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Mapping SPBE Challenges in Indonesia: Systematic Review by Architecture Domain

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Abstract

Growing disparities in digital governance readiness across Indonesia highlight the urgency of strengthening the nation's Electronic-Based Government System (SPBE). This study conducts a systematic literature review of 34 recent studies to identify key factors that influence SPBE implementation across six architecture domains: Business (Organizational) Architecture, Data Architecture, Application Architecture, Infrastructure Architecture, Security Architecture, and Service Architecture. Drawing on the PRISMA methodology, the review uncovers recurring obstacles such as governance misalignment, fragmented system development, infrastructure limitations, inadequate data management, weak cybersecurity, and inconsistent service delivery. While these challenges inform the analysis, the proposed conceptual framework reframes each domain as a positive construct—suggesting that stronger performance in these areas contributes to greater SPBE implementation success. This framework provides policymakers with a structured lens to guide targeted digital transformation efforts. The study emphasizes the importance of policy coherence, inter-agency collaboration, human resource capacity, and integrated digital ecosystems, and invites future empirical research to validate and refine the framework through quantitative testing and in-depth case studies, particularly focusing on governance and people-centered factors.

Keywords : E-Government; SPBE; Systematic Literature Review, PRISMA Methodology, Challenges.

1. INTRODUCTION

E-government refers to the utilization of information and communication technologies (ICTs) by government organizations to transform and enhance interactions with citizens, businesses, and other branches of government [1], [2], [3]. Initially considered a digital parallel to traditional commerce, e-government has evolved into a comprehensive transformation tool—extending beyond simple service delivery to incorporate organizational change, capacity building, and improvements in democratic practices [3], [4]. A comprehensive definition emphasizes the management of electronic systems to enhance citizen access to government information, streamline public service delivery, and improve transparency, communication, and interaction between government entities and their stakeholders [5].

In Indonesia, e-government implementation takes the form of the Electronic-Based Government System (SPBE). SPBE is specifically defined as a comprehensive framework designed to ensure the effective implementation of regulations, direction, and control within public administration to deliver high-quality, reliable, and accessible services to stakeholders, including government agencies, civil servants, businesses, and citizens [6], [7]. The implementation requires several key components, including application development, infrastructure availability, legal frameworks, and human resource development [8]. According to Presidential Regulation No. 132 of 2022, the SPBE architecture consists of six primary domains: business processes, data and information, applications, infrastructure, security, and services [9]. These domains work together to achieve key objectives including creating clean, effective, transparent, and accountable governance while delivering quality and reliable public services. The architecture provides convenience in increasing efficiency and effectiveness, as well as being a guide for SPBE governance in Central Agencies and Regional Governments.

The Business Process Domain serves as the foundation for electronic government services, focusing on planning, design, and implementation of government operational workflows. This domain directly interacts with the Service Domain and Data/Information Domain to establish standardized operational procedures and processes that guide government activities. It provides the framework for how government functions are executed and services are delivered [10]. The Data and Information Domain functions as a central component that interacts with all other domains, managing the integration and flow of government data. This domain establishes frameworks for data management, integration, and utilization across government institutions, including standards and guidelines for data interoperability. It ensures that data can be accessed and shared through SPBE applications according to established regulations while maintaining proper security protocols. The Infrastructure Domain provides the technological foundation for SPBE operations, encompassing hardware, software, and facilities that support system operations. It consists of three main components: computing facilities, platforms, and system integration. This domain interfaces with the Application, Data/Information, and Security domains to ensure proper system functionality and resource allocation [10].

