governance but underscore the gap that still exist in the region.

Table 5: Online Service Index (OSI) and its components

Country	OSI		IF		CP		SP		EPI		TEC	
Ecuador	0.88 5	96.88%	0.96	96%	0.89	100%	0.867	100%	0.877	92.75%	0.687	100%
Uruguay	0.88 3	96.67%	1.00	100%	1.00	112.50%	0.831	95.83%	0.863	91.30%	0.812	118.2%
USA	0.91 4	100%	1.00	100%	0.89	100%	0.867	100%	0.945	100%	0.687	100%

Online Service Index (OSI). Institutional framework (IF). Services provision (SP). Content provision (CP). Technology (TEC). E-participation (EPI).

Source: 2022 United Nations E-Government Survey.

However, a deeper analysis of its three stages (Table 6) reveals a significant paradox. Ecuador performs strongest in Stage 3: e-decision-making (86.7% of the U.S. benchmark). This result, reflects the existence of digital platforms that allow citizens to engage in policy co-design, service co-production, and other decision-making processes. Despite this relative strength, the overall level remains moderate, suggesting that participatory democracy and civic engagement through digital means are still in the early stages of institutionalization in Ecuador. In contrast, Ecuador's performance in the earlier stages, e-information (Stage 1) and e-consultation (Stage 2), lags significantly (24.5% and 28.6% lower than the U.S., respectively). These shortfalls point to limited access to timely and relevant public information and insufficient mechanisms for gathering citizen input during policy formulation and service delivery.

This paradox shows that Ecuador's EPI score is based on technical provision of high-level tools (e-decision-making features) but fails in meaningful, foundational engagement (the core of participation). Multiple structural and institutional barriers contribute to these disparities. Low human capital (digital literacy) and gaps in ICT infrastructure (the TII), especially in rural and marginalized regions, limit citizens' capacity to navigate and utilize participatory platforms, regardless of their technical availability.

Table 6: E-Participation Index (EPI) and its utilization by stages in Ecuador 2024.

Country	EPI		E-information Stage 1		E-consultation Stage 2		E-decision making Stage 3	
Ecuador	0.877	92.75%	0.7091	76.47%	0.714	71.43%	0.65	86.67%
Uruguay	0.863	91.30%	0.8889	95.86%	0.954	95.45%	0.67	88.89%
USA	0.945	100%	0.9273	100%	1.000	100%	0.75	100%

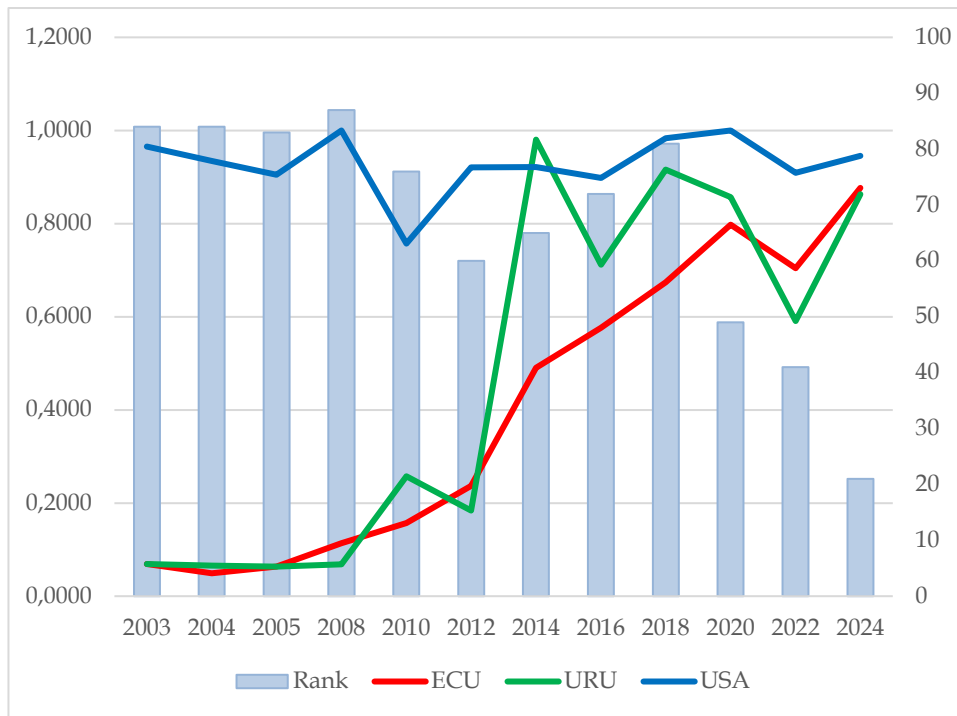
Source: 2022 and 2024 United Nations E-Government Survey.

