

Digital Transformation and Technological Tools in the Public Sector Insights from Peru

Julio Quispe¹  and Giannina Castro² 

¹²Universidad ESAN, Perú, jquispe@esan.edu.pe, gcastro@esan.edu.pe

Abstract– *The digital transformation of Peru’s public sector has shifted from a technical aspiration to a central pillar of state reform. Over the last decade, governments have promoted online platforms, digital identity, interoperable registries and data driven decision making to simplify procedures and bring the administration closer to citizens. The results are significant but uneven. Connectivity has expanded, more residents use the internet and Peru has improved in international rankings of digital government, yet territorial inequalities, fragmented institutions and limited digital skills among public servants restrict the impact of these advances. This study offers an integrative analysis of digital transformation in the Peruvian public sector based on recent empirical research, international assessments and secondary data. It proposes a conceptual framework that links three dimensions: infrastructure and access, service design and use, and governance and trust. Through this lens, the study examines evidence on municipal digitalization, hospital management, local efficiency and public employees’ digital competences, connecting these experiences with wider debates on corporate governance, transparency and citizen confidence in institutions. The analysis argues that technology is necessary but not sufficient. Sustainable digital transformation depends on organizational culture, leadership, human capital and policy frameworks that coordinate central and subnational initiatives. The study concludes that closing territorial and social gaps, strengthening digital skills and consolidating governance arrangements are critical conditions for turning digital tools into tangible improvements in public services and higher levels of trust in the Peruvian state.*

Keywords - *Digital transformation; public sector; Peru; e-government; citizen engagement; transparency.*

I. INTRODUCTION

Digitization of public administration across most countries has significantly impacted the social contract between governments and citizens. Digital tools allow governments to provide services quicker with fewer mistakes while also allowing for the Government to better target how it spends money while providing new opportunities for government-citizen engagement. For many emerging economies, digital tools are part of a larger development agenda to include social inclusion, increase productivity, strengthen weak institutions, etc. In Peru, there are stark contrasts in progress made concerning broadband access (connectivity) and developing an effective legal and institutional framework for Digital Government versus the reality that many Peruvian citizens still

live in poverty and lack access to basic services. Therefore, digital transformation in Peru does not apply equally to all citizens, and thus cannot be considered a universal public good in Peru [1].

Digital transformation has become a key component of public governance as asserted by many international organizations. The Organisation for Economic Co-operation and Development conducted a review of digital government in Peru and determined that the establishment of the Secretariat for Digital Government, the enactment of the Digital Government Law, and the acknowledgment of digital government as a matter of national interest are three significant developments; however they cautioned that progress with respect to these developments has been slower than that of other comparable countries in Latin America and the Caribbean [1]. The complementary worldwide evaluations of the United Nations Digital Government Indexes have determined that Peru has become part of the high Digital Government Development category. Despite this fact, Peru is still behind other countries at the highest level of development [2].

An increasing number of studies show how digital technologies have transformed the way public sector institutions operate in Peru. The findings of these studies suggest that public employees' ability to use digital technologies correlates with increased levels of productivity and performance. This effect is particularly pronounced in organisations that are subject to a high degree of regulatory complexity [3]. According to research, municipal administration is increasingly reliant on technology and digital tools, and by implementing this technology in a planned manner, with an eye toward creating new organizational structures, municipalities may achieve greater financial viability and transparency through the use of their new tools [4], [5]. Other analyses examine how digital administrative systems in northern Peru influence efficiency in service provision and how sociodemographic factors shape the adoption and effective use of digital channels [5].

Digital transformation has also emerged as a major focus within the health sector. Studies of Peruvian public hospitals have illustrated the benefits of electronic health record (EHR), appointment scheduling systems and use of telemedicine for enhancing patient experience. Nevertheless, there still remain obstacles such as legacy systems, lack of coordinated governance, and inability to share patient information between facilities due to lack of interoperability [6]. Similarly, the advanced analytics used in the tourism industry also include machine learning models used to predict traffic spillage along Moche Road to improve infrastructure and promotional

initiatives in that area that show how data-driven practices in the tourism industry can create data-driven practices in other areas of governmental operations [7].

