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Sustainability of E-Government Initiatives: Evidence from Gauteng Provincial Government, South Africa

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Abstract: This study examined the sustainability of e-government initiatives in the Gauteng Provincial Government, where sustainability refers to the long-term viability, adaptability, and institutional integration of digital public services. We used the Delphi method to gather expert consensus from nine professionals over three iterative rounds of anonymized questionnaires. Findings revealed that sustainability was impeded by infrastructural deficiencies, limited digital literacy, and fragmented interdepartmental coordination. Despite these challenges, experts emphasized that transparency, citizen engagement, and inclusive digital capacity building offer viable pathways for enhancing long-term impact. We concluded that sustainable e-government requires strategic planning, coordinated governance, investment in foundational ICT infrastructure, and a commitment to participatory digital transformation. These findings contribute to the discourse on e-government in developing contexts by offering policy-relevant recommendations grounded in expert insight.

Keywords: Public Sector Management; Governance; Delphi; Strategic Planning; Digital Transformation

JEL Classification: D73; H11; H83; O33; O38

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1. Introduction

E-government, or the use of information and communication technologies (ICTs) to deliver public services, has evolved as a distinctive feature of contemporary governance. Governments around the world are investing more in e-government platforms to increase administrative efficiency, transparency, and citizen participation (Bolívar et al., 2025). In Africa, e-government is widely regarded as a strategic tool for socio-economic development, offering the potential to overcome infrastructural and institutional challenges through digital innovation (Rarhoui, 2024).

South Africa, as one of the continent's most advanced economies, has made significant progress in adopting e-government at national and sub-national levels (Nkomo, 2021). Within the country, Gauteng Province the economic hub has positioned itself as a leading site of digital transformation. Yet, despite this progress, many of Gauteng's e-government initiatives continue to face obstacles that threaten their long-term viability (Rarhoui, 2024). The sustainability of these systems their ability to endure, adapt, and consistently deliver public value remains both critical and insufficiently examined in existing research.

Drawing on frameworks such as the Brundtland Commission's definition of sustainable development (Auty et al., 2021) and the Triple Bottom Line (Naveed et al., 2024), this study conceptualizes sustainable e-government as the ability of digital public service initiatives to remain operational, inclusive, and effective over time. This includes economic feasibility, social equity, institutional resilience, and alignment with broader development goals such as the UN Sustainable Development Goals (SDGs).

While the global literature on e-government has expanded rapidly, empirical research on sustainability in developing country contexts particularly at the provincial or municipal level remains limited (Pandey et al., 2022). Most existing studies emphasize implementation barriers or technological readiness but do not examine what enables e-government systems to persist and adapt amid resource constraints, fragmented governance, and socio-political complexity. Moreover, few studies focus specifically on Gauteng Province, despite its importance in South Africa's digital governance landscape.

This study seeks to fill that gap by investigating the institutional, infrastructural, and social factors that influence the sustainability of e-government initiatives in the

Gauteng Provincial Government (GPG). The study addresses the following research question:

What factors contribute to or hinder the sustainability of e-government initiatives in the Gauteng Provincial Government, and how can these be addressed to enhance long-term impact?

The contributions of this study are as follows:

1. *Theoretical Contribution:* The study advances the conceptual understanding of sustainable e-government by synthesizing sustainability theory with digital governance literature, offering a multidimensional framework for assessing long-term viability in developing contexts.

2. *Empirical Contribution:* It provides original, expert-driven evidence from Gauteng Province, an understudied but strategically significant provincial context using the Delphi method to identify priority challenges and opportunities for sustainable digital transformation.

3. *Methodological Contribution:* By employing a structured Delphi approach, the study demonstrates the value of consensus-building techniques for complex, interdisciplinary questions where conventional data may be limited.

4. *Practical Contribution:* The findings yield actionable insights for policymakers and practitioners, including recommendations on infrastructure investment, digital literacy development, interdepartmental coordination, and citizen trust-building mechanisms.

By addressing a critical gap in the literature and providing grounded policy guidance, this study contributes to ongoing efforts to design resilient, inclusive, and future-ready e-government systems in South Africa and similar developing regions.

The structure of the paper is as follows: Section 2 reviews the literature on e-government sustainability, Section 3 describes the research methodology and outlines the materials and methods employed in the study and presents the discussion of results, Section 4 presents the discussion of findings, and Section 5 concludes with recommendations.

2. Literature Review

The sustainability of e-government initiatives in South African municipalities is widely recognised as contingent not solely on technological deployment, but also on the institutional capacity, governance culture, and citizen participation that underpin their operation (Omweri, 2024). E-government is defined as the systematic use of information and communication technology (ICT) to improve service delivery, transparency, and civic involvement (MacLean et al., 2022). Scholarly debates emphasise that its long-term viability arises from the interplay between enablers and barriers (Reddy et al., 2022) and Figure 1 depicts a conceptual representation of the connection.

2.1. Enablers of E-Government Sustainability

Robust ICT infrastructure constitutes a foundational enabler, providing the technical capacity for reliable, secure, and scalable service provision. In the South African context, disparities in broadband access, cybersecurity safeguards, and systems interoperability remain acute (Singh et al., 2025), making targeted infrastructural investment imperative. Equally salient is capacity building, particularly the cultivation of advanced digital literacy and adaptive competencies among municipal. Without these skills, technology adoption risks superficial uptake and operational inefficiency (Distel et al., 2022).

