Increasing Citizen Satisfaction with E-Public Administration: SERVQUAL and Holistic Governance Model in Comparison

(Selected Literature Review)

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Abstract

The computerization of public services, accelerated by the widespread adoption of artificial intelligence (AI), is transforming fundamentally governments' dealings with citizens. The shift away from the older human-to-human to human-to-technology-based interfaces calls for fresh methodologies of measuring the quality of e-public services, particularly within the framing of sustainable and inclusive governance. Amongst the most widely recognized evaluation tools are the SERVQUAL model, measuring the gap between perceived service delivery and citizen expectations, and the Holistic Governance Model (HGM), which takes a more integrated, people-oriented approach across governance dimensions. This paper conducts a comparative literature review of the two frameworks, their relevance and applicability in the United Nations Sustainable Development Goals (SDGs) context, with a focus on Goal 16 (Peace, Justice, and Strong Institutions) and Goal 9 (Industry, Innovation, and Infrastructure). In doing so, it incorporates scholarly research on citizen satisfaction with digital public services and establishes methodological and conceptual trends. To ground these findings in practice, the paper takes a case study of Estonia's X-Road platform to explore how socio-technical integration can contribute towards citizen confidence, institutional accountability, and quality services in digital government in line with broader global efforts to build strong, transparent, and participatory public institutions.

CCS Concepts

• **Social and professional topics** → Digital rights management; Sustainability.

Keywords

citizen satisfaction, e-public service, digitalization, SERVQUAL, holistic governance, Estonian e-governance

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1 Introduction

Digitalization, and more particularly the rapid diffusion of Artificial Intelligence (AI), is widely perceived as a game-changer for the private and public sector alike. Within public administration, one fundamental challenge consists of developing AI governance arrangements that prioritize the public interest, democratic accountability, and long-term societal benefits. This paper argues in favor of a market-shaping approach to AI governance based on anticipatory instead of end-of-pipe regulation [12]. According to [18], security, trust, and effective feedback mechanisms are crucial to ensuring public acceptance and social approval of digital government services. Citizen feedback plays a key role in shaping the future of digital government.

Kim (2022) also pointed out that citizen satisfaction is not only a measure of government performance but also a prominent contributor to public values such as accountability, trust, and social equity (as cited in [18]). Public trust in digital governance systems is essential to the long-term success of e-government projects and is built through citizens' perceptions of public e-services reliability, responsiveness, and transparency [6]. Estonia's X-Road data exchange platform and e-Residency programme are a case in point of how well-designed, citizen-centred e-services can lead to extremely high satisfaction and trust rates, placing the country at the forefront of digital government globally [13, 14]. Similarly, [1] finds a strong correlation between citizen satisfaction and trust and cites the critical role of service quality in driving user take-up and enabling sustainable governance. As technology now assumes a more central role in daily life, digital governance platforms have become necessary to deliver public services efficiently and with transparency. But their success depends not only on technological advances but also on the satisfaction and trust of citizens who utilize them. [12] argued that human-AI collaboration significantly expands the scope of improvement possibilities. While automation replicates existing human capability, AI-based augmentation enables greater possibilities to innovate.

As citizens perceive digital services to be reliable and user-friendly, they would be more inclined to trust and participate actively in such platforms, inducing a positive feedback loop that creates continuous improvement and innovation in digital government. Avila et al. (2011), as cited in [5], noted that the development in technology has significantly enhanced the transparency of governments through the increased access to information for citizens. The development of digital governance, coupled with transparency policies, has created new opportunities for civic engagement and public oversight. Policies of transparency and accountability can bridge the gap between citizens and policymakers, solidifying government-citizen relationships through online platforms.