A second theme of discussion based on the concept of Digital Transformation is the perspective of Governance, Transparency and Trust. Evidence from financial system markets, corporate sector businesses in the region of Latin America, including Peru, indicates that companies that have established robust governance procedures, as well as have stronger and more clear organisational structures for the dissemination of information about their financial information, are generally able to generate greater levels of profitability, generate more stable returns for their investors and create higher levels of investor confidence [8]. The results in these cases were consistent with the corporate social responsibility, corporate reputation and business confidence analyses of Peruvian banking and education, in which responsible or ethical behaviour has been shown to relate positively with the perception of a company's stakeholders [9]. Credible disclosure, accountability, and incentive alignment are considered to be closely aligned with mechanisms that underpin digital government reforms. The goal of these reforms is to leverage technology to enhance the quality and reliability of citizen-state interaction through better communication with government.

Similar to other aspects of society, digital transformation does impose non-neutral outcomes associated with how the resources/infrastructure, human capital and attention given to digital transformation is distributed. For example, studies examining the development of digital competencies in the public administration sector in Peru have revealed discrepancies in digital competency because of the generational gap, regional disparities between central- and sub-national level entities, and continued lack of accessibility to training opportunities [3]. Analyses of local governments point to significant disparities in access to equipment, connectivity and specialized staff, which result in very heterogeneous levels of digital administrative efficiency across municipalities [5]. International evaluations show that Peru possesses a significant number of geographical divides with respect to internet connectivity and the overall quality of government-provided online services; rural areas and regions of poverty are particularly disadvantaged when compared to Lima and other major urban centers located along the coast [1], [2].

This study builds upon previous contributions by transforming an initial narrative review into a more structured and systematic analysis, which include a Narrative Review of the initial document and develop a more systematic and detailed analysis of Digital Transformation and Technology tools utilized in the Peruvian Public Sector as well as a more in-depth analysis of the impact of Digital Transformation on how Government Deliver Services Digitally. The purpose of this article is to clarify and structure the Narrative Review into an organized format and to augment it with up-to-date evidence and quantitative data. There are three key research questions

addressed by this article. First is an analysis of what has happened to the levels of Connectivity and Access (CAP) and the Development of Digital Competences in Peru in recent years and how those trends affect the State's capacity to deliver services digitally. Second is the examination of the academic literature on the impact of Digital Tools on Government Efficiency/Transparency/Citizen Experience at specific sectors and levels of Government. Third is looking to enhance our understanding of how insight from the Governance and Corporate Finance literature, particularly transparency and trust, can assist in the understanding of the Digital Government trajectory of Peru [8], [9].

In many facets, this piece also adds value through new contributions to existing literature; therefore, it provides a succinct overview of current Peruvian and international research, pulls comparative performance metrics from international data and creates an analytical structure enabling connections between key elements of infrastructure/service design/governance, as well as providing opportunities for connecting the discussion of digital transformation to existing information on governance and trust as documented in the financial and corporate sectors where Peru has substantial research backing [9]. In the end, it examines the current research agenda on this topic, including areas where there are knowledge gaps, and suggests areas of possible future research to help inform policy and practice, particularly with regard to the realities of subnational contexts and the long-term social and economic impact of digitalization on individuals in vulnerable positions.

II. LITERATURE REVIEW

As a result of the rapid growth in the last ten years, there has been a growing body of literature that deals with digital transformation in public sector organisations. Digital transformation in the public sector is an umbrella term that includes conceptual reflections on the present and future of digital transformation, analytical studies across various countries, and in-depth examples of successful implementation within government agencies. There has been an evolution in the terminology and conceptual framework of digital government on a global scale. The progression from e-Government to digital government has been conceptualised as a transition from an emphasis on basic digitisation to a more comprehensive transformation of the manner in which governments develop, deliver and assess public policies and services [1]. The view of government being the primary subject, not technology, is further supported by the need to change how we think about organizational culture, coordination mechanisms and data governance in the use of digital technologies to support policy enforcement. Digital technology has a very strong impact on how regulations are monitored and how they are implemented [10].

The topic of digital competencies among Latin American, and specifically Peru's, public sector is addressed through three components in service of this objective. Medina Esquivel et al.'s

investigation explores how digital proficiency influences public sector employee productivity within a Peruvian agency and shows through their findings that there is a strong link between an individual's capabilities related to ICTs and improved employee performance [3]. According to their logistic regression results, digital competence accounts for a significant portion of the variances in productivity; therefore, not only are investments in training desirable, but they are also essential for an organization's success in digital transformation. It is also observed that there exists a generational digital gap, whereby younger workers demonstrate greater competencies, creating additional considerations related to professional development and the transfer of knowledge within public administration [3].

