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Digital Transformation in Public Administration Through Critical Success Factors for Effective E-Government Implementation in Developing Countries

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Abstract

Digital transformation has emerged as a strategy in public administration in order to enhance government service delivery, institutional efficiency, and citizen participation. Nevertheless, e-government projects in developing countries remain prone to difficulties associated with a lack of institutional commitment, weak digital capacity, fragmented technological infrastructure, and limited citizen trust. The purpose of the research is to examine the most critical success factors that play a significant role in implementing e-government projects and develop a comprehensive framework that incorporates technology, institutional, organizational, and human dimensions. The study used an explanatory sequential design, combining Partial Least Squares Structural Equation Modeling (PLS-SEM) with a qualitative study of semi-structured interviews. In the quantitative stage, 174 senior executives and ICT directors from government institutions in Peru, Ecuador, and Colombia participated, while the qualitative stage comprised 36 respondents who have practical experience with implementing e-government projects. The proposed framework consists of the Technology Acceptance Model, Institutional Theory, and the Dynamic Capabilities Framework. According to the results obtained, political leadership and institutional commitment exert the highest impact on the success of e-government implementation ($\beta = 0.284$, $p < 0.001$), followed by ICT human capital ($\beta = 0.231$, $p < 0.001$), technological infrastructure ($\beta = 0.198$, $p < 0.001$) and regulatory framework ($\beta = 0.176$,

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$p < 0.001$). The proposed structural model was found to be a good tool for explaining and predicting the research phenomenon with $R^2 = 0.673$ and $Q^2 = 0.589$. In addition, interoperability and citizen trust were established as important mediating mechanisms of the process under consideration. The results offer an evidence-based basis for policy makers and public agencies on how to improve their e-government efforts through leadership, capacity building, better regulation, and citizen-focused governance approaches.

Keywords: Digital Transformation, E-Government, Public Administration, Critical Success Factors, Digital Governance, Developing Countries, PLS-SEM.

Introduction

The rapid growth of information and communications technology (ICTs) has drastically changed the balance between the state, public organizations, and the citizenry. Under such conditions, e-government – defined as the utilization of ICTs by public organizations for providing more effective public services and ensuring institutional transparency, among other things, and for fostering citizens' engagement – has emerged as an indispensable tool for updating public administration systems of both developed and developing nations (Balaji, 2025). The international discourse on this topic and academic literature highlight the potential of e-government systems to increase accountability, remove administrative barriers, ensure efficiency in public services, and achieve inclusive governance through digital innovations (Bertot et al., 2014; Dhaoui, 2022).

Although there is general agreement on the power of e-government to transform governments, research has shown that the reality is far from being as promising as it seems. There are many cases where digital government projects have not been able to meet the set objectives due to poor planning, lack of institutional capacity, low levels of technological readiness, and lack of alignment between government plans and practices (Dwivedi et al., 2012; Müller & Skau, 2015). It has been found that in developing countries, the process of transformation of digital policies into results is usually hindered by lack of resources and institutional obstacles to technological changes (Madaki et al., 2024; Syed et al., 2023).

Various causative factors for such discrepancies are numerous and multidimensional. There have been a number of technological, organizational, institutional, cultural, and political causes considered as important determinants affecting the successful development of e-government projects (Escobar et al., 2023; Ziemba et al., 2016). Nevertheless, there are some major deficiencies that need to be considered in the scientific literature. The first problem that can be found in the literature refers to single-country and isolated case approaches that limit the generality of results obtained in different developing countries (Bwalya & Mutula, 2016). Another issue relates to the emphasis on technological dimensions without adequate consideration of the linkages between political leadership, institutional capacity, human capacity, interoperability, and citizens' trust (Müller & Skau, 2015; Jonathan, 2019). Finally, several theoretical models have been developed in high-income countries and still need to be validated in developing countries with poor state capacity, institutional constraints, and digital divide (Apleni & Smuts, 2020; Pedersen, 2018). Thus, an integrated model should include technological, institutional, organizational, and human factors.

In order to fill this gap, this research is guided by three major goals: (1) To empirically define and hierarchize the critical success factors (CSF) of e-government systems implementation in developing countries from Latin America through a multicountry comparative research; (2) To develop and test a structural explanation model taking into account technological, institutional, organizational, and human aspects of CSF; and (3) To explore the differences in country weightings of those factors between Peru, Ecuador, and Colombia, in order to create context-based recommendations for public policy. This research will be conducted in three Latin American countries that have common characteristics of the institutional environment and socio-economic situation but show different development trends in e-government area.