The Application Domain focuses on the development and management of software applications that enable digital government services. It connects with Service, Data/Information, Infrastructure, and Security domains to deliver

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integrated digital services. This domain helps government institutions plan, develop, and integrate applications needed for implementing integrated SPBE services. The Security Domain ensures system protection and data integrity across all SPBE components. It encompasses security standards, implementation protocols, and security feasibility recommendations. This domain interacts with Application, Data/Information, and Infrastructure domains to establish comprehensive security measures protecting government assets and information confidentiality. Finally, the Service Domain directly outputs digital government services to various user groups, interfacing with Business Processes, Applications, and Data to ensure cohesive delivery [9]. By coordinating these six domains, SPBE seeks to achieve clean, transparent governance and reliable public services

Despite these initiatives, progress and maturity in SPBE vary significantly nationwide. Guided by a National SPBE Master Plan, local governments have adopted SPBE to different extents, resulting in diverse levels of digital governance [11]. The 2024 SPBE evaluation highlights significant challenges in implementing electronic-based governance across Indonesia. Of the 615 regional governments evaluated, 126 scored in the "Fair" category, and 19 scored in the "Poor" category, indicating persistent gaps in digital governance readiness. These low scores are not limited to underdeveloped areas like Papua, Papua Pegunungan, Papua Barat Daya, and Maluku, where barriers such as limited infrastructure, low technological adoption, and resource constraints are prominent. Even in more developed regions, lower scores were recorded, such as Cilegon City in Banten, which scored 2.56 ("Fair"). Meanwhile, some developed areas like Majalengka Regency in West Java (2.94) and Tanjung Jabung Barat Regency in Jambi (2.92) only achieved "Good" scores, highlighting that challenges persist even in regions with better access to resources. The national SPBE index for 2024 stands at 3.12, categorized as "Good," reflecting steady improvement since 2018 but emphasizing the need for systemic and region-specific interventions [11]. These findings underscore the urgency of addressing these challenges to achieve more equitable and effective digital governance nationwide.

With such disparities in SPBE implementation across Indonesia, it is challenging to develop a comprehensive understanding of the specific obstacles faced in achieving effective digital governance. The 2024 SPBE evaluation reveals persistent challenges across all six SPBE domains. Even regions with better resources face obstacles, as evidenced by the varying SPBE maturity levels across different domains of policy, governance, and services [12]. Despite varying levels of maturity and progress, existing studies have not systematically categorized these challenges by domain, leaving critical knowledge gaps. This complex landscape of challenges requires a systematic approach to understanding and addressing domain-specific obstacles in SPBE implementation across Indonesia's diverse regions. Motivated by this lack of structured insight, this paper aims to explore and categorize the domain-specific challenges in SPBE implementation in Indonesia. Our guiding research question is: What are the patterns and commonalities of SPBE implementation challenges across different regions in Indonesia?.

While previous studies have explored technological and policy aspects, they often lack a comprehensive framework for categorizing implementation barriers across SPBE's architectural domains. Through a systematic literature review (SLR), this study aims to bridge this knowledge gap by examining how implementation challenges manifest across the six core SPBE domains—business processes, data, applications, infrastructure, security, and services. This research contributes to the existing literature in two significant ways. First, it provides a structured synthesis of SPBE implementation challenges, categorized by domain and supported by evidence from various regions across Indonesia. Second, it develops a conceptual framework mapping the relationships between challenges and their corresponding domains, offering policymakers and practitioners a practical tool for understanding and addressing SPBE implementation barriers.

2. RESEARCH METHODOLOGY

This study employs a systematic literature review (SLR) methodology, integrating the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework which ensures a comprehensive, transparent, and reproducible review process [13], [14]. As outlined by [15], the SLR approach provides a structured method to synthesize existing knowledge, identify research gaps, and categorize findings within specific domains, while the PRISMA framework ensures systematic reporting and transparency in study selection and data extraction. Together, these methods enable a robust and comprehensive exploration of the challenges in implementing the Electronic-Based Government System (SPBE) in Indonesia. The review process follows three key stages: preparation, study selection, and assimilation.

