Digital Public Service Quality (PS-DigQual): Proposal of a Multidimensional Framework

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Abstract. This study introduces a multidimensional framework designed to assess Digital Public Service Quality (PS-DigQual) within e-government systems. The proposed framework integrates three pivotal dimensions: System Quality (QSt), Operation Quality (QOp), and Information Quality (QInf). QSt ensures a robust technical foundation through infrastructure reliability, navigability, and compliance with accessibility standards. QOp focuses on responsiveness, personalization, and user support to enhance service delivery. QInf emphasizes transparency, accuracy, and the timely availability of information, thereby fostering trust and accountability. Addressing gaps in traditional models such as SERVQUAL and E-S-QUAL, the framework adapts to the unique requirements of public digital services, where transparency, inclusion, and citizen engagement are critical. The research methodology is grounded in a systematic literature review and bibliometric analysis, spanning publications from 1990 to January 2025. This approach ensures a comprehensive theoretical foundation and identifies critical gaps in existing frameworks. The study further applies the PS-DigQual framework in practical scenarios, demonstrating that improvements in one dimension positively impact others, creating a cycle of continuous enhancement. Key contributions include a scalable analytical tool for policymakers and a robust foundation for further academic inquiry. The framework's adaptability allows it to be tailored across different cultural and institutional contexts, with the potential for incorporating emerging technologies such as artificial intelligence and blockchain. By promoting efficiency, transparency, and inclusion, PS-DigQual represents a significant advancement in evaluating and improving digital public services. The study concludes with suggestions for future research, emphasizing the development of measurement scales and strategies to ensure sustainable public value in the digital era.

Keywords. E-Government, Digital Public Services, System Quality, Operation Quality, Information Quality, Public Sector Innovation.
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1. Introduction

Digital transformation in the public sector, enabled by e-government (e-gov), has reconfigured the paradigms of public administration. By transforming governmental processes, e-government enhances operational efficiency, promotes transparency, and fosters citizen engagement, thereby creating a new interaction model between governments and society (Janssen & van der Voort, 2020; Mergel et al., 2019). The success of these initiatives depends on the adoption of appropriate frameworks to assess and ensure the quality of digital services.

Traditional quality frameworks, such as SERVQUAL and E-S-QUAL, have been widely employed to measure service quality across various private sector contexts. However, studies indicate that these models fail to address critical dimensions required for the evaluation of digital public services, such as transparency, democratic participation, and accountability (Fernandes et al., 2020; Lampeão, 2023). These gaps are concerning, as they undermine the effectiveness of digital service quality measurement in the public sector, hindering the development of public policies aimed at meeting the growing demands for digital inclusion and responsiveness (Santos & Souza, 2021).

Traditional quality frameworks, such as SERVQUAL and E-S-QUAL, have been widely employed to measure service quality across various private sector contexts. However, when applied to the e-government milieu, these models exhibit distinct limitations. Specifically, E-S-QUAL, although adapted for electronic services, prioritizes consumer-centric indicators such as efficiency and reliability, while neglecting essential public sector attributes like transparency, civic engagement, and the ethical use of information (Ahmed et al., 2020; Çelik, 2021). For example, E-S-QUAL does not adequately capture the need for participatory mechanisms or the public value generated by open data initiatives, both of which are central to digital governance. Consequently, the indicators currently utilized in these models may fail to accurately gauge the multidimensional quality expected in public digital services, particularly in contexts where accountability and inclusiveness are paramount.

In the public sector, the complexity and interdependence of technology, processes, and governance render existing approaches insufficient for evaluating quality in e-government. Traditional models overlook key elements of the public sphere, such as the social impact of digital services and their capacity to meaningfully engage citizens. Furthermore, there is a lack of frameworks that integrate technical, social, and informational dimensions to meet the evolving demands of public administrations operating in a digital environment.

This article proposes a multidimensional conceptual framework for evaluating Digital Public Service Quality (PS-DigQual), structured around three interdependent dimensions: System Quality (QSt), Operation Quality (QOp), and Information Quality (QInf). The model addresses theoretical and practical gaps by providing an analytical foundation that combines technical principles with social demands, thereby promoting both efficiency and digital inclusion.

The objective of this study is to develop and validate a multidimensional framework for assessing the quality of digital public services within e-government systems. To guide this endeavor, the following research questions are posed: (1) What are the critical dimensions that define digital public service quality in the context of e-government? (2) How do existing quality models fall short in addressing the unique requirements of public digital services? (3) In what ways can the proposed framework enhance the evaluation and continuous improvement of digital public services, considering diverse sociotechnical and institutional contexts?

The structure of the article is organized into five main sections. Following this introduction, the Theoretical Foundation section presents the theories and existing frameworks that support the proposed model. The Methodology section details the systematic review approach used to develop the framework. The Framework section introduces and discusses the core dimensions and their interrelations. Finally, the article concludes with a section on Contributions and Future Research, highlighting the study's key insights and suggesting avenues for further investigation.

2. Theoretical Framework

This section presents the fundamental concepts related to quality in e-government, as well as the existing challenges and gaps. It discusses the limitations of traditional frameworks for evaluating digital public services and highlights the need for a multidimensional model that integrates technical, social, and informational dimensions, aligning with the specific demands of the public sector.

2.1. Quality in e-Government

E-government requires balancing technical efficiency with transparency, digital inclusion, and social responsiveness, demanding models tailored to the public sector's unique context (Meijer & Bekkers, 2015; Haug,

Dan & Mergel, 2024). While most frameworks stem from Western research, recent studies from Asia, Africa, and Latin America highlight additional challenges, such as digital literacy gaps, infrastructure disparities, and the influence of local governance (Alhassan et al., 2022; Chen et al., 2023; Souza & Silva, 2021). For example, South Korea and Singapore focus on digital identity integration, while Kenya and Brazil address access barriers and community engagement. These diverse perspectives enrich the theoretical basis for digital public service quality and emphasize the need for adaptable frameworks.