The second topic examines how local governments are undergoing digital transformation. [11] used empirical data to study the relationship between technology modernization and a municipality's ability to remain financially sustainable via information systems and fiscal indicators within Peru. Their calculations indicate that the digitisation of financial information would enhance a municipality's ability to be financially responsible and transparent when incorporated into an overall strategic plan. [4], [5] looked at what determines how efficient an organisation operates administratively when utilising digital technologies within municipal structures in northern Peru. By combining survey data with a causal analysis, they have provided evidence that sociodemographic characteristics, as well as institutional and technological infrastructure, all impact on the success or failure of a digital administration. In addition, these authors have shown that the local environment, capacities and leadership of municipalities play a significant role in determining how effectively or not municipalities are able to put their digital strategies to work to improve their operational processes.

The third research approach examines different industry sectors. For example, [6] reviews the digital transformation process for public hospitals in Peru within the health sector with particular attention to the patient's perspective. Their research highlights how digital technologies, such as electronic patient records and appointment scheduling programmes can enhance communication and reduce patient wait times, as well as presents various challenges, including: having dispersed information systems, a shortage of staff, and concerns regarding information privacy [6]. In the tourism sector, [7] employ machine learning techniques to estimate how many visitors will be at a variety of attractions located along the Moche Route in northern Peru. This study indicates how machine learning techniques can assist with identifying, planning for and promoting tourism-related opportunities. Although this study pertains strictly to tourism, it also shows the potential for using similar data-driven methodologies in public sector organisations to develop predictive models or simulate public policy options based on historical data [7].

Aside from Peru, other studies in various geographic locations have highlighted some important themes about how digital transformation is affecting public administration

systems. Research by [12] explores the risk of financial sustainability within public administration; it finds that digital tools can be legislative to mitigate and create new risks, depending upon how they are governed and integrated into public administration institutional practices. Then again, [13] looks at how technology has affected the efficiency of the processes at the Tanzania Bureau of Standards. The results show that by adopting digital systems, the Bureau increased both the speed of its process and the transparency of its decision-making process. However, it wasn't until there were modifications in the culture of the organisation, as well as training for staff, that the benefits of digital systems were evident. [14] conducted a systematic literature review on information management within public administration examining the role of technology, and concluded that successful information management will depend on how well the information architecture, user needs, and decision-making processes are aligned. [15] describes the movement away from traditional public administration towards digital public administration by discussing the need for regulatory coherence as well as institutional preparedness.

A second major area of literature addresses the measurement of digital government and its benchmarking through various means as shown by the UN's work in digital government development and related indicators. The comparison of indicators allows for classification of countries based on levels of maturity in digital government [2]. Peru appears to correlate with this type of classification system; in fact, current findings indicate that it belongs to a high-performance classification for developing its digital government systems, ranking above the global average, but below the best-ranked two of the region [2]. In addition to this measurement of digital government systems, the OECD has produced a digital government framework, consisting of the Digital Government index, as well as assessments of public sector data-driven initiatives, which provide metrics and focus on governance arrangements, openness of data and user-centric design [1], [16].

Previous research on corporate governance in emerging markets highlights that firms with stronger governance structures, transparency, and accountability mechanisms tend to achieve higher profitability, lower capital costs, and stronger investor confidence [8], [9]. His research into the governance of corporations based in emerging market countries as well as studies of how well companies in Latin America perform financially demonstrates that companies with effective governance and clearly established structures have access to lower capital costs and are more profitable [8]. His research into corporate social responsibility (CSR) and corporate image in regard to banks and educational institutions in Peru shows that increasing business accountability and establishing transparency increases stakeholder confidence in the businesses and thus in CSR [9]. Both of these bodies of work identify the significance of transparency, accountability and stakeholder participation as critical components of trust, which are among

the fundamental objectives of the reforms to digital government [9].

In the last phase of development and creativity contributing to the findings of the dissertation research relate to humans and organisations in relation to digital transformation. Specifically, the [3] authors highlight a need to develop the digital skills of public sector employees by taking account of the training elements and generational dynamics associated with digital transformation. In virtually all major international research studies regarding digital skills in public administration and education, the explicit requirement is for digital skills to be continuously developed through learning strategies. In addition, all major international studies indicate the need to create frameworks which define the skills required of digital professionals in the 21st Century [3]. The findings outlined in this section support and complement the recommendations made by OECD regarding Peru, which recommend the establishment of a Digital Academy for civil servants, the creation of Competency Frameworks for Digital Leaders and adopting agile, user-centred methodologies in the development and delivery of policies and services [1].