Governance-oriented enablers, including transparency and accountability, have been shown to reinforce public trust and legitimacy (Abdulnabi, 2024). Mechanisms such as open-data portals, performance dashboards, and participatory budgeting platforms can demystify bureaucratic processes and institutional decision-making (Islam, 2025). Yet, as Wong et al. (2023) caution, the mere publication of data is insufficient; content must be relevant, interpretable, and underpinned by stringent privacy safeguards to generate genuine citizen engagement. The citizen engagement dimension in Figure 1 extends beyond tokenistic consultation, encompassing continuous, two-way interaction between the state and the public across both digital and offline domains.

2.2. Barriers to E-Government Sustainability

The literature identifies structural and socio-political impediments that correspond directly to the barriers depicted in Figure 1. The digital divide, exhibited as unequal access to connections, devices, and skills, exacerbates disparities in service uptake (Omweri, 2024).

Organizational and institutional restrictions, such as rigid hierarchies, compartmentalized activities, and insufficient interdepartmental coordination, impede digital platform integration. The trust gap, which results from perceptions of corruption, unreliable services, and privacy risks, hinders the use of online systems (Shankar et al., 2002). Finally, financial and structural constraints, particularly in under-resourced municipalities, impede the ability to maintain ICT investments and innovation (Osah et al., 2020).

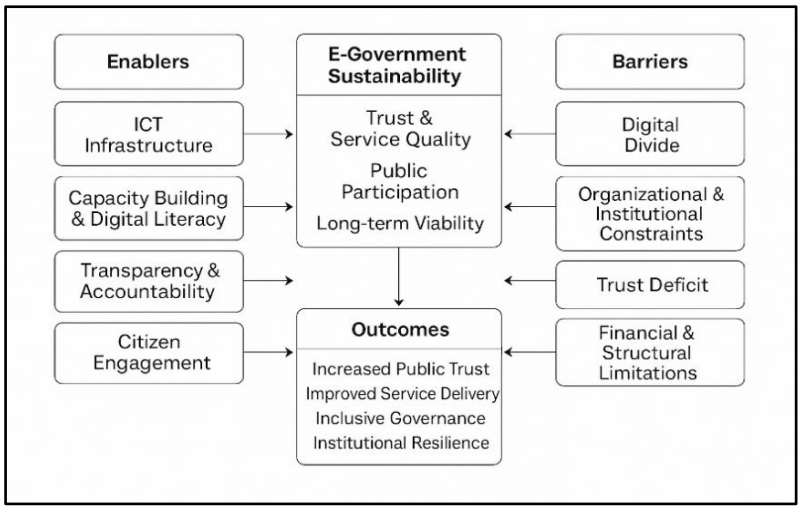

Figure 1. Conceptual framework

Figure 1 depicts the E-Government Sustainability Framework, which was modified from integrative models in the e-government literature (Luna-Reyes et al., 2012; Gupta et al., 2016; Gacitúa et al., 2021). The framework depicts the dynamic relationships among enabling conditions, constraining factors, sustainability dimensions (trust and service quality, public participation, and long-term viability), and the resulting governance outcomes. Within this study, the framework serves as both a diagnostic tool and a conceptual lens for investigating e-government efforts

in the Gauteng Provincial Government, allowing for a systematic examination of how the combination of enablers and obstacles influences long-term results.

2.3. Critical Gaps and Future Research Imperatives

According to recent studies, e-government transformation requires a multifaceted, systemic strategy that integrates organizational, legal, ethical, sociocultural, and technical factors (Omweri, 2024). Emerging technologies like block-chain for tamper-evident record-keeping and artificial intelligence for predictive analytics are frequently mentioned as ways to improve resilience and adaptability (Panday, 2024). However, in order to prevent escalating inequality, these innovations must be incorporated into strong governance, ethical, and policy frameworks. The longitudinal reach of empirical research in South Africa is still restricted; few studies compare performance across provinces or trace the longevity of changes over lengthy periods of time.

This study addresses these gaps by applying the framework in Figure 1 to examine institutional, infrastructural, and strategic determinants of sustainability in Gauteng Province, generating evidence-based insights to inform more inclusive, accountable, and adaptive digital governance.

This paper seeks to critically explore the sustainability of e-government initiatives within the Gauteng Provincial Government in South Africa. By investigating the institutional, infrastructural, and strategic dimensions that shape the long-term success of these digital governance efforts, the paper contributes to both scholarly discourse and practical policy-making. In doing so, it offers evidence-based insights that can support more effective governance, enhance citizen participation, and align public service delivery with broader sustainable development goals.

3. Research Methodology

3.1. Material and Methods

The Delphi method was adopted as the core research approach due to its unique capacity to synthesise expert knowledge in areas where empirical evidence is fragmented, context-specific, or non-standardised. E-government sustainability in provincial governance contexts is characterised by rapidly evolving technological, political, and socio-economic conditions, making longitudinal empirical

measurement difficult (Abbas et al., 2024). Unlike survey-based methods that capture only static perceptions, Delphi's iterative structure supports reflection, reconsideration, and convergence of opinion over successive rounds, enhancing conceptual clarity (Schifano et al., 2025).