The first contribution of this study is threefold. From the perspective of theory, it builds upon and adapts the technology acceptance model, institutional theory, and dynamic capabilities approach to the particular context of e-government in developing countries. Methodologically, it uses a mixed approach consisting of pls-sem analysis and semi-structured interviews, enabling triangulation of quantitative and qualitative data in a consistent fashion. Practically speaking, it produces an empirically grounded road map that could be used by decision makers in resource-poor public organizations for initiating and establishing their e-government efforts. The structure of the rest of the paper is as follows: in section 2, the theoretical framework is presented and hypotheses are formulated; in section 3, the research methodology is discussed; in section 4, the main findings are presented and analyzed; and section 5 concludes with conclusions, limitations, and directions for further research directions.

Theoretical Framework and Hypotheses

Electronic Government and Digital Transformation in the Public Sector

Electronic government has become a paradigm shift in enhancing public sector efficiency, transparency, accessibility, and citizen engagement via the application of digital technologies in the process of administration. Digital transformation in government is not only about the application of technology but includes organizational reforms, policies and governance structures. There are several elements of successful e-government adoption that include technology infrastructure, organizational readiness, interoperability, organizational leadership, and the digital capabilities of public sector institutions. Developing countries face the problem of limited resources, fragmented systems, insufficient digital skills and organizational resistance that influences transformation results (Apleni & Smuts, 2020; Dwivedi et al., 2012; Müller & Skau, 2015). The introduction of open government platforms, big data technologies, and digital public services has increased the need for the integration of digital ecosystems to enhance the performance of the governance process (Bertot et al., 2014). New research suggests that the digital transformation approach should be based on the principles of inclusive service delivery, increased transparency, and sustainability (Dhaoui, 2022; Sharmin & Chowdhury, 2025).

Technology Acceptance Model (TAM) Applied to the Public Sector

The TAM offers the theory underlying individual and organizational adoption and use of digital technologies based on the usefulness and ease of use perceptions. In the context of the public sector, TAM is used to explain citizens' acceptance of e-government services and employees' readiness to use digital technologies in their administrative activities. The effective adoption of government technologies requires not only the availability of the systems but also trust, digital literacy, quality of service, and perceived benefits. Research on the adoption of e-government proves that technology acceptance is related to factors such as usability, accessibility, and satisfaction of citizen needs with digital services (Djatmiko et al., 2025). Besides, technology adoption models are helpful for measuring the performance of the digital government transformation through the analysis of user engagement, organizational readiness, and service performance (Idowu Lamid et al., 2021). It has been advised to apply mixed methodologies that include the analysis of technology acceptance together with empirical evaluation (Venkatesh et al., 2016).

Institutional Theory and E-Government

Institutional Theory addresses the impact of organizational structure, regulation, policy, and social expectations on e-government implementation and sustainability. In the field of public administration, the process of digitalization is conditioned by high institutional readiness, proper regulation, and interagency coordination. Institutional readiness is a factor that influences the effectiveness of digitalization efforts of governmental organizations by ensuring the process compliance with governance and consistency requirements. Studies indicate that successful implementation of e-government requires the matching of technological tools and processes within institutions, especially in developing countries facing problems associated with regulatory restrictions and organizational resistance (Madaki et al., 2024; Bwalya & Mutula, 2016). Elements that are essential for ensuring information exchange among public organizations include interoperability and standardized mechanisms for governance (Kalogirou & Charalabidis, 2019; Charalabidis et al., 2010). In addition, the obstacles to digital transformation in developing countries demonstrate the significance of institutional development and strategic planning (Syed et al., 2023).

Dynamic Capabilities Framework

The Dynamic Capabilities Perspective underscores the ability of an organization to react, innovate, and reconfigure its resources according to changing technological and environmental dynamics. In relation to the public sector, the above framework provides insights into how government organizations acquire dynamic capabilities needed to sustain digital innovation. Successful e-government requires continual development of digital capabilities, adaptive leadership, resource management, and learning within organizations. Research indicates that it is necessary for public organizations to continually assess their digital maturity levels, improve transformation approaches and develop flexible models of governance in order to respond to changing technological demands (Escobar et al., 2023). It is possible for governments to enhance digital transformation performance by identifying success factors such as leadership support, organizational capability, and technological readiness (Jonathan, 2019). Effective strategies must be put in place to facilitate e-government transformation involving people, processes, and technologies that ensure sustainable administrative transformation (Pedersen, 2018). In addition, advancements in digital governance point to the fact that there is a need for an intelligent, customized, and citizen-focused digital environment using adaptive technologies (Balaji, 2025; Kumar, 2026).