2.1 Preparation

This systematic literature review begins with a clear research question: "What are the domain-specific challenges in implementing SPBE (Sistem Pemerintahan Berbasis Elektronik) across Indonesian government institutions?". In the preparation step, the search strategy was designed to identify studies on implementing or evaluating SPBE, e-government, or digital government in Indonesia. The search strings were crafted using both English and Indonesian keywords to ensure comprehensive coverage. The English search strings include "SPBE implementation" OR "SPBE evaluation" OR "e-government implementation" OR "e-government evaluation" OR "digital government implementation" OR "digital government evaluation". Indonesian search strings included "implementasi SPBE" OR "evaluasi SPBE" OR

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"implementasi pemerintahan elektronik" OR "evaluasi pemerintahan elektronik" OR "implementasi pemerintahan digital" OR "evaluasi pemerintahan digital".

The search was conducted in Google Scholar, leveraging its extensive database to access both academic and grey literature, including locally published studies not indexed in other databases. Filters were applied to include studies published within the last 5 years (2019-2024), written in English or Indonesian, and appearing in peer-reviewed journals or conference proceedings. This approach ensures a comprehensive review of SPBE and e-government implementation challenges in Indonesia.

2.2 Study Selection

The study selection phase adheres to the PRISMA framework to maintain a systematic and transparent selection process. The search results from Google Scholar are screened in multiple steps: first, duplicates are removed, and titles and abstracts are reviewed for initial relevance. Subsequently, a detailed full-text review is conducted to assess eligibility based on criteria such as relevance to SPBE implementation, publication in peer-reviewed or reputable journals, and coverage of SPBE challenges. A PRISMA flow diagram is used to visually document the selection process, detailing the number of studies identified, screened, assessed for eligibility, and included in the final review.

The initial database search was conducted using Google Scholar, utilizing both English and Indonesian search strings to maximize the coverage of relevant literature. English search strings included terms such as "SPBE implementation" OR "SPBE evaluation" OR "e-government implementation" OR "e-government evaluation" OR "digital government implementation" OR "digital government evaluation". Indonesian search strings were crafted as "implementasi SPBE" OR "evaluasi SPBE" OR "implementasi pemerintahan elektronik" OR "evaluasi pemerintahan elektronik" OR "implementasi pemerintahan digital" OR "evaluasi pemerintahan digital". Before applying any filters, the search yielded 14,400 results for English terms and 493 results for Indonesian terms. To focus on recent studies, a publication year filter was applied to include only studies from the last 10 years, reducing the results to 6,740 and 463, respectively.

The selection of relevant studies involved assessing the relevance, robustness, and quality of the articles using specific selection criteria. To ensure that the titles explicitly mentioned a region, filters were applied to focus on articles containing location-specific terms, reducing the results to 265 English studies and 37 Indonesian studies. In the next stage, inclusion and exclusion criteria were established to ensure the relevance and quality of the selected studies. Inclusion criteria required studies to explicitly state the location or region within Indonesia, focus on e-government or SPBE implementation, and discuss challenges or barriers to implementation in their region. Exclusion criteria eliminated systematic literature reviews (SLRs) or review articles, studies that did not mention specific regions in Indonesia, and studies primarily centered on e-government or SPBE acceptance theories rather than implementation. These results were further screened based on the inclusion and exclusion criteria, which required studies to address SPBE or e-government implementation challenges within specific regions in Indonesia. After screening titles, abstracts, and full texts, and applying the criteria, a total of 34 studies were selected for further assessment. This rigorous selection process ensures that the final set of studies provides a focused and comprehensive basis for analyzing SPBE implementation challenges across Indonesia.

