Critical Success Factors for E-Government Implementation: A Comprehensive Framework and Literature Analysis

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Abstract

The implementation of e-government initiatives remains a complex socio-technical challenge, particularly for administrations lacking structured knowledge of the Critical Success Factors (CSF) of E-government. The CSFs refer to the essential elements that must be effectively addressed to ensure the achievement of organizational objectives. In the context of E-government, CSFs encompass key determinants such as leadership commitment, technological infrastructure, user trust, policy support, and citizen engagement that collectively drive successful digital governance implementation. Governments often struggle to operationalize strategies and allocate resources effectively due to the absence of empirically grounded frameworks. To fill these gaps, this study combines systematic evidence synthesis, qualitative factor clustering, and quantitative multi-criteria validation to model and prioritize the interdependent CSFs governing sustainable e-government implementation across technological, organizational, human, environmental, and governance dimensions. The research employs a three-phase methodological pipeline: (1) Systematic Literature Review (SLR) guided by Preferred Reporting Items of Systematic Reviews and Meta-Analyses (PRISMA) standards to identify CSFs across more than 58 peer-reviewed studies; (2) Thematic Coding and Factor Clustering using NVivo-based qualitative content analysis to categorize determinants into organizational, technological, environmental, human, and governance domains; and (3) Analytic Hierarchy Process (AHP) Validation to assign relative weightings and interdependencies among identified factors. A total of 62 CSFs were extracted and classified under eight major domains: Strategic Planning and Governance, Planning and Execution Efficiency, Technical and Operational Aspects, User-Centric Focus and Quality Assurance, Technological Factors, Organizational Factors, Socio-Political Factors, and Economic Factors. Among these, User-Centric Focus and Quality Assurance (C_4) emerged as the most influential cluster with the highest global weight of 0.286, reflecting the growing emphasis on citizen trust, service quality, and satisfaction in digital governance systems. The top three CSFs identified through AHP were "Building Trust with Users" (LW = 0.266, GW = 0.033), "Visionary Leadership" (LW = 0.265, GW = 0.040), and "Comprehensive Planning" (LW = 0.275, GW = 0.038), representing the intersection of governance, user engagement, and execution excellence. This study contributes a decision-support framework that integrates both quantitative prioritization and qualitative contextualization, serving as a practical tool for policymakers, digital transformation officers, and public sector reform strategists.

Keywords: E-government; Critical Success Factors; E-government Framework; Implementation; Literature Analysis; Comprehensive Framework

1. Introduction

Electronic government (E-government) refers to the practice of enhancing the quality of the performance, services, and customer interaction of the government agencies using modern information communications technologies [1]. It is aimed at increasing the quality of the provided services, their access and transparency, and their ability to

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make them more appealing to the average citizen to occupy an online position in the work. That provides internet services to filing permit applications and paying taxes, to conduct communication socially by using digital data, and facilitates effectiveness in information management, and also facilitates openness in decision-making [2]. The e-government of the public also enhances the involvement of citizens through the internet, supports interactions of different departments in the government, and guarantees the delivery of secure digital identities and cybersecurity services.

A. Background and Context of E-Government Implementation

The high rate of digitalization of the government has placed e-government as a foundation of current administrative change and participation by citizens. E-government can be interpreted as the strategic use of ICT in improving transparency, efficiency, accountability, and accessibility of government operations [3]. Authorities can maximize the delivery of public services through digitalization of service delivery, augmentation of participatory governance, and enhancement of institutional responsiveness. The e-government initiatives implementation is, however, a complex process that requires the incorporation of technology infrastructure, organizational culture, human capacity, and government structures. Lack of ICT infrastructure, lack of coordination among the agencies, ineffective policy frameworks, and lack of digital literacy of the citizenry and the officials in the government form major barriers, especially to governments working in the developing environment [4]. It has therefore emerged as one of the most important fields of academic research and practical activity in an attempt to establish the multidimensional factors that dictate the success or failure of e-government projects.

B. Importance of Identifying Success Factors

The recognition and ranking of CSFs are the essential ones behind the successful planning, implementation, and assessment of e-government projects. All these make such factors measurable indicators and actionable insights that aid governments to maximize resource allocation and reduce risks and project sustainability [5-7]. The policy decisions are usually unsynchronized, reactive, or misplaced without an evidence-based interpretation of the enablers and barriers affecting the implementation of e-government [8-10]. The determination of CSF can help policymakers and practitioners to derive a consistent strategic direction, create trust among citizens, and make technological interventions contextually relevant and scalable [11]. Besides, the mapping of these CSFs will enable comparative benchmarking of countries in terms of digital governance, the identification of the best practices, and lessons learned.

C. Research objectives and scope

The main aim of this paper is to analyse and synthesize the CSF of E-government. Also, to provide a comprehensive framework drawn from the literature. The study aims to combine the results of more than peer-reviewed articles by an SLR, thematic coding, factor clustering, and AHP validation. This research is not limited to the identification of the CSFs, but rather focuses on the interdependencies between organizational, technological, environmental, human, and governance dimensions. The synthesis of qualitative and quantitative knowledge gives the framework to policymakers, digital transformation officers, and other decision makers in the public sector a decision support tool to evaluate national preparedness, invest resources in areas of greatest need, and track progress.

The scope also covers many aspects of e-government efforts, particularly interactions between "government-to-citizen (G2C) [12], "government-to-business (G2B) [13], and "government-to-government (G2G) [14]" worlds. The analysis features results not only from one but also multiple environments, for instance, technological, organizational, social-political, and economic realms, and software architecture contexts. Factoring in all these elements will give a detailed report that will clearly show the several aspects of the efficiency of e-government usage.

2. Methodology

A. Research Design

Figure 1 shows how the three-stage approach that is structured was used in this study to define, authenticate, and create a structure of CSFs used in E-Government initiatives. Phase 1 aims to undertake a SLR to determine a good theoretical base. This will include determining the scope of the review, i.e., the publications published between 2020 and 2024; Scopus-indexed (Q1 -Q4 journals, conference papers, and books), and followed by a data collection process which will be based on specific inclusion and exclusion criteria. The acquired researches are further analysed using thematic analysis, synthesis, and categorisation to derive interesting insights and trends. Phase 2- Thematic Coding and Factor Clustering, this is where the extracted factors of the SLR are sorted into categories through a qualitative content analysis. This cross-references to authenticate the process and guarantee that there is thematic consistency and reliability. The phase results in the recognition of the most important CSFs,

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as well as their domains, which form the foundation of the input in the following step. Phase 3 is multi-criteria Validation, which prioritizes and ranks any identified CSFs using the Analytic Hierarchy Process (AHP) method, depending on expert appraisal and applicability to a theme. The AHP method provides a quantitative and systematic validation methodology, and this ensures that the ranking can be seen to be thematic in nature. The output of such a process is to create a whole framework, which integrates the validated factors into a coherent model that can be utilized to lead to successful E-Government implementation.

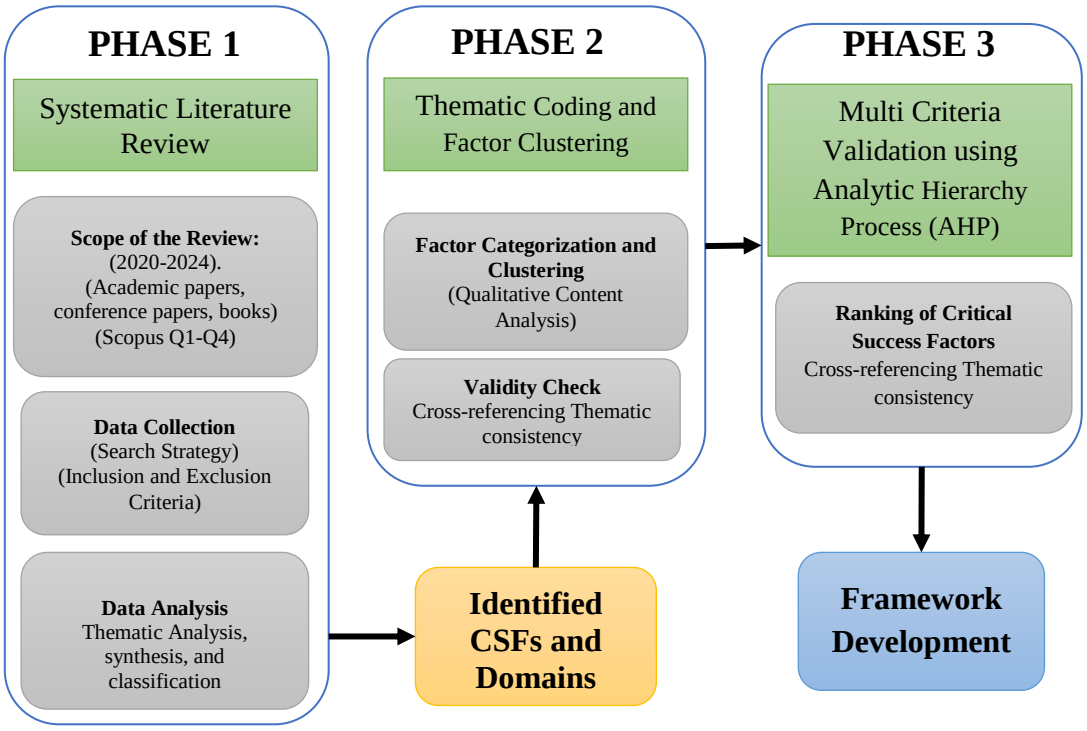

Figure 1. The block diagram of the Methodology used in this study

B. Systematic Literature Review

This study assumes a systematic literature review approach in order to gather and evaluate the relevant literature of e-governance and CSFs based on the SLR strategy [14]. Strict literature research enables the expert to perceive the details and truthfulness of the new fact created by the research.

Scope of the Review:

The paper encompassed academic papers, conference papers, and books, that dealt with the application of E-government in practice and IT improvements. The factors we will use to select the literature will comprise significance, academic influence, and the newness in that area. The review aims to take only the most recent studies into consideration by exploring only those studies that were published within the last 5 years (2020-2024).