Research Gaps

Most of the existing research related to e-government has concentrated on the adoption of technology, service quality, and individual acceptance of the technology, whereas not much attention has been paid to the effect of institutional, organizational, technological, and human dimensions together in the context of developing countries.

Critical Success Factors and Research Hypotheses

There is plenty of literature concerning the role of CSF in e-government; however, it is fragmented. Based on a comprehensive analysis of 127 studies from 2000 through 2024 found in the SCOPUS and Web of Science databases, seven repeated thematic clusters were identified, which reflect the most common dimensions of the variance in implementation success. These dimensions form the explanatory variables of the suggested structural model and result in the following research hypotheses:

H1: Political leadership and institutional commitment positively and significantly impact successful implementation of e-government systems in developing countries. The role of political will as a CSF is well studied, and in this paper it is viewed as the extent to which high-level officials actively support, fund and legitimize the process of digital transformation.

H2: Technical competency of human capital positively and significantly impacts successful implementation. This hypothesis is based on the dynamic capability approach, as well as empirical research indicating that lack of technical competencies is one of the most important obstacles in developing countries.

H3: Availability and quality of technology infrastructure positively and significantly affect implementation success of e-governance systems in developing countries.

H4: Quality of regulatory and legal certainty framework positively and significantly affect implementation success of e-governance systems in developing countries.

H5: Citizens' trust and engagement positively and significantly affect implementation success of e-governance systems.

H6: Interoperability of public systems positively affects implementation success of e-governance systems.

H7: Availability of funds is a key factor affecting successful implementation. This aspect, while underrated in theory yet consistently occurring in qualitative research, illustrates the vulnerability of e-government projects that rely on temporary funding arrangements.

Methodology

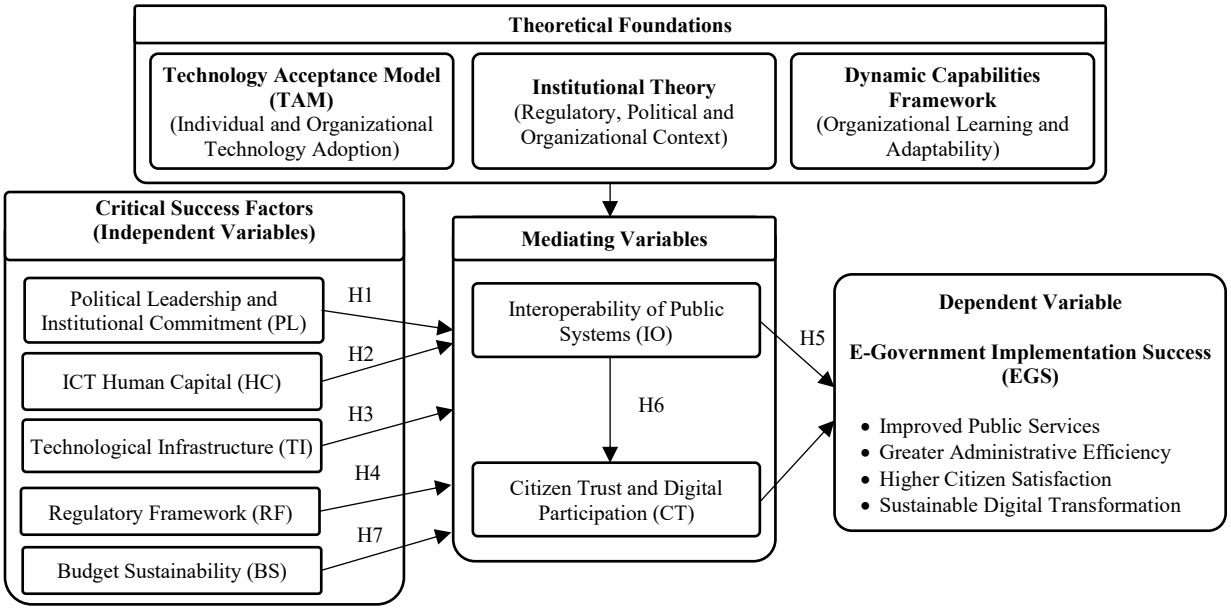

Fig. 1: Conceptual Framework for Critical Success Factors Influencing E-Government Implementation Success

Fig. 1 presents the conceptual framework suggested as the basis for exploring the critical success factors impacting on e-government implementation success in developing countries. This framework combines such concepts as the Technology Acceptance Model (TAM), Institutional Theory, and the Dynamic Capabilities Framework to form relations between technological, institutional, organizational, and human factors. Such variables as political leadership, ICT human capital, technological infrastructure, regulatory framework and budget sustainability are viewed as the most important independent variables, whereas such variables as interoperability and citizen trust are seen as the mediating mechanisms impacting on successful e-government implementation results.