Table 1. SPBE Regional Distribution of Reviewed SPBE Studies

Island	Regions	Total References
Sumatra	Palembang, Kabupaten Sijunjung, Muaro Jambi Regency, Bener Meriah Regency, Jambi (Province), Padang	7
Java	Bandung, Surabaya, Banyuwangi, Sleman, Gresik, Kulon Progo, Sumedang, DIY, Wonogiri, West Java, East Jakarta, DKI Jakarta, Semarang, Bogor, Tangerang City, Serang Regency	18
Kalimantan	Pontianak	1
Sulawesi	South Sulawesi (Province), Gowa Regency, Soppeng Regency,	5
Bali & Nusa Tenggara	Bali, Lombok Barat Regency	3
Maluku & Papua	Halmahera Selatan, East Seram, Banda Islands, Jayapura	4

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2.3 Assimilation

The assimilation phase involves systematic data extraction and synthesis. Consistent with the thematic classification approach of [15], the selected studies are categorized into the six SPBE architectural domains—business processes, data, applications, infrastructure, security, and services. Patterns and commonalities of challenges across regions are identified and synthesized into a conceptual framework, providing a structured representation of the findings.

3. RESULTS AND DISCUSSION

3.1 Bibliometric Information

The distribution of papers by publication year shows a clear trend in research interest focused on SPBE and e-government implementation challenges in Indonesia. The analysis reveals that the majority of the papers were published between 2020 and 2024, with the largest concentration in 2023 (10 papers) and a substantial number in 2022 (9 papers). Early research in this area is sparse, with only one paper from 2019 and six papers from 2020, likely representing foundational studies following the introduction of relevant regulations, such as Presidential Regulation No. 95 of 2018.

From 2021 onwards, the number of studies steadily increased, reflecting growing interest and efforts to address emerging challenges in SPBE governance and implementation. By 2023 and 2024, research activity peaked, with 16 out of 34 papers published during these years. This indicates a heightened focus on evaluating the progress and barriers to e-government adoption as digital transformation gained momentum nationwide. The data demonstrates that research on SPBE is becoming increasingly relevant, with a significant emphasis on recent developments. This upward trend underscores the importance of addressing implementation challenges to improve Indonesia's digital governance framework and aligns with the pressing need for regional and national advancements in this field.

Table 1 provides a consolidated overview of regions across Indonesia where implementation or evaluation has been studied, as identified in the literature. Its respective island or island cluster groups each region, and the total reference count indicates how many times it appears in the reviewed papers. It is important to note that one paper can cover multiple regions, resulting in multiple references for that paper. Notably, all major island groups in Indonesia are represented—Sumatra, Java, Kalimantan, Sulawesi, Bali & Nusa Tenggara, and Maluku & Papua—showing that the studies have a national-scale distribution. Java has the highest number of references (18), reflecting a concentration of SPBE-related work in provinces like West Java (Bandung and Sumedang), East Java (Surabaya, Banyuwangi, and Gresik), and the Special Region of Yogyakarta (Sleman, Kulon Progo). Kalimantan, however, shows fewer studies (only Pontianak), which may indicate a gap in SPBE research for that island. Similarly, Sulawesi (5 references), Bali & Nusa Tenggara (3 references), and Maluku & Papua (4 references) each have several specific areas cited—such as Gowa, Lombok Barat, and Halmahera Selatan—demonstrating that while coverage exists nationwide, the concentration of studies varies. Overall, this data highlights both the breadth of SPBE research across Indonesia and potential areas for further inquiry, particularly in underrepresented regions.

3.2 The Thematic Summary of SPBE Challenges

Below is an overview of the key challenges that recur throughout the literature on SPBE in Indonesia. This thematic summary provides a concise snapshot of the barriers that collectively hinder the success of SPBE initiatives across diverse regions. By presenting these domain-specific challenges in a systematic way, we highlight common patterns and regional variations, as detailed in Table 2, which inform the subsequent sections of this paper.

3.2.1 Business Architecture

A central concern under the Business Architecture domain involves governance, policy, and coordination gaps. In places like Bandung [16] and Surabaya [12], weak inter-departmental communication leads to siloed efforts, while East Seram [17] and Sijunjung [18] highlight how local rules often clash with national SPBE directives. Such misalignment can exacerbate bureaucratic barriers, exemplified by the rigid hierarchies reported in Wonogiri [19] and Padang [20], where lengthy approval chains delay digital transformation. Moreover, accountability and transparency gaps emerge where local governments fail to publish critical information or regularly evaluate SPBE performance, as seen in Jambi [21] and Padang [22], undermining public trust and limiting the potential for continuous improvement.