Note: Detailed stage-level data for Ecuador's 2024 EPI are not publicly available. Figures shown are from the 2022 dataset.

The evolution of the EPI (Figure 7) contextualizes this progress. It reveals a remarkable upward trajectory since 2012, leaping from 81st in the world in 2018 to 21st in 2024. The temporary decline in 2022, likely due to post-pandemic fiscal pressures, was corrected by a rapid recovery in 2024. The

strong recovery of both OSI and EPI suggests the impact of several strategic developments, including a renewed governmental focus on digital transformation. This rebound, likely driven by initiatives like the Digital Transformation Agenda (2022–2025) and the Second Open Government Action Plan (2022–2024), shows the country’s growing resilience and institutional capacity.

Figure 7: Evolution of E-Participation Index (EPI) in Ecuador, Uruguay and USA.



Source: 2024 United Nations E-Government Survey.

Left scale: EPI value. Right scale: Ranking.

Finally, this analysis clearly diagnoses the implementation capacity and reveals the importance of the normative foundation’s dimensions. The high OSI and EPI scores indicate a relative success in Implementation Capacity, showing that the state can develop high-quality, centralized digital services. However, these scores mask a fundamental failure in the early stages of implementation, as evidenced by the weak TII. The TII demonstrates a non-sequential, fragmented implementation path. This can create massive risks in the absence of strong normative foundations. Without a robust institutional and legal framework for managing the data and participation that these services generate, these high scores represent a "hollow" or "risky" achievement. We will analyze this topic in the next section.

4.2. Qualitative analysis: Institutional progress, strategic innovation, and implementation gaps in Ecuador's digital transformation

The consistent upward movement in the EGDI subindices and the EPI in Section 4.1 suggests significant institutional and policy reforms toward digital governance, along with increasing levels of citizen engagement through digital platforms.

This section performs a qualitative analysis that moves beyond the previous quantitative scores by applying the five-dimensional (5-D) analytical framework introduced in section 3 to diagnose Ecuador's digital transformation. We also use this analysis to explore the "big data gap", the persistent divide between data availability (e.g., laws, platforms, strategies) and its effective use in public decision-making.

Each of the five dimensions (Normative Foundations, Technological Capacity, Citizen Participation, International Integration, and Implementation Capacity) is examined based on qualitative evidence (laws, strategic documents, and institutional progress) to reinforce the analytical lens and provide context for the gaps identified in the EGDI sub-indices (TII and HCI). These dimensions represent the foundational elements of a comprehensive digital governance system and offer a structured framework that may also inform comparative analysis across national contexts.

4.2.1. Normative foundations: A gap in enforcement

This dimension involves building a solid legal and institutional foundation. The criteria for evaluation are the enactment of key legislation, institutional creation, and the enforcement capacity for data protection standards.

In this regard, Ecuador has made significant progress in modernizing its laws and building the institutional capacity necessary for digital governance. These reforms have taken place both domestically and in alignment with international frameworks, with the aim of supporting a more transparent, efficient and participatory digital state. However, a closer examination reveals significant implementation asymmetries, coordination gaps, and underutilized tools⁴. Its digital transformation began in 2007 when it endorsed the Ibero-American Charter of Electronic Government (CIGE) alongside 20 other nations. Through this commitment, Ecuador pledged to promote transparency, citizen trust, and digital inclusion. This was followed by the Electronic Government Plan (PGE) in 2009, which introduced participatory mechanisms and modernized public engagement (Zamora et al., 2017).

