

Innovating Governance through Technological Tools in Latin America

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Abstract– *In the last decade, digital governance continues to expand in Latin America; however, outcomes remain variable because of the ongoing structural divisions regarding connectivity, institutional capability, and regulatory structure. This work looks at how technology is changing governance by looking at transparency, inclusion, and the creation of value to the public. For the methodology, this research utilized an integrative literature review along with the comparative analysis of secondary data from global indicators, for example, GovTech Maturity Index, E-Government Development Index from the United Nations and regional connectivity data. The outcome of this study shows the contradictory nature of Latin America's digital government maturity level: although the maturity level of Latin America is higher than that of the global average (GovTech Index 0.591 vs. GovTech average for the world 0.552), massive disparities in the internet access rate (67.3% for Latin America versus 91.1% for OECD countries) for example, limit the inclusiveness of digital service provision. Furthermore, the emergence of governance models based on algorithms and civic technology present opportunities for efficiency and risks associated with bias, lack of transparency and regulatory voids. Therefore, this study makes a contribution to the existing literature by proposing a model for governance in which digital transformation and risk management (ISO 31000) are combined. It also highlights the need for a citizen-centric, contextually sensitive and rights-based approach to risk management in not only developing and enhancing digital governance but also ensuring that sustainable digital governance requires coordinated reforms in the institutions, oversight of ethical practice and investment in digital inclusion.*

Keywords - *Digital governance, Latin America, Transparency, Citizen Participation, Digital divide.*

I. INTRODUCTION

Technical advancements, with their ability to confuse the existing dynamics between the ongoing quest for a democratic landscape, perpetual inequality and weak institutions, have added a layer of complexity to governance conversations in Latin America. In addition to creating new ways to provide institutional support, these technologies also provide ways to exacerbate inequality through their unregulated usage. Increasingly, digital platforms are mediating how public decisions are made (e.g. social benefit allocation, urban service provision and compliance monitoring) through platforms created by the internet and IT [1].

In general practice, digital governance concerns themselves with using information & communication technology as a tool for helping public authorities manage better, hold themselves accountable to their citizens, & to enable greater inclusion through increasing citizen engagement in decision-making processes. This theme within Latin America has developed concurrently with debate surrounding state capacity issues; regulatory governance; & how public administrative systems help create the conditions that enable inclusive development [2]. The region has combined ambitious digital strategies with chronic fiscal constraints, policy volatility and fragmented institutional arrangements, which partially explain the mixed results of innovation efforts.

There has been an increase in the amount of space and social organization due to technological innovation. Examples include different Smart City programs that have been put into place to provide a more efficient management of infrastructure using sensor networks, urban platforms, and data analysis [3]. However, many of the projects mentioned above appear to focus mainly on capital cities and more affluent municipalities. Therefore, they seem to have neglected rural areas and smaller cities, which have fewer financial resources available to invest in connectivity or the use of digital tools. The same is true for the development of infrastructures or for more innovative governance models in higher education, healthcare systems, as well as local governments; this situation is mirrored by the existing frameworks for developing a sustainable corporate structure within Latin American universities [4].

Expansion of Digital Platforms and Algorithmic Systems Is Not Neutral. For example, in many Latin America countries, both governments and private actors have used Automated Decision-Making Systems (ADMS) for areas such as welfare targeting, policing and credit scoring with little or no oversight from third-party organizations or public discussions [1]. The rising worry about algorithmic governmentality, data colonialism and the reinforcement of systemic inequalities by invisible technology has been raised by a growing number of citizen groups, academic researchers and regulators. In addition, many citizens, academics and regulators are also raising the need to include human rights and ethics in the development of AI and digital government policy [5].

The Covid-19 pandemic has forced public sectors all over to take advantage of the digital world and speed up their digital transformation efforts. Governments had to provide a digital framework to deliver services, a way to work remotely (from home), and implement real-time monitoring systems such as video conferencing. The rapid move from 'bricks' to 'clicks' during this pandemic has exposed opportunities as well as

limitations in the many existing digital technology capabilities. Research conducted regarding the use of digital technologies within colleges and universities in Latin America has shown that expanding innovation also highlighted the significant disconnects in connectivity and skills gaps [6]. Similar tensions are present in public health, procurement and regulatory agencies, where information systems are essential for effective response but depend on stable infrastructure and coordinated governance [7], [8].