The DeLone and McLean Information Success Model (2003) is foundational, proposing System Quality, Information Quality, and Service Quality as key, interacting dimensions for evaluating user satisfaction and organizational outcomes. System Quality ensures robust, secure, and accessible platforms, reducing failures and building trust (Teo et al., 2009). However, usability and navigability are also vital for digital inclusion, especially for users with limited skills or access.

Information Quality, as defined by DeLone and McLean (2003), supports decision-making and interaction by ensuring data is clear, accurate, and timely, which strengthens transparency and accountability—crucial for public trust (Zaidi & Qteishat, 2012). Service Quality relies on robust systems and reliable information, enabling responsive and personalized services, especially important for real-time or high-demand situations (Teo, 2020).

These dimensions are interdependent. Strong technical infrastructure enables rapid, accurate information processing, supporting responsive services and fostering public trust, which drives continuous improvement (Lindgren et al., 2019). Transparency, closely tied to Information and Service Quality, ensures citizens understand data use and have access to reliable information. However, the emphasis on democratic values like transparency and participation varies by context, sometimes conflicting with efficiency or New Public Management principles.

The PS-DigQual framework addresses these nuances, allowing flexible integration of democratic principles according to local priorities and cultures, thus remaining relevant across diverse environments and supporting both efficiency and inclusive governance. Digital inclusion cuts across all dimensions, ensuring accessibility for all citizens and promoting equity and participation (Teo, 2020; Zuiderwijk et al., 2021).

In sum, the interdependence of these dimensions highlights the need for integrative approaches in e-government, as reliable systems and information enhance service quality, engagement, and trust, ultimately generating sustainable public value (DeLone & McLean, 2003; Zaidi & Qteishat, 2012). Quality in e-government must be operationalized in an integrated way to foster efficiency, transparency, and citizen engagement.

2.2. Integration of Dimensions and Operationalization in E-Government

The Digital Public Service Quality (PS-DigQual) Framework adopts a multidimensional approach, addressing gaps in traditional models by incorporating the specific needs of the digital public sector. Transparency and accountability are fundamental for evaluating digital public services, fostering trust and citizen engagement (Miller & Sanders, 2023). Integrating these elements into assessment frameworks strengthens governmental accountability and ensures digital services are more responsive to citizens' needs (Torres, Pina & Acerete, 2024).

Unlike traditional models focused on technical and relational aspects of the private sector, PS-DigQual broadens the perspective by including transparency, digital inclusion, and accountability. These elements reflect core public governance values and highlight the need for greater interaction between technology, information, and citizens. The framework links technical robustness, information reliability, and user experience, showing how these interdependencies generate public value.

The integration of System Quality (QSt), Information Quality (QInf), and Operation Quality (QOp) forms a framework that aligns technical, informational, and relational aspects with demands for transparency, responsiveness, and accountability (Janowski et al., 2018; Lindgren et al., 2019; Miller & Sanders, 2023; Torres et al., 2024). Grounded in Sociotechnical Systems Theory, it emphasizes the interdependence of technology, processes, and users (Trist, 1981). Recent frameworks also stress the need for transparency and accountability to enhance trust and engagement.

QSt is the technical foundation, covering Robust Infrastructure, Navigability, Accessibility, and Security. These ensure stable, inclusive, and secure platforms, supporting high traffic and protecting data (Yang et al., 2019; Zuiderwijk et al., 2021). Metrics like response time and accessibility standards ensure the infrastructure supports services and citizen interaction, underpinning QInf and QOp.

QInf centers on Transparency, Accuracy, and Relevance, ensuring data is clear, reliable, and useful. Transparent information boosts accountability, while accuracy reduces ambiguities. Operationalization includes clarity, real-

time updates, and data in multiple formats (Meijer & Bekkers, 2015; Cucciniello et al., 2019). Digital inclusion, linked to QSt, ensures marginalized groups can access services (Teo, 2020; Zuiderwijk et al., 2021).

QOp focuses on the interaction between systems and citizens, including Support, Efficiency, Responsiveness, and Personalization. Unlike SERVQUAL, the model values the government's ability to meet demands in a personalized, agile way. Responsiveness measures issue resolution speed, while Personalization assesses adaptation to user needs (Panagiotopoulos et al., 2019).

Integrating these dimensions is critical. QSt enables efficient, responsive services; QInf builds trust through accurate information; and their synergy, supported by iterative evaluation, drives continuous improvement in e-government (Lindgren et al., 2019; Cordella & Paletti, 2019).To consolidate the differences between the proposed PS-DigQual framework and existing models, Table 1 presents a comparative analysis, highlighting the gaps in traditional models and demonstrating how the proposed framework comprehensively addresses essential aspects of e-government. This includes the integration of technical, informational, and social dimensions, which are either overlooked or inadequately addressed by previous approaches.