A key legal milestone was the enactment of the Law on the National System of Public Data Registry (2010), aimed at regulating access to public data, promoting transparency, and fostering technological integration within public administration. This law established the National Directorate of Public Records (DINARP), later restructured (October 2021) as the central authority responsible for

⁴ Please refer to Annex 1 for a summary of the key policies and frameworks that have been referenced.

managing public records and ensuring their accessibility⁵. Under DINARP's leadership, the National System of Public Registers (SINARDAP), now restructured as SINARP, was developed to consolidate dispersed public data into a unified platform, providing both citizens and government institutions with centralized access to official information⁶. It manages platforms like Dato Seguro (a centralized registry database for citizen identification and registration verification) and Info-digital, (a data verification tool used by public institutions).

The massive 2019 data breach that exposed the personal data of 17 million Ecuadorians, revealed the country's urgent need for stronger data governance mechanisms. This incident prompted the enactment of the Personal Data Protection Law (LOPDP) in 2021, marking a significant step toward aligning Ecuador's regulatory framework with international standards for transparency, accountability, and citizen rights (UN-DESA, 2020; Kim & Cho, 2017). The creation of the Superintendence of Personal Data Protection (SPDP) in 2024 reflects an institutional upgrade aimed at oversight and enforcement, with mandates for Data Protection Officers (DPOs) appointments and cybersecurity protocols (Chamberlain, 2013; Al-Badi et al., 2018). These actions show the importance of enforceable governance standards (Manzoni et al., 2022).

However, while these frameworks demonstrate regulatory maturation, their enforcement and operationalization remain limited. A persistent normative big data gap reflects the disparity between increasingly sophisticated legal frameworks and the under-resourced capacity for effective enforcement and use. Moreover, the absence of a cohesive national e-government strategy has hindered long-term coordination, resulting in inconsistent implementation and reactive policymaking (World Bank, 2022).

4.2.2. Technological capacity: A gap in strategy

This dimension focuses on infrastructure, emerging technologies, and strategic innovation. It aligns closely with the Telecommunication Infrastructure Index (TII) and Human Capital Index (HCI) components of the EGDI.

National policy documents increasingly frame Big Data and Artificial Intelligence (AI) as catalysts for public sector modernization, aligning with global trends in digital governance (Manyika et al., 2011; Tan & Taeihagh, 2020). Initial steps were laid out in the National Plan for Telecommunications and Information Technologies (2016–2021), which focused on expanding infrastructure, connectivity, and digital access. The Public Policies for the Telecommunications Sector and the Information Society (2017–2021) followed, which broadened the vision to include digital citizenship, data protection, and the integration of emerging technologies to support socioeconomic development.

⁵ <https://www.registropublicos.gob.ec/la-institucion/estructura-institucional/resena-historica/>

⁶ <https://www.registropublicos.gob.ec/programas-servicios/servicios/sinardap/>

These goals were operationalized in the Information and Knowledge Society Plan (PSIC) (2018–2021)⁷, which explicitly promoted Big Data solutions in public services, including localized deployment models and BDaaS (Big Data as a Service) platforms, thus laying the groundwork for data-driven public management. The National e-Government Plan (PNGE) (2018–2021)⁸, further prioritized transparency and citizen-centered service delivery, particularly in sectors such as health, education, and risk management.

More recently, the Digital Transformation Agenda (2022–2025) and the Universal Service Plan (2022–2025)⁹ have emphasized interoperability, smart services, and the need to bridge the digital divide, particularly in rural and underserved regions. These efforts reflect a strategic alignment between digital transformation and broader social inclusion goals, reinforcing Ecuador’s commitment to territorial equity and public service accessibility.