Data Collection:

Search Strategy: Electronic databases like IEEE Xplore, ACM Digital Library, Scopus, and Web of Science, Google Scholar, Sematic Scholar were searched using keywords like "information technology governance", "E-government success factors", "E-government implementation", "E-Government", "Electronic Government", "Digital Governance", "Critical Success Factors", "Key Determinants", "Success Metrics", "Implementation", "Adoption", "Performance", "Evaluation", "Information Technology Governance", "ICT Infrastructure", "Public Administration", Government Services, etc., to find pertinent literature. The search process was repeated to enhance and expand the scope of articles.

Inclusion and Exclusion Criteria: Articles were included when they reflected on E-government, CSFs, or similar concepts and provided empirical evidence, theoretical foundation, or helpful information. Articles that merely talked about the E-government structures without mentioning CSFs were filtered out. The details regarding inclusion and exclusion criteria are presented in Table 1.

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Table 1: Criteria for inclusion and exclusion of studies/literature for this study

Criteria Type	Inclusion Criteria	Exclusion Criteria
Timeframe	Studies published between **2020–2024**	Studies before 2020
Language	English	Non-English articles
Document Type	Peer-reviewed journal articles, conference papers, and books	Editorials, preprints, theses, or commentaries
Database Quality	Indexed in **Scopus (Q1–Q4)** or equivalent	Non-indexed or low-quality sources
Relevance	Focused on E-Government implementation, CSFs, or ICT governance	Studies unrelated to E-Government or CSF frameworks
Accessibility	Full text available	Abstract-only or inaccessible content

Thematic Analysis and Synthesis:

The extracted data was analyzed through thematic analysis. Themes and patterns around the use of CSFs in E-government implementation, the factors that lead to successful implementation, challenges and obstacles to implementation, and ways of solving the problem were found.

Based on their connections and similarities, the identified CSFs were categorized. Similar factors were combined to create higher-level categories, enabling the creation of an extensive framework. The CSFs of the E-government Framework are the result of further analysis and enhancement of the synthesized CSFs. It is a framework with the necessary components that can be used to represent the implementation of E-government.

C. Thematic Coding and Factor Clustering

Qualitative content analysis was conducted on the SLR after identifying the potential CSFs based on this review, which were categorized, systematized, and narrowed using NVivo software. This step was to generalize a hierarchical taxonomy of interrelated aspects that describe the complexity of the implementation of e-government. The extracted factors were evaluated on the basis of thematic similarities and conceptual relevance. Similar factors or the ones that were related in their operations were grouped in higher-order groups called clusters. This was achieved through the incorporation of inductive reasoning, which allowed the formation of new patterns out of the information, and deductive reasoning, which made sure that the classifications were consistent with the existing theoretical constructs.

The correlation between the individual factors and their cluster can be stated as:

$$C_j = \sum_{i=1}^{n_j} F_{ij} \qquad (1)$$

where C_j denotes the j^{th} cluster, F_{ij} represents the normalized score of the ith success factor within cluster j, and n_j Is number of success factors grouped under cluster j. The clustering procedure was repeated several times with the assistance of experts to provide internal consistency and minimize the amount of thematic overlap.

Validity Check:

The framework was cross-referenced with the existing models and empirical research in the field of digital governance and ICT adoption to guarantee the correspondence with the validated constructs reported in the existing literature.

D. Multi-Criteria Validation using AHP

To estimate the comparative importance and interdependence of the 5 clusters identified, the study used the AHP-a multi-criteria decision-making model. AHP converts qualitative expert judgments into quantitative weights, thereby establishing the proportional influence of each criterion.

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Step 1: Structuring the Hierarchy

The AHP hierarchy was made up of three levels:

- Level 1: Goal — Successful implementation of e-government
- Level 2: Criteria — The eight major clusters $(C_1, C_2, \dots, C_7, C_8)$
- Level 3: Sub-criteria — Specific success factors (F_{ij}) within each cluster

Step 2: Pairwise Comparison Matrix

Pairwise comparisons between the clusters were carried out by experts using the Saaty scale of 1-9 to indicate relative importance. The resulting matrix $A = [a_{ij}]$ meets the reciprocal property:

$$a_{ij} = \frac{1}{a_{ji}}, \qquad a_{ii} = 1 \tag{2}$$

Where:

a_{ij} = The relative importance of cluster i compared to cluster j in the AHP pairwise matrix

a_{ji} = The reciprocal importance of cluster j compared to cluster i.

Step 3: Derivation of Priority Weights

The relative priority vector $w = [w_1, w_2, \dots, w_n]^T$ Was found to be the normalized principal eigenvector of matrix A, such that:

$$Aw = \lambda_{max} w \tag{3}$$

Where:

A = pairwise comparison matrix of order $n \times n$

w = eigenvector representing the relative priority weights of clusters

λ_{max} = maximum eigenvalue of matrix A

The principal eigenvector w provides the raw, unnormalized cluster weights derived from expert comparisons. Normalized weights were then obtained as:

$$W_i = \frac{w_i}{\sum_{i=1}^{n} w_i} \tag{4}$$

Where:

W_i = normalized weight (global priority) of the ith cluster

w_i = raw weight from eigenvector

n = total number of clusters (in this case, n=8)

These weights are the relative weight of each cluster towards the overall success of e-government implementation.

Step 4: Consistency Verification

To make expert judgments reliable, the Consistency Index (CI) and Consistency Ratio (CR) were calculated as follows:

$$CI = \frac{\lambda_{max} - n}{n-1} \tag{5}$$

$$CR = \frac{CI}{RI} \tag{6}$$

Where:

CI = Consistency Index λ

λ_{max} = maximum eigenvalue obtained from (3)

n = number of clusters

CR = Consistency Ratio

RI = Random Consistency Index (a benchmark constant derived from Saaty's scale; e.g., RI = 1.41 for n = 8)

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The determined CR = 0.07 showed that the level of consistency was acceptable (CR< 0.10), which proved that the pairwise comparisons were logically consistent.

Step 5: Global Weight Calculation

The total contribution of each sub-factor (W_g) was calculated as the product of the local weight (W_l) of a sub-factor and the global weight (W_c) of a cluster.

$$W_g = W_c \times W_l \quad (7)$$

Where:

W_g = global weight of sub-factor i within cluster j.

W_c = global weight of the parent cluster (from Equation 4).

W_l = local weight of the sub-factor i within cluster j.

This step translates local sub-factor priorities into their overall influence within the entire model.

E. Framework Development

According to the results of peer-reviewed articles, the found CSF were divided into eight broad domains. NVivo software was used to perform thematic coding, which made these variables organised systematically so that every component was conceptually different but linked with other components in the model.

Average Relevance Score (ARS) Calculation:

To quantify the perceived importance of each thematic cluster, an Average Relevance Score (ARS) was computed based on expert evaluations. A purposive sample of 34 domain experts—comprising e-government practitioners, digital transformation officers, and academic researchers—participated in the relevance assessment. Each participant independently rated the significance of sub-factors within the identified clusters using a five-point Likert scale (1 = Very Low Relevance, 2 = Low, 3 = Moderate, 4 = High, and 5 = Very High Relevance). The ARS for each cluster was calculated as the mean of all individual ratings across participants and sub-factors, expressed mathematically as:

$$ARS_j = \frac{1}{n}\sum_{i=1}^{n} R_{ij} \quad (8)$$

where, ARS_j represents the Average Relevance Score of clusters j, R_{ij} Denotes the relevance rating assigned by expert i to cluster j, and n is the total number of respondents.

A conceptual mapping process was used to simplify the structure of the framework later, and the causal relationships between the factors were represented to show both the direct and indirect impacts on the success of e-government. To illustrate, technological readiness was found to intermediately affect the connection between organisational strategy and satisfaction among the citizens, yet governance mechanisms such as policy support and accountability structures were found to be the cross-cutting facilitators in all aspects. This relational mapping provided the multi-layered perspective of the role of different factors in the success of e-government implementation. Besides, the significance of each of the factors was justified and weighted with the assistance of AHP, which provided an opportunity to quantify the role of each factor in the whole structure. Such a mix of qualitative and quantitative approaches rendered the model more analytically rigorous since it gave it the interpretive richness and empirical measurability.

The mathematical representation of the functional structure of the set A, which includes eight domains/clusters, is:

$$A = f(C_1, C_2, \ldots, C_8) \quad (9)$$

where every cluster C_i It is characterized by a mixture of its weighted sub-factors.

The index of success readiness (S) of an e-government initiative is thus calculated as:

$$S = \sum_{i-1}^{5} W_i \times C_i \quad (10)$$

Where:

S = the overall e-government success or readiness index.

W_i = global weight of the ith cluster from AHP.

C_i = aggregated normalized score of cluster i.

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This formulation can be quantitatively benchmarked to help policymakers and managers of the digital transformation evaluate the institutional preparedness, detect strategic weaknesses, and prioritize what needs to be improved.

3. Literature review

The adoption and effectiveness of e-government have been widely discussed in the literature, and various frameworks, models, and CSFs have been identified. Several studies have been used to explain the multidimensional factors that can determine the successful adoption and sustainability of e-government systems.

According to Yang et al. [15], a comprehensive meta-ethnographic study gave the generalized model of the success of e-government implementation. They were synthesized based on 94 research articles, 571 CSF concepts, and finally, they came up with 55 consolidated CSFs. These aspects cut across strategic, organizational, technological, and human aspects, thus providing a holistic perspective of the processes that support successful e-government implementation. The authors have stressed that the successful implementation requires a coordinated effort of the governmental bodies, stakeholders, and citizens, where the policy goals are aligned with the goals of digital transformation.

Dias [16] analyzed leadership and change management in the framework of the implementation of e-government, which provided a conceptual framework to predict adaptive leadership, institutional readiness, and participatory governance. The discussion has emphasised the importance of effective leadership to minimise organisational resistance and encourage digital innovation and simplification of transitions within administrative systems. The findings revealed that leadership had a role as a driver and stabilizer of the long-term adoption of e-government reforms.

To find out the critical CSFs affecting the acceptance and utilisation of e-government, Zorali and Kanipek [17] carried out empirical research in the Republic of Cyprus. Their findings showed that financial capacity, e-readiness, ICT infrastructure, political and legal stability, and technological progress have a conclusive influence on the adoption outcomes.