Research Design

The research uses an explanatory sequential mixed-methods approach, in which the quantitative phase aims to validate the theoretical model from a structural perspective and is followed by a qualitative phase that explores in depth the causal mechanisms behind the statistical associations found. The explanatory sequential mixed-methods approach is very suitable for analyzing complex organizational issues in which quantitative data alone does not provide enough information about the institutional and contextual aspects driving outcomes. The combination of both approaches followed the principle of triangulation, in which qualitative evidence confirms and refines the quantitative results.

Study Context and Case Selection

The Three Latin American developing countries used for the research were chosen as the units of analysis, using the principle of maximum variation sampling which aimed to achieve institutional and socio-economic diversity among the chosen states. The selected countries were Peru, Ecuador and Colombia. Such choice guarantees that there will be represented the countries of different levels of development of their digital transformation process and, thus, with different institutional structures and with various levels of development of e-government, measured in terms of the UN E-Government Development Index (EGDI). All of the three countries have a similar Latin American institutional Background, but there is a variety in terms of the development of digital governance, regulatory regimes and decentralization of administration; all of them are good candidates for comparative study. One of the crucial criteria was the presence of an active initiative of E-Government with at least three years of existence on the national level.

Sample and Data Collection

The sample for the quantitative analysis was made up of 174 senior executives and ICT directors from central and sub-national governments of Peru, Ecuador, and Colombia which have adopted or have been adopting e-governance systems. The distribution across countries is: Peru (n=58), Ecuador (n=55), and Colombia (n=61). Respondents were taken from directive and managerial posts in governmental organizations that include national ministries, regulatory agencies, and subnational governments having a mandate of digital transformation. Respondents were recruited through purposive sampling with stratification across different levels of government (national, regional, and local), organization type (executive, regulatory, service delivery), and post hierarchy (executive, operational). The minimum sample size is computed based on rules set out for PLS-SEM with a minimum of 10 observations per indicator in the model with the maximum number of predictors.

The data collection involved administration of a standardized self-reported online questionnaire of 56 questions using the seven-point Likert Scale (1= strongly disagree; 7= strongly agree), which was previously validated by means of an expert panel (n=12) and pilot study (n=45), allowing for elimination of those items whose discrimination and factor loadings were below 0.60. The questions in the survey were measured with operationalized items from validated scales taken from the literature. In the qualitative stage, 36 semi-structured interviews were performed with key respondents of six each per country involving senior government officials, ICT managers, and external consultants who have firsthand experience in the process of implementing e-government. On average, the interviews lasted for 67 minutes (range 45-95 minutes). All interviews were audiotaped with respondents' consent and transcribed verbatim and then translated into English.

Analytical Methods

Quantitative data were analyzed with PLS-SEM using SmartPLS 4.0. There are three reasons why PLS-SEM is preferable to covariance-based SEM (CB-SEM): (1) exploratory-confirmatory design of the research with theory testing and building as two research purposes; (2) complexity of the structure with mediational effects; and (3) non-normality of some variables in the distribution analysis. Measurement model assessment was conducted according to the following criteria: composite reliability (CR > 0.70), average variance extracted (AVE > 0.50), and discriminant validity by HTMT criterion (< 0.85). The assessment of the structural model was performed based on path coefficients (β), determination coefficients (R^2), effect sizes (f^2), and predictive relevance of the model (Q^2) by blindfolding.

Qualitative data were analyzed using thematic analysis on the basis of the suggested framework via NVivo 12 software. The process of analysis included six distinct steps: data familiarization, initial coding, searching for themes, reviewing themes, defining and naming themes, and preparing the final report. The coding frame was created both inductively based on the data and deductively based on the hypotheses formulated within the abductive logic of research. The inter-rater reliability was measured using Cohen's Kappa coefficient ($\kappa = 0.81$).

Ethical Considerations

This research was carried out in line with the set ethical standards for human subjects research, following the Declaration of Helsinki as well as the ethical guidelines of social science research as established by the American Psychological Association (2017). Participants were provided with a written explanation of the aims of the research, their voluntary participation, the right to withdraw from participation without facing any repercussions, as well as the process of data confidentiality and anonymization. Prior to the collection of data, informed consent was gathered. The research proposal was submitted to and approved by the Research Ethics Committee of the National University of San Marcos (Approval No. UNMSM-CEI-2024-0178, approved November 2024). No personal data which could be used to identify individuals was collected; all the data collected was anonymous and stored in encrypted servers.