While Delphi originated in the 1950s, it has undergone methodological refinements and remains a recognised tool in technology forecasting, ICT governance, and policy-oriented research (Belton et al., 2022). Recent e-government studies continue to adopt Delphi when: (i) the research domain involves multi-dimensional constructs not easily reducible to single indicators, and (ii) expert consensus is required to frame policy priorities (Harvey, 2024; Nusir et al., 2024). These conditions are directly relevant to the Gauteng Province's case.

The sustainability of e-government initiatives cannot be evaluated solely on the basis of technical performance indicators; it requires integration of policy, governance, capacity, and citizen adoption considerations (Umbach et al., 2022). The Delphi method was adopted because:

1. Data limitations: GPG's e-government initiatives have incomplete longitudinal datasets, limiting purely quantitative modelling.

2. Complexity of variables: Sustainability depends on interacting institutional, technological, and social factors that demand qualitative and expert-driven evaluation.

3. Consensus-building need: Policymaking benefits from a consolidated expert view to prioritise interventions amidst resource constraints.

A purposive sampling strategy was applied to recruit nine experts who met stringent eligibility criteria designed to ensure relevance, credibility, and diversity of perspectives. The criteria were:

- *Professional experience:* Minimum of 10 years in e-government implementation, ICT policy, or related governance roles.

- *Demonstrable expertise:* At least one peer-reviewed publication, government policy contribution, or technical report on ICT governance or e-government.

- *Sectoral representation:* Inclusion from government (policy and operations), academia (research and evaluation), private sector (technical and service provision), and consultancy (implementation oversight).

- *Provincial relevance:* Direct involvement or advisory role in projects linked to GPG or other South African provincial e-government systems.

The final panel comprised:

- 2 Government IT professionals (direct operational knowledge of GPG digital infrastructure)
- 3 Academics (specialists in e-government frameworks and digital inclusion)
- 2 Private-sector experts (service delivery and cybersecurity)
- 2 Consultants (evaluation of public ICT projects)

This composition allowed triangulation between policy intent, technical feasibility, and practical implementation realities, as shown in Table 1, which summarizes the expert profiles. While small, this sample size aligns with recommended Delphi ranges of 7–15 experts for highly specialised domains, where depth of expertise outweighs breadth of representation (Franc et al., 2023). Experts were identified through a multi-stage process:

1. Document review of published research, government strategy papers, and technical reports to identify individuals with substantive contributions to South African e-government discourse.

2. Professional network mapping through academic, governmental, and ICT industry associations to validate candidates' reputations and ensure sectoral diversity.

3. Eligibility screening against the criteria above, with emphasis on GPG-specific knowledge.

4. Invitation and consent, including disclosure of research aims, expected time commitment, and anonymity provisions.

3.1.1. Questionnaire Design

Questionnaires were grounded in constructs derived from established e-government and sustainability frameworks, including digital infrastructure, strategic alignment, citizen engagement, transparency, and digital literacy. Questions were designed to solicit evaluative judgments rather than generic confirmations, thereby aligning responses with theoretical constructs and avoiding over-simplified prompts.

Table 1. Expert Profiles

##	*Sector*	*Years of Experience*	*Relevant Publications Contributions*
E1	Government IT	13	Led GPG's digital services integration project
E2	Government IT	11	Co-authored provincial ICT infrastructure plan
E3	Academia	16	Published on e-government policy frameworks
E4	Academia	14	Research on ICT adoption in public sector
E5	Academia	10	Studies on digital literacy in governance
E6	Private Sector	18	Developed cloud-based solutions for public services
E7	Private Sector	12	Advised on cybersecurity frameworks
E8	Consultancy	15	E-government implementation reviews
E9	Consultancy	12	Digital transformation strategy reports

3.1.2. Delphi Implementation

A three-round Delphi sequence was conducted:

Round 1: Open-ended elicitation of perceived sustainability drivers and barriers.

Round 2: Structured questionnaire rating and ranking of identified factors.

Round 3: Re-ranking after presentation of aggregated panel feedback to facilitate convergence.

Two-week intervals between rounds ensured sufficient reflection without loss of engagement. Attrition was zero, indicating strong participant commitment. The panel size was determined in line with best practices for Delphi studies, ensuring diversity and representativeness across stakeholder groups, as presented in Table 2, which outlines the distribution of experts across the three Delphi rounds.

Table 2. Delphi experts' panel size

Experts	***Number***
Government IT Professionals	2
Academia	3
Private Sector	2
Consultancy	2

3.1.3. Sustainability Index Construction

Following the Delphi rounds, thematic dimensions were weighted based on the mean rankings from Rounds 2 and 3. Sub-element scores within each dimension were aggregated and normalised to produce a Sustainability Index (SI) for the GPG e-government context. The sustainability index was constructed by integrating multiple dimensions, economic, social, technical, and institutional sustainability, each weighted through expert consensus, as detailed in Table 3.