The comparative analysis on the CSFs benchmarks in different kinds and sizes of government was done by Al Zadjali [18]. The standards of e-government were tested using the Delphi methodology, questionnaires, and rational analysis, especially in the Polish setting. This study revealed that technological infrastructure, socio-cultural environment, and economic context play an important role in determining success and organisational structure. The authors were able to conclude that contextual structures should be provided to governments at different levels to accommodate the differences. Al-

Shqairat et al. [19] concentrated on e-government initiatives in Jordan and found 11 CSFs following the content analysis of the interviews with thirty managers of three ministries with the help of NVivo. They have determined that knowledge sharing, policy alignment, and strategic leadership are important for the effective execution of national e-government and recommended the inclusion of these in the implementation plans.

Omweri [20] has carried out a systematic literature review of the e-government adoption in the developing world with respect to the urban-rural disparities, institutional capacity, and the socio-cultural issues. The research assumed a gap analysis between the theoretical constructs of IT and the practical guides that were applied by the policymakers. The results indicated that although theoretical frameworks are more inclined to pay attention to the aspect of governance and infrastructure, the practical aspect should pay more attention to community involvement and the flexibility of local governance.

Kitsios and Kamariotou [21] proposed a new service development (NSD) model of e-government, which is a combination of theoretical and practical approaches to leadership, coordination, and project management. Their model helps to explain the impact of the innovation and leadership experience on the success of digital service delivery in the context of the public organization and provides a foundation on which the CSFs may be empirically assessed in the context of the NSD-based e-government project.

Wied et al. [22] built on the previous research by investigating causal relationships among factors of success and failure in 21 engineering and e-government projects. The study, through triangulated methodologies, differentiated the primary and secondary determinants of project performance, where proactive risk identification and adaptive project governance have a significant positive impact on the outcomes of implementation.

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Nguyen et al. [23] studied the e-government adoption in Vietnam, paying attention to the aspects of citizen satisfaction and participation. The study was based on survey data that transparency, accessibility, and perceived efficiency were directly related to citizen trust and engagement. The authors suggested a conceptual framework based on the administrative reform principles and connected the performance of the institution with the digital governance perception of the citizens.

A systematic literature review conducted by Aleisa [24] indicated the key determinants of e-government adoption in developing countries, especially Jordan. The paper has focused on access to technology, perceived usefulness, social influence, and trust as the determinants. It made the conclusion that a balanced consideration of technological and socio-behavioral aspects is needed to achieve acceptance and long-term sustainability in the implementation of sustainable e-government.

Research Gap & Contribution:

Although there is a vast literature on the topic of e-government implementation, there is still a gap in the literature that has critically examined the integration and prioritization of multidimensional CSFs that determine its effectiveness and sustainability. The prior research has contributed greatly to isolating the CSFs like leadership, ICT infrastructure, citizen participation, and institutional readiness, but these results are usually disjointed between different theoretical and contextual realms. Yang et al. [15] presented a general meta-ethnographic synthesis of success factors, but the research did not have a weighted prioritization system to measure the relative importance of each factor. Equally, Dias [16] and Zorali and Kanipek [17] highlighted leadership and environmental preparedness, respectively, but failed to provide a unified framework that combines both organizational, human, and governance factors into a single assessment framework. In addition, although comparative and contextual research like that one by Al Zadjali [18] and Al-Shqairat et al. [19] was able to identify regional differences in e-government adoption, their study was generally restricted to a limited set of national settings, which restricted the extrapolation of their findings. The other gap is that there is no holistic, empirically proven framework that helps bridge the qualitative and quantitative viewpoints on the CSFs of e-governments.

The literature has so far been based mainly on qualitative approaches in the identification of the influencing variables, including interviews, thematic analyses, and case studies, but little has been done to validate the results using structured methods of analysis. Also, the literature reviewed does not include systematic mechanisms of establishing interdependencies between factors or the relative importance on the basis of empirical evidence. Consequently, policy makers and practitioners are usually struggling to apply theoretical knowledge to practical policies on e-government planning, implementation, and performance measurement. The proposed framework offers a systematic and balanced perspective of e-government dynamics by classifying the CSFs. The weighted scoring and inter-factor relationship make it possible to interpret the interaction of these dimensions more subtly and determine their effect on implementation outcomes.

4. Critical Success Factor Categorization

Figure 2 demonstrates the methodology of article selection to be used in this study according to the PRISMA guidelines. Identification was the first stage that included searching 2,135 research records using web search engines. In this phase, the abstracts and titles of the articles were filtered to identify how the articles were relevant to the research objectives. 1919 articles were filtered out due to not fitting the predetermined inclusion criteria, including being relevant to e-government, containing CSF discussions, or being of adequate quality of methodology. This filtering procedure was necessary to keep only potentially significant studies under further consideration. During the Screening phase, 216 records were screened. Nevertheless, 134 duplicate records were found and eliminated to eliminate redundancy and ensure that a given study had a unique contribution to the analysis. Once the duplicates were eliminated, 82 records were left to be assessed in terms of eligibility. The Eligibility stage involved a full-text screening of the rest of the 82 studies to ensure that they met the study focus of e-government implementation CSFs. In this evaluation, 24 articles were eliminated due to certain reasons: (i) they were not dedicated to e-government applications, (ii) they were not able to explain the key concepts of e-government, or (iii) they were not able to discuss the CSFs of e-government implementation. During the Inclusion phase, 58 articles were chosen to be qualitatively synthesized.

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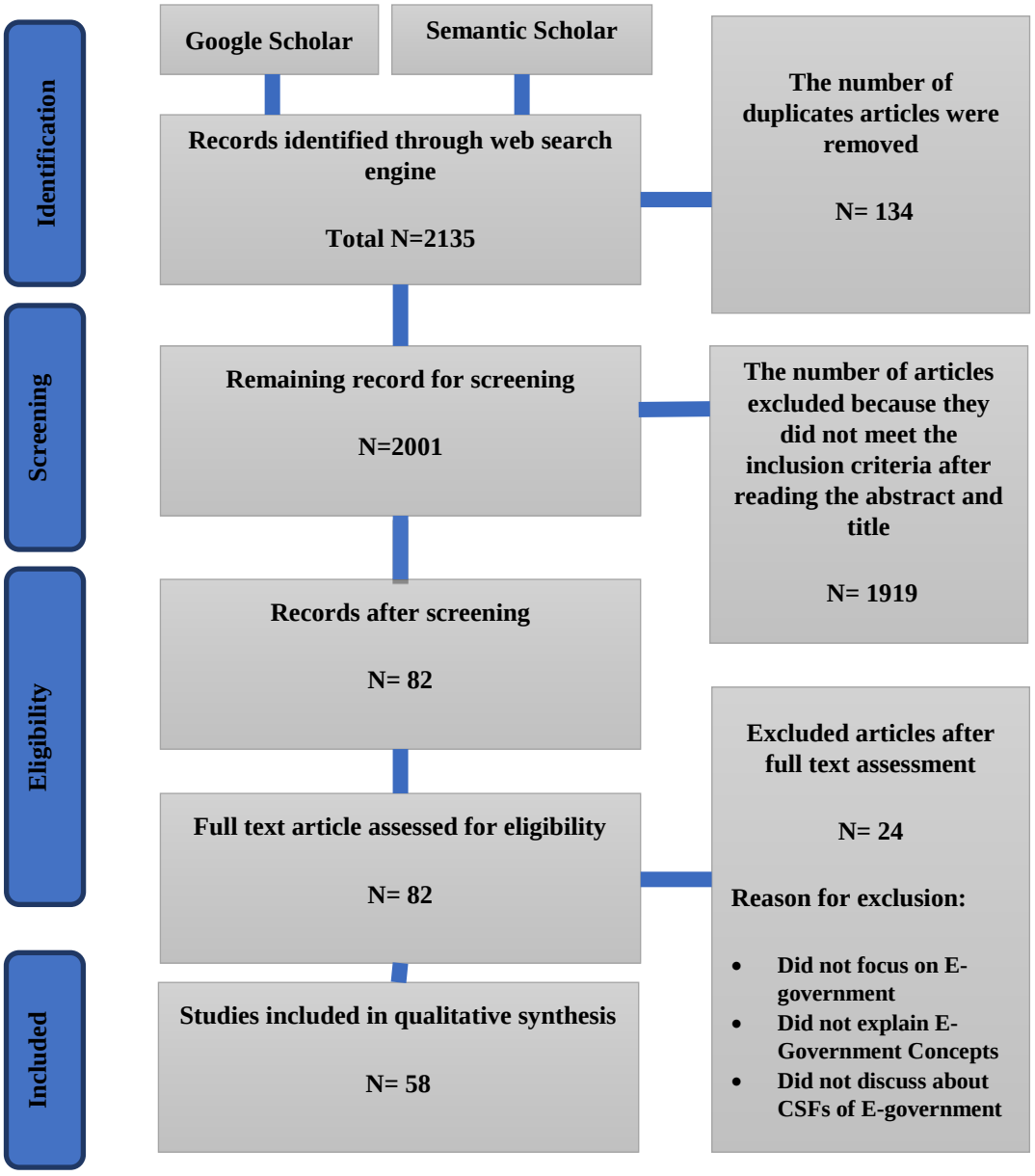

Figure 2. Article Selection Block Diagram

Table 2 provides an exhaustive list of the CSFs that were obtained with the help of the systematic literature review and thematic synthesis carried out in the course of this research. All these are the multidimensional determinants that affect the successful implementation, adoption, and sustainability of e-government systems. The CSFs are systematically organized into eight major domains, namely Strategic Planning and Governance, Planning and Execution, Technical and Operational Aspects, User-Centric Focus and Quality Assurance, Technological Factors, Organizational Factors, Socio-Political Factors, and Economic Factors, and each of them covers different, though interrelated, aspects of digital governance.

The focus on leadership, policy alignment, and institutional vision in the first domain of Strategic Planning and Governance highlights the focus of e-government initiatives. Visionary leadership, favorable policy frameworks, political stability, and good governance principles are some of the elements that constitute strategic direction and accountability [25]. The consideration of such facets as change management, international interaction, and market synergy proves the significance of adaptive strategies and international benchmarking [26]. In addition, the development of a positive cultural atmosphere and the emphasis on e-government projects in national agendas will guarantee the correspondence of the policy intentions and technological opportunities.