Further, citizen satisfaction levels bring about higher participation, transparency, and accountability. Citizen satisfaction is not just an objective but an integral element in building and maintaining trust in digital governance systems. [6] cited Fugini et al. (2014) and Carter et al. (2022) and noted how e-government (EG) efforts by utilizing information and communication technology (ICT) can heighten public satisfaction with greater efficiency and accessibility of services. Key benefits of digital governance include: (1) open data policies that allow citizens to access government information efficiently; (2) access to accurate and timely information that enhances government accountability; (3) online platforms that facilitate citizen participation in decision-making through web-based surveys, discussion forums, and electronic consultations; (4) direct interaction between citizens and government agencies; (5) improved efficiency through fewer bureaucratic processes, leading to cost and time savings for the private and public sectors; and (6) robust cybersecurity controls that protect sensitive information, hence promoting trust in digital services.

A case in point is the United Kingdom Government Digital Service, which offers valuable lessons on government digitalization. Digitalization in the UK has significantly improved citizens' satisfaction through user experience refinement, integration of services, and transparency. However, future developments must emphasize universality and simplicity of access to address the needs of different demographic groups [9].

This paper presents a review of existing literature on models used to measure citizens' satisfaction with electronic public administration, focusing on two models: SERVQUAL and the Holistic Governance Model (HGM). The choice of these models is explained by their complementary perspectives and well-documented applications. However, a gap exists in evaluating their potential for use in e-public administration. This paper is founded on the socio-technical systems (STS) theory, as reflected in Industry 5.0 and Society 5.0, which emphasize the balance of both technological and social elements in digital governance. The article illustrates the perspectives through Estonia's X-Road digital platform, a leading example of digital governance.

The structure of the paper is as follows: Section 2 provides an overview of SERVQUAL and HGM. Section 3 compares the models systematically. Section 4 uses Estonia's X-Road platform as a case study. Section 5 addresses the implications of the frameworks for public administration. Section 6 concludes with recommendations for future research.

2 THEORETICAL FOUNDATION

This section provides an overview of the theoretical and methodological foundations of SERVQUAL and the Holistic Governance Model (HGM).

2.1 The SERVQUAL Model

The SERVQUAL model, originally developed by [15], provides a structured approach to evaluating service quality through gap analysis. The model measures discrepancies between citizens' expectations and their actual service experience across five key dimensions: Tangibility, Reliability, Responsiveness, Assurance, and Empathy [15, 16]. Each of these dimensions plays a critical role in assessing and improving service quality, particularly in the context of digital public services.

In recent years, SERVQUAL has been adapted to assess public sector digital services, where traditional face-to-face interactions have shifted to online platforms. The application of SERVQUAL in this domain has led to the expansion of its dimensions, incorporating additional factors that reflect the digital transformation of service delivery. For example, Tangibility in a digital context no longer pertains to physical infrastructure but rather to the user interface, website design, and accessibility features of e-government platforms [21]. Governments have increasingly focused on developing user-friendly digital interfaces to enhance citizen satisfaction, aligning with studies that suggest visually appealing and accessible digital environments positively impact user perceptions of service quality [22].

Reliability in digital public services is associated with system uptime, accuracy of information, and consistency in service delivery. Citizens expect government websites and online portals to function without disruption, provide error-free information, and process transactions securely [7]. Digital service failures, such as website crashes during peak usage or inaccurate information, diminish public trust and contribute to dissatisfaction. Therefore, government agencies must ensure that digital platforms are robust and continuously monitored for reliability.

Responsiveness, which traditionally refers to the willingness of service providers to assist customers, is now reflected in the efficiency of online customer support channels such as chatbots, help desks, and automated responses. Many governments have adopted AI-driven virtual assistants to provide instant responses to citizen inquiries, reducing response times and enhancing user experience [19]. The incorporation of responsiveness metrics into digital service evaluation frameworks aligns with citizen expectations for real-time support and assistance.

Assurance in the digital public sector is linked to cybersecurity, data protection, and the credibility of online services. Citizens need to trust that their personal information is secure when interacting with government digital services [8]. As cyber threats become more sophisticated, governments must implement strong security protocols, transparent privacy policies, and clear communication about data usage. High levels of assurance can improve citizen confidence in using digital public services, which is crucial for achieving widespread digital adoption.

Empathy, which involves personalized and citizen-centric service delivery, has been redefined in digital service frameworks.