3.2.2 Data Architecture

In the Data Architecture domain, the principal challenge is data management and integration. Bandung [16] notes conflicting views on data publication and curation for Open Data initiatives, while Wonogiri [19] struggles with digitizing archival records and managing them securely. In Sulawesi Selatan [23] and South Sulawesi [24] [25], departments operate with fragmented workflows that hinder unified data handling, sometimes due to incomplete digitization of internal processes. Similarly, Serang Regency [26] and Bali [27], [28] cite difficulties in standardizing how data is uploaded, protected, or shared across agencies. Further compounding this problem, Kabupaten Sumedang [29] and Pontianak [30] experience interoperability issues that cause duplicate record-keeping, while Tangerang City [7] and Sijunjung [18] acknowledge that patchy data integration undermines the efficiency of otherwise promising SPBE applications. These

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gaps in data governance and uniform standards keep local agencies from realizing the full benefits of evidence-based decision-making and seamless public services.

3.2.3 Application Architecture

For Application Architecture, the issue of fragmented or inconsistent application development appears prominently in Surabaya [12], Sijunjung [31], and Tangerang City [7]. In these areas, multiple government units commission their own standalone applications, resulting in overlapping functionality and limited interoperability. For instance, Sijunjung [31] indicates that OPDs (regional work units) often develop applications independently, creating a patchwork of systems that do not communicate effectively. Without a unified strategy or technical guidelines, local governments risk duplicating efforts, wasting resources, and confusing end-users with multiple, disjointed interfaces.

Table 2. Key SPBE Implementation Challenges and Their Frequency in Reviewed Studies

Challenges	Brief Explanation	Freq
Business Architecture		
Governance, Policy, & Coordination	Fragmented planning, siloed agencies, and weak inter-agency collaboration slow SPBE progress. Local regulations may be misaligned with national guidelines, creating duplication and inefficiency.	25
Bureaucratic & Institutional Barriers	Rigid hierarchies, lengthy administrative procedures, and "sectoral egos" hinder rapid digital transformation, delaying decisions and resource allocation.	7
Accountability & Transparency Gaps	Irregular publication of budgets, project updates, or open data, coupled with weak monitoring and evaluation, undermines public trust in e-government.	5
Data Architecture		
Data Management & Integration	Difficulties standardizing or sharing data across agencies, incomplete digitization, and weak open data practices reduce overall SPBE efficiency.	12
Application Architecture		
Fragmented or Inconsistent Application Development	Regional government agencies build separate, non-interoperable systems, resulting in redundant features, inconsistent user interfaces, and limited integration with central SPBE platforms.	4
Infrastructure Architecture		
Infrastructure & Connectivity Gaps	Unreliable internet, low bandwidth, limited hardware, and electricity instability undermine SPBE services, particularly in rural or remote areas.	34
Outdated / Legacy Systems	Reliance on older or incompatible systems hinders integration with modern SPBE platforms and typically requires substantial financial and technical resources to upgrade.	2
Security Architecture		
Cybersecurity & Data Security	Insufficient protection against cyberattacks, weak privacy protocols, and low staff awareness put sensitive information at risk.	8
Service Architecture		
Limited or Inconsistent Service Coverage	Some regions remain partially excluded from SPBE services, leading to manual processes or partially digitalized platforms that vary in quality or availability.	2
User Experience & Interface Issues	System design is often not user-friendly, resulting in difficulties for both citizens and staff (e.g., frequent errors, complicated navigation).	2
Prolonged or Inefficient Service Delivery	Even when online platforms exist, long processing times or poor workflow integration the benefits of SPBE for residents and businesses.	3
Lack of Standardized Service Processes & Evaluations	Various localities implement SPBE with different procedures, resulting in uneven quality. Limited or inconsistent feedback mechanisms also hinder continuous improvement of digital services.	2
Public Trust & Adoption Challenges	Citizens may distrust new e-government tools if they experience errors, delayed responses, or limited transparency in service updates, thereby inhibiting widespread usage.	1