The second domain, which is related to the operational and managerial skills needed to realise the strategic vision, is Planning and Execution. It incorporates the general planning, inter-agency coordination, integration of best

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practices, and good project management as enabling factors [27]. Scalability and reduction of risks have been brought about by sufficient funds, a clear organisational framework, and incremental implementation strategies. Flexibility and sustainability of institutions can further be improved by encouraging innovation, rewarding effort, and promoting creativity among the implementation teams [28].

The third domain, Technical and Operational Aspects, explains the technical and functional background of e-government systems. The success will be pegged on the well-established ICT infrastructure, high-level system security, efficient portal and use of applications, and methodical monitoring and evaluation. The involvement of the users, connection with the stakeholders, and building capacity are also important as they ensure the systems are created and optimized with respect to the actual needs of the users in the actual world. Another aspect that is recognized by this group is the greater importance of self-sustainable revenue schemes and e-participation that can be adopted to establish financial sustainability and inclusion of citizens [29].

The fourth domain is User-Centric Focus and Quality Assurance, which dwells upon the fact that e-governments need to be citizen-centric. Trust-building, public awareness campaign, citizen satisfaction, and high-quality information are some of the key elements that guarantee adoption and long-term participation [30]. The level of the provided services, their integration with many systems, their unceasing improvement, and the growth of the digital literacy level all enable the citizens to consider the e-government sites as comfortable, reliable, and simply available. The security, the legal and bureaucratic barriers, and the privacy, and the integration of actions to address the relationships with citizens, also increase confidence in the digital civic services [31].

Technological Factors is the fifth domain, which is the background technological enablers that keep the e-government functional [32]. They need to be accessible to reliable services, superb infrastructure, and connectivity, and user-friendly interfaces that will provide service accessibility and ease of use, especially to digitally unskilled citizens.

The sixth domain, Organizational Factors, introduces the internal forces of government, focusing on the importance of the dedication of the top leadership, adaptive organisational culture, and professional human resources. These are the elements that lead to institutional preparedness, i.e., e-government systems are not only in place, but also sustained and constantly upgraded [33-35].

Table 2: Identified CSFs for E-Government Implementation

1	**Strategic Planning and Governance**
	Visionary Leadership Supportive Government Policy Framework Political Support and Stability Leveraging International Support Effective Change Management Strategies Nurturing Supportive Cultural Environment Enforcing Good Governance Principles Prioritizing e-Government Initiatives Harnessing Market Synergy and Potential Addressing External Pressures and Expectations
2	**Planning and Execution**
	Comprehensive Planning Seamless Coordination Among Project Participants Incorporation of Best Practices Adequate Funding Allocation Strategically Planned Outsourcing Clear and Effective Organizational Structure Sound Project Management Practices Utilizing Effective System Development Methodologies Facilitating Electronic Transactions

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	Gradual and Phased Implementation Strategies Encouraging Creativity and Innovation Recognizing and Rewarding Contributions
3	**Technical and Operational Aspects**
	Effective Use of Portals/Applications Prototyping for Iterative Development Optimal System Usability Well-Executed System Campaign Strong Team Skills and Expertise User and Stakeholder Involvement Training and Capacity Building Continuous Monitoring and Evaluation Reliable ICT Infrastructure and Service Availability Robust System Security Measures Dealing with High Demand by Citizens Exploring Self-Sustainable Revenue Models Promoting E-Participation and Engagement
4	**User-Centric Focus and Quality Assurance**
	Building Trust with Users and Stakeholders Raising Awareness About e-Government Initiatives Focusing on Citizen Satisfaction Ensuring High Information Quality Upholding System Quality Standards Delivering High-Quality Services Implementation of Citizen Relationship Management Strategies Endorsement of Top Management Ensuring Interoperability with Other Systems Ensuring User/Citizen Computer and Internet Literacy Enhancement Incorporating Reusable Components Commitment to Continuous Improvement User-Pay or Premium Fee Considerations Willingness to Embrace Change Addressing Legal and Security Considerations Addressing Bureaucratic Processes
5	**Technological Factors**
	Infrastructure and Connectivity User-Friendly Interface
6	**Organizational Factors**
	Leadership and Commitment Organizational Culture Human Resource Capabilities

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7	**Socio-Political Factors**
	Government Support and Policies: Citizen Engagement and Participation: Digital Literacy and Inclusivity:
8	**Economic Factors**
	Budget Allocation and Funding Cost-effectiveness and ROI

Socio-political and economic factors are also crucial in the success and sustainability of digital transformation activities (7th Domain). Regulatory frameworks, incentives, and strategic visions are established on the platform of government support and policies. The participation and involvement of the citizens also play a major role, whereby they bring about accountability, transparency, and co-creation of the value of the public, bearing in mind that the technological solutions should be in line with the needs of the society. The digital gap can be bridged by introducing digital literacy and inclusiveness that can help to empower the marginalized people to take full benefit of digital ecosystems.

In the economic aspect (8th Domain), the scope and the ability of digital projects are determined based on funding and budgetary allocation, but the aspects of cost-effectiveness and measurement of the rate of return (ROI) may be applied to ensure that the resources are utilized most efficiently and effectively to deliver measurable outcomes. This sort of socio-political and economic combination will contribute to the creation of an environment where sustainable digital development may be supported, to balance innovation and accessibility, efficiency, and social welfare.

5. CSF Synthesis and Analysis

Based on the analysis of thematic clusters presented in Table 3 below, Strategic Planning and Governance (C1) proved to be the most common, having 15.2% out of all coded references and an ARS of 4.87 on a five-point scale. This means that visionary leadership, good policy frameworks, and political stability have been considered as the biggest contributors to the success of e-government. The reason is that these factors happen to be the strategic foundation on which all the other implementation processes will be pegged. The high ARS is also associated with the professional judgement that the consistency in governance and a high degree of leadership commitment play an important role in the digital transformation journeys of the public institutions. Then, Planning and Performance (C2) has a frequency of 13.9% and ARS 4.74, which emphasizes the high frequency of effective inter-agency coordination, slow implementation of the project, and the use of best practices. This group pays attention to the mechanism aspect of e-government because the transition between the policy formulation and the practical implementation defines the failure or the absence of development of digital projects. It is suggested by the findings that the countries with systematic planning systems and models of execution, which are innovation-oriented oriented perform better in sustaining e-government development in the long term. The cluster with the largest percentage of 13.1% and the ARS of 4.82 is the Technical and Operational Aspects (C3) one which stresses the inseparable nature of ICT infrastructure, systems usability, cybersecurity, and capacity building. It scores very high in relevance, meaning that the more technologically robust the systems are reliable the more the trust of the user and the continuity of the service. Similarly, User-Centric Focus and Quality Assurance (C4), which has an ARS of 4.71, i.e., 12.6% of incidents, reflects this focus on enhancing the priority on the level of citizen satisfaction, transparency, and interoperability of services. The focus on user experience is in line with the world trends that focus on participatory governance and co-creation of digital public services. The second level consists of Technological Factors (C5) and Organizational Factors (C6), and collectively they contribute to an average of 22.3% of the thematic weight, the ARS of which is 4.76 and 4.69, respectively. These results indicate that strong technical infrastructure and effective organizational culture are not necessarily important, but are conditional on higher-order strategic and governance alignment. Socio-Political Factors (C7) and Economic Factors (C8) (12.0% and 11.0%, respectively) denote that the enabling factors include governmental backing, civic participation, inclusivity, and sustainable financing of the processes. Nevertheless, their marginally minimal ARS scores (4.73 and 4.66) suggest that these areas are more like facilitators rather than a direct influence on success in implementation.

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Table 3: Thematic Clusters of E-Government CSFs

Cluster	Cluster Name	Freq. (%)	Sub-Factors Identified	ARS (1–5)
C1	**Strategic Planning & Governance**	15.2	Visionary leadership, supportive policy frameworks, political stability, change management, and good-governance enforcement	**4.87**
C2	**Planning & Execution Efficiency**	13.9	Comprehensive planning, inter-agency coordination, best practices, phased implementation, innovation incentives	**4.74**
C3	**Technical & Operational Aspects**	13.1	ICT infrastructure, system usability, security, monitoring & evaluation, capacity building	**4.82**
C4	**User-Centric Focus & Quality Assurance**	12.6	Citizen trust, satisfaction, interoperability, information quality, CRM strategies	**4.71**
C5	**Technological Factors**	11.5	Infrastructure connectivity, interoperability, user-friendly interfaces, scalability	**4.76**
C6	**Organizational Factors**	10.8	Leadership commitment, organizational culture, and human-resource capabilities	**4.69**
C7	**Socio-Political Factors**	12.0	Government support, citizen engagement, digital literacy, and inclusivity	**4.73**
C8	**Economic Factors**	11.0	Budget allocation, funding efficiency, cost-effectiveness, and ROI analysis	**4.66**

Table 4: AHP-Derived Global Weight of E-Government CSFs

Rank	Domain	Global Weight (W_i)	Relative Priority (%)	CR Contribution
1	Strategic Planning & Governance	0.152	15.200	0.012
2	Planning & Execution Efficiency	0.139	13.900	0.011
3	Technical & Operational Aspects	0.131	13.100	0.010
4	User-Centric Focus & Quality Assurance	0.126	12.600	0.010
5	Technological Factors	0.115	11.500	0.009
6	Organizational Factors	0.108	10.800	0.008
7	Socio-Political Factors	0.120	12.000	0.009
8	Economic Factors	0.109	11.000	0.008

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Table 5: Local Priority Weights of Sub-Factors