The strategic opportunity through digital tools for improved transparency and efficiency within Public Procurement is another area where electronic tools may provide the opportunity to increase transparency and efficiency. Research indicates that electronic information systems, greater access to information about public procurement and cooperation across regions provides support for improved outcomes for public procurement of medicines in South America, as well as demonstrating the limitations on the benefit of using these tools associated with the fragmentation of data among institutions and lack of institutional capacity [8]. These findings resonate with broader regulatory governance analyses that emphasize the importance of robust institutions and accountability mechanisms in sectors such as energy, telecommunications and water [9].

Concurrently with this trend, there has also been a consistent increase in the number of frameworks for Governance, Risk and Compliance throughout Latin America. The Three Lines Model of corporate governance is being adapted by many companies in Latin America as a way of clarifying responsibilities among Management, Risk Oversight and Independent assurance [10]. Examples from industry players such as the Mining Sector indicate that the way in which businesses are governed impacts the way in which they achieve success and the way in which communities perceive them as legitimate. Specifically, practitioners found the use of risk management practices and stakeholder engagement to be the most important factors in the successful operation of businesses within areas experiencing high levels of social conflict and the existence of multiple regulatory requirements [11]. In addition, new guidance recently released by the International Organization for Standardization (ISO) is advocating that organisations within Latin America begin to integrate new technological tools into their comprehensive risk management systems rather than viewing them as separate, stand-alone projects [12].

Due to the many contextual factors affecting digital governance in Latin America, the presence or absence of applications/platforms is not sufficient information to assess digital governance. A better description of digital governance in Latin America is the connection/interactions between the four major elements that comprise digital governance: technology infrastructure(s), institutions, regulatory frameworks, and social stakeholders. In addition, recent events in Latin America have caused these four elements to be rapidly changing; for example, Latin America has gone through many

periods of economic austerity, political divide, and sudden changes in the development of science and technology policy. Funding has been cut off from the majority of science systems and many new digital innovation ecosystems throughout Latin America (specifically in Argentina), and these cases highlight how rapidly a decision made about the governance of a specific technology can reduce a country's capacity to develop new technology and/or make investments that will put it into the future [13].

The purpose of this research paper is to examine the role of technology in reshaping ways that government operates and the conditions under which technology creates more open, participatory and resilient public institutions. Three questions guide this study: what are the dominant narratives/models of digital governance as seen in the literature from Latin America; how do the various regional indicators of connection and GovTech maturity present both opportunities and challenges for innovation; and lastly, what governance insights have emerged from the most recent case studies on regulation, participation and risk management.

Following this introduction, the article is divided into five sections. The second section will review existing literature about digital governance, algorithmic governmentality, participation, and regulatory governance in Latin America. The third section will provide an overview of the methodology used, including how the authors selected their literature and how they created their figures and tables using official data sources. The fourth section will discuss the major findings from this study, including regional indicators and various emergent models of governance. In the final section, the authors will provide final thoughts and recommendations for policymakers, regulators, and organisations operating throughout the region.

II. LITERATURE REVIEW

Digital governance has its foundations in the rich history of how research has been conducted in the areas of public administration, information systems and political science. Early research into Smart Cities was done with a strong emphasis on using technology to develop urban solutions for transportation, energy usage and urban building [3]. In Latin America this agenda intersects with decades-long existing discussions about urban inequity and informality. The agenda raises questions regarding whose issues are being solved by smart solutions and how citizens are involved in planning and implementing them.

In addition to studying the various digital governance models being implemented in cities, researchers have also looked at how social accountability is affected by citizen engagement within digital governance models. The World Bank has classified the various factors driving social accountability as mechanisms that are either formal (i.e. ways in which citizens can hold their governments accountable) or informal (i.e. how social networks create social capital among citizens). The applied usage of these concepts will also maintain the same dichotomy of formal and informal mechanisms, though their application to digital governance will depend on

the presence of institutions that foster accountability and enable responsive and sanctioning behaviour when using open data portals or participatory platforms.

The recent rapid development of technology and communications has altered both the methods by which we produce knowledge and also the ways in which we create governmental policies. A good example would be the use of distributed, publically available, space-based participatory knowledge management systems (often shortened as participatory spatial knowledge management) to show how digital tools can be used to help incorporate local knowledge into urban planning and risk management [14]. Technologically, these systems have emerged at the intersection between technology and governance; consequently, they have created opportunities for new ways of cooperating -- but their existence also presents challenges regarding data quality, data representativeness, and the ways in which governments control access to this type of information.

Critiques of the idea that digitalisation would improve upon current methods of democratic governance have been made recently within the Critical Data Studies literature. Algorithmic governmentality is defined in the Critical Data Studies literature as how organisations implement automated governmental systems through the use of algorithms, thereby controlling how citizens behave and how society distributes/supplies government services through these systems [1]. The conversation surrounding algorithmic governmentality within Critical Data Studies has begun to address the issue of non-transparency of many automated government services due to their reliance on constant data processing. A historical example of the interplay between technology and power dynamics and surveillance within Latin America has generated a rich discussion about how the types of surveillance and power dynamics established in history continue to exist through new technologies, added through algorithmic systems that support immediate real-time responses and multiple channels of engagement.