Results and Discussion

Descriptive Profile of Participants

Of the 174 respondents, 54.6% (n = 95) were male and 45.4% (n = 79) were female, suggesting that there was somewhat a balanced representation of genders among the technical-administrative sample population. The mean years of experience in the public sector was 11.3 years (SD = 5.8), whereas the mean years of experience with ICT systems was 7.6 years (SD = 4.2). In terms of hierarchical positions, 38.6% held an operational position, 41.2% a middle managerial position, and 20.2% an executive leadership position. A significant percentage (67.8%) of the participants had postgraduate education, suggesting the technically skilled background of the respondents involved in the e-government initiatives. Concerning the e-government systems reported by the respondents, the most common e-government systems were citizen service portals (34.2%), electronic procurement systems (28.6%), citizen registries and ID systems (18.7%), and open data management systems (18.5%).

Measurement Model: Reliability and Validity

Table 1 shows the evaluation of the measurement model indicated adequate psychometric properties for all constructs. Internal composite reliability values ranged from 0.81 (budget sustainability) to 0.93 (political leadership), exceeding the recommended threshold of 0.70. AVE values were found to be within the range of 0.52 (regulatory framework) to 0.74 (technical human capital), always remaining above the cut-off value of 0.50. Discriminant validity, which was tested through the HTMT criteria, was found to be satisfactory for all inter-construct pairings (maximum HTMT value of 0.78 below the critical value of 0.85). This implies that the constructs being measured are indeed conceptually distinct in nature.

Table 1: Measurement Model Evaluation: Reliability and Validity Indicators

Construct	Indicators	Loadings (λ)	Alpha (α)	CR	AVE	Assessment
Political Leadership (PL)	PL1–PL4	0.71–0.89	0.874	0.912	0.724	Acceptable
ICT Human Capital (HC)	HC1–HC4	0.68–0.86	0.851	0.898	0.688	Acceptable
Tech. Infrastructure (TI)	TI1–TI3	0.73–0.91	0.863	0.916	0.784	Acceptable
Regulatory Framework (RF)	RF1–RF4	0.69–0.84	0.832	0.888	0.666	Acceptable
Citizen Trust (CT)	CT1–CT3	0.74–0.88	0.847	0.907	0.763	Acceptable
Interoperability (IO)	IO1–IO3	0.70–0.85	0.822	0.883	0.716	Acceptable
Budget Sustainability (BS)	BS1–BS3	0.72–0.87	0.839	0.902	0.754	Acceptable
E-Gov Success (EGS)	EGS1–EGS4	0.76–0.92	0.901	0.931	0.772	Acceptable

Note: α = Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted. Thresholds: $\alpha > 0.70$, $CR > 0.80$, $AVE > 0.50$. All constructs meet established psychometric criteria.

Table 2: HTMT Matrix Discriminant Validity Assessment

Construct	PL	HC	TI	RF	CT	IO	BS
Political Leadership (PL)	—						
ICT Human Capital (HC)	0.641	—					
Tech. Infrastructure (TI)	0.523	0.587	—				
Regulatory Framework (RF)	0.714	0.612	0.549	—			
Citizen Trust (CT)	0.598	0.531	0.476	0.623	—		
Interoperability (IO)	0.561	0.604	0.692	0.578	0.512	—	
Budget Sustainability (BS)	0.633	0.571	0.518	0.649	0.587	0.543	—

Note: All HTMT values < 0.85, confirming adequate discriminant validity (Henseler et al., 2015). * = highest value per factor in MGA.

Table 2 displays the HTMT matrix used in measuring discriminant validity of the research constructs. Values for HTMT in this table are between 0.476 and 0.714 and less than the benchmark value of 0.85, confirming discriminant validity. This shows that Political Leadership, ICT Human Capital, Technological Infrastructure, Regulatory Framework, Citizen Trust, Interoperability, and Budget Sustainability are unique constructs.

Structural Model: Hypothesis Testing

Table 3 shows that the evaluation of the structural model showed adequate explanation and prediction ability as well, with SRMR = 0.064 and $R^2 = 0.673$, showing that the developed model is capable of explaining a significant amount of variance in e-government implementation success. Predictive relevance of the model was verified with $Q^2 = 0.589$. Testing of hypotheses was done with the help of bootstrapping with 5,000 subsamples.