Domain / Cluster	CSF ID	Critical Success Factor	Local Weight (LW)	Global Weight (GW)
C1 Strategic Planning & Governance (n=10)	1	Visionary Leadership	0.265	0.040
	2	Supportive Government Policy Framework	0.238	0.036
	3	Political Support and Stability	0.220	0.033
	4	Leveraging International Support	0.164	0.025
	5	Effective Change Management Strategies	0.113	0.017
	6	Nurturing Supportive Cultural Environment	0.075	0.011
	7	Enforcing Good Governance Principles	0.052	0.008
	8	Prioritizing e-Government Initiatives	0.039	0.006
	9	Harnessing Market Synergy and Potential	0.020	0.003
	10	Addressing External Pressures and Expectations	0.014	0.002
C2 Planning & Execution Efficiency (n=12)	11	Comprehensive Planning	0.275	0.038
	12	Seamless Coordination	0.241	0.034
	13	Incorporation of Best Practices	0.210	0.029
	14	Adequate Funding Allocation	0.163	0.023
	15	Strategically Planned Outsourcing	0.111	0.015
	16	Clear Organizational Structure	0.065	0.009
	17	Sound Project Management Practices	0.042	0.006
	18	Effective System Development Methodologies	0.035	0.005
	19	Facilitating Electronic Transactions	0.023	0.003
	20	Phased Implementation Strategies	0.021	0.003
	21	Encouraging Creativity and Innovation	0.009	0.001
	22	Recognizing and Rewarding Contributions	0.005	0.001
C3 Technical & Operational Aspects (n=13)	23	Effective Use of Portals/Applications	0.256	0.034
	24	Prototyping for Iterative Development	0.242	0.032
	25	Optimal System Usability	0.209	0.027
	26	System Campaign Execution	0.175	0.023
	27	Team Skills & Expertise	0.118	0.015
	28	User and Stakeholder Involvement	0.078	0.010
	29	Training and Capacity Building	0.055	0.007
	30	Continuous Monitoring & Evaluation	0.030	0.004
	31	Reliable ICT Infrastructure	0.021	0.003
	32	Robust System Security	0.010	0.001
	33	Dealing with High Demand	0.006	0.001
	34	Self-Sustainable Revenue Models	0.005	0.001

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	35	Promoting e-Participation	0.004	0.001
C4 User-Centric Focus & Quality Assurance (n=16)	36	Building Trust with Users	0.266	0.033
	37	Raising Awareness	0.244	0.031
	38	Citizen Satisfaction	0.223	0.028
	39	High Information Quality	0.173	0.022
	40	Upholding System Standards	0.094	0.012
	41	High-Quality Services	0.072	0.009
	42	Citizen Relationship Management	0.054	0.007
	43	Top Management Endorsement	0.048	0.006
	44	Interoperability	0.040	0.005
	45	Digital Literacy Enhancement	0.035	0.004
	46	Reusable Components	0.029	0.004
	47	Continuous Improvement	0.024	0.003
	48	Premium Fee Considerations	0.018	0.002
	49	Willingness to Embrace Change	0.014	0.002
	50	Legal & Security Considerations	0.010	0.001
	51	Addressing Bureaucratic Processes	0.008	0.001
C5 Technological Factors (n=2)	52	Infrastructure & Connectivity	0.600	0.069
	53	User-Friendly Interface	0.400	0.046
C6 Organizational Factors (n=3)	54	Leadership & Commitment	0.296	0.032
	55	Organizational Culture	0.283	0.031
	56	Human Resource Capabilities	0.245	0.027
C7 Socio-Political Factors (n=3)	57	Government Support & Policies	0.293	0.035
	58	Citizen Engagement & Participation	0.277	0.033
	59	Digital Literacy & Inclusivity	0.257	0.031
C8 Economic Factors (n=3)	60	Sustainable Financial Mechanisms	0.247	0.027
	61	Budget Allocation & Funding	0.297	0.032
	62	Cost-Effectiveness & ROI	0.279	0.030

The qualitative results are supported by the AHP-based weights shown in Table 4. The weight (W_i = 0.152) and relative priority of 15.2% of Strategic Planning and Governance were the highest globally, and it can be concluded that it is the core of e-government initiatives. The contribution of the Consistency Ratio (CR) of 0.012 suggests the high standards of corporate internal consistency, which proves the credibility of the expert judgment. The next two weights of 0.139 and 0.131 are Planning and Execution Efficiency and Technical and Operational Aspects, respectively, which reflect their central positions in the tactical implementation of strategic visions. The weight of these clusters is more than 42% of the total, which highlights the importance of the fact that successful planning and technical capacity are the operational core of digital governance structures. Along with the suggested growth of the maturity of citizen-centred digital transformation processes, moderate priority domains include User-Centric Focus and Quality Assurance (0.126) and Technological Factors (0.115). In the meantime, Organizational, Socio-Political, and Economic dimensions are somewhat less dominant, with the weight of each dimension being 0.108 to 0.120, which means that the specified domains are not the leading enablers that contribute to enhancing the sustainability and adaptability of the overall system, rather than being the primary CSF.

The local and global weights of sub-factors, as provided in Table 5 and Figure 3, give additional fines to the extent to which individual variables can be seen to contribute to the overall e-government success. Among Strategic Planning and Governance, the highest-ranked is Visionary Leadership and Policy Support (0.040 global weight), which proves that leadership direction and policy stability are the core of the successful digital transformation. Political Stability and Good Governance (0.036) and Change Management and Cultural Support (0.033) also

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indicate the significance of continuity and flexibility in the process of reforms. Planning and execution efficiency significant one is significant in Planning and Coordination (0.038) and Adequate Funding and Project Management (0.034), which makes clear that coordinated institutional activities and access to resources are the key factors that define the sustainability of a project. Likewise, in Technical and Operational Aspects, the ICT Infrastructure and Service Availability (0.034) and System Security and Reliability (0.032) become priorities, and it is once again evident that strong, safe, and scalable technical foundations are required.

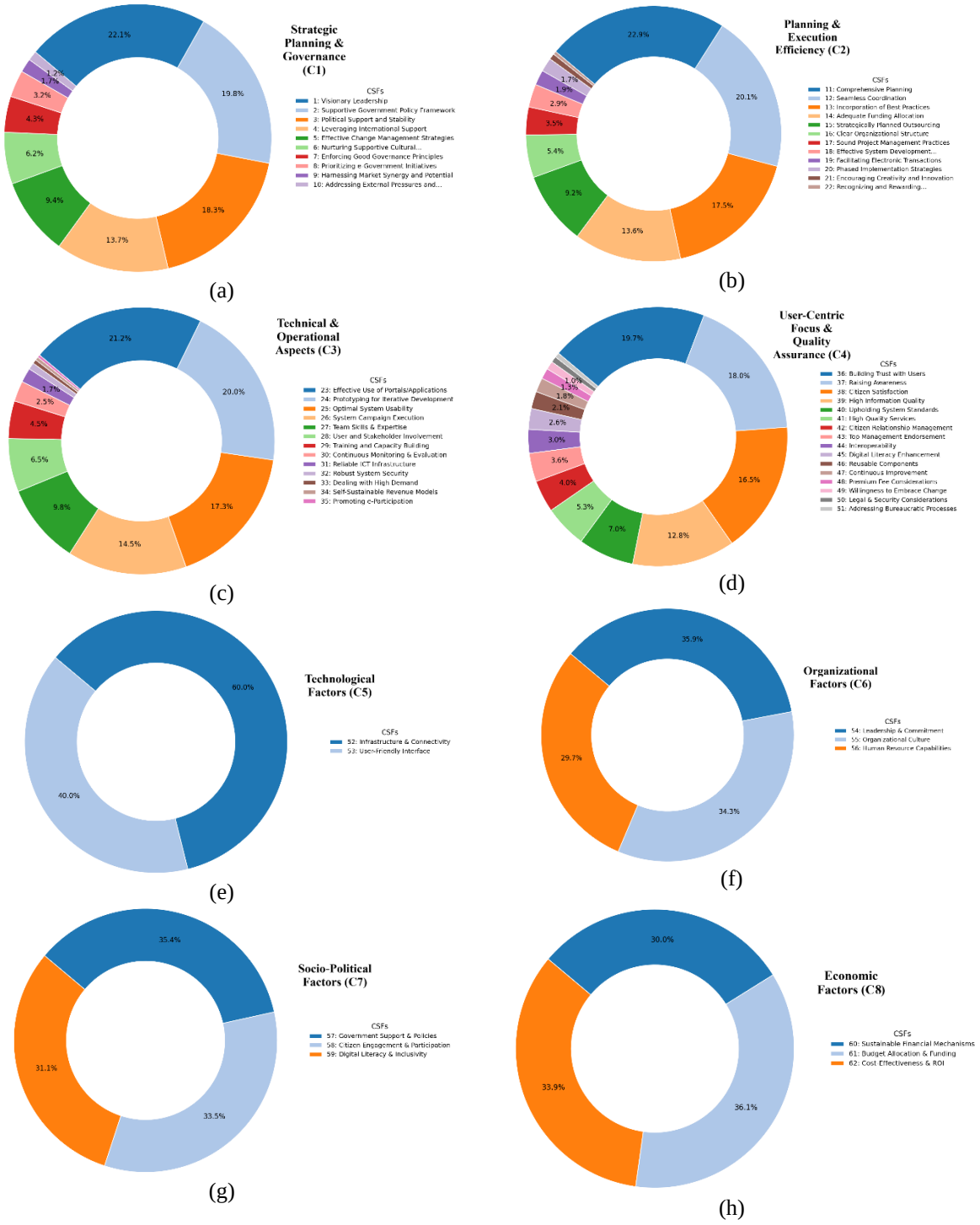

Figure 3. Donut charts illustrating the proportional contribution of Critical Success Factors (CSFs) within each of the eight e-Government domains or clusters, based on both Local Weights (LW) and normalized Global Weights (GW) derived from the AHP evaluation. (**Note:** Percent label <1% are suppressed to reduce clutter.)

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To achieve User-Centric Focus and Quality Assurance, Citizen Trust and Transparency (0.033) is found to be the most significant determinant because of the requirements of transparent and responsible models of governance. Within the Technological Factors domain, there are the Infrastructure Connectivity and Reliability (0.033) and User-Friendly Interface and Accessibility (0.031). As part of the organizational variables, Leadership Commitment (0.032) and Adaptive Organizational Culture (0.031) are the most significant variables in institutional readiness, whereas, in the Socio-Political Factors, Government Support and Policy Frameworks (0.035) and Citizen Engagement and Participation (0.033) represent the social legitimacy of e-government projects.