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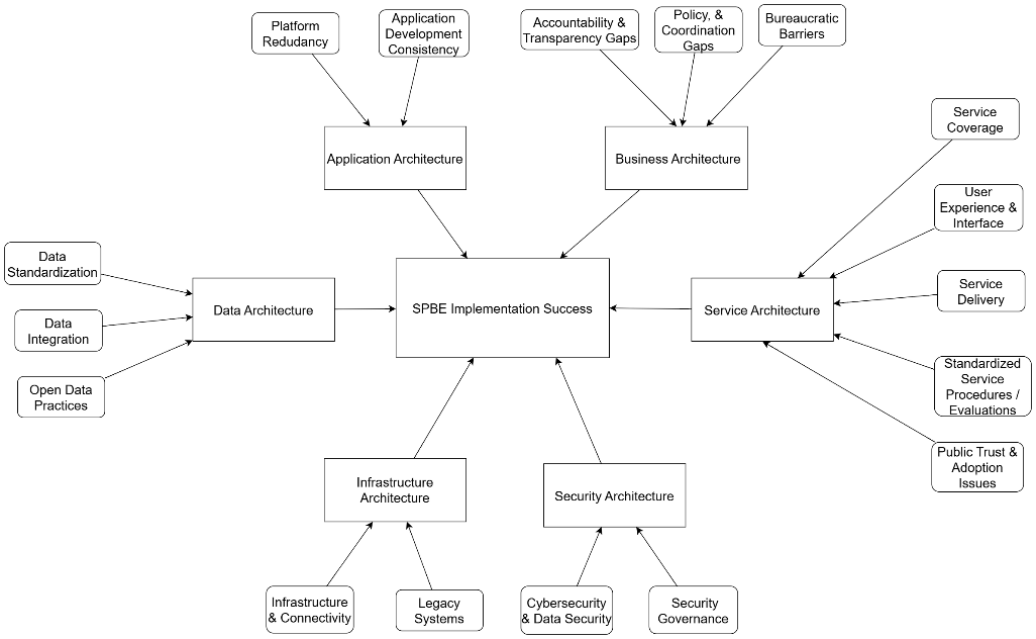

Figure 1. Conceptual Framework of SPBE Implementation Success Factors

3.2.3 Infrastructure Architecture

The most frequently cited domain, Infrastructure, addresses infrastructure and connectivity gaps—a problem noted from Bandung [16], [32], DIY [33], Muaro Jambi [34], Bener Meriah [35], Gowa Regency [36], Soppeng Regency [37], West Lombok [38], Maluku [39] to Halmahera Selatan [40] and East Seram [17]. Remote or rural areas especially struggle due to their geographical isolation, facing greater difficulties in infrastructure deployment, which aligns with findings indicating that unequal internet access not only creates a digital divide but also reproduces existing social inequalities by privileging urban and tech-savvy populations [41]. Remote regions wrestle with limited broadband, unstable electricity, or outdated hardware, a reality that also affects seemingly more developed locales like West Java [42], [43] and DKI Jakarta [44] (where certain sub-areas suffer from "network flashing spots"). Additionally, outdated or legacy systems compound the challenge in places like Halmahera Selatan [40] and South Sulawesi [24], where transitioning from older platforms to modern architectures requires significant time, budget, and technical expertise.