Table 3. Sustainability Index Construction

Dimension	*Sub-elements*	*Weighting Method*	*Aggregation Formula*	*Score*
Digital Infrastructure (D)	Connectivity, Interoperability, Security	Mean rank across R2–R3	$SI_D = \frac{(\Sigma \text{ sub-element scores})}{n}$	0.78
Strategic Alignment (S)	Policy Coherence, Budget Integration	Mean rank across R2–R3	$SI_S = \frac{(\Sigma \text{ sub-element scores})}{n}$	0.72
Citizen Engagement (C)	Accessibility, Feedback Mechanisms	Mean rank across R2–R3	$SI_C = \frac{(\Sigma \text{ sub-element scores})}{n}$	0.69
Transparency & Accountability (T)	Open Data, Audit Mechanisms	Mean rank across R2–R3	$SI_T = \frac{(\Sigma \text{ sub-element scores})}{n}$	0.74
Digital Literacy (L)	Public Training, Staff Capacity-Building	Mean rank across R2–R3	$SI_L = \frac{(\Sigma \text{ sub-element scores})}{n}$	0.65
Composite SI ($Total$)	—	Mean of all dimensions	$SI_{Total} = \frac{(\Sigma SI_X)}{m}$	0.72

3.1.4. Methodological Contribution

This study will use a modified Delphi approach to evaluate the sustainability of e-government inside the Gauteng Provincial Government. It promotes academic knowledge as well as practical policy direction by incorporating methodological improvements such as construct-linked instruments, clear expert qualification standards, and quantified consensus thresholds. The Sustainability Index that results provides a systematic, empirically grounded instrument for assessing the relative importance of sustainability elements, helping to evidence-based digital governance planning.

4. Presentation and Discussion of Results

This study used a three-round Delphi approach with a panel of nine experts to identify major success factors and obstacles affecting the sustainability of e-government projects in the Gauteng Provincial Government of South Africa. The analysis of expert replies intends to enrich policy frameworks and strategic planning for the region's long-term digital governance sustainability.

The findings demonstrate a complex interplay of institutional, infrastructural, and social elements that determine the course of e-government deployment. One notable subject that arose was the critical significance of digital infrastructure. Limited connection and uneven access to digital services were often identified as important barriers, particularly in underprivileged populations. These limits not only impede service delivery, but they also deepen the digital divide, weakening attempts to assure equitable access to government services. Strategic and operational collaboration across government ministries has also emerged as a major concern. Fragmentation and a lack of interdepartmental integration were shown to cause duplicative efforts and misaligned initiatives. Improving cross-departmental communication was thus emphasized as critical to establishing a coherent and effective digital governance framework.

Equally, the importance of citizen engagement was strongly emphasized. Experts noted that the design and delivery of e-government services must be user-friendly and inclusive, accompanied by targeted digital literacy initiatives that empower citizens to access and use these platforms confidently. Greater citizen participation not only improves adoption rates but also strengthens democratic accountability.

Transparency and accountability were further identified as foundational to sustainable e-government. Enhanced openness in government processes fosters public trust and encourages civic involvement. The development of digital competencies, particularly among public sector employees, was seen as critical. The capacity of government personnel to manage and innovate within digital platforms directly influences the effectiveness and adaptability of e-government systems.

Despite these challenges, the study also revealed several opportunities for strengthening e-government sustainability. Experts highlighted the potential of mobile technologies as a strategic enabler, particularly due to their widespread penetration and accessibility. Mobile platforms offer a convenient, personal means of service delivery that can reach broader segments of the population. In addressing

the digital divide, the expansion of digital skills training and the promotion of equitable access to technology were seen as priority interventions.

Governance frameworks also help to shape long-term digital change. The study lends credence to the concept that inclusive governance, defined by diversified ownership structures and gender participation on decision-making boards, can improve accountability and strategic supervision (Irani et al., 2023). Integrating sustainability objectives into organisational performance measurements, such as pay systems, was also proposed as a means of matching institutional aims with long-term development results.

Poor interdepartmental coordination and insufficient cohesiveness were recognized as ongoing barriers to implementation, mirroring previous study findings (Mohammed, 2024). To minimize these impediments, it was suggested that governance frameworks be strengthened to increase internal controls and that leadership structures be made more inclusive.

The study provides both theoretical and practical contributions. From a policy standpoint, the findings offer specific suggestions for designing and implementing more robust and inclusive e-government systems. This paper presents a comprehensive framework for improving digital governance in Gauteng and comparable contexts, with a focus on digital literacy, organisational integration, and strategic infrastructure investment.

In the first phase of the Delphi process, an open-ended questionnaire was distributed to nine experts with extensive experience in the design, implementation, and assessment of e-government programs. These professionals came from a variety of backgrounds, including public administration, ICT policy, digital transformation, and provincial planning, and were chosen for their extensive knowledge of the local government context. Anonymity was preserved to enable independent, unbiased contributions consistent with the Delphi technique.

The first-round responses provided rich qualitative insights into how sustainability is conceptualised in the context of digital governance. Experts broadly agreed that sustainability extends beyond technological continuity to include institutional resilience, ongoing citizen value, policy adaptability, and user uptake. Moreover, they identified a number of enabling and inhibiting factors, including infrastructural deficits, limited funding, and political will, as well as the need for stakeholder collaboration, public trust, and capacity development.

These findings underscore the multidimensional nature of e-government sustainability and the importance of a context-sensitive, systems-based approach. By capturing diverse expert perspectives, this study addresses a critical gap in the South African e-government literature and offers a foundation for more effective and sustainable digital transformation in the public sector.