The body of literature reviewed illustrates that digital transformation is a complicated and multifaceted process, which continues to evolve in the Peruvian public sector. Progress has been made regarding the level of connectivity and the development of both legal frameworks and sector-wide initiatives, while significant limitations remain regarding the development of capability (or human resources), what form of coordination exists between entities, and how organisations evaluate the impact of their efforts. The next part of this paper builds on existing literature in order to articulate the methodology utilised to compile the research presented in this study, as well as to provide an overview of the results of the empirical research conducted and their significance for public policy in Peru.

III. METHODOLOGY

Using both qualitative and descriptive methodology and secondary data analyzed by reviewing literature from global databases, this project will combine the information obtained through the literature review and provide as its goal to synthesize all the current available research on the topic of Digital Transformation in public administration in Peru, with a view to developing an analytical structure that will better prepare future researchers to conduct further empirical studies in this area.

Initially we completed a comprehensive search of the literature available from the university and academic institutions. Our search used several database resources (Scopus, Web of Science, Google Scholar) using combinations of search terms (digital government, digital transformation, public sector, Peru, Latin America, municipal management, hospital management, digital competency, & public employee) from 2018 to present. The search results in many cases were limited to articles published between 2018 to the present as

many of these materials provide recent data; but some older articles (based on the authors' foundations or longer-term viewpoints) were also included. The selection criteria focused on materials that were related to the public sector and that utilized either empirical or systematic review methodology and that were published in reputable peer-reviewed journals or institutional series. The literature identified several important articles in Peru whose authors investigated digital competency, municipal modernization, digital efficiency within municipalities, and hospital administrative management [3], [4], [5], [6], [7].

The second part includes the analysis of secondary quantitative data produced by official sources as well as other recognized international sources. For example, indicative statistics include: the proportion of persons who utilize the internet and fixed broadband subscriptions per 100 residents (both available in synthesised format via TheGlobalEconomy and World Bank's World Development Indicators), as well as the Digital Government Development Index created by the UN [2], [16]. Indicators in the OECD Review of Digital Government in Peru and the World Bank GovTech Maturity Index provide an overview of Peru's level of digital government maturity and connectivity and also give context to the institutional reforms, governance structures, and policy recommendations related to the digital government [1], [17].

For the second component, an analytical framework is developed to provide a systematic analysis of the context of digital government across three dimensions: infrastructure and access, service design and use, and governance and trust. The infrastructure and access dimension is defined by the degree of connectivity between citizens and the government, the availability of digital devices and the basic requirements to produce digitally-based interactions. The service design and use dimension examines the implementation of specific digital initiatives by public sector organisations, as well as how these initiatives impact the efficiency of operations and the experience of users. The governance and trust dimension considers the rules, policies, procedures, systems, and culture that govern how digital technology and tools promote the transparency, accountability, and confidence of citizens in government. The framework is based on the OECD's digital government dimensions and the governance and trust literature found in both corporate finance and public administration [1], [9].

Empirical articles combined with data from case study analysis were compared to the dimensions defined above. Digital skills of public servants defined in [3] were addressed within the intersecting area of "Governance" and "Infrastructure" as the digital skills of public servants provide both a resource and an outcome of the institutional decision. Municipal studies regarding the technology modernization and the efficiency of public administration were evaluated based on the "Service Design" dimension, whereas the Healthcare Management Study addressed how both sector-specific factors can affect national policies [4], [5], [6]. The tourism analytics

examined were representative of a much wider range of potential applications for using "Data Driven Tools" to support public sector decision-making [7].

The final section serves as an analytical anchor. It has presented quantitative evidence of how Peru stands in relation to Internet usage, broadband connectivity, and e-Govt development through the creation of a comparison table and a conceptual bar chart based on the previously established indicators of these areas. This table shows Peru's position in comparison to the rest of the world and to its neighbours using a variety of different types of data; this bar chart visually represents these same types of data and can be easily reproduced in both formal presentations and documents. The table and the bar chart do not provide a comprehensive economic framework, but they do provide qualitative synthesis of the previous information through quantitative means [2], [17].