Customization features, such as personalized dashboards, targeted notifications, and adaptive service recommendations, demonstrate an empathetic approach by addressing individual user needs. The integration of AI and machine learning in e-government services allows for more personalized experiences, aligning digital service delivery with user preferences and behaviors [3].

Recent research has introduced two additional dimensions to SERVQUAL: the Co-creation gap and the alignment gap. The co-creation gap reflects the extent to which users and service providers collaborate to enhance the service experience [22]. Public sector digital services increasingly incorporate participatory design elements, where citizens contribute feedback to improve service functionality. Open government initiatives, such as crowdsourced policymaking and user-generated content on public platforms, serve as practical examples of co-creation in digital governance.

The alignment gap highlights the mismatch between organizational goals and citizen expectations. Despite strategic digital transformation initiatives, many government agencies struggle to align their service delivery with user-centric needs. Bridging this gap requires a shift from bureaucratic decision-making to agile, iterative development that priorVitizes citizen feedback [19]. Adaptive governance frameworks, where services are continuously refined based on real-time user insights, can help address the alignment gap in public sector digital services.

2.2 The Holistic Governance Model (HGM)

The HGM, introduced by [11], offers a comprehensive approach to governance that integrates various stakeholders, including government agencies, businesses, and civil society. Unlike the SERVQUAL model, which focuses on service quality assessment, HGM presents governance as an interconnected system, emphasizing sustainability, collaboration, and digital transformation.

HGM is characterized by its sustainability focus, aligning governance practices with the UN Sustainable Development Goals (SDGs). Governments worldwide are integrating sustainability into policy frameworks, ensuring that digital transformation initiatives contribute to long-term social, economic, and environmental well-being [24]. For instance, Estonia's e-government model is built on principles of digital sustainability, using blockchain technology to secure data, reduce paper-based transactions, and promote environmental conservation. Such practices illustrate how HGM can be applied to create governance systems that balance technological advancement with sustainable development.

A key component of HGM is multi-stakeholder engagement, which fosters collaboration between public institutions, private enterprises, and citizens. This participatory governance model strengthens trust in public administration by ensuring that policy decisions reflect diverse perspectives [5]. A notable example is the European Union's Open Government Partnership (OGP), which facilitates cross-sector collaboration to improve transparency and accountability. By involving multiple stakeholders in decision-making processes, governments can develop policies that better address societal needs and enhance public trust. Digital governance is another core emphasis of HGM, leveraging technology to enhance transparency, data-driven decision-making, and citizen engagement [4]. The rise of open data initiatives, where governments release datasets for public use, exemplifies HGM's digital governance principles. Countries like the United Kingdom and Canada have implemented open data platforms that allow citizens to access government information, fostering accountability and civic participation. These initiatives demonstrate how HGM's digital governance framework supports the transition toward more transparent and citizen-centric administrations.

Methodologically, HGM employs a mixed-methods approach to assess governance effectiveness. This includes network analysis, which evaluates interactions among stakeholders, and sustainability indicators, which measure governance outcomes [11]. The use of big data analytics in public policy evaluation represents a practical application of HGM's methodological framework. Governments are increasingly using predictive analytics to assess policy impacts, optimize resource allocation, and improve service delivery. For example, Singapore's Smart Nation initiative utilizes data analytics to enhance urban planning, transportation management, and public health services, aligning with HGM's emphasis on evidence-based governance.

Moreover, HGM supports agile policy implementation, enabling governments to adapt to evolving societal challenges [19]. The COVID-19 pandemic highlighted the necessity for flexible governance models, where rapid digital adaptation was crucial for public service continuity. Governments that employed agile methodologies, such as digital contact tracing, online citizen support services, and AI-driven health monitoring systems, demonstrated the practical application of HGM in crisis management. By integrating technology and multi-stakeholder collaboration, HGM facilitates resilient governance structures capable of addressing complex challenges

3 COMPARATIVE ANALYSIS OF SERVQUAL AND HGM

The SERVQUAL model and the Holistic Governance Model (HGM) offer distinct but complementary approaches to evaluating and improving public service quality. While SERVQUAL focuses on assessing service quality from the citizen's perspective [15], HGM emphasizes governance effectiveness through systemic coordination and integration [10]. Besides, while SERVQUAL has been widely used in service industries, including healthcare, education, and customer-oriented public services [3], HGM is more applicable in policymaking and institutional governance [11]. By comparing their strengths, weaknesses, and potential overlaps, it is possible to identify how both models can be leveraged together to enhance digital public administration. Table 1 below provides a comparative summary of the key aspects of both models.