Increasing attention has been paid to the ethical and regulatory aspects of AI within the region. Colombia's current assessment of its Artificial Intelligence National Strategy shows a continued tension between the market-driven approach versus self-regulation, versus protecting human rights as well as maintaining democratic oversight [5]. This study illustrates that Artificial Intelligence Policy includes many more dimensions than merely being a technical roadmap; it provides insight into governance and value decisions made by state decision-makers. Furthermore, research ethics and regulatory governance studies conducted during the COVID-19 pandemic indicate that most national systems were not adequately prepared to respond to the urgent research needs that arose due to the pandemic. Additionally, it is clear that most national systems lacked effective coordination and transparency in their support for and facilitation of COVID-19-related research as well as adequate public engagement strategies [7].

Digital technologies are influencing how students and faculty learn and collaborate in higher education. A recent survey of universities across Latin America showed that digital tools allowed for new ways of learning and collaborating, but that disparities in access to the internet, limited technology infrastructure, and limited knowledge of how to effectively use technology resulted in inequities for both faculty and students [6]. At the same time, there are numerous conceptual models emerging about sustainable practices in operating and managing colleges and universities so they meet the principles set forth in the 2030 Agenda through creating mechanisms to enhance stakeholder digital participation and inclusion [4].

Digital technologies have been recognised as valuable tools in enhancing Public Procurement and Health Systems when measured against the existing technological and legal environments of countries. A study of the trends and issues surrounding the procurement of medicines within one country in South America resulted in the conclusion that Information Technology Systems and Transparency mechanisms are an effective way of providing access to Pharmaceuticals and reducing their cost; however, achieving these outcomes is highly influenced by the level of Regulatory Harmonisation and Support; the existence of an Enabling Political Climate; and the presence of adequate Management Capabilities within the country [8]. In another study of access to ICTs and Broadband across Latin America, while on-going advancements in the penetration of Internet technologies and the ability of Governments to provide Digital Government Services; the lack of sufficient infrastructures as well as affordability continue to influence the ability of Rural and Low-Income Populations from fully accessing Digital Public Services; therefore, Studies suggest that even the most sophisticated Portals or Platforms cannot achieve their desired outcomes if Households do not possess Reliable and Affordable Means of Connectivity and Basic Digital Competency [15], [16].

As part of a broader effort to better understand how regulators are governed, comparative analyses have recently been done using OECD indicators. In many instances, Latin America has made great strides in both establishing independent authorities (e.g., energy regulators) and developing more robust systems for holding those authorities accountable, yet there remains considerable variation from one country/sector to another [9]. This research highlights the importance of considering regulatory governance when evaluating the effectiveness of digital initiatives that require independent regulatory entities.

Latin American academia has been focusing more on investigating how technology can assist in integrating other initiatives into their overarching frameworks of Corporate Governance (CG) and Risk Management (RM). A three lines of defence model is being used to demonstrate how CG, RM and Compliance operate within Latin American companies. This requires the development of a clear structure together with the use of an integrated digital information system to facilitate the integration of these initiatives [10]. In Peru's mining industry,

it has been found that companies that implement the best governance practices (Transparent Financial Reporting, Engagement with Stakeholders, etc.) have far superior financial and reputational performance than those who do not adopt these practices [11].

Recent studies of ISO 31000 by Latin American businesses demonstrate that risk management must be implemented in a coordinated, systematic way with continual technological support to identify, analyse and monitor risks [12]. This means that in the public sector, digital tools must be included in risk-based methods for developing and executing policy, rather than being implemented exclusively as stand-alone projects.

Last but not least; the literature concerning Political economy and the science policy of Latin American countries demonstrates how sudden shifts to the priorities of the government can lead to destruction among the Innovation Ecosystem (i.e. Argentina). The studies analyse both the funding cuts to Science and Technology and the Institutional Reform and Discursive Attack against the Scientific Community that undermine long-term capacity for Digital Transformation and Governance Innovation [13]. These types of experiences serve as a reminder that sustainable Investment is necessary for Technology to be coupled with sufficient Institutional Investment, Human Capital Investment, and Research Infrastructure.