Finally, the January 2025 partnership with Google, Palantir, and Healthbird to establish a national Center of Excellence in Data Science and AI marks a significant shift toward externally supported, future-oriented digital governance (Infobae, 2025). This initiative signals Ecuador’s effort to integrate global expertise into domestic digital infrastructure and policy execution.

Despite these ambitious strategies, a strategic big data gap persists. The adoption of emerging technologies in Ecuador remains largely fragmented and pilot-driven, with limited institutional integration or long-term vision. As Mahrenbach et al. (2018) note, public sector applications of Big Data in the Global South typically generally align with three policy visions: political, service delivery, and developmental. Ecuador’s current efforts align most closely with the “service delivery” vision, focused on improving efficiency and access, but reveal a persistent gap in leveraging technology for broader social transformation. Moreover, these initiatives often lack systemic integration into decision-making processes (Riggins & Klamm, 2017; Choi et al., 2019), which limits their transformative potential to achieve “digital citizenship” and “social inclusion”, core elements of the Human Capital Index (HCI). Moving toward the “political” and “developmental visions”, which emphasize citizen empowerment, structural reform, and long-term capacity building, will be essential to realizing Big Data’s full public value.

On the other hand, although Ecuador’s policies aim to promote digital citizenship, its low scores in the Human Capital Index (HCI), particularly in Mean Years of Schooling and Gross Enrollment Ratio, reveal a persistent underinvestment in the foundational human capacities needed to make this goal attainable.

⁷ <https://www.telecomunicaciones.gob.ec/wp-content/uploads/2018/11/Plan-de-la-Sociedad-de-la-Informacion-PSIC-20181026.pdf>

⁸ https://www.gobiernoelectronico.gob.ec/wp-content/uploads/2018/09/PNGE_2018_2021sv2.pdf

⁹ https://www.telecomunicaciones.gob.ec/wp-content/uploads/2022/06/plan_de_servicio_universal_2022-20250564678001655319190-1.pdf

4.2.3. Citizen participation: A gap in engagement

This dimension captures the outcomes and use aspects of digital transformation, the effect side of the framework, and is closely associated with the E-Participation Index (EPI). It evaluates the mechanisms and effectiveness of civic engagement through digital platforms, focusing on three main criteria: (1) the availability of digital tools, (2) their functional uptake and user interaction, and (3) the establishment of reliable feedback loops between government and citizens.

Ecuador's relatively high EPI score reflects the government's efforts to expand digital platforms for public service delivery and citizen interaction. The Quipux document management system, for example, has achieved widespread institutional adoption, exemplifying successful platform diffusion. However, the analysis reveals a striking contrast between the high EPI score (based on technical provision) and the limited citizen uptake of many participatory tools. Platforms such as Tramiton.to (that allows citizens to submit proposals for administrative improvements), Contacto Ciudadano (for complaints, and suggestions), and the Dato Seguro (for data access and privacy management) have seen low citizen usage, undermining their participatory promise.

Thus, Ecuador's experience introduces a central insight from the e-participation literature: the mere provision of digital tools does not generate effective digital citizenship. Meaningful engagement or effective digital citizenship, as emphasized by Jayashree & Marthandan (2010) and David (2018), depends on service responsiveness, usability, and public trust. Despite infrastructure improvements, Ecuador's limited progress in EPI stages 1 and 2 (e information and e-consultation) further confirms this gap as the participatory mechanisms (such as reliable access to information and channels for meaningful feedback) remain underdeveloped despite advances in infrastructure. These findings are consistent with Martínez-Mosquera & Luján-Mora's (2019), who note that deficits in digital literacy deficits and persistent public skepticism remain critical barriers to inclusive e-governance in Latin America.