3.2.4 Secutrity Architecture

Under Security Architecture, cybersecurity and data security shortfalls arise in Palembang [45], West Java [42], and Bali [28], where e-government platforms may lack robust encryption or trained cybersecurity personnel. Serang Regency [26] and Jayapura [46] further highlight the risks: limited local awareness of secure protocols allows potential data breaches, undermining public trust in digital services. As more government operations shift online, concerns intensify about protecting sensitive personal and administrative data, prompting calls for stronger regulatory frameworks and better staff training in cybersecurity awareness.

3.2.5 Service Architecture

This domain covers how public services are designed, delivered, and experienced by end-users through SPBE platforms. It overlaps with the other domains—especially Business (for policy and processes) and Application (for technical functionality)—but focuses specifically on the service layer delivered to citizens, businesses, and other stakeholders. Service Architecture covers the end-user experience and how SPBE platforms actually deliver public services. South Sulawesi [25] and Semarang [20] illustrate limited **or** inconsistent service coverage, where sub-districts still rely on manual processes, resulting in unequal access for residents. In East Jakarta [47] and Padang [22], user experience and interface issues lead to frequent errors or crashes, driving up frustration for applicants. Meanwhile, Surabaya [12] and Semarang [20] mention prolonged or inefficient service delivery, such as slow ID issuance, which discourages citizens from using e-government portals. Even where infrastructure exists, lack of standardized service processes [7] and low public trust [44] can undermine successful adoption if the systems deliver inconsistent results or fail to communicate progress updates effectively.

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3.3 Discussion

3.3.1 Conceptual Framework

Guided by the insights obtained from our review, we propose a conceptual framework as illustrated in Figure 1, that highlights the positive relationship between the six SPBE architecture domains—namely Business Architecture, Data Architecture, Application Architecture, Infrastructure Architecture, Security Architecture, and Service Architecture—and SPBE Implementation Success. Specifically, the framework demonstrates how issues in these domains can individually and collectively diminish the effectiveness of e-government in Indonesia, without delving into sub-variables beyond those shown in the model. The first domain, Business Architecture, captures organizational-level governance factors that often shape strategic direction and alignment. Data Architecture focuses on how well public sector entities manage and share their information resources, while Application Architecture deals with the development and interoperability of software systems. Infrastructure Architecture covers connectivity and hardware readiness, Security Architecture addresses the protection of digital assets and public trust, and Service Architecture reflects citizens' on-the-ground experiences with e-government processes. By conceptualizing each domain as a distinct construct that leads to lower SPBE implementation success when its challenges are more severe, this framework underscores the multifaceted nature of digital transformation in the public sector, inviting future empirical exploration into which domain-based barriers most significantly impede the maturity of Indonesia's e-government initiatives.

3.3.2 Contributions to Research

This study contributes to the academic literature on e-government in several important ways. First, by systematically reviewing challenges across the six SPBE architecture domains (Business, Data, Application, Infrastructure, Security, and Service), it offers a comprehensive conceptualization of the multifaceted barriers that impede digital transformation in the public sector. While previous studies have highlighted isolated issues—such as infrastructure gaps or data integration—this paper extends the discussion to show how organizational governance, security risks, and citizens' service experiences are interconnected under one national framework (Presidential Regulation No. 95 of 2018). Second, it enriches the existing body of research by integrating insights from multiple regions in Indonesia, demonstrating that similar obstacles—e.g., underdeveloped security protocols in Palembang [45] or poor inter-agency collaboration in Bandung [16]—often share deeper structural roots. Third, the conceptual model proposed in this study explicitly positions each domain's challenges as positive predictors of SPBE Implementation Success, thereby advancing our theoretical understanding of how and why these domains interact to influence e-government maturity. This positive causal perspective paves the way for empirical validation through quantitative methods (e.g., Structural Equation Modeling), thereby supporting future research in identifying which domain-level obstacles exert the strongest downward pressure on digital government outcomes. Lastly, by linking each SPBE domain to tangible regional examples, the paper provides a locally grounded framework that researchers can adapt to other developing country contexts, offering a comparative lens on the universal and location-specific challenges in achieving robust, citizen-centric digital governance.