The research indicates that technology can enhance transparency, participation, and efficiency in governance throughout Latin America. However, in order for this to happen, the use of technology must be integrated into established institutional/regulatory systems, with equitable access to all citizens (digital divide), and underpinned by ethical and democratic principles. This study furthers the body of knowledge by offering a conceptual perspective based on empirical measurements related to Government(s) Technology maturity and digital connectivity, with a focus on risk management strategies within the context of relevant Governance discussions.

III. METHODOLOGY

This article utilizes an integrated literature review and analysis of secondary data as part of their qualitative research design. To ensure both transparency and replicability, this section outlines the three distinct phases in which this article's methodological strategy was carried out.

To conduct the search for academic literature systematically, a basic systematic search of the available literature on digital governance has been performed using Ts and Web of Science along with combinations of the following keywords in English and Spanish; digital governance, e-government, GovTech, algorithmic governmentality, Latin America, regulatory governance, risk management, social accountability, artificial intelligence and public sector. The searches were also conducted in a manner aimed at capturing articles published between 2015 and the present with emphasis on peer-reviewed journals and books produced by

recommended academic publishers and policy publishers published between 2018-2025. Seminal works published prior to 2015 may also have been included in some cases based on their conceptual relevance to the research for example foundational texts on smart cities and social accountability [2], [3].

Subsequently, as a complementary step, we undertook a systematic search for institutional publications and official policy documents published by the various official online archives operated by multilateral and regional organizations that deal with key indicators and analytical frameworks about Digital Transformation in Latin America. Specifically, we endeavored to locate and review all relevant publications issued by the World Bank, United Nations, Organisation for Economic Co-operation and Development and United Nations Economic Commission for Latin America and the Caribbean (ECLAC), dealing with Connectivity, Digital Government, GovTech, Reg Gov and NTECH. These publications will facilitate our ability to provide comparable data on the availability of the internet, Broadband penetration, GovTech maturity and Mature Digital Government in Latin America.

Additionally, articles also refer to specific aspects of Latin American Governance, Compliance and Risk Management scholarship, including research completed by Edmundo Lizarzaburu et al on the "three lines model", governance practices, and ISO 31000 for Latin American countries. The process of identifying these articles was accomplished using focused searches using Edmundo Lizarzaburu's name, along with terms such as Governance, Risk Management, ISO 31000 and Latin America, followed by filtering the results for aggregation or only including publications indexed in peer-reviewed journals or institutional repositories that contained DOIs or hyperlinks [10], [11], [12].

The method used to analyze the literature was through thematic coding within an inductively and iteratively developed analytical framework. The research considered the following major thematic categories: Definitions of Digital Governance and GovTech; Algorithmic Governmentality and Data Governance; Participation and Social Accountability; Regulatory Governance and Ethics; Digital Connectivity and Digital Divide; and Governance, Risk and Compliance (GRC). Each publication was then coded against each of the major categories, and patterns were identified by looking for Convergence, Tensions and Gaps.

The article emphasizes that to create the quantitative perspective of the digital governance environment throughout Latin America, four different indicators were taken from readily available database information. Each of these indicators illustrates the level of access to digital resources by individuals and families across this area of South America. For instance, the first indicator pertains to the average ratio of the overall number of families and households within Latin America and the Caribbean with internet connectivity and the average ratio for families/households across the OECD, in 2022. This information came directly from the latest study on individuals'

ability to access, use, and develop skills regarding mobile technology and digital services in this area and was derived from national sources [15]. The second indicator compares the Latin American and Caribbean regional average of the GovTech Maturity Index (GMI) for 2022 against the average of all countries, using the World Bank's regional report as the source [17].

The third metric is the regional average of the United Nations E-Government Development Index for Latin America, as of 2022 (the UN index summarises digital service delivery, human capital and telecommunications infrastructure) [18]. The fourth metric indicates full fixed broadband penetration in Latin America and the Caribbean households (based on definitive statistics from ISI Global Market Intelligence (Global Market Intelligence (S&P)) for 2024 and forecasts for 2025 [16]). These metrics represent complementary aspects of the enabling conditions necessary for digital governance to work effectively: connectivity, digital governance capacity and technology/telecommunications infrastructure.

In a single table, the indicators are displayed alongside other global or OECD benchmarks to allow for straightforward comparison between Latin America and the rest of the world. A unique bar chart was also created from these same data values, which can be duplicated using any spreadsheet program or statistical packages and follows a clear and transparent methodology to create tables and figures that will be useful for researchers who want to create tables and figures similar to those presented in this article.