4.2.4. International integration: A gap in translation

This dimension assesses Ecuador's commitment to aligning its digital governance trajectory with global and regional agendas. Ecuador has demonstrated a strong normative alignment with international frameworks such as the United Nations Sustainable Development Goals, particularly SDG 9 (focused on innovation and infrastructure) and SDG 16 (promoting inclusive and accountable institutions), the Open Government Partnership (OGP), which Ecuador joined in 2018, and the Digital Agenda for Latin America and the Caribbean (eLAC 2022-2024). Initiatives such as the Second Open Government Action Plan and E-Participa reflect Ecuador's normative commitment to transparency, civic innovation, and ethical digital governance (Gobierno Abierto Ecuador, 2022)¹⁰.

Empirical evidence supports that multilateral engagement enhances digital performance: for instance, OGP membership has been associated with significant improvements in e-participation (Wil-

¹⁰ <https://www.telecomunicaciones.gob.ec/mintel-fortalece-la-participacion-ciudadana-digital-a-traves-de-la-firma-del-compromiso-del-segundo-plan-de-accion-de-gobierno-abierto/>

son, 2020), particularly in contexts with established civic traditions. Even in less democratic environments, globalization itself can foster digital participation and institutional learning (Åström et al., 2012).

However, Ecuador's experience reveals a big data gap in translation, a disconnection between strong international commitments (availability) and their effective domestic operationalization (use). Despite its normative convergence with global standards, persistent weaknesses in technology adoption, citizen participation, and enforcement mechanisms limit the translation of these frameworks into tangible outcomes. The 2025 partnership with Google and Palantir (Infobae, 2025) reflects an attempt to bridge this gap by importing technical expertise to strengthen domestic data management and policy implementation capacities.

4.2.5. Implementation capacity: The central axis gap

This dimension functions as the connecting process that translates rules, strategies, and citizen demands into tangible outcomes. It assesses the effectiveness of institutional coordination, resource allocation, and operational mechanisms that sustain digital initiatives.

Despite near-universal compliance with Organic Law on Transparency and Access to Public Information (LOTAIP), transparency in Ecuador remains more formal than functional. Over 97% of executive branch institutions publish online management reports, thus meeting the legal requirements. Yet these participatory tools often fail to translate access to information into actual policy influence, echoing concerns raised by Attard et al. (2015) and UN-DESA (2020) about the limitations of open government when participatory structures are weak. As Okwechime et al. (2021) argue, open data initiatives without robust institutional support and citizen-centered design risk falling short of participatory and accountability goals.

Ecuador's experience illustrates a persistent implementation gap, marked by failures in effective use (enforcement, strategic integration, citizen uptake). This weakness cascades across the other four dimensions: laws vs. enforcement, plans vs. fragmented pilots, platforms vs. users and global goals vs. local realities. These dynamics mirror those described in Layne & Lee's (2001) e-government model: while Ecuador has advanced in vertical integration through platforms such as Quipux and SINARP, which enables multi-level data access, it continues to struggle with achieving full horizontal integration and service interoperability across ministries and agencies. Quantitatively, the high OSI score (reflecting vertical success) and the low TII score (indicating weak horizontal implementation) demonstrate this disparity.

Similarly, as Margetts & Dunleavy's (2013) argue in their *Digital-Era Governance*, technical rein- tegration alone does not ensure meaningful engagement if services are not designed around citizens' needs, a principle they call needs-based holism. Likewise, Lazzarini et al. (2020) emphasize that effective digital governance depends not only on legal reform but also on strong implementation capacity, inter-institutional collaboration, and active stakeholder engagement.

Importantly, these challenges are not unique to Ecuador. Comparative research suggests that successful digital participation initiatives rely on the combination of infrastructure, governance quality,

and institutional commitment. For instance, Lee-Geiller (2024) finds that e-participation preparedness strongly correlates with robust telecommunication infrastructure and high-quality governance dispositions. Similarly, Girish et al. (2013) and Tavares et al. (2020) emphasize that the integration of technological capacity with coherent governance strategies is essential for meaningful e-government outcomes. Chen (2010) and Lee et al. (2011) point out the role of citizen feedback mechanisms, political culture, and internal commitment in embedding e-democracy. Strengthening these dimensions will be essential if Ecuador is to close its “big data gap” and translate digital potential into public value

In summary, Ecuador’s digital evolution reflects both significant progress and persistent systemic constraints. While legal reforms, institutional modernization, and global alignment have established a strong normative base, the translation of these advances into operational efficiency and citizen engagement remains uneven. Closing the implementation gaps in infrastructure, digital inclusion, and inter-agency coordination, as well as establishing a coherent national e-government strategy, will be decisive for sustaining digital transformation and ensuring its resilience in times of high demand, such as the post-pandemic recovery (World Bank, 2022).