IV. RESULTS AND DISCUSSION

A. Overview of Peru's digital readiness

The first focus of the analytical framework's dimension of infrastructure and access shows that, according to official data, Peru has seen a continually increasing use of the internet over the last ten years. More specifically, by 2023, nearly 80 per cent of Peruvians will have access to the internet which puts Peru above the global average and very close to some upper-middle-income countries [16]. The number of fixed broadband subscribers is still lower than expected; however, there has continued to be an improvement in these numbers as well as an increase in the use of mobile broadband as the predominant means of accessing the internet and overall digital services. This provides evidence that a growing portion of the population now has the potential to access digital public services based upon basic connectivity; however, there are still large geographic and socio-economic gaps in these provisions. Urban areas of Peru such as Lima and the coastal region will continue to have a greater variety of digital public service options available to them, at a much higher level of quality, as compared with rural inland areas of Peru where people have limited access to and higher costs for internet connectivity, making them less able to take advantage of the benefits associated with these services [1], [2].

To make these contrasts more tangible, it is useful to organize the available indicators in a simple table that highlights Peru's position relative to global and regional benchmarks.

TABLE 1.
SELECTED INDICATORS OF DIGITAL READINESS AND DIGITAL GOVERNMENT IN PERU

Indicator	Year	Peru (%)	Comparative value (%)	Unit of comparison
Internet users as a percentage of the population	2023	79,5	72,46 por ciento	World average
Fixed broadband subscriptions per 100 inhabitants	2023	10,44	17,0	Latin America and the Caribbean average
Fixed broadband subscriptions per 100 inhabitants	2023	10,44	38,0	Average for high-income countries
Digital government development index value	2022	0,7524	0,6235	Global median

Source for connectivity indicators: World Bank World Development Indicators as reported in public datasets on Peru. Source for digital government index and global median: United Nations digital government development index dataset [2], [16].

The simplest means of demonstrating the above-mentioned differences is by using a bar chart that contains two distinct groups of bars. In the first group, one bar represents Peru's 2023 Internet user share while the other represents the global average for that same year. The second group shows Peru's digital government index value against the global median. This chart, which can be included in an executive summary or professional presentation, demonstrates that Peru's Internet user share is slightly larger than the global average for 2023, while its Value of Digital Government Index is well above the median in globally developing countries. However, it leaves room for improvement in achieving the levels of developed nations and those of countries in the region that are classified as high-income [2].

These indicators convey many implications. First, they confirm the increasing presence of the basic connectivity conditions required to support the delivery of digital public services, especially in urban areas. Additionally, the gap in terms of the availability of fixed broadband networks and their associated limitations will act as major constraints on the operation of more complex applications that require stable and high-speed Internet connections, such as telehealth services, the provision of high-quality online learning using rich media content, or the use of advanced analytics by remote offices. Finally, the fact that the country occupies a relatively high position on various digital government indices suggests that not only has infrastructure been developed but also that institutional and human capital have been adequately developed, consistent with the reforms noted in the nation's digital strategies[1], [17].

B. Digital competencies and the public workforce

The human capital segment fuels digitization through Human Capital Dimension 2 of the Digitization Roadmap Framework. Data from The Republic of Peru demonstrate

mixed results related to their public servants' digital competence: younger workers experienced no difficulty adapting to digital tools because they grew up in the digital era; whereas many older public servants participated in a technology-free workforce during their formative years and will struggle with rapid advancements in technology [3].

This research provides insight into the relationship between digital competencies and productivity in a Peruvian government organization. The information revealed by this study demonstrates a relationship between increased proficiency in Digital Information Management Skills, Digital Communication Skills and Digital Problem Solving Skills with increased productivity [3]. Individuals with superior knowledge and capability among those who serve the public, or the public service, are best equipped to provide the most substantial benefit as it relates to task completion velocity and contribution to innovation and to adaptation of processes to new digitalised environments. However, the results of this study indicate that the distribution of this superior skill set is unevenly distributed across younger employees, who tend to have a higher level of digital capability; on the other hand, older public servants tend to utilise a skill set developed largely through their procedural experience and their tacit knowledge and this does not necessarily translate to effective use of new technology.

The policymakers face a duality in which there is both an opportunity and a challenge. The opportunity is the potential for younger staff to act as catalysts for digital transformation and for older staff to help ensure that any transformations take into account the existing legal, social and regulatory frameworks, as well as institutional memories from their time spent in that particular industry. The challenge for policymakers will be how to establish a system of training and organizational structure for the two groups that will produce a collaborative rather than adversarial relationship. Digital tools must not be seen as a threat to the existing professional identity of the two groups, nor should they be seen as an additional burden. If they are perceived as a tool for enhancing professional independence and improving the quality of service that the individual professional provides, they will more likely be embraced rather than resisted.