Table 1. Comparative Analysis: Proposed Framework vs. Traditional Models

Dimension	**COBRA**	**SERVQUAL**	**E-S-QUAL**	**Miller & Sanders (2023)**	**Torres et al. (2024)**	**Other Frameworks**	**Proposed Framework**
System Quality	Does not directly address technical infrastructure but includes cost-benefit analysis.	Partially addresses technical reliability without focusing on infrastructure.	Emphasizes usability and security, but limited to the e-commerce context.	Emphasizes robust and secure infrastructure to support essential public services and minimize technical risks.	Focuses on scalability and technical resilience to promote inclusion and trust, aligned with digital accountability.	Examples: GovQual, TAM – Focus on flexibility and technical efficiency in systems.	Integrates robust infrastructure, universal accessibility, and technical security with digital inclusion.
Operation Quality	Focus on cost-benefit, risk, and opportunity for user satisfaction.	Based on responsiveness, empathy, and reliability in the private sector.	Evaluation based on efficiency and reliability without considering citizen responsiveness.	Emphasizes responsiveness and personalization as means to maximize the impact of digital public services.	Adopts metrics to measure responsiveness and support as a foundation for accountability and citizen engagement.	GovQual and other models include reliability and technical user support.	Focuses on citizen support, operational efficiency, and responsiveness in the public context.
Information Quality	Explores accuracy and relevance without explicit focus on transparency.	Addresses information quality in a limited manner, focusing on user perception.	Focuses on information quality as support for e-commerce.	Transparency as a central pillar, linked to data clarity and ethical information usage.	Prioritizes transparency and information accessibility as tools for citizen engagement and trust.	Models like TAM emphasize accuracy, relevance, and information usability.	Centers transparency and accountability as essential for public trust and citizen engagement.
Refer	Osman	Parasurama	Parasuraman	Miller, J., &	Torres, L.,	Batini et al.,	Mergel et al.,

ences	et al., (2014); Weera kkody et al., (2013)	n et al., (1988); Papadomich elaki & Mentzas, (2009)	et al., (2005); Zeithaml et al., (2002)	Sanders, R. (2023)	Pina, V., & Acerete, B. (2024)	(2009); Papadomich elaki & Mentzas, (2012); Venkatesh et al., (2003)	(2019); Lindgren et al., (2019); Panagiotopo ulos et al., (2019)

Source: Research Data

Table demonstrates that System Quality (QSt) is insufficiently addressed by traditional models. COBRA and SERVQUAL do not directly explore technical infrastructure, while E-S-QUAL focuses on usability and security but is limited to the context of e-commerce. In contrast, the frameworks proposed by Miller and Sanders (2023) and Torres et al. (2024) take a step forward by emphasizing the need for technical resilience, scalability, and support for digital inclusion in public services. The proposed framework builds on these recent approaches, further broadening the scope by integrating robust infrastructure, universal accessibility, and technical security while considering digital inclusion as a cross-cutting aspect. This approach addresses the specific demands of the digital public sector by ensuring resilient, accessible systems that align with the transparency and accountability required in contemporary e-government.

In the dimension of Operation Quality (QOp), traditional models focus on factors such as cost-benefit, responsiveness, and empathy—typical characteristics of the private sector. E-S-QUAL, for example, evaluates efficiency but overlooks the citizen responsiveness required in e-government. Conversely, the frameworks by Miller and Sanders (2023) and Torres et al. (2024) make significant contributions by emphasizing personalization and responsiveness as mechanisms to strengthen trust and accountability in public services. The proposed framework complements these approaches by prioritizing citizen support, operational efficiency, and responsiveness, aligning with the requirements of the public sector, where trust and engagement are essential. This evolution is noteworthy as it treats the user not merely as a customer but as an active participant in the delivery of digital services.

The analysis of Information Quality (QInf) reveals that models such as COBRA and SERVQUAL address accuracy and relevance but overlook transparency and accountability—critical elements for e-government. The frameworks by Miller and Sanders (2023) and Torres et al. (2024) place transparency at the center, linking it to data clarity and ethical information usage. The proposed framework goes further by centralizing transparency and accountability as essential components for fostering public trust and citizen engagement. This reinforces the role of clear, reliable, and verifiable information in digital governance, highlighting its interdependence with other dimensions.

In conclusion, the proposed framework addresses the gaps in traditional models by offering a holistic view of quality in digital public services. Its practical application extends beyond academic analysis, providing public managers with a structured tool to diagnose strengths and weaknesses in digital service delivery. For instance, by systematically evaluating system robustness, information transparency, and operational responsiveness, policymakers can identify targeted interventions to enhance user experience and foster greater citizen trust.

Additionally, the framework supports benchmarking across different governmental units and facilitates the monitoring of progress over time, thereby informing strategic decisions and resource allocation in digital transformation initiatives.

3. Method

To support the proposal of a multidimensional conceptual framework for evaluating the quality of digital services in e-government, a systematic literature review with a bibliometric approach was conducted. The selection protocol, while rigorous, adopted strict inclusion and exclusion criteria to ensure the relevance and quality of the analyzed studies.