A key strength of SERVQUAL lies in its well-defined dimensions: tangibility, reliability, responsiveness, assurance, and empathy that allow for quantitative analysis of service quality gaps. Its structured methodology makes it highly effective in measuring citizen satisfaction with public services. However, its primary limitation is its reduced applicability to digital services, as it was originally designed for traditional service environments. Additionally, SERVQUAL's heavy emphasis on expectations versus actual

Table 1: Characteristics of SERVQUAL and HGM Model

Aspect	SERVQUAL	Holistic Governance Model (HGM
Primary Focus	Assessing service quality from a consumer perspective [15].	Enhancing governance effectiveness and integration [11].
Key Dimensions	Tangibility, reliability, responsiveness, assurance, empathy	Coordination, integration, internal mechanism, and external factors
Approach	Quantitative, based on gap analysis between expectations and perceptions	Qualitative and systemic, focusing on governance interactions.
Application	Commonly used in the service industry and public sector	Applied in governance and policymaking.
Critiques	Limited application to digital service, overemphasis on expectations	Lack specific references to UN SDGs.

a. Elaborated by the authors

service delivery may not fully account for broader governance dynamics. In contrast, HGM takes a more strategic and systemic approach by focusing on coordination, integration, and both internal and external governance mechanisms. This makes it highly applicable to policymaking and public administration. However, its qualitative and systemic nature can make it less actionable for direct service quality improvements. Moreover, while HGM aligns with broad governance objectives, such as those outlined in the UN Sustainable Development Goals (SDGs), it lacks specific references to these frameworks.

Despite their differences, SERVQUAL and HGM share common goals in improving governance and service quality. SERVQUAL's consumer-focused approach ensures that public service delivery is aligned with the expectations and needs of the public, while HGM's governance interactions perspective ensures that service delivery is integrated within a broader strategic framework. By integrating SERVQUAL's focus on tangible service dimensions with HGM's emphasis on systemic governance, policymakers can create a governance model that is both responsive and structurally sound. For example, digital governance initiatives can benefit from combining SERVQUAL's service evaluation metrics with HGM's systemic coordination mechanisms. Estonia's X-Road platform demonstrates how digital services can be structured efficiently while maintaining high levels of citizen satisfaction. By embedding SERVQUAL dimensions within HGM's broader governance structures, public administrations can create a hybrid model that ensures both service efficiency and long-term strategic coherence.

Both SERVQUAL and HGM exhibit scalability potential but in different ways. SERVQUAL, with its quantitative service quality assessment, is more suited for localized implementations, such as municipal government services, where direct citizen feedback can drive improvements. Its application at the national level may be more challenging due to the complexity of large-scale service delivery systems. Conversely, HGM's broad governance framework makes it well-suited for national-level implementations, where systemic integration and policy coordination are crucial. However, its effectiveness at the local level may be limited unless adapted to smaller-scale governance structures. A hybrid approach—where SERVQUAL informs local service delivery improvements and HGM ensures strategic alignment at higher governance levels—could offer an optimal model for scalable and adaptive digital governance.

4 CASE STUDY: ESTONIA'S X-ROAD DIGITAL PLATFORM

This section gives crucial characteristics of Estonia's X-Road platform as a case study

4.1 Description of the Estonian model

Estonia's X-Road digital platform represents the cornerstone of the country's e-governance ecosystem, enabling secure, decentralized data exchange among more than 900 public and private sector organizations. Established in 2001 as part of the broader "e-Estonia" initiative, X-Road has evolved into a critical socio-technical infrastructure that exemplifies how digitalization can enhance transparency, efficiency, and trust in public administration [25]. By 2025, 99% of public services in Estonia were available online, and 98% of citizens possessed a digital ID, demonstrating the country's exceptional digital maturity [23].