As far as policy is concerned, these findings clearly show the need for more comprehensive and structured approaches towards developing digital capabilities among the workforce. Instead of offering one-off short courses, organisations must establish competencies frameworks to define what kind of digital capabilities are required for different roles, as well as develop diagnostic tools that help managers determine where gaps exist among team members. In addition, they also require tailored learning pathways that consist of formal training opportunities, peer support and mentoring, and on the job assistance. National-level agencies responsible for establishing civil services can establish policy directives, offer technical resources and create motivation and rewards for using these resources; while each ministry and local authority has

flexibility to implement those policies and the associated tools within their own organisational settings [1], [3].

C. Municipal digitalization and local administrative efficiency

Digital Transformation of Subnational Governments (the Third Dimension). Peru's administrative structure identifies the municipality as the most immediate provider of a range of services, including: civil registration; licensing; local taxes; and basic infrastructure. By improving these services with digital tools, municipalities can modernize their administrative processes, which will affect the way citizens perceive and interact with the government on a daily basis [4].

Research conducted on municipalities within Peru indicates a strong correlation between municipal financial sustainability and administrative efficiency, and the adoption of modern technologies. Municipalities that invest in integrated financial management systems, online reporting tools, and online payment systems generally perform better in terms of both revenue collection and budget execution transparency. Additionally, municipalities that have access to these technologies are better able to monitor their expenditure efforts [4]. The use of these technologies will allow municipalities to track their revenue and expenses in real time, limit opportunities for discretion and error, and generate reports for both the municipalities' oversight authority and citizenry. However, the majority of municipalities may not possess the technical or fiscal resources to purchase software, employ qualified individuals to implement these systems, or maintain adequate connectivity [5].

The following is additional evidence regarding the diversity of information about digital administrative efficiency throughout northern Peru. Factors contributing to digital administrative efficiency include; education level of staff working for the municipality, access to computers and networks, and supportive leadership. Higher-scoring municipalities process procedures more quickly, handle larger volumes of request, and respond more rapidly on behalf of their citizens digitally than municipalities with lower-scoring variable. Even though some municipalities may have digital platforms available, they may not take full advantage of the platform due to other reasons such as being understaffed or not having the technical resources necessary for handling numerous requests through a digital channel. Thus, it would not be correct to assume that every municipality has a digital channel and that those municipalities provide better service to their users than those municipalities that do not have digital channels.

Based on the conclusion of the investigation, it is important for municipalities to develop a digitalization strategy that goes beyond requiring the installation of a system. Municipalities must also address the conditions necessary for effectively using the system. To effectively use, maintain and upgrade digitalization systems, municipalities will need stable funding, training and technical support for employees, platforms that are user-friendly for both government officials and citizens, and the cooperation and coordination of municipal officials with state

government officials regarding digitalization implementation strategies. Additionally, nationwide digital government policies can create common digital infrastructure, templates and standards that help municipalities reduce costs and complexity while enabling municipalities to adapt to their own needs at a local level [1].

D. Sectoral experiences in health and other areas

Sectoral Initiatives relate directly to municipal management and provide new knowledge about the digital transformation environment and the potential impact/constraining elements Digital Transformation has on public hospitals in Peru, for example. Research from the health sector found that public hospitals in Peru implemented electronic health records, online appointment scheduling, and telehealth as part of their respective digital transformations [6]. The result of these implementations was a significant decrease in patient wait time, improved continuity of care, and improved communication between providers and patients. The implementation of these tools is seldom a linear process of implementation because most hospitals have multiple information systems within their infrastructure (many of which are legacy systems), making the integration of each of the information systems a complex process. Interoperability between data is a significant challenge in health care as it requires seamless data transfers between departments and different levels of care [6].

The limitations of infrastructure previously discussed also apply here. In major metropolitan areas, hospitals will typically have adequate levels of connectivity and technical support; however, hospitals located in remote areas face problematic issues such as poor connection reliability and limited physical resources. Digital system implementation could change the way health professionals conduct their practice as well as shift the power dynamics within the organization. As such, there is likely to be resistance from end-users unless the implementation process is handled properly. Health professionals who work directly with patients might perceive digital tools to be additional administrative burdens, and managers might perceive the technology as increasing their exposure to evaluation through performance metrics. Successful technologies integrate technology with extensive management of organizational change, clear communication of goals, and direct involvement of clinical staff in developing the technology.