5. Conclusions

Ecuador has made substantial progress in digital governance agenda, as reflected in its improved 2024 performance in the E-Government Development Index (EGDI) and the E-Participation Index (EPI), a complementary index that measures citizen engagement through online services. High scores in the Online Service Index (OSI) and the E-Participation Index (EPI) reflect Ecuador’s significant progress in digital service delivery and participatory governance. However, a closer look at the EPI stages reveals uneven development: while e-decision-making (Stage 3) performs strongly, the earlier stages, e-information (Stage 1) and e-consultation (Stage 2), remain underdeveloped, indicating limited citizen access and engagement at the initial stages of participation.

The Telecommunications Infrastructure Index (TII), representing the “hard” component of technological capacity, remains one of the country’s weakest areas. Ecuador ranks 16th in Latin America, and the persistently high cost of connectivity continues to constrain equitable access to digital services. Similarly, the Human Capital Index (HCI), the “human” component of technological capacity, reveals structural gaps in education and digital skills. Low average schooling levels and a significant digital literacy divide demonstrate that the human capital required to sustain inclusive digital transformation remains underdeveloped.

The qualitative 5-D approach reveals growing institutional commitment in Ecuador, reflecting a maturing legal and regulatory framework, the gradual integration of digital tools into public service delivery (such as Tramiton.to, Contacto Ciudadano, and Dato Seguro), and increasing alignment with international agendas including the Sustainable Development Goals (SDGs 9 and 16), the Open Government Partnership (OGP), and the eLAC 2022–2024 regional strategy. Legislative developments, particularly the approval of the Organic Law on Personal Data Protection (LOPDP) and the creation of the Superintendence of Personal Data Protection (SPDP), mark a key institutional shift

toward stronger data governance and the protection of digital rights. Furthermore, strategic initiatives like the Digital Transformation Agenda 2022–2025 and partnerships with global actors such as Google, Palantir, and Healthbird reflect the government's ambition to modernize state capabilities and enhance citizen-centric services through technologies through emerging technologies including Big Data and artificial intelligence.

On the other side, Ecuador's progress is not fully understood through structural or institutional integration alone. It reveals critical disconnects between legal advances and operational delivery, strong technical design and limited civic uptake, as well as global partnerships and uneven local execution. The implementation dimension remains the most pressing challenge, explaining the existence of a persistent big data gap, a deep, structural disconnect between this impressive availability of digital potential and its effective use in practice. While legal and strategic frameworks are in place, operational delivery continues to be uneven. The absence of a cohesive national e-government strategy has undermined cross-sector coordination, leading to fragmented institutional efforts (World Bank, 2024). This gap between national ambition and infrastructure reality is particularly acute in rural and marginalized areas, where connectivity, affordability, and service quality lag behind.

These structural barriers can be also interpreted through established theoretical models. According to Layne and Lee's (2001) e-government model, Ecuador has made progress in vertical integration, as demonstrated by platforms like SINARP and Quipux, yet horizontal integration across agencies remains limited. Similarly, Digital-Era Governance theory (Margetts & Dunleavy, 2013) suggests that while efforts to consolidate functions and digitalize services are underway, the principle of needs-based holism, designing systems around citizen needs rather than administrative routines, remains underdeveloped. Tools such as Tramiton.to and Contacto Ciudadano illustrate this gap: despite their availability, low user uptake reflects shortcomings in usability, trust, and participatory design (David, 2018; Jayashree & Marthandan, 2010; Martínez-Mosquera & Luján-Mora, 2019).