Ultimately, there are limitations associated with this work. The research presented in the article comes exclusively from secondary sources. In addition, the use of secondary data means that the research has relied on the availability, accuracy and relevance of previously collected information and databases at the time of analysis. There are certain indicators which have only been developed at the regional level, potentially masking the heterogeneity that exists between individual countries. Additionally, the fast pace at which digital technology continues to advance may result in findings becoming obsolete once new policies and initiatives are introduced. Limitations also highlight the need for caution when interpreting results from the current analysis and that continual updates to the empirical information used in future research must occur.

IV. RESULTS AND DISCUSSION

The evolving phenomenon across all of Latin America as it relates to digital government consists of both positive advances and ongoing barriers. For example, while there are significant examples of new forms of governmental institutions, improvements in GovTech maturity and ambitious plans for digitally transforming government, there are also significant Connectivity Divides, Capacity constraints and Weaknesses in Regulation which continue to restrict the effectiveness and extent of these initiatives. As will be discussed below, several other dimensions essential to the discussion on Digital Governance in Latin America will also be addressed, including

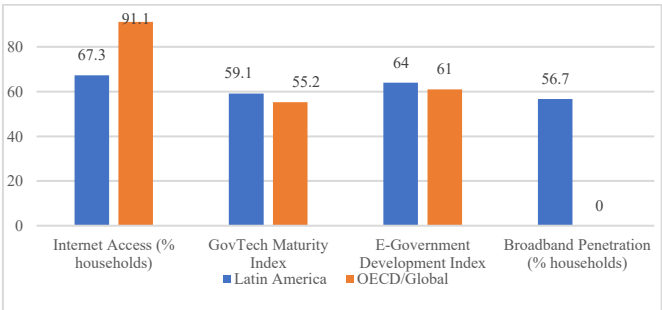
enabling infrastructure/indexes, Emerging Governance Models, Participation/Accountability, as well as Risk & Ethical Challenges.

An enabling environment for digital governance is defined by various national and regional indicators. Four of these indicators, which capture digital connectivity, the capacity of government to provide digital services, and the infrastructure for broadband access in Latin America and the Caribbean, are presented in Table 1. The indicators provide a quantitative view of regional conditions that allow the use of technology to assist or limit government functions.

TABLE 1 SELECTED DIGITAL GOVERNANCE AND CONNECTIVITY INDICATORS IN LATIN AMERICA AND THE CARIBBEAN				
Indicator	Latin America and Caribbean	Comparison region	Year	Source note
Households with internet access (% of households)	67.3	91.1 (OECD countries)	2022	Regional study on ICT access, use and skills based on official statistics World Bank
GovTech Maturity Index (score from zero to one)	0.591	0.552 (global average)	2022	GovTech Maturity Index regional brief
E Government Development Index (average score from zero to one)	0.64 (regional average)	0.61 (world average)	2022	United Nations E Government Survey
Residential fixed broadband penetration (% of households, subscriptions)	Around mid fifties, projected 56.7	Not applicable	2024–2025	Industry data synthesized for Latin America and the Caribbean

Source: Own elaboration based on regional ICT studies, World Bank GovTech Maturity Index, United Nations E Government Survey and industry data for broadband in Latin America and the Caribbean.

FIGURE 1
COMPARISON OF DIGITAL GOVERNANCE INDICATORS
(LATIN AMERICA VS OECD/GLOBAL)



Source: Own Elaboration

Figure 1 illustrates the comparison of key digital governance indicators between Latin America and benchmark regions (OECD and global averages). While the region shows relatively strong performance in institutional digital capacity, as reflected in the GovTech Maturity Index (0.591 vs. 0.552 global average) and the E-Government Development Index (0.64 vs. 0.61), a significant gap persists in connectivity. Internet access in Latin America (67.3%) remains substantially below OECD levels (91.1%), and broadband penetration is still limited. This contrast highlights a structural paradox: advances in digital government capacity are not matched by equivalent levels of citizen access, which constrains the effectiveness and inclusiveness of digital governance initiatives.

To address the heterogeneity across countries, Table 2 presents a comparative overview of selected digital governance indicators in three representative Latin American countries.

TABLE 2
COMPARATIVE DIGITAL GOVERNANCE INDICATORS: SELECTED COUNTRIES

Country	GovTech Maturity Index	E-Government Index	Internet Access (%)	Key Challenge
Chile	High ($\approx 0.7+$)	High	High ($>85\%$)	Regulatory fragmentation
Peru	Medium (≈ 0.6)	Medium	Medium ($\sim 70\%$)	Rural digital divide
Brazil	High	Medium	Medium	Institutional coordination

Source: Own elaboration based on World Bank, UN, and regional ICT data.

This comparison highlights that digital governance progress in Latin America is not uniform. While countries like Chile have achieved high levels of digital maturity, others such as Peru and Brazil face structural challenges related to connectivity gaps and institutional coordination.