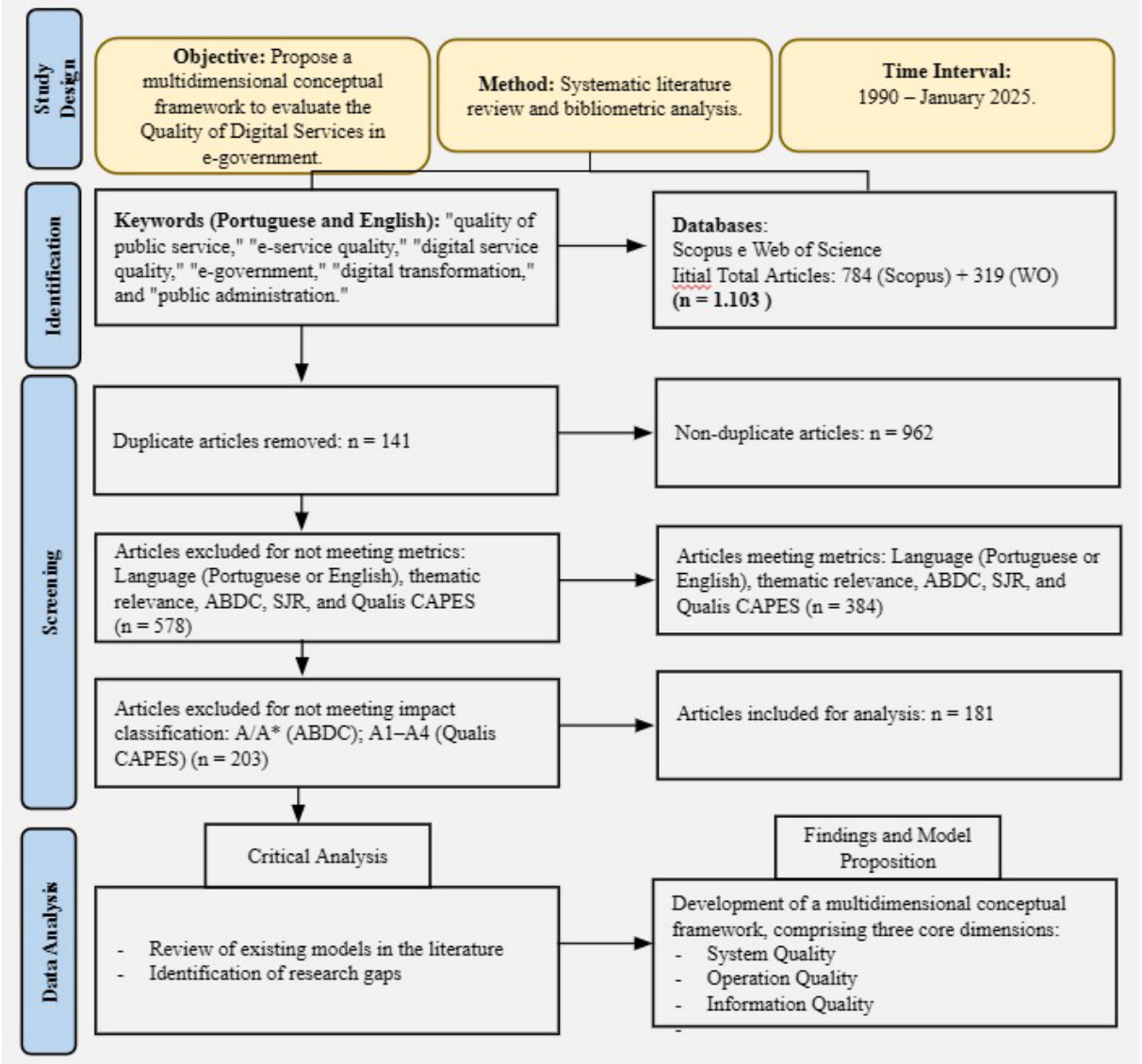
However, this narrow focus may have inadvertently excluded pertinent research, particularly studies published in non-English languages or in regional journals not indexed in major databases. This limitation suggests that some relevant perspectives, especially from emerging economies or underrepresented regions, may not have been fully captured. Future research should consider expanding the scope of the review to include a broader array of sources, thereby enriching the analysis and enhancing the global applicability of the proposed framework.

By integrating both quantitative and qualitative analyses, as well as tools such as the Bibliometrix package in RStudio and manual validations, the SLR-4 model identifies trends, gaps, and provides a robust foundation for discussions and future recommendations, directly contributing to the study's objectives. This approach is particularly suitable for fields such as e-government, which require integrative analyses to capture theoretical

advancements, identify emerging trends, and explore gaps in the literature.

The chosen methodology ensures methodological rigor, a comprehensive and detailed overview of the state of the art in the field, and reliable outcomes for guiding future research (Tranfield, Denyer & Smart, 2003; Kitchenham, 2004; Donthu et al., 2021). Figure 1 illustrates the research design followed in this study.

Figure 1: Research Design



Source: Prepared by the authors (2025)

Once the research objective and method were defined—outlined in the first stage presented in Figure 1 (Study Design)— 1990 to January 2025 was established. The next phase, referred to as Identification, involved the following steps:

Definition of keywords: Terms in both English and Portuguese were selected to cover three main areas: digital public service quality, e-government, and emerging technologies.

Database search: The search was conducted in the Scopus and Web of Science databases, resulting in the initial identification of 1,103 articles. This process was carried out at the end of the second semester of 2024.

Additionally, the search strings were constructed using Boolean operators to combine the keywords and ensure precision in article retrieval. The search in the Scopus database was conducted as follows: (TITLE-ABS-KEY("qualidade do serviço público" OR "quality of public service" OR "service quality" OR "public service efficiency" OR "public service delivery" OR "e-service quality" OR "digital service quality") AND (TITLE-ABS-KEY("e-government" OR "e-gov" OR "digital government" OR "e-government services" OR "digital transformation"

OR "inovação tecnológica" OR "technological innovation" OR "tecnologias da informação" OR "information technology" OR "ICT" OR "TIC" OR "digital governance" OR "information systems" OR "interoperability")) AND (TITLE-ABS-KEY("setor público" OR "public sector" OR "administração pública" OR "public administration" OR "serviço público" OR "public service" OR "gestão pública" OR "public management")) AND (LIMIT-TO(DOCTYPE, "ar") OR LIMIT-TO(DOCTYPE, "re")). Na Web of Science, a estratégia de busca foi: TS=("quality of public service" OR "service quality" OR "public service efficiency" OR "public service delivery" OR "e-service quality" OR "digital service quality") AND TS=("e-government" OR "digital government" OR "e-government services" OR "digital transformation" OR "technological innovation" OR "information technology" OR "ICT" OR "digital governance" OR "information systems" OR "interoperability") AND TS=("public sector" OR "public administration" OR "public service" OR "public management") AND (LIMIT-TO(DOCTYPE, "article") OR LIMIT-TO(DOCTYPE, "review")).