These findings align with global evidence indicating that successful digital transformation depends on more than just infrastructure or regulation; it also requires quality governance, operational capacity, and stakeholder engagement. Studies confirm that countries with strong civic institutions, effective coordination, and active participation in international frameworks like the Open Government Partnership (OGP) are more likely to achieve meaningful digital inclusion (Lee & Geiller, 2024; Tavares et al., 2020; Wilson, 2020; Lazzarini et al., 2020).

Overall, Ecuador's digital transformation reflects commendable institutional and legal progress, as well as ambitious strategic planning. However, implementation gaps, uneven infrastructure, and limited participatory mechanisms constrain its full potential. Transitioning from aspiration to realization requires policy continuity, operational execution, cross-sector collaboration, and governance models centered on usability, trust, and civic empowerment. Ecuador's challenge is no longer one of vision; rather, it is about embedding that vision into practice to build a more inclusive, resilient, citizen-driven digital state.

These findings highlight the need to evaluate digital transformation not just by system sophistication, but by how effectively reforms translate into inclusive, usable, and sustainable public services.

5.1. Strategic recommendations

To consolidate recent gains and address persistent challenges in Ecuador's digital transformation, a coherent set of strategic priorities must be advanced with urgency, continuity, and institutional commitment.

First, effective implementation hinges on institutional capacity and cross, sector coordination. Ecuador should invest in stable, well trained public sector teams by strengthening technical and managerial human capital and implementing staff retention strategies to reduce leadership turnover. Overcoming policy fragmentation requires enhanced inter, institutional collaboration through shared digital infrastructure, national interoperability standards, and integrated governance structures. These efforts must be supported by robust monitoring and evaluation systems, including clear performance indicators for implementation progress, service quality, and citizen satisfaction.

Second, closing the digital divide demands expanded digital literacy and inclusive access to public services. Ecuador must scale up national digital skills programs, especially targeting rural, indigenous, and underserved communities. Digital competencies should also be embedded in formal education and vocational training systems to foster long term readiness. Public platforms must adopt user, centered design principles to improve usability and accessibility. Initiatives like E-Participa should be strengthened to institutionalize citizen feedback and link it meaningfully to service design and policymaking.

Third, full implementation of the Organic Law on Personal Data Protection (LOPDP) requires continued institutional support for the Superintendence of Personal Data Protection (SPDP). Public awareness campaigns on digital rights, data protection, and cybersecurity are essential to promote digital hygiene and build public trust. Clear and transparent government communication about data practices, how personal information is collected, processed, and stored, is necessary to reinforce accountability and prevent misuse.

Fourth, Ecuador must go beyond policy commitments to actively operationalize emerging technologies such as Artificial Intelligence, Big Data, Blockchain, and the Internet of Things. This involves developing implementation roadmaps and launching pilot initiatives in high, impact sectors like health, education, agriculture, and customs. Adoption should be guided by ethical frameworks, legal safeguards, and interoperability standards to ensure responsible and sustainable integration into public administration.

Fifth, alignment with global and regional frameworks should remain a strategic priority. Continued engagement with the Sustainable Development Goals (SDGs), eLAC 2022–2024, and the Open Government Partnership (OGP) reinforces Ecuador's normative commitments. At the same time, international collaborations with actors like the European Union, Google, Palantir, and Healthbird should be governed by transparency, national sovereignty, and alignment with domestic priorities. Peer learning and regional cooperation can enhance innovation, reduce implementation costs, and bolster institutional resilience.

By advancing these strategic priorities, Ecuador can transition from a phase of digital policy innovation to one of deep institutionalization and measurable public value. Building on the five strategic dimensions identified in this study, the country's next challenge lies in translating its digital vision into embedded, citizen-centric practice, closing the implementation gap and building an inclusive, resilient, and future-ready digital state.

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Annex 1.