In 2022, more than two-thirds of Latin America's and the Caribbean's homes were connected to the internet, whereas over nine-tenths of homes throughout the OECD were connected. The gap between these averages is indicative of the population's inability to access sufficient Internet infrastructure to allow for on-going use of governmental digital public services. In contrast, the regional average score for the Governance Technology Maturity Index is above the world average, suggesting that many nations have taken great strides towards adopting modernized governmental infrastructure, providing delivery of services digitally and developing regulatory frameworks that permit the use of these innovations.

Latin America has developed relatively advanced online services and capabilities compared with the world average as shown in the regional average E Government Development Index score. The presence of substantial access gaps combined with the connectivity-level data indicates the presence of sufficiently sophisticated digital platforms; however, the lack of access to these services remains a persistent challenge for

much of the region. The fourth row of this report shows that in the fourth row that residential fixed broadband penetration covers little over half of households in the region although the penetration rate has grown.

We can create a bar chart of the data we collected. This chart would include a horizontal axis that displays four different measurements of e-Government maturity: Households with Internet Access, Government Technology Maturity Index (GovTech), E-Gov Development Index (E-Gov Dev), and Fixed-Line Broadband Penetration. The vertical axis would show a percentage or score for each of the four indicators. For the first three measurements, there will be two bars next to each of them; one representing Latin America and the Caribbean, and the other being a benchmark for comparison (either OECD or Global Average). The Fixed-Line Broadband Arrow would have only one arrow much like the other measurements, except this arrow will reflect the value for the entire Latin American region. The resulting chart illustrates the difference between having a well established and developed digital Government Capacity; however, there is still a gap between providing every citizen with access to high quality broadband service.

The pattern of information presented is organized in a numerical format which provides context for understanding how there has been significant progress towards many new methods of governance. There have been numerous projects throughout the country that support the creation of many different tools and strategies for the governance of technology and digital transformation (i.e., creating the types of portals, platforms, and software applications that result in improved efficiency and transparency). In addition to the project-based approach of creating Government Technology (GovTech) units to support this type of effort within various departments of government, some countries have also established secretariats for digital transformation, as well as innovation labs to act as coordinating units for this type of effort. The establishment of such units, along with the average respective scores that countries earned in relation to both the GovTech score and the e-Government score, indicates that the creation of those units (and through the establishment of those units) has facilitated an increased level of success in modernising their processes, integrating registries, and making it easier for users (both citizens and businesses) to interact with their governments.

Digital transformation cannot be reduced solely to the implementation of technology, but requires consideration of also factors of organizational culture, leadership and regulation. Studies have shown through numerous examples from around the world as well as a number of countries across Latin America that successful digital initiatives include these additional criteria. Further, if these initiatives are approached as discrete projects within one department or agency, they tend to lose steam as a result of political shifts when new administrations take over. By contrast, initiatives that are embedded within a broad framework of long-term digital government statutes, interoperable standards and coordinated institutional mechanisms (e.g., in conjunction with private-sector partners)

greatly reduce any potential disruption caused by political cycles, which is particularly true for Latin American countries experiencing political volatility and polarization during election years.

As algorithmic systems and data analytics become popular in public administration in the region, there is an important trend developing. Governments are beginning to test out predictive models for tax compliance, risk-based inspection in customs and health surveillance, as well as evaluating scoring systems to determine eligibility for social programs. While these new initiatives offer potential benefits of improved targeting and productivity in using public resources, they also challenge our understanding of fairness, transparency and accountability. The emergence of algorithmic governmentality thus provides a conceptual framework for understanding how data processing and the automation of decision-making processes will be reshaping existing power relationships between the state and its citizens through the use of technology.

The majority of these kinds of systems face limited community oversight through the procurement procedure on these algorithmic instruments; the impact assessments associated with the use of these algorithmic instruments have been performed by only a small number of organizations. In recent years, civil society and researchers have collected evidence of bias and discrimination in digital solutions such as in Latin America, and have provided documentation attesting to the biases and disproportionate use of digital technologies for surveillance. This documentation is compelling evidence of the need to implement safeguard measures to protect against these issues. A robust, transparent mechanism for developing transparency through external auditing, providing citizens with an opportunity to challenge automated decisions, is critical to preventing new technological tools from perpetuating or exacerbating existing disparities and undermining public trust.