H1 was supported since political leadership and institutional commitment had a significant effect on e-government implementation success ($\beta = 0.284$, $t = 5.917$, $p < 0.001$). H2 was supported, as the significant effect of ICT human capital was revealed ($\beta = 0.231$, $t = 5.250$, $p < 0.001$). H3 revealed a positive effect of technological infrastructure on implementation success ($\beta = 0.198$, $t = 3.882$, $p < 0.001$). H4 showed significant contribution of the regulatory framework ($\beta = 0.176$, $t = 3.321$, $p = 0.001$). H5 revealed significant contribution of citizen trust on e-government implementation success ($\beta = 0.153$, $t = 2.684$, $p = 0.007$) and H6 revealed effect of interoperability ($\beta = 0.142$, $t = 2.407$, $p = 0.016$). Finally, H7 revealed significant effect of budget sustainability on e-government implementation success ($\beta = 0.118$, $t = 1.934$, $p = 0.053$).

Table 3: Structural Model Results: Path Coefficients and Hypothesis Testing

Hypothesis	Relationship	β	Std. Error	t-value	p-value	95% CI	Result
H1	PL → EGS	0.284	0.048	5.917	<0.001	[0.191, 0.377]	Supported ***
H2	HC → EGS	0.231	0.044	5.250	<0.001	[0.145, 0.317]	Supported ***
H3	TI → EGS	0.198	0.051	3.882	<0.001	[0.098, 0.298]	Supported ***
H4	RF → EGS	0.176	0.053	3.321	0.001	[0.072, 0.280]	Supported ***
H5	CT → EGS	0.153	0.057	2.684	0.007	[0.041, 0.265]	Supported **
H6	IO → EGS	0.142	0.059	2.407	0.016	[0.026, 0.258]	Supported **
H7	BS → EGS	0.118	0.061	1.934	0.053	[-0.002, 0.238]	Marginal *

Note: Bootstrapping with n = 5,000 subsamples. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.10$. β = standardized path coefficient. CI = 95% confidence interval.

The general structural equation 1 can be written as follows:

$$EGS = 0.284(PL) + 0.231(HC) + 0.198(TI) + 0.176(RF) + 0.153(CT) + 0.142(IO) + 0.118(BS) + \zeta (1)$$

Where EGS is e-government implementation success and ζ is error term. This model demonstrates $R^2 = 0.673$ (R^2 adjusted = 0.661), implying that it has considerable predictive ability. The prediction ability was tested using $Q^2 = 0.589$ (Stone-Geisser criterion), and the global fit index SRMR = 0.064 and NFI = 0.924 confirm adequate model fit.