The screening phase involved the removal of duplicates, language criteria, thematic relevance, academic quality metrics, and impact classification. A total of 141 duplicate articles were removed, and the remaining documents were initially screened based on language (English and Portuguese), thematic relevance, and recognized academic metrics such as the Australian Business Deans Council (ABDC), SCImago Journal Rank (SJR), and Qualis CAPES. As a result, 578 articles were excluded, leaving 384 studies for further analysis.

The selection of ABDC, SJR, and Qualis CAPES as metrics serves as a benchmark for classifying journals according to their academic quality: ABDC is one of the main indicators in the field of management (ABDC, 2022), SJR measures the visibility and impact of scientific journals by considering both the number of citations and the quality of the citing articles, making it a reliable indicator of international research impact (SJR, 2023) and Qualis CAPES is a Brazilian system for evaluating academic production, used to assess the quality of journals across various fields of knowledge. The choice of these metrics was essential to ensure that the study relied on high-quality literature. By combining these metrics, the study encompasses both international academic quality and relevant regional indicators.

Further in the screening process, 203 articles not classified by impact (A/A* in ABDC and A1–A4 in Qualis CAPES) were excluded, resulting in 181 articles. The impact classification reflects the decision to prioritize articles published in high-impact and highly relevant journals, which are more likely to contain robust theoretical and methodological approaches and significant contributions to advancing knowledge in the studied field.

The data analysis phase involved a critical review of the 181 selected articles, which, through a meticulous reading process, enabled the identification and study of existing models on service quality and digital service quality in the literature, as well as the identification of research gaps in this field. This process provided the foundation for recognizing three key dimensions: System Quality, Operation Quality, and Information Quality. These dimensions were critical in the development of the multidimensional conceptual framework, the central objective of this study.

Since the main focus of this research is the proposition of the conceptual model, which was made possible by preliminary analyses, including bibliometric analysis, detailed results of these analyses are not presented. Instead, the description and discussion of the proposed multidimensional conceptual framework are prioritized. However, it is worth noting that preliminary analyses using the Bibliometrix package in R Studio generated keyword co-occurrence maps, collaboration networks, and temporal evolution charts, which provided valuable insights for developing the framework.

These preliminary analyses played a crucial role by offering a comprehensive view of trends and gaps in the literature, guiding the construction of the proposed model. Additionally, they helped to theoretically support the key dimensions that comprise the framework, ensuring its relevance and alignment with the current needs of the field of study.

4. Proposed Framework for Digital Public Service Quality (PS-DigQual)

The PS-DigQual Framework is an integrated structure developed to assess and enhance the quality of digital public services in the context of e-government.

4.1. General Structure of the Framework

Grounded in the core dimensions of System Quality (QSt), Operation Quality (QOp), and Information Quality (QInf), the framework combines technical, relational, and informational aspects to address the complexities of the digital public sector. This multidimensional approach ensures transparency, inclusion, and efficiency in an increasingly challenging digital governance environment (Mergel et al., 2019; Lindgren et al., 2019).

Figure 2 integrates the three dimensions, illustrating how each contributes to the overall quality of e-government services:

QSt (System Quality) provides the necessary technical infrastructure.

QOp (Operation Quality) focuses on responsiveness and personalized citizen service.

QInf (Information Quality) ensures the transparency and clarity of the information provided.

The interaction between these dimensions fosters public trust, citizen engagement, and sustainable public value.