Social accountability and citizen engagement are other important aspects of digital governance. Several countries in Latin America have implemented open government portals, participatory budgeting tools and complaint processes where citizens can file complaints, monitor projects and obtain information regarding how public funds are spent. These mechanisms can help bridge information gaps and provide citizens with a means to express their views even when elections are not taking place. However, it is necessary for citizens to possess digital literacy skills, have access to the Internet and feel confident in these platforms' ability to create real change. If a community has little or no access to the Internet or lacks trust in institutions, digital platforms will likely be underutilized and viewed by citizens as mere symbols of political participation.

Integrating technology into previous ways of engaging with the public on planning matters presents an opportunity to foster improved participation. By such means as creating an online platform to engage the public with face-to-face discussions, holding community meetings, and/or holding public hearings, all of which can facilitate increased

participation and provide for more extensive and meaningful discussions about issues. Community mapping tools are examples of participatory planning methodologies that have emerged in conjunction with participatory spatial planning and disaster risk management, enabling community residents to collect evidence of issues affecting them while providing their own suggestions for how to resolve those issues, while also creating georeferenced evidence for decision-makers to use in making policy decisions. The greatest challenge that lies ahead appears to be ensuring that the information generated through citizen participation will directly influence decision-making processes and will not be ignored or usurped by other entities or government agencies.

In the area of digital governance, the significance of ethics and risk management as key aspects has evolved; applying the principles of a Corporate Risk Management Framework to the government sector (such as the "three lines of defence" Principle, and ISO 31000) gives a framework to understand how roles and responsibilities can be distributed with respect to the use of technology. If first line management (which includes both Manager and Employee) have an understanding of digital risks, the second line of defence provides guidance regarding these risks, and the third line of defence conducts independent assessments, then the likelihood that any identified issues can be identified and properly mitigated is increased. With regard to digital environments specifically, these structures become more important because risks exist not only in isolation but, instead, often act in concert across a broad spectrum of environments, are often systemic, and evolve at a rapid pace.

Despite this reality, the majority of Latin America's governmental agencies and quasi-public entities do not yet have developed RM systems in place. There have been instances where digital projects were initiated without conducting an adequate RM analysis and/or formulating a business continuity plan (BCP) or a cybersecurity strategy. This has resulted in a significant number of data breaches, interruptions of services and security flaws in critical systems. The integration of digital technologies into the existing bureaucratic procedures creates a unique form of operational risk, as illustrated by the fact that both antiquated paper-based processes and digital platforms exist simultaneously without defined standards about which records should be treated as official.

In addition to privacy and security, ethical concerns regarding the use of data and algorithms in government also include issues such as representativeness, consent, explanation rights, and discrimination. Although there are many different moral frameworks being developed for artificial intelligence throughout the region, most lack the operational detail needed to implement them effectively. Several countries have produced overarching statements regarding the principles they will follow. At the same time, some countries are developing regulatory "sandboxes" or creating guidelines to assist public sector entities who wish to utilize artificial intelligence within their jurisdictions. Gaining insight from the experience the governance structure for research ethics provided during times

of public health crisis can help provide insight into properly preparing for and implementing advanced technologies within sensitive areas through the identification of roles and engaging all stakeholders prior to the introduction of a new technology.

The political economy governing digital technologies in Latin America has to be considered. The willingness of governments to invest in and develop digital infrastructures, create platforms and build innovation ecosystems will depend greatly on their available fiscal resources, political powers and the collaborations that exist among the private sector, public institutions and international organizations. When there have been sudden and drastic decreases in funding for science, technology and innovation there have been numerous examples demonstrating the fragile nature of these systems when they lack the foundation of a larger, societal agreement. On one hand, there is a significant chance that technologies will succeed in achieving high visibility; however, from an overall value-added perspective, they may represent far less than they could possibly do if the resources, policies and institutional capabilities supporting their development were more stable, cohesive and better aligned with the long-term goal of building capacity.

Overall, it appears that Latin America is making progress in terms of its digital governments and the maturity of its GovTechs; however, there are still significant barriers to progress such as lack of connectivity, institutional failings, and a lack of regulations and ethical guidelines governing these technologies. Digital tools have enormous potential to improve the transparency, citizen participation, and efficiency of governments; however, their actual impact will ultimately depend on the definition, governance and to a lesser degree on the integration process of these tools into larger systems of public service reform and social inclusion.

V. CONCLUSIONS

Digital technologies are changing how governments function in Latin America. However, the changes associated with digital transformation do not necessarily occur uniformly or automatically. Rather, it is clear that digital transformation requires political and organisational processes that rely on political authority and social inequality, in contrast to existing institutional arrangements and the existing structures of power within each country in Latin America. Based on the review of literature on digital transformation and the use of Digital Government Index (DGI) and other regional indicators to measure the development of digital government capabilities, evidence shows that Latin America has made considerable progress in establishing the ability to use digital technologies to govern the public sector; however, many countries continue to suffer from large gaps in both availability of connectivity and skills necessary to develop digital government capabilities.