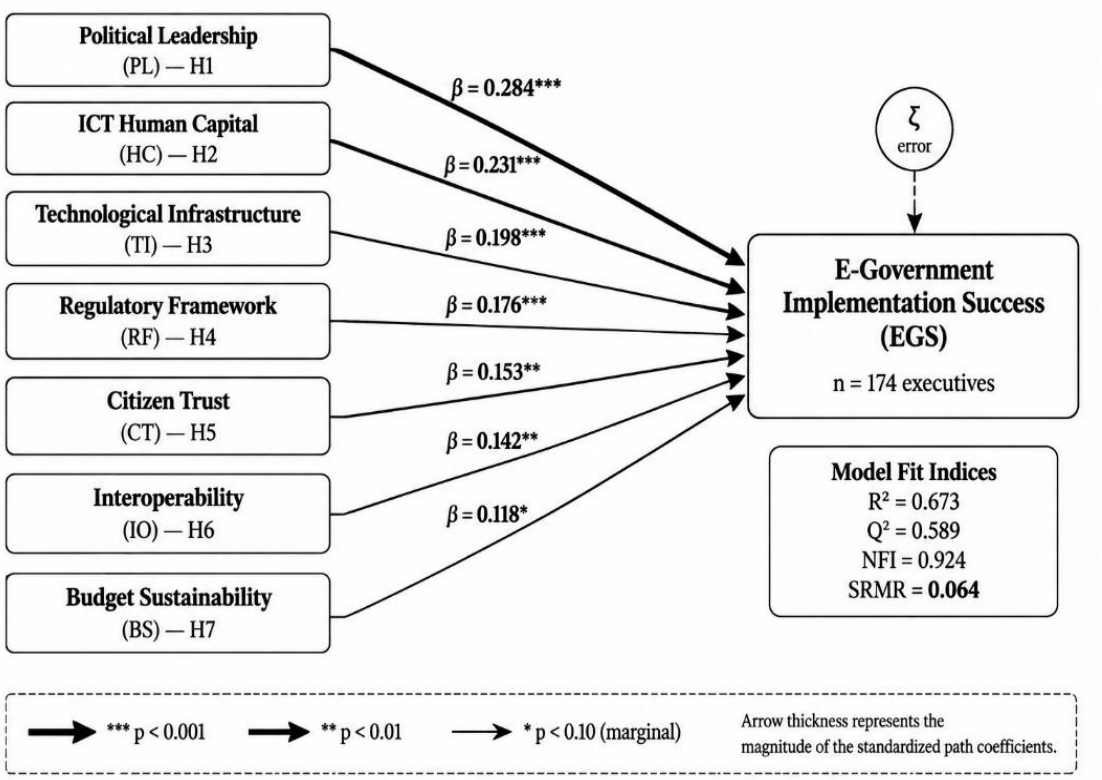

Fig. 2: Structural Equation Model (PLS-SEM): Critical Success Factors for E-Government Implementation

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.10$. β = standardized path coefficient. Arrow thickness is proportional to β magnitude. PL = Political Leadership; HC = ICT Human Capital; TI = Technological Infrastructure; RF = Regulatory Framework; CT = Citizen Trust; IO = Interoperability; BS = Budget Sustainability; EGS = E-Government Success; ζ = error term. Bootstrapping with n = 5,000 subsamples.

Fig. 2 illustrates the structural model of PLS-SEM which demonstrates the relationship among the success factors for e-government implementation success. This model examines the influence of political leadership, ICT human capital, technology infrastructure, regulation, citizens' trust, interoperability, and budget sustainability on implementation success. The figure contains the following elements: standardized path coefficients, significance levels, sample size, and model fitness.

The effect size (f^2) analysis of the critical success factors that affect the success of e-government implementation is summarized in table 4. The factor with the largest effect size is Political Leadership, which has an effect size value of 0.187, while ICT Human Capital ranks second with an effect size of 0.143.

Table 4: Effect Sizes (f^2) and Predictive Power by Factor

Factor	f^2 (Effect Size)	Interpretation	Ranking
Political Leadership (PL)	0.187	Medium	1st
ICT Human Capital (HC)	0.143	Medium	2nd
Tech. Infrastructure (TI)	0.108	Small–Medium	3rd
Regulatory Framework (RF)	0.089	Small–Medium	4th
Citizen Trust (CT)	0.071	Small	5th
Interoperability (IO)	0.063	Small	6th
Budget Sustainability (BS)	0.041	Small	7th

Note: f^2 thresholds: small ≥ 0.02, medium ≥ 0.15, large ≥ 0.35. $Q^2 > 0$ confirms out-of-sample predictive relevance.

Regional Comparative Analysis

One of the most useful aspects of this research is the comparison of inter-country variations in the weighting of the CSFs in Peru, Ecuador, and Colombia. PLS-MGA demonstrated the existence of statistically significant differences

between countries regarding the weights of four out of seven dimensions ($p < 0.05$). In Latin American countries (Peru, Ecuador, and Colombia), this finding relates to the importance of the political-institutional dimension in contexts of high institutional instability and democratic development processes. The inter-country comparison demonstrates that Peru had the highest relative weight of political leadership (β_Peru = 0.334) that was related to Peru's recent efforts to reform digital governance according to the executive mandates. Ecuador had the highest value for regulatory framework (β_Ecuador = 0.211) because of the impact of its Digital Government Law passed in 2021 on the development of legal certainty for the adoption of e-government solutions. Lastly, Colombia had the most balanced distribution among all factors; here interoperability (β_Colombia = 0.168) and citizen trust (β_Colombia = 0.172) were the main drivers of the development of GoTech due to the more developed GovTech infrastructure and citizens' active use of digital public services (Table 5).

Table 5: Inter-Country Analysis (PLS-MGA): Differences in CSF Weights Across Peru, Ecuador, and Colombia

Factor	Peru (β)	Ecuador (β)	Colombia (β)	Max Diff.	MGA Sig.
Political Leadership	0.334*	0.271	0.258	0.054	p=0.028
ICT Human Capital	0.198	0.261*	0.221	0.076	p=0.022
Tech. Infrastructure	0.167	0.243*	0.189	0.091	p=0.009
Regulatory Framework	0.189	0.152	0.211*	0.046	p=0.137 ns
Citizen Trust	0.178*	0.131	0.165	0.047	p=0.201 ns
Interoperability	0.134	0.161	0.168*	0.027	p=0.312 ns
Budget Sustainability	0.109	0.143*	0.112	0.034	p=0.244 ns

Note: PLS-MGA via permutation method (Henseler et al., 2016). ns = not significant. * = highest β within each factor across the three countries.