Some industries demonstrate how other industries can create similar collaborative projects as described in the tourism example. For example, machine learning has been used in tourism to help predict visitor flow into specific locations. As such, it has shown that academia and government entities can work together to create predictive models that help determine how and where policy action is taken [7]. Thus, it allows for greater efficiency in the investment of infrastructure, for the timing of promotional campaigns and for the establishment of services related to seasonal fluctuation. While the tourism sector is not strictly within the definition of public

administration, it exemplifies how an ecosystem for data driven innovation is established around the practice of digitalising the public sector. Similar type collaborations also could be established in the transport, environmental and education sectors.

E. Governance, transparency and trust

The last dimension relates to the way that governance and trust intersect. Digital technologies are commonly portrayed as neutral tools that improve productivity; however, they are bound to interact with other institutions, norms, and power structures that already exist. In many countries, including Peru, trust in public institutions has historically been weak due to incidents of corruption, political instability, and the lack of responsiveness to the needs and wants of citizens. The implementation of digital transformation initiatives could assist in restoring trust in public institutions by creating new ways of operating that enhance the transparency of processes, reduce the number of discretionary jurisdictions, and have a definite impact on the quality of service. However, the implementation of such initiatives may also lead to dissatisfaction, if they are viewed as being only cosmetic and do not address the underlying issues of governance.

Research in finance and corporate governance provides some valuable inferences about the above. Specifically, research on companies throughout Latin America demonstrates that companies demonstrating stronger governance practices, as well as engaging in transparent financial reporting and making credible commitments to pay a responsible business approach, are correlated with higher levels of profitability and greater stability in their relationships with their investors [8]. The way agencies handle information asymmetries and agency problems can be positively impacted by having agencies create transparent policies, provide users with accurate and trustworthy data, and align the interests of all stakeholders with each other. Additionally, the transformation of state-level digital government can also provide a similar type of impact through the establishment of open data, transparency in the processes by which government agencies operate and a focus on users during the design of services.

In the Peruvian context, digital portals that provide real time information on budgets, procurement and program performance have the potential to reduce information asymmetries between the state and citizens [1], [17]. When citizens can access information about how their government allocates and spends its resources and where they can report instances of misuse, the perceived separation between citizens and their government will appear to shrink. However, all of these benefits can only be attained if access to this information is provided accurately, in real time, and in relation to the citizens' needs. If not, these digital platforms could become places of storage for lots of information but not be of any use to many people.

Governance involves how each entity within government creates digital leadership positions and sets up groups who will support the work done across different levels of government

through creating national strategies for digitization. There are several additional elements to good governance in relation to digitizing; however, all of them require the authority, resources, and political backing in order to succeed. In most cases, digital organizations will not achieve any meaningful transformation because they are treated like support teams that have little to no power in shaping what happens within the organization. If, on the other hand, digital leaders are disciplined at being part of the overall strategic leadership, they can act as a bridge between organizations and assist with aligning technology investments with public policy goals and ensuring coherence in the integration of digitization [1], [17].

Overall, the available evidence shows Peru has been progressing well on a number of fronts with its efforts to enhance the government's infrastructure for digital services, as well as improving access to, and availability of, digital connectivity across the country; however, there remain many structural issues that will impede continued digital growth for Peru and its citizens.

Regional disparities among Peru's population create significant barriers for citizens to access digital services. Meanwhile, the gaps in educational, technological, and digital competencies, along with a fragmented approach to implementing government-wide information technology, and the unevenness of government support across regional and national levels, continue to be major barriers to the development of a fully-functioning digital service model for the country.

V. CONCLUSIONS

The synthesis of literature, indicators and case studies presented in this article allows several conclusions about digital transformation and technological tools in the Peruvian public sector.

Digital readiness and institutional frameworks have made considerable progress in Peru. Increased levels of Internet access have continuously grown to the point of exceeding the global average and placing Peru into a group of countries that have established governance systems with developed digitalisation capabilities. The Government of Peru has shown clear political commitment by creating specialized agencies for digital government, establishing an overall legal framework for digital government and supporting the establishment of digital transformation in the National Interest. These developments offer the groundwork to begin to implement more comprehensive digital service reform, particularly related to developing integrated digital service delivery and data-driven decision-making.

The second theme of the study is the link between public servants' digital competence and the overall performance of organisations. In cases where public organisations have made investments to develop employees' skills, there is a clear correlation between the use of digital tools and increased productivity, as well as a propensity for innovation and

improved customer service delivery. However, in the absence of investments to develop staff skills, advanced technologies may be underutilised or applied to repetitive, traditional business processes. The generational divide in terms of digital skills presents both an opportunity for organisations to create effective intergenerational teams through training and intergenerational learning environments that leverage technical skills and knowledge derived from their respective organisations.