International Frameworks and Memberships	United Nations Sustainable Development Goals (SDGs)	Goal 9 (Infrastructure & Innovation) and Goal 16 (Institutions, Transparency).
	Ibero, American Charter of Electronic Government (CIGE) (2007)	Regional agreement to guarantee citizens' rights through ICTs.
	Open Government Partnership (OGP) (Joined 2018)	Commitment to transparency, citizen participation, and innovation.
	European Commission's Call for Proposals (August 2024)	"Leading the Transformation of Digital Governance in Ecuador" to support the digitalization of the governance system.
Strategic National Plans and Agendas	Electronic Government Plan (PGE) (2009)	First step toward modernizing public administration through ICTs.
	National Plan for Telecommunications and Information Technologies (2016–2021)	Development of infrastructure and ICT services.
	Public Policies for the Telecommunications Sector and Information Society (2017–2021)	Regulatory framework to guide ICT sector growth.
	Information and Knowledge Society Plan (2018–2021)	6 programs including Digital Economy, Digital Inclusion, and Big Data.
	National e, Government Plan (PNGE 2018–2021)	Promoting open, friendly, effective, and efficient government.
	First Open Government Action Plan (PAGA 2019–2022)	10 commitments; achieved 94% compliance.
	Second Open Government Action Plan (PAGA 2022–2024)	15 commitments; focused on Open State, Transparency, Participation.
	Digital Transformation Agenda (2022–2025)	7 transversal guidelines; includes Emerging Technologies and Digital Security.
	SPDP's Plan Estratégico Institucional (PEI) 2024–2028	Approved in September 2024, focusing on innovation, security, and regulatory compliance.
	Plan Regulatorio Institucional (PRI) 2025:	Approved in February 2025 to strengthen personal data protection and ensure compliance with the LOPDP
	Resolution No. SPDP, SPDP, 2024, 0019, R	Issued in December 2024, establishing guidelines for the SPDP's privacy and data protection policy

	Ecuador's Digital Inclusion Initiative 2025	Aims to create 15,000 digital employment opportunities and skill development programs across the country
Key Laws and Legal Instruments	Law on the National System of Public Data Registry (SINARDAP → SINARP) (2010)	Regulation of registration and access to public data.
	Organic Law on Personal Data Protection (LOPDP) (May 2021)	Citizen rights to data access, rectification, opposition, deletion.
	Creation of the Superintendence of Personal Data Protection (SPDP) (April 2024)	Enforcement body for the LOPDP.
Main Government Institutions	MINTEL (Ministry of Telecommunications and the Information Society)	Leads digital transformation, policy design, and open government initiatives.
	DINARP (formerly DINARDAP)	Manages public data registries and data protection platforms.
	SPDP (Superintendence of Personal Data Protection)	Oversees compliance with data privacy regulations.
Key Digital Platforms and Tools	Dato Seguro	Centralized database for public records; underutilized by citizens.
	Infodigital	Verification tool for public institutions connected to SINARP.
	Quipux	Document Management System; highly functional and widely used. Active - 4.48M users, 262 institutions
	Tramiton.to	Platform for citizen proposals in administrative processes (minimal use).
	Contacto Ciudadano	Web application for questions, complaints, and suggestions (now inactive).
Emerging Technologies Initiatives	Big Data	Promoted under the 2018-2021 Knowledge Society Plan.
	Artificial Intelligence	Applied in targeted investment projects (Ministry of Agriculture and Livestock). AI chatbot implemented by the National Customs Service.
	Collaboration with Google, Palantir, and Healthbird	In January 2025, Ecuador announced a digital transformation project with support from these companies, including the creation of a Center of Excellence in data science and artificial intelligence.

Source: elaboration by the author

Author Contributions

FMM was responsible for the conceptualization of the study, methodology design, data collection and curation, statistical and data analysis, interpretation of results, writing of the original draft, and reviewing and editing of the manuscript. FMM also managed the project administration and approved the final version of the manuscript.

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