Key Challenges Identified

- *Digital Infrastructure Deficiencies:* All nine experts cited persistent challenges with foundational digital infrastructure as a core impediment to sustainability. This includes outdated ICT systems, unreliable internet connectivity in peri-urban and rural areas of Gauteng, and inadequate maintenance of e-government platforms.

- *Digital Divide and Inclusion Gaps:* A majority of experts emphasized that the digital divide particularly disparities in digital literacy, access to devices, and connectivity significantly undermines the inclusive uptake of e-government services. This view aligns with global literature highlighting the socio-economic dimensions of digital exclusion.

- *Weak Interdepartmental Coordination:* Seven experts pointed to fragmented coordination across provincial departments, noting siloed decision-making, duplication of digital efforts, and a lack of shared strategic vision. One expert remarked that "even where digital tools exist, they are not being leveraged synergistically across departments."

- *Policy Inconsistencies and Leadership Turnover:* Several respondents noted that the frequent turnover of political and administrative leadership often results in shifting priorities, policy discontinuity, and the stalling of long-term digital initiatives. This instability was described as "a systemic vulnerability" by two participants.

Key Opportunities and Enablers

- *Enhanced Citizen Engagement and Co-creation:* Six experts argued that sustainable e-government requires more than top-down service delivery. They advocated for models that integrate citizen feedback, participatory design, and digital civic engagement to build trust and relevance over time.

- *Building Digital Competencies within Government:* Eight experts stressed the importance of upskilling public servants at all levels to foster digital literacy,

adaptability, and innovation. Without internal capacity, one expert noted, "even the best digital policy remains aspirational."

- *Strategic Alignment and Long-Term Planning:* A recurring recommendation was the institutionalization of long-term digital strategies that transcend political cycles. Experts argued for evidence-based roadmaps that align with provincial development goals and embed digital sustainability at the core of governance reform.

- *Transparency and Accountability Mechanisms:* Finally, respondents highlighted the role of digital platforms in enhancing transparency, improving public accountability, and creating more responsive governance systems. Several experts cited successful pilots within Gauteng where digital tools enabled real-time reporting and service tracking.

Although total agreement was not reached in the first round, there was a noticeable thematic overlap about the main enablers and constraints affecting the sustainability of e-government. This convergence gave the Delphi research a strong foundation for moving on to the following stage. Both subject area competence and a thorough comprehension of the unique environment inside the Gauteng Provincial Government were demonstrated by the experts' high level of participation. These elements supported the choice to move forward with the next round. In order to move the process closer to broader consensus, the second round of the questionnaire was created using the insights obtained to further evaluate and rate the relevance of the emerging themes.

4.1. Round Two Results

During the second round of the Delphi process, a structured questionnaire was distributed to the same panel of nine experts who had participated in the initial round. The primary aim of this phase was to build on the preliminary insights and move closer to a consensus regarding the key factors influencing the sustainability of e-government initiatives within the Gauteng Provincial Government. Drawing from the themes identified in Round One, the second-round instrument included a series of statements grouped under five core dimensions: Digital Infrastructure, Digital Inclusion, Institutional Capacity, Policy and Leadership Stability, and Citizen Engagement.

Participants were asked to express their level of agreement with each item using a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). To ensure

objectivity and encourage honest feedback, all responses were anonymised, consistent with the principles of the Delphi technique.

The collected data was subjected to descriptive statistical analysis to assess the level of consensus among experts. This included calculating measures of central tendency (mean and median) as well as dispersion (standard deviation and interquartile range). In line with standard Delphi methodology, an interquartile range (IQR) of one or less was used as the benchmark for determining consensus across the responses, as summarized in Table 4.

Table 4. Summary of Round Two Expert Responses

Theme	*Statement*	*Mean*	*Median*	*SD*	*IQR*	*Consensus*
Digital Infrastructure	Inadequate digital infrastructure is a major barrier to sustainability.	4.78	5.0	0.44	0	Yes
	Outdated ICT systems hinder cross-departmental collaboration.	4.56	5.0	0.53	1	Yes
Digital Inclusion	The digital divide severely limits citizen access to e-government services.	4.67	5.0	0.50	1	Yes
	Digital literacy programs are insufficient to support widespread adoption.	4.33	4.0	0.71	1	Yes
Institutional Capacity	Lack of skilled ICT professionals in the public sector weakens implementation	4.56	5.0	0.53	1	Yes
	There is inadequate funding for ongoing system maintenance and upgrades.	4.44	4.0	0.53	1	Yes
Policy and Leadership Stability	Frequent changes in leadership disrupt e-government continuity.	4.67	5.0	0.50	1	Yes
	There is a lack of a long-term digital strategy aligned with provincial goals.	4.22	4.0	0.67	1	Yes

Citizen Engagement	Citizen participation in e-government design is minimal.	4.11	4.0	0.78	1	Yes
	E-government initiatives would benefit from stronger community feedback loops.	4.56	5.0	0.53	1	Yes
Transparency & Accountability	Digital platforms enhance government transparency.	4.44	4.0	0.73	1	Yes
	There is insufficient use of data analytics to monitor service delivery.	4.33	4.0	0.71	1	Yes
Strategic Planning	E-government sustainability requires integration across departmental plans.	4.67	5.0	0.50	1	Yes
	Sustainability is not adequately embedded in current e-government policies.	4.00	4.0	0.71	1	Yes
	Political will remains inconsistent across provincial leadership.	4.44	4.0	0.53	1	Yes

- There was a high degree of consensus across all 15 items, as evidenced by IQR values of 1 or lower. This indicates a strong convergence of expert opinions regarding the key factors affecting the sustainability of e-government initiatives in Gauteng.