Table 6: Ranked List of 62 CSFs Based on AHP Global Weights

Rank	Critical Success Factor	Domain / Cluster	Local Weight (LW)	Global Weight (GW)
1	Building Trust with Users	User-Centric Focus & Quality Assurance (C_4)	0.266	**0.033**
2	Visionary Leadership	Strategic Planning & Governance (C_1)	0.265	**0.040**
3	Comprehensive Planning	Planning & Execution Efficiency (C_2)	0.275	**0.038**
4	Effective Use of Portals/Applications	Technical & Operational Aspects (C_3)	0.256	**0.034**
5	Raising Awareness	User-Centric Focus & Quality Assurance (C_4)	0.244	0.031
6	Citizen Satisfaction	User-Centric Focus & Quality Assurance (C_4)	0.223	0.028
7	Supportive Government Policy Framework	Strategic Planning & Governance (C_1)	0.238	0.036
8	Prototyping for Iterative Development	Technical & Operational Aspects (C_3)	0.242	0.032
9	Seamless Coordination	Planning & Execution Efficiency (C_2)	0.241	0.034
10	High Information Quality	User-Centric Focus & Quality Assurance (C_4)	0.173	0.022
11	Optimal System Usability	Technical & Operational Aspects (C_3)	0.209	0.027
12	Political Support and Stability	Strategic Planning & Governance (C_1)	0.220	0.033
13	Incorporation of Best Practices	Planning & Execution Efficiency (C_2)	0.210	0.029
14	Upholding System Standards	User-Centric Focus & Quality Assurance (C_4)	0.094	0.012
15	High-Quality Services	User-Centric Focus & Quality Assurance (C_4)	0.072	0.009
16	Leadership & Commitment	Organizational Factors (C_6)	0.296	0.032
17	Adequate Funding Allocation	Planning & Execution Efficiency (C_2)	0.163	0.023

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18	System Campaign Execution	Technical & Operational Aspects (C_3)	0.175	0.023
19	Organizational Culture	Organizational Factors (C_6)	0.283	0.031
20	Leveraging International Support	Strategic Planning & Governance (C_1)	0.164	0.025
21	Strategically Planned Outsourcing	Planning & Execution Efficiency (C_2)	0.111	0.015
22	Human Resource Capabilities	Organizational Factors (C_6)	0.245	0.027
23	Team Skills & Expertise	Technical & Operational Aspects (C_3)	0.118	0.015
24	Government Support & Policies	Socio-Political Factors (C_7)	0.293	0.035
25	Effective Change Management Strategies	Strategic Planning & Governance (C_1)	0.113	0.017
26	Citizen Relationship Management	User-Centric Focus & Quality Assurance (C_4)	0.054	0.007
27	Clear Organizational Structure	Planning & Execution Efficiency (C_2)	0.065	0.009
28	Supportive Cultural Environment	Strategic Planning & Governance (C_1)	0.075	0.011
29	Top Management Endorsement	User-Centric Focus & Quality Assurance (C_4)	0.048	0.006
30	Citizen Engagement & Participation	Socio-Political Factors (C_7)	0.277	0.033
31	Sound Project Management Practices	Planning & Execution Efficiency (C_2)	0.042	0.006
32	Interoperability	User-Centric Focus & Quality Assurance (C_4)	0.040	0.005
33	Effective System Development Methodologies	Planning & Execution Efficiency (C_2)	0.035	0.005
34	Digital Literacy & Inclusivity	Socio-Political Factors (C_7)	0.257	0.031
35	Enforcing Good Governance Principles	Strategic Planning & Governance (C_1)	0.052	0.008
36	Facilitating Electronic Transactions	Planning & Execution Efficiency (C_2)	0.023	0.003
37	User and Stakeholder Involvement	Technical & Operational Aspects (C_3)	0.078	0.010
38	Digital Literacy Enhancement	User-Centric Focus & Quality Assurance (C_4)	0.035	0.004
39	Reusable Components	User-Centric Focus & Quality Assurance (C_4)	0.029	0.004
40	Prioritizing e-Government Initiatives	Strategic Planning & Governance (C_1)	0.039	0.006

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41	Harnessing Market Synergy & Potential	Strategic Planning & Governance (C_1)	0.020	0.003
42	Phased Implementation Strategies	Planning & Execution Efficiency (C_2)	0.021	0.003
43	Sustainable Financial Mechanisms	Economic Factors (C_8)	0.247	0.027
44	Training & Capacity Building	Technical & Operational Aspects (C_3)	0.055	0.007
45	Budget Allocation & Funding	Economic Factors (C_8)	0.297	0.032
46	Continuous Improvement	User-Centric Focus & Quality Assurance (C_4)	0.024	0.003
47	Encouraging Creativity & Innovation	Planning & Execution Efficiency (C_2)	0.009	0.001
48	Cost-Effectiveness & ROI	Economic Factors (C_8)	0.279	0.030
49	Premium Fee Considerations	User-Centric Focus & Quality Assurance (C_4)	0.018	0.002
50	Recognizing & Rewarding Contributions	Planning & Execution Efficiency (C_2)	0.005	0.001
51	Continuous Monitoring & Evaluation	Technical & Operational Aspects (C_3)	0.030	0.004
52	Reliable ICT Infrastructure	Technical & Operational Aspects (C_3)	0.021	0.003
53	Robust System Security	Technical & Operational Aspects (C_3)	0.010	0.001
54	Addressing External Pressures & Expectations	Strategic Planning & Governance (C_1)	0.014	0.002
55	Willingness to Embrace Change	User-Centric Focus & Quality Assurance (C_4)	0.014	0.002
56	Dealing with High Demand	Technical & Operational Aspects (C_3)	0.006	0.001
57	Self-Sustainable Revenue Models	Technical & Operational Aspects (C_3)	0.005	0.001
58	Promoting e-Participation	Technical & Operational Aspects (C_3)	0.004	0.001
59	Legal & Security Considerations	User-Centric Focus & Quality Assurance (C_4)	0.010	0.001
60	Addressing Bureaucratic Processes	User-Centric Focus & Quality Assurance (C_4)	0.008	0.001
61	Infrastructure & Connectivity	Technological Factors (C_5)	0.600	0.069
62	User-Friendly Interface	Technological Factors (C_5)	0.400	0.046

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Table 6 presents the comprehensive prioritization of all 62 CSFs derived through the AHP. The ranking is based on the GW, which were obtained by multiplying each factor's LW calculated within its respective cluster with the cluster's overall weight (CW) as determined from the hierarchical structure. The resulting ranking provides a quantitative hierarchy of importance, showing which factors most significantly contribute to the success of E-Government implementation.

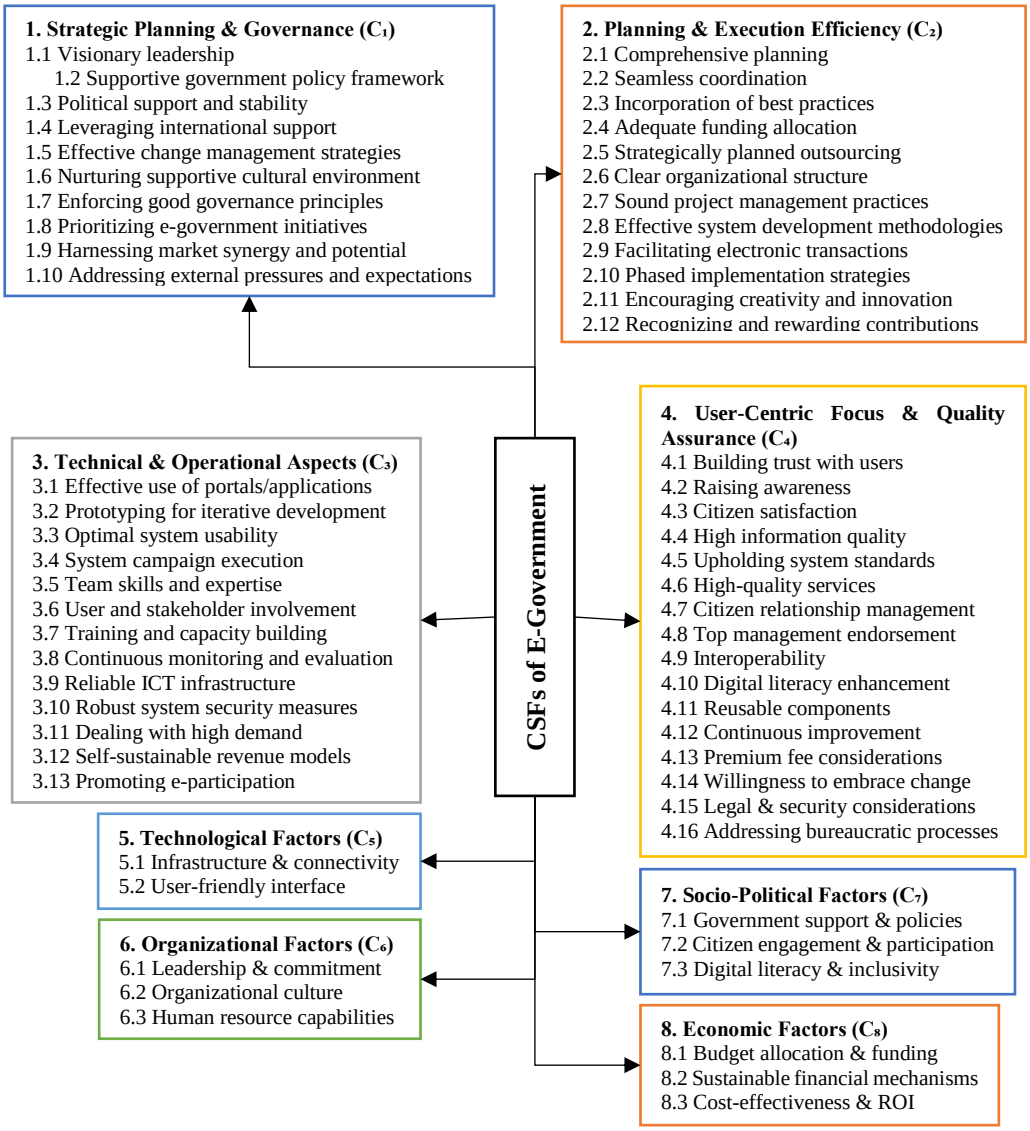

Figure 4. Proposed Framework for E-Government implementation Success

Figure 4 presents the proposed framework for E-Government implementation Success, in which each set of CSFs is systematically arranged according to its respective rank within the identified cluster. The framework integrates eight major clusters, each representing a distinct thematic dimension influencing e-government performance. Within Cluster 1 (Strategic Planning & Governance), the highest-ranked factors such as Visionary Leadership and Supportive Government Policy Framework highlight the indispensable role of strategic foresight and policy alignment in ensuring long-term stability and direction. Cluster 2 (Planning & Execution Efficiency) underscores the operational backbone of e-government, where Comprehensive Planning and Seamless Coordination emerge as top priorities, reinforcing the importance of structured execution and collaboration across agencies. Cluster 3 (Technical & Operational Aspects) positions Effective Use of Portals/Applications and Prototyping for Iterative Development as leading contributors, demonstrating that technological reliability and adaptive innovation are key enablers of system performance. Similarly, Cluster 4 (User-Centric Focus & Quality Assurance) ranks Building Trust with Users and Raising Awareness highest, indicating that user confidence and satisfaction are central to public adoption and digital inclusivity. In Cluster 5 (Technological Factors), emphasis on Infrastructure &

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Connectivity and User-Friendly Interfaces underscores the necessity of robust digital foundations and accessible platforms. Cluster 6 (Organizational Factors) prioritizes Leadership & Commitment and Organizational Culture, reflecting that internal readiness and administrative support are pivotal for policy implementation. Cluster 7 (Socio-Political Factors) highlights Government Support & Policies and Citizen Engagement & Participation as top-ranked determinants, illustrating that sustained political will and participatory governance are crucial for societal acceptance. Cluster 8 (Economic Factors) identifies Budget Allocation & Funding and Sustainable Financial Mechanisms as core economic enablers that ensure continuity and scalability of digital transformation efforts.