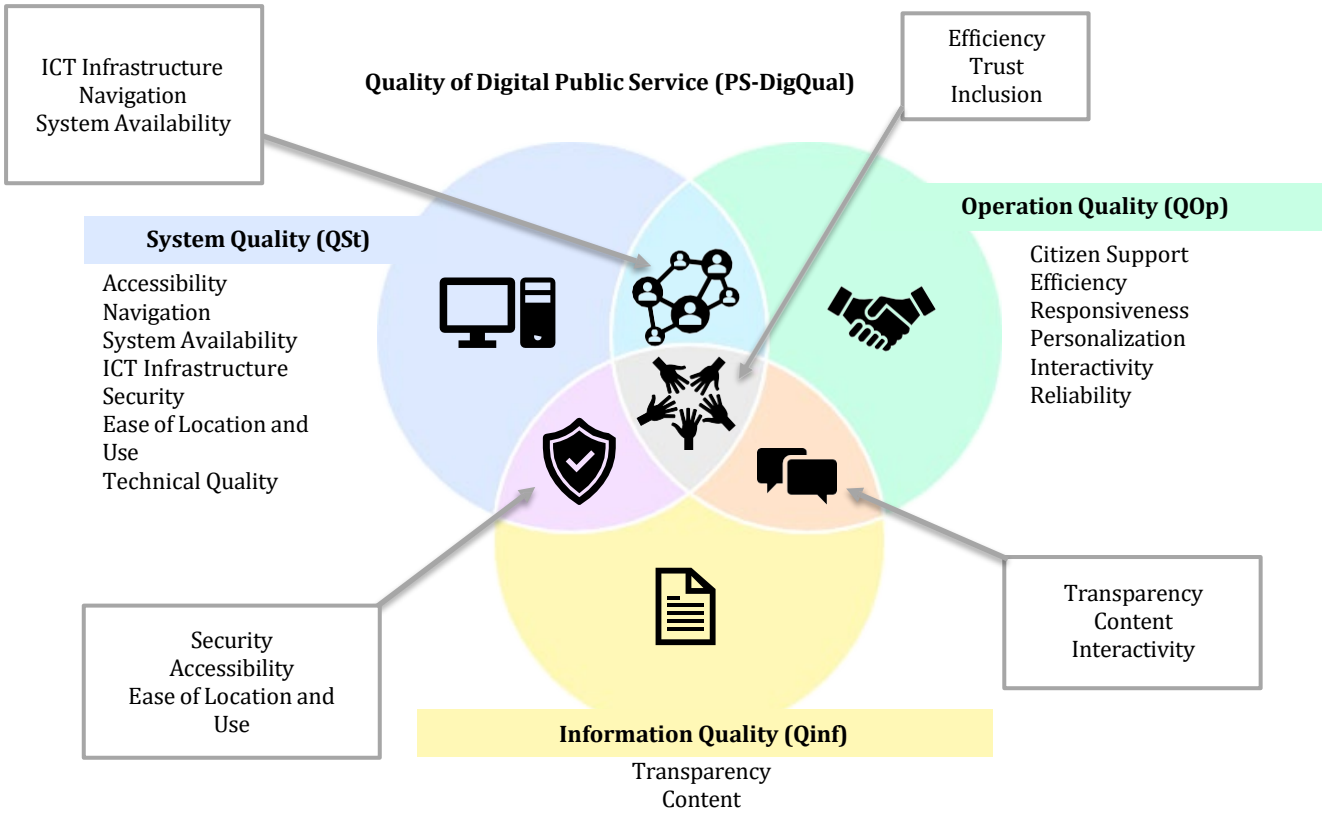


Figure 2. Quality of Digital Public Service Framework
Source: Research Data

The intersections between the dimensions reflect relationships and synergies that underpin the framework's effectiveness. The technical robustness of QSt ensures stability and security, supporting the transparency and informational accessibility of QInf. Simultaneously, this reliable information strengthens citizen trust and makes personalized support, part of QOp, more efficient (Panagiotopoulos et al., 2019; Cucciniello et al., 2019; Miller & Sanders, 2023; Torres et al., 2024). Additionally, frameworks proposed by Lindgren et al. (2019) and Mergel et al. (2019) emphasize the importance of integrating technical, relational, and informational dimensions to promote greater digital inclusion and accountability in public digital services.

The ultimate goal of the framework is achieved at the intersection of the dimensions, represented by Efficiency, Trust, and Inclusion. This centrality reflects the ambition to foster a robust and responsive e-government, where reliable systems, clear information, and interactive services work together to maximize public impact. This approach integrates the principles of Sociotechnical Systems Theory, which highlights the importance of dynamic interactions between technology, citizens, and public institutions (Trist, 1981; Janowski et al., 2018).

Moreover, the framework addresses gaps identified in traditional models, such as SERVQUAL and E-S-QUAL, by adapting to the specificities of the digital public sector. Although widely used, these models fail to capture critical elements such as transparency, digital inclusion, and governmental accountability. The multidimensional integration proposed in the framework addresses these limitations, offering a robust foundation for the continuous

evaluation and improvement of public digital services (Twizeyimana & Andersson, 2019).

The overall structure of the framework also responds to the growing need for more inclusive and efficient digital governance. Platforms such as GOV.UK and Gov.br can directly benefit from this approach by using the metrics associated with each dimension to continuously monitor and adjust their services. This adaptability makes the framework a valuable tool for public managers seeking to align digital transformation with the demands and expectations of contemporary society (Cordella & Paletti, 2019).

In summary, the PS-DigQual Framework represents a significant contribution to both the practice and theory of e-government. Its ability to integrate technical, informational, and service dimensions into a cohesive model provides not only a basis for quality evaluation but also a strategic guide for innovation and continuous improvement in the digital public sector. This framework establishes a more comprehensive analytical paradigm for public governance, aligning with the demands for efficiency, trust, and inclusion (Lindgren et al., 2019; Yang et al., 2019).

4.2. Detailed Description of Core Dimensions

The following section discusses the core dimensions of the PS-DigQual Framework and the specific components that support e-government quality. Each dimension—QSt, QInf, and QOp—is analyzed in terms of its relevance and impact on the delivery of digital services. This approach fosters a comprehensive evaluation based on quality metrics.

4.2.1. System Quality

System Quality (QSt) is the technical pillar of the framework, providing the necessary foundation for the efficient and secure operation of public digital services. Components such as robust infrastructure, intuitive navigability, accessibility, and technical security ensure that systems can support high user volumes, promoting a reliable and inclusive experience (Zuiderwijk et al., 2021; Panagiotopoulos et al., 2019; Medaglia et al., 2024).

Robust Infrastructure is essential to meet large-scale demands, particularly for digital services accessed by millions of citizens simultaneously. Studies by Klievink et al. (2017), Janowski et al. (2018), and Bassey (2022) emphasize that resilient and scalable systems not only handle high traffic volumes but also ensure the integrity and continuity of operations, even in critical scenarios. This robustness is crucial for enabling integration with other framework dimensions.

Intuitive Navigability and Accessibility play key roles in promoting digital inclusion. Platforms adhering to accessibility standards, such as WCAG, ensure that individuals with varying abilities or technological limitations can effectively interact with public services. This approach broadens access and enhances the user experience, especially for vulnerable groups, aligning with the recommendations of Lindgren et al. (2019), Medaglia, Rukanova & Zhang (2024), and Cordella & Paletti (2019).

Technical Security is indispensable for safeguarding sensitive data and enhancing public trust by ensuring information integrity in digital environments. Secure systems prevent data breaches and cyberattacks, which can undermine platform credibility. Security is a critical element for ensuring the sustainability and continued adoption of e-government services, particularly in high-risk and complex contexts (Yang et al., 2019; Wirtz et al., 2022; Bassey, 2022).