- The strongest agreement was observed in statements related to digital infrastructure, leadership stability, and strategic planning.

- Although agreement was slightly more variable in items related to citizen engagement and digital literacy, these also met the consensus threshold, suggesting recognition of their importance albeit with differing views on current levels of implementation.

- Experts consistently emphasized the interconnected nature of these themes, highlighting that the absence of progress in one domain (digital infrastructure) adversely impacts others (inclusion and institutional capacity).

The insights gathered in this round served as the basis for refining the statements presented in the final stage of the Delphi process. This concluding round aimed to validate the identified priorities and generate a ranked set of actionable recommendations tailored to inform policy and practice within the Gauteng Provincial Government.

4.2. Round Three Results

In the third and final round of the Delphi process, the refined questionnaire was in the third and concluding stage of our Delphi study, we re-circulated a streamlined questionnaire to the same nine specialists who had engaged in the earlier rounds. This final survey asked them to confirm and prioritise the thematic dimensions identified previously, rating their agreement with ten distilled statements on a 5-point importance scale (where 1 denotes "Not Important" and 5 signifies "Critically Important").

As shown in Table 5, the aggregated responses reveal a strong degree of convergence: most items achieved an interquartile range of one or less—our pre-established benchmark for consensus. We further quantified the level of agreement and the spread of opinions by calculating means and standard deviations for each statement, thereby providing a clear statistical picture of which factors the expert panel deemed most vital to the enduring success of e-government initiatives in the Gauteng Provincial Government.

Table 5. Final Round Expert Consensus

#	*Statement*	*Mean*	*SD*	*IQR*	*Consensus*
1.	Limited digital infrastructure impedes sustainability.	4.89	0.33	0	Yes
2.	The digital divide restricts equitable access to e-government services.	4.78	0.44	1	Yes
3.	Inadequate interdepartmental coordination limits system integration.	4.67	0.50	1	Yes
4.	Enhancing digital competencies among civil servants is essential.	4.78	0.44	1	Yes
5.	Embedding long-term strategic planning into digital initiatives is critical.	4.89	0.33	0	Yes
6.	Continuity in leadership is necessary for programme longevity.	4.67	0.50	1	Yes
7.	Institutionalizing citizen engagement mechanisms supports sustainability.	4.56	0.53	1	Yes

8.	Transparent processes foster public trust in digital government.	4.78	0.44	1	Yes
9.	Policy inconsistency across political cycles undermines sustainability.	4.56	0.53	1	Yes
10	Data-driven decision-making is underutilized in current practices.	4.44	0.73	1	Yes

4.3. Analysis and Interpretation

In the final Delphi round, the expert panel reached a clear consensus on the factors most critical to sustaining e-government in Gauteng. Digital infrastructure and long-term strategic planning emerged as top priorities, with both items earning the highest possible agreement (mean = 4.89, IQR = 0), underscoring their foundational importance.

Yet, the experts also underscored that lasting e-government success extends beyond technology alone. Persistent barriers such as the digital divide (mean = 4.78, IQR = 1), fragmented interdepartmental coordination (mean = 4.67, IQR = 1), and gaps in digital competencies among public servants (mean = 4.78, IQR = 1) demand systemic and policy‑level interventions. The fact that all ten statements achieved consensus further validates the relevance and robustness of the themes identified earlier in the study.

On the opportunity side, the panel highlighted several avenues for strengthening sustainability: enhancing citizen engagement (mean = 4.56), embedding transparency in every process (mean = 4.78), and harnessing data analytics to inform decision-making (mean = 4.44). These priorities resonate with broader scholarship on participatory governance and evidence-based public administration, suggesting that fostering open, data-driven, and inclusive practices will be key to enduring digital transformation.

4.3.1. Discussion

This article explores the long-term viability of e-government programmes within the Gauteng Provincial Government using a three-stage Delphi survey of nine experts. By iteratively refining their feedback, the study arrived at a clear consensus on the primary forces that drive or undermine the sustainability of digital governance in a developing-region setting. In doing so, it fills a crucial gap in existing research, illuminating how infrastructural capacity, socio-economic realities, and institutional arrangements uniquely interact to shape e-government outcomes in the Global South.4.3.2. Bridging Knowledge Gaps i -Government Sustainability

Existing sustainability frameworks for e-government have largely been derived from experiences in developed nations, often failing to capture the specific challenges faced by regions like Gauteng. By drawing directly on the insights of local experts, this study addresses that shortfall with fresh empirical evidence. In the initial Delphi round, participants identified several overarching obstacles most notably, outdated digital infrastructure, the persistence of a digital divide, and insufficient collaboration across departments. These themes were then tested in the second and third rounds, where statistical measures (IQR $\leq$ 1) confirmed their centrality to sustainable e‑government deployment.

By validating these factors in a context-sensitive manner, the research lays the groundwork for tailored assessment tools that can guide provincial policymakers in monitoring progress and directing resources where they are most needed—be it in bolstering connectivity, enhancing digital literacy, or strengthening institutional coordination. These findings lend support to literature call for theoretical models that are not only robust but also responsive to the nuances of e-government in developing environments.