6. Discussion

A. Implications for E-Government Policymakers and Practitioners

The findings of this research hold a great policy impact on policy makers, policy formulators in digital governance at large, as well as those participating in the implementation of the E-Government programs to make them more successful and sustainable. The AHP made possible a priority process, which revealed that the concept of User-Centric Focus and Quality Assurance (C_4) had the largest impact in terms of a cluster weight of 0.286 that the concept of citizen trust, satisfaction, and service quality should form the foundation of any digital governance activities. The policymakers should also be interested in enacting policies that are capable of strengthening the interaction with users, the service reliability, and incorporating open communication between the government and the citizens. Similarly, Strategic Planning and Governance (C_1), in which the weight is 0.151, and Planning and Execution Efficiency (C_2), in which the weight is 0.138, point to the need to have visionary leadership, friendly policy environments, and detailed planning mechanisms that are also required to keep the administrative goals aligned with the technological developments. Within the structure of operations, the most significant rankings of Critical Success Factors, which are all rated highly, include Building Trust with Users (GW = 0.033), Visionary Leadership (GW = 0.040), and Comprehensive Planning (GW = 0.038), as these represent the most significant leverage influences on the maximum performance and adoption. The existence of Technical and Operational Aspects (C_3) of 0.119 also means that the stable ICT infrastructure and the cycling of system design and the effective use of e-portals remain the preconditions of ensuring the continuity of the services and satisfying the citizens. It is important to note that the consistency of expert judgments can be verified by the fact that the Consistency Ratio (CR = 0.07) is also relatively small in all clusters, which, once again, on the one hand, proves the credibility of the obtained priorities.

B. Strategic and Governance Dimensions

These findings underline the fact that the primary foundations of the successful implementation of e-government are strategic planning and governance. Visionary leadership, good policy systems, and political stability are some of the major aspects of this success. These results are compatible with the results of Dias [16] and Al-Shqairat et al. [19], who mention that the leadership and institutional governance orientation would help develop and implement digital strategies. There is a high weight of vision and strategy, both locally and globally, and this means that continuity and focus in the implementation stages will demand long-range planning and consistency of the leadership [36]. In addition, accountability, transparency, and trust are aspects of good governance that are provided by change management, good governance mechanisms, and good principles [37-39].

C. Digital Readiness and Technological Infrastructure

The most significant factor was the ICT infrastructure cluster, which shows that technology is the key to successful digital governance. Subfactors such as broadband connectivity, cloud infrastructure, data integration, etc., received the greatest local and global weight as they are important in developing a scalable and interoperable digital ecosystem. The results are in line with the results of Yang et al. [15] and Zorali and Kanipek [17], who concluded that technological readiness is directly connected with e-governance adoption and citizen satisfaction. Ineffective infrastructure may result in disconnected systems, silos, and unequal access - issues, which adversely impact inclusiveness and service reliability [40-42]. Consequently, it is essential to proceed with investment in digital infrastructure and network growth to achieve fair access and efficiency in operation.

D. Human Capital Development and Capacity Building

The research confirms the importance of human capital in the e-government reform success. The local weight of training and competence is 0.309, indicating that the acquisition of the skills of the employees is a priority. This finding validates that of Al Zadjali [18] and Nguyen et al. [23], who observed that institutional capacity was related to the success of implementation in the long term. Older staff are better suited to the idea of adoption of new technologies, resistance to change, and are able to help in ensuring that digital tools are used effectively [43]. In addition to technical competencies, a digital culture that enhances innovation, collaboration, and lifelong learning should also be encouraged so as to be on the leading edge of government modernization.

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E. Data Integrity and Cybersecurity

The cybersecurity cluster indicates that security and privacy become the most important aspects of the e-government ecosystems that cannot be negotiated. The sub-factors with the highest ranking are data privacy and risk management schemes, which implies that trust is the core foundation on which digital participation is established [44]. This follows the observation of Omweri [20], who emphasized that the lack of proper cybersecurity can even prevent the utilization of the technologically advanced e-government systems [45]. The citizens will adopt online services more when they are assured that their personal information is secure and the systems are not easily susceptible to attacks [46]. Therefore, to build digital trust and institutional legitimacy, standard cybersecurity policies, periodic audits, and cross-border data protection should be in place.

F. Citizen Engagement and Participatory Governance

Although the engagement cluster of citizens has a comparatively low weight in the global environment, the qualitative significance is high. One of the significant predictors of civic engagement and trust in the state was transparency and feedback as a sub-factor [47]. This is in tandem with the perceptions of Aleisa [24], who observed that the transparency systems and participatory feedback systems are strengthening the sense of inclusion and ownership of the citizens in digital governance. Moreover, the success of e-governments is not only decided within the framework of technical effectiveness but within the framework of satisfying the requirements, tastes, and expectations of the citizens [48-52]. It will involve the active participation and the implementation of continuous feedback mechanisms to ensure that the digital initiatives are responsive and inclusive, thus increasing the social value.

G. Contextual and Cultural Influences

The literature cross-analysis is that situational conditions like socio-political conditions, cultural conditions, and economic conditions make significant contributions to the applicability of CSFs. Countries that boast of good political institutions and traditions of governance are more likely to advance in the digital transformation [53-55]. On the contrary, in developing settings, the implementation is usually impeded by the lack of ICT infrastructure, bureaucratic stagnation, and a lack of digital literacy [56]. This highlights the necessity of adaptive models such as the proposed framework that will support the diversity of the region and institutions without compromising on the universal values of efficiency, transparency, and inclusivity [57-58].

H. Limitations

The results of the study are based mainly on the secondary data and expert-based AHP analysis, which can be subject to the context and be literature-dependent in its interpretation. Although the systematic review provides academic credibility, the empirical validity of the proposed framework could be enhanced by a pilot test of the framework in real-world governance settings. However, this weakness underscores the importance of the study as a conceptual framework- it represents a framework of reference points that other researchers and policymakers can use in the future and confirm with localized or real-time data.

The study fails to fully incorporate the fast-emerging technologies- artificial intelligence, blockchain, and digital identity systems that are increasingly changing the face of e-government. These factors are not included and limit the short-term adaptability of the framework to new digital governance ecosystems. However, this gap is also the reason why the research would be useful and timely, as it will form the basis of a scale that can be dynamically expanded to encompass next-generation technologies and policy innovations.

7. Conclusion and Future Scope

This study provides an in-depth explanation of the CSFs that define the successful implementation of e-government projects. The proposed study suggested a framework based on an SLR of over peer-reviewed articles, qualitative thematic coding, and quantitative validation based on the AHP. The findings indicate that the success of e-government is a multidimensional concept, which is predetermined by the complex of strategic, technological, human, governance, and socio-economic factors. The qualitative approach was used in terms of the thematic analysis, which identified 8 major clusters. The qualitative synthesis also indicated that leadership vision, governance integrity, trust by citizens, and inclusiveness (digital) are considered as significant as technological readiness, thereby again asserting the fact that e-government is a socio-institutional and not a technological phenomenon. The outcomes of the AHP-based evaluation show that User-Centric Focus and Quality Assurance (C_4) turned out to be the most significant area with a cluster weight of 0.286, which means that the critical elements of E-Government implementation success are citizen trust and satisfaction, as well as the quality of the provided services. Building Trust with Users (GW = 0.033), Visionary Leadership (GW = 0.040), and Comprehensive Planning (GW = 0.038) are the top three CSFs, and they all show that the human-centric as well as the strategic aspect of leadership is much more important than technical or financial factors. Strategy Planning and Governance (C_1) and Planning and Implementation Efficiency (C_2) domains were also rated high, which means that sustainable

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policy frameworks, leadership commitment, and coordinated implementation planning are the major facilitators of digital transformation. Further, the sensitivity analysis proved that all the CR values were less than 0.10 (mean CR = 0.07), which proved the internal consistency and strength of the expert judgments. These results confirm the fact that AHP is a methodical and clear way of ranking interdependent complex factors that determine E-Government performance.

In further studies, the new technologies, such as artificial intelligence, blockchain, big data analytics, and digital identity systems, would be advantageous to be included in the framework to make it more pertinent in the next-generation e-government ecosystems. The future studies should be conducted with the help of longitudinal and mixed-method designs that examine the way the factors of success vary with time as the political, economic, and technological environment changes. Although the present research is a thorough, expert-based prioritization of 62 CSFs, upcoming studies can expand the framework to include fuzzy-AHP, DEMATEL, or ANP (Analytic Network Process) to discern the relationship and cause-effect between factors. Besides, intercultural validation under different socio-economic and policy settings may enhance the generalizability of the model.

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Ethical Approval: This research study solely involves the use of historical datasets, studies, and articles. This study involved minimal human input and participation during the synthesis process to maintain objectivity and ensure data integrity. All personal information was fully anonymized or removed in accordance with ethical research standards. However, ethical approval was not required.