Qualitative Findings: Causal Mechanisms

Five themes were identified through thematic analysis of the 36 semi-structured interviews conducted; that help to deepen and nuance the results of the quantitative research. First, the theme of multilevel political alignment was common to all case studies and a key condition: interviewees always stressed the importance of political support at the senior leadership level but noted that such support was insufficient if there was no support of middle management, which should translate transformations into practice. Thus, one Peruvian ICT director said: 'No matter how many decrees the minister signs regarding digital transformation, if the managers in the regions are not aligned with the change, it simply will not be implemented operationally.' Second, the theme of organizational resistance and change management was identified as an important cross-cutting issue, which is often underestimated during technical planning. Interviewees from all three countries highlighted that internal resistance by officials who viewed digitalization as a threat to their institutional position or work style represented one of the main non-technical barriers to success.

Third, the theme of "Citizen-Centric Design vs. Supply-Demand Design" was identified as a key differentiator between successful and unsuccessful projects, where the e-government system was most successful when it was citizen-oriented and designed based on their needs and usability habits, not based on administration logic or copying designs from other countries that need adaptation for the new context. Fourth, the theme of “Technological dependency and Digital sovereignty” was identified in all the Latin American cases, especially in relation to the problems related to the dependency on foreign providers of technology, proprietary platforms and the lack of local digital capacity. It has been pointed out by the interviewees from Peru, Ecuador and Colombia that being too dependent on foreign technologies can be problematic in terms of sustainability due to the lack of system customization, knowledge transfer, cybersecurity management and the maintenance of institutional autonomy. Fifth, the theme of "Inter-Agency Coordination as a Structural Problem" was highlighted as the key barrier to interoperability, since it is the structural problems within government agencies that hinder interoperability.

Recommendations, Implications and Suggestions

In this regard, some important implications of this study can be mentioned for policymakers and the authorities of public administration who are undertaking digital transformation projects. First of all, since political leadership and institutional commitment were revealed as the two most influential predictors of the success of implementing e-governments ($\beta = 0.284$, $p < 0.001$), it is vital that governments have clear strategies regarding their digital transformation process, which are driven by leadership, commitment, and organizational coordination. Moreover, there is a need to focus on enhancing the ICT human capital in public institutions via continuous training programs, skill-building programs, and other knowledge-based programs. It is also important that the legislation in place is

improved in order to offer legal certainty for digital transactions, cybersecurity, and data governance. Interoperable digital architecture is needed in government institutions to avoid fragmented systems and improve information sharing among institutions.

Theoretically, the current study contributes to the field of e-government by merging three established theories into one framework applicable in the country context. The developed and validated model shows that in order to have a successful digital transformation process, the combination of technological readiness, institutional capability, adaptability, and social acceptance needs to be taken into account. In future applications, citizen-centered approaches, sustainable budget planning, and dynamic governance approaches need to be considered to make digital government initiatives more effective in the long run. As a recommendation for future research, it is suggested that longitudinal studies be conducted to explore how success factors change over time, more countries in the developing world be considered for validating the current findings, and applications of e-government in different sectors such as health care and education be explored.

Conclusions, Limitations, and Future Research

This research sought to explore the critical success factors affecting the successful implementation of e-government in developing countries through building and validating a holistic framework that takes into account the technology, institutional, organizational and human aspects. An explanatory sequential design involving both quantitative and qualitative methods was used for analysis of data obtained from 174 senior officials and ICT directors in Peru, Ecuador and Colombia using partial least squares – structural equation modeling. The results revealed that the digital transformation of public administration in developing countries is affected not only by the technological aspect but also by the institutional one and by the citizen-oriented nature of governance. The structural model revealed high explanatory and predictive power, yielding $R^2 = 0.673$ and $Q^2 = 0.589$, respectively. Political leadership and institutional commitment emerged as the most influential critical success factors on e-government implementation success ($\beta = 0.284$, $p < 0.001$), followed by ICT human capital ($\beta = 0.231$, $p < 0.001$), technological infrastructure ($\beta = 0.198$, $p < 0.001$), and regulatory framework ($\beta = 0.176$, $p < 0.001$). Also, interoperability, citizen trust, and budget sustainability were confirmed as the relevant factors contributing to sustainable digital transformation. However, despite all these positive aspects, there are still some limitations for this research. First of all, it is focused only on three Latin American countries, which does not allow its results to be generalized to other developing regions. Second, due to the fact that the research design is cross-sectional, it cannot provide full information about the development of the discussed processes over time. Finally, the study used self-reported answers from the respondents, which might have resulted in perceptual bias. Future studies should be focused on longitudinal studies, wider geographical coverage, and sectoral studies.

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