4.3.2. Bridging Knowledge Gaps in E-Government Sustainability

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By validating these factors in a context-sensitive manner, the research lays the groundwork for tailored assessment tools that can guide provincial policymakers in monitoring progress and directing resources where they are most needed—be it in bolstering connectivity, enhancing digital literacy, or strengthening institutional coordination. These findings lend support to literature call for theoretical models that are not only robust but also responsive to the nuances of e-government in developing environments.

4.3.3. Infrastructure, Digital Literacy, and Institutional Coordination

Solid digital literacy and a solid infrastructure were unanimously recognized by the expert group as the foundations of successful e-government. According to Manana et al. (2022), the foundation of all other projects must be strong internet connectivity and well-developed digital skills among residents and public personnel.

However, Gauteng continues to have a significant digital gap that restricts fair access to internet services, even with increased investment in ICT. According to the experts, every e-government plan needs to take into consideration the diverse range of user skills, socioeconomic situations, and the noticeable differences between urban and rural settings. To bridge these gaps and ensure long-term survival, extensive digital literacy initiatives and focused infrastructural improvements are therefore crucial.

The panel further highlighted how even the most effective technology solutions are undermined by departmental fragmentation. Digital platforms run the danger of functioning independently in the absence of interoperable technologies and transparent governance frameworks, a finding backed by Malik et al. (2023). Gauteng's agencies must promote integrated procedures and smooth information sharing at all administrative levels in order to fully realize the promise of e-government.

4.3.4. Transparency, Trust, and Citizen Engagement

The study additionally noted the importance of openness in fostering public trust and increasing citizen involvement, two things that are essential to e-government's long-term viability. Echoing the findings of Molina Rodríguez-Navas et al. (2021) on the trust-boosting impact of openness, the expert panel came to a solid consensus that government credibility is increased by publicly providing information about service delivery procedures and choices.

The panel emphasized the importance of integrating public interaction directly into digital platforms in addition to openness. According to Pislaru et al. (2024), who characterize e-government as a tool for participatory governance, governments may promote a more responsive and inclusive system by asking users to join policy debates, co-design services, and provide feedback.

Transparency by itself, however, is insufficient. According to Saeed (2025), individuals' trust in governments is based on their perceptions of system security and usability as well as how effectively and consistently they communicate. Provincial authorities must thus launch persistent outreach and public awareness efforts that

emphasize the useful benefits and security of digital services in order to promote broad adoption.

4.3.5. Implications for Policy, Practice, and Research

Policymakers and e-government Practitioners and can draw several key lessons from these findings:

Commit to a Long-Term Vision: Experts agreed that short electoral cycles and frequent leadership turnover can undermine digital transformation. Embedding e-government goals within a stable, multi-year strategy helps ensure that progress survives political changes and shifting priorities.

Invest in Capacity-Building: Digital skills are not an optional extra, they are the foundation upon which sustainable e-government rests. Training programmes should target everyone from front-line service staff to senior managers, and extend to citizens and private sector partners who interact with government platforms.

Harness Data for Continuous Improvement: While data analytics remains underused in many public agencies, it offers powerful tools for understanding user needs, measuring service performance, and identifying areas for refinement. By adopting evidence-based governance models, governments can make more informed, proactive decisions that keep digital services relevant and efficient.

Align with Broader Development Goals: Finally, this study situates e-government within the larger framework of sustainable development. By championing inclusivity, transparency, and accountability, digital initiatives can contribute directly to national and global objectives—transforming not only how services are delivered, but also how citizens engage with and trust their institutions.

Together, these insights underscore that successful e-government is as much about people, processes, and policy as it is about technology. When governments embrace this holistic approach, digital transformation becomes a driver of innovation, resilience, and citizen empowerment.

5. Conclusion

E-government sustainability in the Gauteng Provincial Government emerges from the interplay of infrastructural, socio-economic, and institutional forces. Our findings demonstrate that robust strategic planning, targeted investment in digital

infrastructure, the cultivation of digital literacy, and seamless coordination across departments are indispensable for lasting success. Crucially, the Delphi exercise highlighted the necessity of tailoring these efforts to the specific conditions of developing regions like Gauteng, where resource constraints and governance dynamics differ markedly from those in more affluent settings.

Although the study uncovered promising avenues such as, leveraging transparency, deepening citizen involvement, and streamlining administrative processes, persistent obstacles remain. Uneven infrastructure, a widening digital divide, and siloed decision-making all undermine the potential of e-government platforms. In practice, this means that digital initiatives must be integrated with broader efforts to build public trust, enhance institutional capacity at every level, and embed principles of openness and responsiveness into the very fabric of governance.

Sustainable digital transformation is therefore not simply a matter of deploying new technologies. It requires continuous engagement with stakeholders, mature institutions capable of adaptive learning, and coherent policies that align technological innovation with inclusive development goals and democratic principles.

5.1. Policy Recommendations

Based on the findings, the following policy recommendations are proposed to enhance the sustainability of e-government initiatives in the GPG and similar contexts:

- *Invest in Foundational Digital Infrastructure:* Expand broadband access, ensure reliable internet connectivity across urban and rural areas, and upgrade legacy systems to support integrated digital platforms.