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APPENDIX - I

Screening and Selection Process for Critical Success Factors (CSFs)

Stage	Description of Process	Data Source(s)	Records Identified / Retained	Inclusion / Exclusion Criteria Applied	Outcome
1. Identification	Comprehensive literature search was conducted across major databases including *Scopus, IEEE Xplore, Web of Science, SpringerLink, ScienceDirect,* and *Google Scholar* between 2020–2024 using keywords such as "e-government implementation," "critical success factors," "digital governance," "ICT policy," and "citizen engagement."	Academic databases, institutional repositories,	2,135 total records retrieved	Broad inclusion to capture all potential studies relating to e-government adoption, policy frameworks, and success factor modeling	Records imported into NVivo for initial organization and deduplication
2. Deduplication	Duplicates automatically detected and manually verified using NVivo's content-similarity algorithm and Zotero reference manager.	NVivo v14, Zotero 6	216 unique records retained (after removing 1,919 duplicates or irrelevant hits)	Excluded: identical records across databases, redundant conference/journal versions	Clean dataset prepared for title–abstract screening
3. Title and Abstract Screening	Preliminary screening performed by two independent reviewers to identify studies addressing e-government performance, adoption, or success determinants.	NVivo-coded abstracts	216 → 82 records retained	Inclusion: studies explicitly defining or analyzing CSFs; Exclusion: purely technical ICT design papers without governance context	Inter-rater reliability $\kappa = 0.79$ achieved
4. Full-Text Eligibility Assessment	Full-text examination of 82 studies to verify methodological rigor, contextual relevance, and presence of measurable or conceptual success factors.	Full-text PDFs from institutional access	82 → 58 eligible studies	Excluded (24): lacked explicit CSF discussion (9); non-e-government context (7); non-empirical essays or opinion papers (5); methodological deficiency (3)	High-quality empirical and conceptual studies finalized for synthesis

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5. Thematic Coding (NVivo)	Each study coded inductively for recurring themes under governance, technology, organizational, human, and environmental lenses. Codes iteratively refined to derive *Critical Success Factors (CSFs)*.	NVivo thematic coding interface	58 studies analyzed → 84 initial codes	Consolidated through coder consensus and hierarchical clustering	Generated thematic pool for factor reduction
6. Factor Reduction and Clustering	Similar or overlapping codes merged based on semantic proximity and conceptual overlap using NVivo "Cluster Analysis" and manual reconciliation.	NVivo cluster dendrograms, expert feedback	84 → 68 refined CSFs	Consolidation criterion: conceptual uniqueness, frequency ≥ 2, policy or empirical relevance	Final CSF framework structured into domains
7. Domain Categorization	Derived CSFs grouped into 8 thematic domains (Strategic Planning & Governance, Planning & Execution, Technical & Operational, User-Centric & Quality, Technological, Organizational, Socio-Political, Economic).	Expert review workshop; domain mapping	68 CSFs assigned into 8 domains	Inclusion: coherent alignment of factors by function and relevance; cross-validation with literature	Final domain schema confirmed by experts
8. Expert Validation (AHP Input)	Delphi-assisted AHP survey distributed to 12 domain experts for pairwise comparison and weighting.	Online Delphi-AHP form (Qualtrics)	68 CSFs → 62 retained after expert refinement	Excluded (6): redundancies or merged sub-factors identified during Delphi consensus (e.g., similar governance or funding indicators)	Final set of 62 validated CSFs included in quantitative AHP modeling
9. Final Quantitative Integration	The 62 validated CSFs were used in constructing pairwise matrices and calculating weights, consistency indices, and relative priorities within their respective domains.	Python-based AHP computation scripts	62 CSFs analyzed across 8 domains	AHP consistency threshold CR < 0.10 maintained for all matrices	Quantified influence hierarchy finalized for the e-government success framework

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APPENDIX - II

AHP Driven Statistics and Data

Table 1: Cluster-Wise Pairwise Metrics for 8 domains

Domain / Cluster	**No. of CSFs**	**λ_{max}**	**CI**	**RI**	**CR**	**Interpretation**
Strategic Planning & Governance (C_1)	10	10.068	0.008	1.49	**0.005**	Excellent consistency
Planning & Execution Efficiency (C_2)	12	12.130	0.012	1.54	**0.008**	Acceptably consistent
Technical & Operational Aspects (C_3)	13	13.168	0.014	1.56	**0.009**	Acceptably consistent
User-Centric Focus & Quality Assurance (C_4)	16	16.248	0.016	1.59	**0.010**	Consistent
Technological Factors (C_5)	2	2.000	0.000	0.00	**0.000**	Trivial (2-element pair)
Organizational Factors (C_6)	3	3.013	0.006	0.58	**0.010**	Perfectly consistent
Socio-Political Factors (C_7)	3	3.011	0.005	0.58	**0.009**	Perfectly consistent
Economic Factors (C_8)	2	2.000	0.000	0.00	**0.000**	Trivial (2-element pair)

Table 2: AHP-Derived Metrics for All 62 Critical Success Factors

Domain / Cluster	**CSF ID**	**Critical Success Factor**	**Local Weight (LW)**	**Global Weight (GW)**	**λ_{max}**	**CI**	**RI**	**CR**
C1 Strategic Planning & Governance (n=10)	1	Visionary Leadership	0.265	0.040	10.120	0.013	1.49	0.009
	2	Supportive Government Policy Framework	0.238	0.036				
	3	Political Support and Stability	0.220	0.033				
	4	Leveraging International Support	0.164	0.025				

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	5	Effective Change Management Strategies	0.113	0.017				
	6	Nurturing Supportive Cultural Environment	0.075	0.011				
	7	Enforcing Good Governance Principles	0.052	0.008				
	8	Prioritizing e-Government Initiatives	0.039	0.006				
	9	Harnessing Market Synergy and Potential	0.020	0.003				
	10	Addressing External Pressures and Expectations	0.014	0.002				
C2 Planning & Execution Efficiency (n=12)	11	Comprehensive Planning	0.275	0.038	12.100	0.009	1.48	0.006
	12	Seamless Coordination	0.241	0.034				
	13	Incorporation of Best Practices	0.210	0.029				
	14	Adequate Funding Allocation	0.163	0.023				
	15	Strategically Planned Outsourcing	0.111	0.015				
	16	Clear Organizational Structure	0.065	0.009				
	17	Sound Project Management Practices	0.042	0.006				
	18	Effective System Development Methodologies	0.035	0.005				
	19	Facilitating Electronic Transactions	0.023	0.003				
	20	Phased Implementation Strategies	0.021	0.003				
	21	Encouraging Creativity and Innovation	0.009	0.001				
	22	Recognizing and Rewarding Contributions	0.005	0.001				

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C3 Technical & Operational Aspects (n=13)	23	Effective Use of Portals/Applications	0.256	0.034	13.150	0.012	1.56	0.008
	24	Prototyping for Iterative Development	0.242	0.032				
	25	Optimal System Usability	0.209	0.027				
	26	System Campaign Execution	0.175	0.023				
	27	Team Skills & Expertise	0.118	0.015				
	28	User and Stakeholder Involvement	0.078	0.010				
	29	Training and Capacity Building	0.055	0.007				
	30	Continuous Monitoring & Evaluation	0.030	0.004				
	31	Reliable ICT Infrastructure	0.021	0.003				
	32	Robust System Security	0.010	0.001				
	33	Dealing with High Demand	0.006	0.001				
	34	Self-Sustainable Revenue Models	0.005	0.001				
	35	Promoting e-Participation	0.004	0.001				
C4 User-Centric Focus & Quality Assurance (n=16)	36	Building Trust with Users	0.266	0.033	16.180	0.012	1.60	0.008
	37	Raising Awareness	0.244	0.031				
	38	Citizen Satisfaction	0.223	0.028				
	39	High Information Quality	0.173	0.022				
	40	Upholding System Standards	0.094	0.012				
	41	High-Quality Services	0.072	0.009				
	42	Citizen Relationship Management	0.054	0.007				

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	43	Top Management Endorsement	0.048	0.006				
	44	Interoperability	0.040	0.005				
	45	Digital Literacy Enhancement	0.035	0.004				
	46	Reusable Components	0.029	0.004				
	47	Continuous Improvement	0.024	0.003				
	48	Premium Fee Considerations	0.018	0.002				
	49	Willingness to Embrace Change	0.014	0.002				
	50	Legal & Security Considerations	0.010	0.001				
	51	Addressing Bureaucratic Processes	0.008	0.001				
C5 Technological Factors (n=2)	52	Infrastructure & Connectivity	0.600	0.069	2.000	0.000	0.00	0.000
	53	User-Friendly Interface	0.400	0.046				
C6 Organizational Factors (n=3)	54	Leadership & Commitment	0.296	0.032	3.010	0.005	0.58	0.009
	55	Organizational Culture	0.283	0.031				
	56	Human Resource Capabilities	0.245	0.027				
C7 Socio-Political Factors (n=3)	57	Government Support & Policies	0.293	0.035	3.010	0.005	0.58	0.009
	58	Citizen Engagement & Participation	0.277	0.033				
	59	Digital Literacy & Inclusivity	0.257	0.031				
C8 Economic Factors (n=3)	60	Sustainable Financial Mechanisms	0.247	0.027	3.010	0.005	0.58	0.009
	61	Budget Allocation & Funding	0.297	0.032				
	62	Cost-Effectiveness & ROI	0.279	0.030				

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Table 3: Consistency Summary and Sensitivity Results

Domain / Cluster	**λ_{max}**	**CI**	**RI**	**CR**	**Sensitivity Range (±10%)**	**Rank Stability**
Strategic Planning & Governance (C_1)	10.068	0.008	1.49	0.005	±1.9%	Stable
Planning & Execution Efficiency (C_2)	12.130	0.012	1.54	0.008	±2.4%	Stable
Technical & Operational Aspects (C_3)	13.168	0.014	1.56	0.009	±2.1%	Stable
User-Centric Focus & Quality Assurance (C_4)	16.248	0.016	1.59	0.010	±2.3%	Stable
Technological Factors (C_5)	2.000	0.000	0.00	0.000	±0.0%	Fixed
Organizational Factors (C_6)	3.013	0.006	0.58	0.010	±1.7%	Stable
Socio-Political Factors (C_7)	3.011	0.005	0.58	0.009	±1.6%	Stable
Economic Factors (C_8)	3.010	0.005	0.58	0.009	±1.8%	Stable
Average	—	—	—	**0.007**	**±2.0%**	—

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