The legal foundation of Estonia's digital government is underpinned by the Public Information Act (2000) and the Data Exchange Layer Act (2017), which mandate interoperability and data security across agencies. X-Road enables real-time data sharing between state databases without creating centralized repositories, thus minimizing cybersecurity risks and enhancing privacy. This model aligns with the principles of the EU's Digital Decade Policy Programme (2023) and contributes directly to the UN Sustainable Development Goals (SDG 16 – "Peace, Justice and Strong Institutions" and SDG 9 – "Industry, Innovation, and Infrastructure") [26]

X-Road's success is grounded in a socio-technical systems (STS) approach, emphasizing the interdependence between technological innovation and human-centric governance. Unlike purely technical solutions, the STS approach ensures that trust, accessibility, and transparency are integrated into design and implementation. Estonia's X-Road embodies this philosophy by combining cutting-edge technology with governance strategies that foster collaboration, accountability, and citizen confidence [6, 11]. Its open-source architecture and decentralized model minimize security risks, enhance interoperability, and promote adaptability across institutional boundaries. Successful replications in Finland, Iceland, and Japan illustrate its global relevance as a model of scalable, secure, and citizen-oriented digital governance.

Table 2: Mapping SERVQUAL and HGM Frameworks to Estonia's X-Road Features

SERVQUAL/ HGM Dimensions	Estonian X-Road Example	Outcome/Relevance
Reliability	99% of system uptime ensured by decentralized architecture and blockchain-backed audit trails	High level of citizen trust; data integrity and continuity of public services
Responsiveness	Real-time data exchange between 900+ institutions, automated updates reduce administrative delay	Faster delivery service; improved citizen feedback integration
Assurance	Legally mandated cybersecurity, encryption, and personal data protection protocols	Public confidence in digital interactions, alignment with SDG16
Empathy	User-oriented design via e-Estonia Gateway and personalized citizen portals	Inclusive service design; enhanced accessibility for diverse experience
Tangibility	Clean interface, open-source platform design, and multilingual support	Usability and trustworthiness in digital experience
Coordination (HGM)	Multi-agency interoperability through X-Road; government-private co-development	Cross-sector collaboration; improved governance integration
Sustainability (HGM)	Paperless transactions save ∼ 2% of GDP annually, reduced carbon footprint	Environmental efficiency; contribution to SDG9 and 16

a. Elaborated by the authors

4.2 Estonia's X-Road Digital Platform from SERVQUAL and HGM's Lenses

The X-Road platform operationalizes both SERVQUAL's citizen-oriented service quality framework and the Holistic Governance Model's (HGM) systemic integration principles. The following table maps SERVQUAL dimensions and HGM pillar to specific features of Estonia's e-governance, demonstrating how both models converge to enhance citizen satisfaction, institutional accountability, and sustainable governance outcomes.

From the SERVQUAL perspective, Estonia's X-Road scores exceptionally in reliability, assurance and responsiveness, as system performance and user trust remain consistently high. The introduction of real-time services and open data channels enhances transparency and service quality. From the HGM perspective, X-Road demonstrates coordination, adaptability, and multi-stakeholder engagement, enabling cross-sector and multi-level governance integration. These institutionalized mechanisms are strengthened through partnership such as the e-Governance Academy and the e-Estonia Council [14, 22]

Compared to such centralized models as Singapore's GovTech [17], Estonia's decentralized architecture promotes citizen empowerment and digital agency rather than top-down control. However, its success depends on a unique combination of small population size, high digital literacy, and trust in public institutions [2]. These contextual factors highlight that while X-Road represents a global benchmark, replicability requires careful institutional adaptation. Overall, the platform's hybrid integration of SERVQUAL and HGM principles positions Estonia as a leading example of democratic, sustainable, and citizen-centered digital governance.