A major takeaway from this research is that the set of tools needed for effective digital governance are still very unevenly distributed around the world. On the one hand, a number of countries have achieved an extremely high level of

technological sophistication, demonstrated by their strong scores on various GovTech/e-government indices and the creation of advanced digital platforms. However, on the other hand, many of these same countries still have a large section of their population without reliable internet connectivity or access to quality broadband services. As a result, there are many individuals residing in rural or informal settlements who cannot take advantage of new digital-based innovations due to their lack of access to the necessary technology (e.g., computers, mobile devices, etc.) or know-how to utilize them. To close this significant digital divide, all stakeholders must work collaboratively to invest in the infrastructure necessary to make digital governance more equitable and accessible to all citizens.

Secondly, because digital initiative-based projects tend to rely heavily on political motivations and isolated innovation centre development (and therefore experience frequent shifts in management), these projects are less likely to deliver permanent structural changes. In contrast, when digital projects take place within existing laws, regulations, and interoperability standards, as well as established formal coordination mechanisms, they have greater potential to create sustainable improvements in transparency/efficiency/accountability.

The use of algorithmic systems and data-based decision-making is expected to expand the administrative practices of public administration across Latin America, thus raising the need for a more proactive approach to ethics and oversight as well as a greater emphasis on opportunity for citizen participation. While automated tools have proven effective at providing fairer and more efficient methods of distributing limited public sector resources, if created without adequate safeguards, they can have negative effects due to the continuation of the same prevailing inconsistency and bias in the distribution of these resources. Therefore, in order to ensure that the risks associated with using algorithmic systems in decision-making are minimized, public entities, regulators and civil society must collaborate in establishing comprehensive standards for algorithmic systems, including minimum requirements for transparency, documentation, risk assessment and independent auditing. For citizens to effectively monitor and challenge the decisions made by public authorities regarding their rights, these institutions must provide accessible channels for public engagement regarding their rights.

Fourthly, the Governance, Risk and Compliance (GRC) Frameworks provide direction for defining roles and responsibilities for Managing Digital Risks in the Public Sector. The application of existing models (e.g., The Three Lines Approach), along with various international Standards related to Risk Management provide both conceptual and practical tools by which the roles of those who design, supervise, and audit technology initiatives can be clearly defined. Incorporating Digital Risks into existing Risk Management Processes enables organizations to avoid siloed approaches and adopt a more comprehensive strategy that considers Cybersecurity, Operational Continuity, Legal Compliance, and Reputational Impact.

Fifth, Digital Governance should also be viewed as a means to enhance democracy and promote social inclusion within society, rather than just being viewed as a way of improving the efficiency of administrative processes. Digital technologies enable the establishment of new, participatory and collaborative forms of engagement, in which citizens are empowered to define how they would like to interact with government(s). Digital platforms must be developed collaboratively with users (rather than being developed as purely technical solutions imposed on users). The combination of digital platforms and F2F systems (face-to-face) with community-based systems and procedures is critical to ensure that only those citizens who have access to the internet (or are unable to read/write have opportunities to participate). Furthermore, the establishment of collaborative decision-making processes and feedback mechanisms that are demonstrably responsive is critical to achieving democratic representation and creating a collaborative culture of governance.

In conclusion, for digital governance in Latin America to have a long-term sustainable future, it is essential to continue building and protecting the knowledge and innovation ecosystems across the region. This means investing in research and development, higher education, and the capacity of public sector institutions to develop ideas and work on projects that are context-sensitive; to adapt existing global technology solutions and create locally suitable ones, as well as to assess the potential impacts of new technologies on society. Sudden shifts in policy direction or a prolonged lack of investment will destroy the very foundation that needs to be created for digital transformation to take place successfully. Therefore, achieving a strong social and political consensus regarding the importance of both digital governance and technological innovation will be one of the biggest challenges facing all Latin American nations in the next few years.

The findings of this study indicate that while there is great potential for leveraging technology in Latin America as a means to enhance transparency, increase efficiency, and maximize participation within democratic structures, it is imperative that any form of technological implementation occurs within an inclusive, rights-based framework that takes account of the risks associated with technology. Governments, regulatory agencies, academia, and civil society across the region have an opportunity to drive the digital transformation process in such a way that enhances democracy and reduces inequality, as opposed to perpetuating the existing disparities between rich and poor. However, accomplishing this will require collaboration among all stakeholders, ongoing learning and a conscious focus on putting people first in the development and use of new technologies in the public sector.

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