- *Prioritize Digital Literacy and Capacity Building:* Implement targeted training programs for both government employees and citizens to improve digital skills, with particular focus on marginalized groups to bridge the digital divide.

- *Enhance Strategic Interdepartmental Collaboration:* Develop formal coordination mechanisms to prevent siloed operations, facilitate data sharing, and align departmental objectives with broader e-government strategies.

- *Strengthen Transparency and Citizen Trust:* Institutionalize mechanisms for open data, real-time service feedback, and participatory decision-making to foster trust and engagement with digital platforms.
- *Institutionalize Long-Term Strategic Planning:* Establish sustainable governance structures and policy frameworks that outlast political cycles, ensuring continuity in e-government vision and implementation.
- *Incorporate Monitoring and Evaluation Tools:* Develop performance indicators to regularly assess the effectiveness, efficiency, and impact of e-government initiatives, allowing for adaptive management and course correction.

5.2. Strategic Recommendations

All stakeholders, including companies, local communities, non-governmental groups, and traditional authority figures, should view effective e-Government policies as important in accelerating e-Government initiatives. These policies are essential mechanisms for service delivery. For digital efforts to be successful, mechanisms that guarantee efficient stakeholder interaction and mapping must be developed. Policies that encourage and enhance government service delivery by tackling slow adoption of ICT are necessary for the long-term viability of e-government initiatives.

Governments that wish to improve efficiency, accountability, and transparency may find that digital transformation is a major force behind change. E-government promotes modern governance ideals including transparency, participation, and public involvement, which lowers costs and improves quality. To boost economic growth, enhance public services, and increase citizen participation, governments must invest in digital technology. E-government speeds up service delivery, improves accountability and transparency, and boosts public involvement. Additionally, by enhancing openness and enabling external monitoring of internal activities, e-government promotes faith in government institutions and programs. The intricate link between openness and trust is shown by the fact that perceptions of transparency can occasionally erode trust.

As a result, inclusive e-government efforts should guarantee that all individuals have equal access to digital services and information, irrespective of their socioeconomic background or geographic location. In order to evaluate the impact and efficacy of e-government programs, governments must also create precise metrics and

assessment frameworks. They should use data-driven insights to improve program design and influence policy choices. To optimize its impact, e-government necessitates changes to leadership styles, organizational structures, and public-private partnerships. It is a fundamental shift in governance. By taking a comprehensive strategy that tackles infrastructure issues, encourages digital inclusion, and stimulates creativity, Gauteng can fully realize the promise of e-government to enhance the quality of life for its people and advance sustainable development.

To find and fix shortcomings, governments should keep a close eye on e-government results in relation to key performance metrics and benchmark against global norms. To encourage accountability and transparency, they should also support open data projects that make government information accessible to companies and individuals. E-government is a strategic instrument for improving public involvement, reforming governance, and advancing sustainable development; it is more than merely the use of technology. E-government integration enhances local governance, fights corruption, and encourages more openness. Additionally, it fosters an educated and involved community and guarantees responsibility.

This article offers insightful information on the potential and sustainability issues that the Gauteng Provincial Government's e-government programs face. It will need consistent dedication from the government, corporations, and residents to address these issues and seize the possibilities in order to create a more sustainable, transparent, and inclusive future for Gauteng. E-government has the power to change how citizens and the government interact by encouraging more engagement, accountability and confidence. Data security and uneven access to technology are two challenges that must be addressed as part of this transition. Multi-party cooperation is being made possible by digital communication platforms, which are changing how individuals, corporations, and governments engage. Understanding the nature of e-government's institutional and political transformation is essential to advancing it beyond surface-level enhancements.

5.3. Limitations and Future Research

Although this Delphi research produced valuable, consensus-driven findings, it should be acknowledged that the technique has a number of drawbacks. First, the conclusions may not be as broadly applicable outside of Gauteng's provincial setting

due to its dependence on expert opinion, which is crucial for examining intricate, context-specific concerns. Second, because the study only looked at one area, it might not accurately represent the diverse institutional, infrastructure, and socioeconomic circumstances that exist in other South African provinces or similar jurisdictions outside.

In order to confirm and expand on the qualitative insights produced, future research might enhance this work by combining expert opinions with empirical data obtained directly from e-government users through surveys, use logs, or field observations. Additionally advantageous would be longitudinal designs, which would allow researchers to monitor the long-term effects of technical investments and policy choices on system performance and public involvement. Which tactics work best in various political and organizational contexts may be further clarified by comparative studies conducted in various governance contexts, both domestically and abroad.

Further research on the organizational and cultural elements that support or obstruct digital transformation is also necessary; in particular, the functions of leadership, change management techniques, and institutional learning will be crucial. New technologies like blockchain, artificial intelligence, and big data analytics have a lot of potential to improve transparency, interoperability, and service quality; their practical effects should be carefully considered. Lastly, combining sustainability theory with digital governance frameworks can provide a more comprehensive framework for creating projects that are resilient, egalitarian, and sensitive to the changing demands of residents in addition to being technologically advanced. While this study emphasizes that e-government is much more than a technical advancement, it also lays the groundwork for a research agenda that embraces mixed methods, longitudinal perspectives, and cross-context comparison, all of which are essential steps in transforming digital ambition into long-lasting public value.

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