5 Public administration implementation: international comparative research needs

The comparative examination of the SERVQUAL model and the HGM provides essential insights into the assessment of the quality and responsiveness of digital public services. Nonetheless, relying exclusively on Estonia's X-Road platform as a model for digital governance threatens to oversimplify the complexities involved in heterogeneous public administration systems. National administrative systems are influenced by distinct historical, legal, and institutional environments. Therefore, the implementation of digital governance must be informed by a broader, international comparative perspective to ensure relevance and adaptability across varying political and bureaucratic environments.

To enhance the applicability of digital governance strategies, policymakers should examine a wider range of governance models beyond Estonia's decentralized, modular infrastructure. For example, Finland's Suomi.fi portal showcases an integrated approach to e-identification, cross-agency interoperability, and user-centered service delivery. In contrast, Singapore's GovTech initiative exemplifies a highly centralized model, leveraging AI and blockchain technologies to streamline bureaucratic processes and strengthen public trust through data transparency and predictive service delivery.

These contrasting models illustrate that successful implementation depends not only on technological innovation but also on institutional alignment. Countries with hierarchical administrative structures may require phased or hybrid approaches to digital transformation that respect existing chains of command while promoting gradual digitization. In such contexts, interoperability must be designed to complement, rather than disrupt, traditional governance mechanisms.

Capacity-building is also critical for successful implementation. Governments need to invest in digital skills training for public servants, especially in the fields of cybersecurity, data ethics, and AI literacy. This involves promoting cross-agency collaboration to break down siloed data systems and facilitate integrated service delivery. Concurrently, legal frameworks need to be agile, responding to new issues such as algorithmic accountability, data sovereignty, and AI governance.

Equally important is empowering citizens through enhanced digital agency. Public trust in digital services is closely linked to users' ability to understand, engage with, and influence the systems that serve them. Initiatives like the "Elements of AI" course by the University of Helsinki—designed to promote basic AI literacy among non-experts—offer a replicable model for improving public digital awareness and participation.

Finally, the success of digital public administration lies in finding a balance between technological efficiency and socio-institutional flexibility. Estonia's X-Road system offers important lessons in decentralization, transparency, and trust-establishment, yet it needs to be placed in a wider global context. Comparative lessons from Finland, Singapore, and other countries can tell us more about sophisticated, adaptive, and inclusive digital governance strategies attuned to varied administrative contexts.

6 Limits and Discussions

This study has contributed to the understanding of digital public administration by comparing the SERVQUAL and Holistic Governance Model (HGM) frameworks. However, the paper has several shortcomings. Future research initiatives required to fill this knowledge gap.

Firstly, the literature review in this article is selective and focuses predominantly on SERVQUAL and HGM without considering other relevant theoretical approaches. Digital governance is a new and rapidly evolving field with several frameworks, such as the Digital Era Governance (DEG) model, platform-based theories of governance, etc. Other theoretical frameworks must be addressed by future research to develop a more consolidated view of digital public administration.

For one, the empirical data in this paper is drawn solely from Estonia's X-Road digital platform, which, albeit exemplary, is just one model that represents a single approach to digital governance. Such a discussion in the context of a one-country case restricts the generalizability of this paper's results. Digital governance models vary substantially by region; e.g., Finland, Singapore, etc. Cross-national comparative research in the future that considers several case studies to provide for institutional variation reduces the considerable empirical "knowledge gap" in this area [2].

Institutional variation is also a fundamental driver of digital governance results. Estonia's model of decentralized data-sharing has been successful, yet countries with diverse legal and administrative traditions will have to depend on alternative solutions. It contrasts Singapore's strongly centralized model of digital governance benefits from falling under firm regulatory oversight. Whereas. the Nordic countries – the reference point of Estonia too - prioritize citizen-centric e-governance.

Additionally, this study does not provide full attention to the role of cutting-edge technologies such as artificial intelligence, blockchain, and big data analytics in digital governance. As these technologies become increasingly integral to public administration, research must address their service quality ramifications, ethical challenges, and regulatory dilemmas.

In conclusion, though this paper makes a worthwhile comparative examination of SERVQUAL and HGM in e-public administration, its findings must be understood in the light of its limitations. Extending the research agenda to cover wider theoretical approaches, multi-country case studies, and new technological trends will be critical to moving the debate on digital governance forward.

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