3.3.3 Future Research

Building on the conceptual model that identifies challenges across the six SPBE domains, future research can offer deeper insights in several ways. First, empirical validation of the framework—using survey-based measures or secondary data—would clarify which domain-specific barriers exert the strongest influence on SPBE Implementation Success, enabling a more nuanced understanding of digital transformation in the public sector. Second, longitudinal studies that track how these challenges evolve over time could highlight whether interventions (e.g., capacity-building programs, updated regulations, or dedicated security frameworks) effectively mitigate long-standing issues like siloed application development or inconsistent service coverage. Third, comparative research across multiple regions in Indonesia or across developing countries with similar e-government initiatives can uncover whether certain challenges (e.g., human resource gaps within Business Architecture) are universally problematic or context-specific. Finally, while this paper focuses on the direct impact of domain-level barriers on e-government outcomes, future work could explore potential moderators or mediators—such as top management support or stakeholder collaboration—to see if certain factors soften or amplify the positive effects of SPBE challenges.

Although this study underscores the six architecture domains as critical to SPBE's success, deeper exploration of governance- and people-centric challenges (i.e., Business Architecture) is particularly warranted. Prior findings suggest that problems such as weak inter-departmental coordination, bureaucratic inertia, limited staff competencies, and socio-cultural resistance frequently derail otherwise well-equipped SPBE initiatives (e.g., Bandung [16], Sumedang [48]). Yet, these issues are often framed merely as secondary or contextual barriers, rather than central topics for inquiry. Future scholars could address this gap by conducting in-depth qualitative studies or systematic literature reviews that focus exclusively on governance and people failures, aiming to uncover (1) the root causes of organizational misalignment, (2) the cultural and motivational factors that inhibit digital adoption, and (3) how inter-agency power dynamics and leadership styles shape SPBE outcomes. Likewise, people-focused investigations—particularly involving the experiences of frontline staff, middle-level managers, or citizens—remain less common. By integrating methods such as interviews, ethnographies, and case studies from multiple government levels, future research can illuminate how personal attitudes, capacity-building efforts, and policy enforcement jointly influence e-government performance. Comparative analyses

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between regions with similar socio-cultural contexts but varying governance structures could then clarify why certain provinces or districts excel in SPBE implementation despite facing similar infrastructural or budgetary constraints. Ultimately, deepening our grasp of governance and people-based challenges will shed light on the nuanced pathways through which organizational culture, leadership commitments, and stakeholder engagement shape the success—or failure—of Indonesia's digital governance transformation

4. CONCLUSION

The systematic review underscores a network of interrelated challenges that impede the progress of Indonesia's Electronic-Based Government System (SPBE). Despite variations in regional resources and technological readiness, recurring issues consistently emerge across the six SPBE architectural domains. These overlapping barriers highlight that domain-specific problems rarely operate in isolation; instead, they frequently interact, creating persistent bottlenecks that hinder service delivery and reduce public trust in digital governance. By mapping each barrier to its respective domain, the conceptual framework introduced in this study provides policymakers, practitioners, and researchers with a clearer path toward targeted interventions. Specifically, the Business (Organizational) Architecture domain requires robust governance and capacity-building; Data Architecture calls for improved standards and integration; Application Architecture benefits from interoperable systems; Infrastructure Architecture demands stable connectivity; Security Architecture necessitates heightened protection measures; and Service Architecture depends on consistent, user-centric delivery. Addressing these interdependencies holistically is crucial to optimizing digital government platforms. Going forward, empirical evaluations—including longitudinal analyses, surveys, and case studies—can further refine this framework. Such investigations would help identify which domains exert the greatest influence under different local and institutional conditions, enabling more strategic resource allocation. Ultimately, tackling the complex interplay among business processes, data, applications, infrastructure, security, and services is indispensable to promoting a more equitable, effective, and sustainable digital transformation within Indonesia's public sector.

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