The experiences of municipalities illustrate that context sensitive approaches to digitalization are vital. The vast majority of governmental services are provided at the local level (and often perceived by citizens to be immediate, tangible services). With the implementation of integrated systems for finance, taxation and administrative procedures, municipalities provide necessary training and leadership and have the infrastructure to implement these systems. Municipalities see improvements in the efficiency and transparency of their operations. However, not all municipalities are able to adopt the same pace or path because of differences in fiscal capacity, technical expertise and connectivity. Therefore, national policy must provide both common standards and platforms, as well as allow local flexibility for adaptations and support weaker jurisdictions.

With sectoral examples of the healthcare industry, it is clear to us that the effective implementation of digital transformation occurs when technological advancements accompany changes in an organization's structure, culture and other factors; for example, when an organization makes use of electronic records, appointment scheduling systems, telecommunications (telemedicine), etc. It has been demonstrated that all of these types of technology can be useful tools to improve a patient's overall healthcare experience... but only if they are developed and produced based on the needs of the users who will be utilizing them, supported by a solid technology infrastructure to ensure that they function properly, and integrated within the existing clinical and administrative processes of the respective organization. Otherwise, if all of these requirements are not met, it is likely that a digital system will serve merely as an additional layer of complication or cause unnecessary frustration.

The fifth dimension of governance emphasizes that technology by itself cannot fix a fundamental lack of trust and legitimacy between government entities and the citizens in that jurisdiction. While digital platforms can promote transparency and accountability through tracking government spending and performance in addition to providing avenues for feedback from their constituents, they should not be viewed as stand-alone solutions. Rather digital technologies must be integrated into larger efforts to build up the integrity of government entities, enforce compliance and respond to the needs of the public. This is very similar to how corporations must build a coherent framework of rules, incentives, and information to create value from their investments in financial technologies; governments will similarly need to develop strong institutions,

as well as a cultural paradigm shift, in order to successfully leverage digital assets for the benefit of society.

The combination of empirical evidence and comparative indicators implies that Peru is in a middle or intermediate position on the continuum of digital government development. Peru has made progress by developing a framework rather than continuing to develop isolated digital government projects; however, there are still substantial gaps related to the implementation, monitoring and evaluation of digital government initiatives. The extent of these gaps is reflected in the differences between how central government entities and municipal governments operate, as well as the significant disparity between urban and rural digital government experiences. To close these gaps, it is imperative to make a long-term commitment to invest in digital government initiatives, establish continuity of digital government policies over the course of multiple electoral cycles, and develop new mechanisms that will facilitate collaboration between the various levels of government and all stakeholders involved with digital government initiatives.

There are many different future research possibilities. Longitudinal studies should track various digital initiatives (with both technical and organizational components), how they evolve over time, and how citizens perceive them. Comparing different parts of Peru (regionally and sub-sectorally) could provide insight into why some organizations advance faster than others. Evaluating/evaluating digital initiatives thoroughly through cost-benefit analysis and impact assessments regarding equity will provide important information for decision makers in public policy.

In order to successfully implement the recommendations made in this report, four major priorities need to be addressed. The first priority should be to increase and enhance the accessibility of high-quality broadband service for individuals living in rural and/or underserved communities. The second priority should be to establish digital competencies within the civil service as part of the management structure, by providing a clear set of standards, assessments, and a system of ongoing training and education. A third priority will involve greater collaboration among agencies regarding the implementation of a digital government, ensuring that there is a cohesive relationship between each agency's strategy, budget, and institutional framework; and that digital government leaders have adequate authority and resources to carry out their responsibilities. Finally, as part of greater efforts toward good governance and providing services that are delivered with integrity, the integration of digital transformation into these two broader areas will allow for the use of technology as an effective means of promoting transparency, civic engagement, and trust, rather than as a temporary fix for existing problems.

Addressing these objectives in a coherent and sustained way will allow for digital transformation to be leveraged as a major force in the strengthening of the Peruvian state, enhancing the quality of public service, and contributing to the development of a more inclusive and participative form of

democracy. While the challenges are great, the evidence reviewed here suggests that significant groundwork has already been laid and that an expanding network of practitioners, researchers and citizens is dedicated to advancing this agenda.

These findings have broader implications for other emerging economies, where digital transformation faces similar structural constraints. The Peruvian case highlights that sustainable digital government requires not only technological investment but also institutional coordination, human capital development, and trust-building mechanisms across multiple levels of governance.

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