4.2.2. Information Quality

Information Quality (QInf) is a central element of the framework, aimed at promoting governmental transparency and strengthening citizen engagement. Clear, accurate, and accessible information ensures that citizens understand government actions, fostering accountability and public trust. The reliability of information is critical to sustaining the legitimacy of public institutions and promoting responsive and transparent governance (Meijer & Bekkers, 2015; Cucciniello et al., 2019; Medaglia, 2024).

In the context of e-government, QInf goes beyond merely providing data; it encompasses characteristics such as relevance, clarity, and real-time updates. These attributes ensure that users have access to reliable and useful data, enabling meaningful interactions with public digital services. Meijer and Bekkers (2015) and Janowski et al. (2018) emphasize the connection between informational reliability and active citizen participation, promoting engagement in decision-making processes.

Transparency is an indispensable component for accountability and legitimacy in e-government. It guarantees that

decisions, processes, and data are accessible and understandable, promoting inclusive and trustworthy governance (Batini et al., 2009; Twizeyimana & Andersson, 2019; Medaglia, 2024). Clarity, accuracy, and relevance are equally essential for building public trust: clarity facilitates understanding, accuracy eliminates ambiguities, and relevance ensures that the data meets citizens' needs (Panagiotopoulos et al., 2019; Lindgren et al., 2019; Medaglia, 2024).

These components create a positive cycle, where reliable information fosters greater citizen engagement and governmental legitimacy. This holistic approach reinforces the interdependence between informational transparency and the operational effectiveness of public services. In this way, e-government becomes a more inclusive and accessible environment, aligned with contemporary demands for accountability and digital inclusion (Osman et al., 2014; Lindgren et al., 2019; Cucciniello et al., 2019; Teo, 2020).

To assess QInf, key metrics such as textual clarity, real-time updates, and accessibility in multiple formats are fundamental. Textual clarity facilitates user understanding of data, while frequent updates strengthen the perception of governmental responsiveness (Cucciniello et al., 2019; Meijer & Bekkers, 2015). In turn, accessibility in diverse formats meets the needs of different citizen profiles, promoting digital inclusion and democratic participation (Lindgren et al., 2019; Janowski et al., 2018).

Supported by transparency and robust metrics, QInf is crucial for establishing a reliable and efficient e-government. It ensures that citizens have access to dependable information and strengthens their ability to actively participate in decision-making processes, thereby promoting accountability and continuous engagement (Panagiotopoulos et al., 2019; Twizeyimana & Andersson, 2019; Medaglia et al., 2024).

4.2.3. Operation Quality

Operation Quality (QOp) is a crucial dimension of the framework, directly addressing citizens' needs through responsive and effective digital services. Its implementation ensures interactive and personalized support, fostering continuous engagement and strengthening public trust (Panagiotopoulos et al., 2019; Meijer & Bekkers, 2015). Studies indicate that a well-structured QOp significantly enhances user satisfaction and reinforces the legitimacy of public institutions (Cucciniello et al., 2019; Lindgren et al., 2019). This dimension emphasizes the ability of digital services to adapt to specific citizen demands by offering quick and efficient solutions. Key components such as Citizen Support, Personalization, and Operational Efficiency are fundamental pillars for aligning services with user expectations (Yang et al., 2019; Cordella & Paletti, 2019). Platforms integrating technical and informational support help eliminate access barriers and promote a meaningful and inclusive citizen experience (Meijer & Bekkers, 2015; Panagiotopoulos et al., 2019).

Citizen Support plays a central role by providing immediate and effective assistance, meeting user needs promptly. This approach strengthens trust in e-government, creating a positive perception of public management (Lindgren et al., 2019; Cucciniello et al., 2019). Additionally, Personalization allows services to be tailored to users' specific needs, improving citizen engagement and fostering a sense of digital inclusion (Cordella & Paletti, 2019; Yang et al., 2019). Operational Efficiency complements these efforts by minimizing delays and ensuring reliable service delivery. Robust infrastructures and automated processes optimize response time, reducing costs and operational errors (Zuiderwijk et al., 2021; Klievink et al., 2017).

The integration of personalization and efficiency results in more accessible digital services, enhancing the perception of reliability. Metrics are essential for measuring the effectiveness of QOp. Resolution Time indicates how quickly requests are addressed, while Satisfaction Levels reflect users' perceptions regarding the clarity, personalization, and responsiveness of the service—critical factors for public trust (Panagiotopoulos et al., 2019; Cucciniello et al., 2019).

Tools such as Net Promoter Score (NPS) and Repeat Usage Rate provide insights into user retention and service impact. Combined metrics help managers continuously adjust digital services, promoting continuous improvement cycles and ensuring that citizen demands are met efficiently and inclusively (Lindgren et al., 2019; Yang et al., 2019).

4.3. Framework Contributions

The operationalization of the proposed framework enables its practical and strategic application in contemporary digital government platforms, such as GOV.UK and Gov.br. This model systematizes the evaluation of the dimensions QSt, QOp, and QInf, fostering alignment between administrative efficiency, digital inclusion, and governmental transparency. This multidimensional approach contributes to more responsive and participatory

governance (Medaglia et al., 2024; Schmitz, 2023).

The implementation of the framework involves the application of both qualitative and quantitative metrics. On Gov.br, metrics such as latency and technical stability evaluate system robustness, while on GOV.UK, indicators such as textual clarity and informational updates promote citizen engagement. Technological advances enable the integration of real-time monitoring systems that measure user satisfaction, resolution times, and compliance with accessibility standards. These iterative development practices allow for dynamic data-driven adjustments, resulting in greater responsiveness and operational efficiency. Longitudinal studies corroborate the effectiveness of these practices in strengthening citizen trust and improving public digital services (Yang et al., 2019; Zuiderwijk et al., 2021; Medaglia et al., 2024).

The adaptability of the framework stands out in different e-government contexts. Strategies focused on personalization and reliability improve the user experience on GOV.UK, while Gov.br leverages the dimensional intersections to foster digital inclusion and governmental transparency. These synergies, supported by recent studies, emphasize the importance of integrating technology, processes, and governance to maximize public value (Lindgren et al., 2019; Panagiotopoulos et al., 2019; Twizeyimana & Andersson, 2019).

The framework's operationalization addresses gaps in traditional models and contributes to the creation of more responsive and inclusive public digital services. Its multidimensional approach reinforces the interdependence between quality pillars, demonstrating how robust infrastructure supports personalized services, while enhanced transparency promotes accountability and public trust—an essential integration given the demands of the digital public sector.

The proposed framework addresses significant gaps in traditional models such as SERVQUAL and E-S-QUAL by integrating critical dimensions of transparency, digital inclusion, and citizen support. Conventional models often overlook these characteristics, which are fundamental in the e-government context, where accountability and responsiveness are indispensable for fostering public trust and institutional legitimacy (Mergel et al., 2019; Medaglia et al., 2024). The integration of these dimensions also responds to the growing demand for inclusive and accessible digital services.

By articulating QSt, QOp, and QInf, the framework provides a holistic approach to the evaluation and improvement of digital services. Multidimensional frameworks enhance the capacity to align technical capabilities with citizen needs, promoting more effective, responsive, and accessible services (Lindgren et al., 2019; Schmitz & Wimmer, 2023).

For public managers, the framework serves as a strategic tool, reinforcing citizen trust through transparent governmental processes. Clear and accessible information, supported by robust systems, is crucial for consolidating trust in public institutions. According to Cucciniello et al. (2019) and Medaglia et al. (2024), digital platforms that prioritize clarity and informational reliability promote both engagement and accountability.

Promoting digital inclusion is another direct benefit of the framework. By adhering to accessibility standards and ensuring intuitive navigability, the model ensures that all citizens, regardless of their limitations, can access and utilize digital services. This inclusive focus addresses the growing need for equitable and socially responsive governance, as emphasized by Panagiotopoulos et al. (2019) and Schmitz & Wimmer (2023).

Operational efficiency is improved through the integration of the framework's technical and social dimensions. Robust infrastructures minimize failures and reduce response times, while personalized services significantly enhance the user experience. Studies by Yang et al. (2019) and Lindgren et al. (2022) show that interdependent systems, such as those proposed, enhance operational agility and reduce costs, benefiting both citizens and institutions.

Finally, the framework contributes to responsiveness by offering tools for monitoring and continuous service adjustments. Aligned with the principles of adaptive governance, this iterative approach allows public managers to respond to citizen demands with agility and precision. Meijer and Bekkers (2015) and Medaglia et al. (2024) highlight that monitoring practices and metrics-based adjustments increase the perception of institutional efficiency and legitimacy.

The implementation of the framework addresses structural and functional gaps, promoting inclusive, efficient, and responsive governance. By consolidating citizen trust and optimizing digital services, the model aligns with contemporary demands for public value and digital transformation in the public sector.

Despite the contributions of this study, several limitations must be acknowledged. The reliance on a systematic literature review with a narrowly defined protocol may have restricted the diversity of perspectives included in

the analysis. Additionally, the framework has not yet been empirically tested in a wide range of governmental contexts, which may limit its generalizability. Future research should seek to validate the framework through case studies and comparative analyses, as well as to incorporate feedback from practitioners and citizens to further refine its dimensions and indicators.

5. Conclusion

This study proposes a multidimensional conceptual framework for evaluating the quality of digital services in the e-government context, integrating technical, informational, and service dimensions. The research highlights the importance of models that consider technical robustness while addressing transparency and citizen participation as central components for the success of inclusive and effective public digital services.

The application of the framework demonstrates how improvements in one dimension can positively influence other areas, fostering a virtuous cycle of enhancement. This model addresses gaps identified in previous frameworks by offering an integrative and scalable approach to digital service evaluation, aligning with contemporary demands for responsiveness and accountability in the public sector.

The contributions of this work span both theory and practice, providing a foundation for future research and for public managers seeking to optimize the delivery of digital services. Additionally, the practical implications of the framework include its ability to guide strategic decision-making in e-government, promoting efficiency, inclusion, and sustainable public value.

The existence of a valid and consistent model for evaluating digital services offered by public entities is essential, serving as a means for citizens to directly assess the quality of the services provided. Various digital government regulations in different countries advocate for the evaluation and monitoring of services as a means of ensuring transparency and social participation. However, the lack of a specific framework for evaluating public digital service quality, as initially proposed in this study, has led to the use of tools that are poorly adapted to the unique characteristics of such services.

The proposed approach in PS-DigQual links key elements related to system, operation, and information, which are essential for evaluating public digital service quality. This approach enhances the development of metrics and scales for assessing e-government outcomes, contributing to the continuous improvement of services provided to citizens.

Future research could explore the integration of emerging technologies, such as artificial intelligence and blockchain, into the PS-DigQual framework to automate and enhance the evaluation of digital public service quality. Additionally, comparative studies across different countries and administrative cultures would provide valuable insights into the adaptability and impact of the framework. Researchers are also encouraged to develop and validate measurement scales for each dimension, as well as to investigate the relationship between digital service quality and broader outcomes such as public trust, social inclusion, and sustainable public value.

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