Indonesian Journal of Applied and Industrial Sciences (ESA)
Vol. 5, No. 3, 2026 : 157 - 172

Evaluating the Implementation Effectiveness of SISFOANGUD Perintis in a 3T Region: A Socio-Technical Perspective

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A R T I C L E I N F O

Keywords: Digital Government, Information System Success, SISFOANGUD, Organizational Readiness, Hybrid Workflow

Received : 16 March 2026
Revised : 20 April 2026
Accepted: 23 May 2026

A B S T R A C T

Digital transformation in the public sector aims to enhance efficiency, transparency, and accountability, particularly in managing public service systems in remote regions. However, the effectiveness of implementation remains uneven, especially in infrastructure-constrained environments such as Indonesia's 3T regions. This study evaluates the implementation effectiveness of the SISFOANGUD Perintis system at the Gunungsitoli Regional Coordination Office using a qualitative case study approach. Data were collected through interviews, observations, and document analysis involving key actors in the reporting chain, including managers, operators, and external stakeholders. The analysis applies the DeLone and McLean Information System Success Model, enriched with organizational readiness and user perception variables. The findings reveal a paradox of effectiveness. The system performs well at the managerial level by supporting reporting, control, and subsidy accountability. However, at the operational level, its effectiveness is limited due to unstable infrastructure, repeated data entry, and reliance on hybrid manual–digital workflows. User satisfaction is low and fluctuating, while trust and perceived risk significantly influence usage behavior. The study contributes to the literature by demonstrating that system success in public organizations depends not only on technical quality but also on organizational readiness and contextual factors. It highlights the importance of socio-technical alignment in ensuring sustainable digital transformation in remote areas.

INTRODUCTION

Digital transformation in the public sector has become a central strategy to improve efficiency, service quality, and accountability in government operations. Through process automation, database integration, and data-driven decision-making, digital systems can significantly reduce service time and operational costs while enhancing transparency and control mechanisms (Duisenkul et al., 2023; Bojović et al., 2023; Wagiman et al., 2023). In particular, integrated financial and back-office systems enable real-time monitoring and reporting, strengthening accountability and reducing opportunities for corruption through digital audit trails (Marienfeldt, 2021; Owusu et al., 2021; Choi et al., 2018). However, these benefits are not automatic; they depend heavily on infrastructure quality, IT governance, and human resource capacity, without which digital transformation may lead to system failure, security vulnerabilities, and organizational resistance (Frost & Lal, 2018; Gyamfi et al., 2019; Choi et al., 2018).

Despite its potential, the implementation of digital systems in remote and underdeveloped regions presents unique challenges. In 3T regions (frontier, outermost, and disadvantaged areas), limited digital infrastructure and unreliable internet connectivity hinder the delivery of e-services and reduce user participation (Lytras & Şerban, 2020; Gebeyehu & Twinomurinzi, 2022). These challenges are compounded by a shortage of skilled human resources, low digital literacy, and geographical constraints that complicate system maintenance and continuous training (Mensah et al., 2020; Wantania et al., 2021; Maharani, 2020). As a result, digital transformation in such contexts requires adaptive approaches, including hybrid service models and targeted capacity-building programs to ensure that efficiency and accountability gains are realized at the local level (Frost & Lal, 2018; Gebeyehu & Twinomurinzi, 2022).

A critical issue in digital government implementation is the persistent gap between system design and operational practice. Top-down system design often fails to incorporate local learning processes, resulting in poor alignment between policy objectives and field conditions (Giulio & Vecchi, 2018). Moreover, e-government initiatives that lack stakeholder integration and local capacity frequently encounter socio-technical dissonance, leading to ineffective implementation (Frost & Lal, 2018; Kasemsap, 2020). Organizational factors such as limited training, resistance to change, and lack of compliance further weaken system use and reduce information system security and reliability (Choi et al., 2018; Wantania et al., 2021; Maharani, 2020). Additionally, fragmented data structures and weak interoperability disrupt workflows and prevent the full realization of automation benefits (Bojović et al., 2023; Chakiri et al., 2020).

In the context of public subsidy management, information systems play a crucial role in enhancing transparency and accountability. Digital systems provide traceable transaction records, integrated fiscal data, and real-time reporting, which reduce manual intervention and minimize opportunities for fraud (Zhuk, 2023; Umbet et al., 2025). Advanced data architectures such as data warehouses and OLAP systems support auditing and anomaly detection in subsidy flows, while platforms like e-procurement and e-invoicing improve

public access to financial information (Chakiri et al., 2020; Aquino & Lino, 2025; Rihandoyo, 2018; Wagiman et al., 2023; Bojović et al., 2023).

Nevertheless, hybrid work practices where manual and digital processes coexist—remain common in many public organizations. This persistence is largely driven by misalignment between system design and operational realities, as well as insufficient stakeholder involvement in system development (Frost & Lal, 2018; Kasemsap, 2020). Infrastructure limitations, inadequate training, and low user trust further reinforce parallel usage, as employees rely on manual processes to ensure data security and continuity of service (Choi et al., 2018; Wantania et al., 2021; Abdulkareem & Ramli, 2021; Gyamfi et al., 2019; Alkraiji, 2020). Consequently, hybrid practices become a rational adaptation rather than a transitional phase, reflecting deeper structural issues in digital implementation.

Evaluating the effectiveness of information systems is therefore particularly important in the public transportation sector, where real-time data integration, operational coordination, and safety considerations are critical. Intelligent transportation management systems require layered architectures capable of handling heterogeneous data and multiple stakeholders (Rehena et al., 2018). The alignment between back-end systems, such as financial management information systems, and front-end service delivery directly affects service performance and fiscal governance, making systematic evaluation essential to identify bottlenecks in integration, auditability, and public value creation (Aquino & Lino, 2025; Chakiri et al., 2020; Umbet et al., 2025).

Despite the growing body of literature on e-government and information system success, most studies focus on citizen-facing services, quantitative adoption models, or contexts with relatively stable infrastructure. There is still limited understanding of how internal government systems operate in constrained environments, particularly in 3T regions where hybrid practices, institutional habits, and infrastructure limitations intersect. This gap indicates the need for context-sensitive analysis that captures the interaction between organizational readiness, system quality, and user perception in shaping implementation effectiveness.

This study aims to evaluate the effectiveness of the SISFOANGUD Perintis system in the Gunungsitoli Regional Coordination Office by examining its use, user satisfaction, and net benefits through the lens of the DeLone and McLean model, enriched with organizational readiness and user perception variables. By focusing on an operational government system in a remote regional context, this research contributes to the literature by providing a socio-technical explanation of why digital systems may succeed at the organizational level while remaining fragile in everyday operational practice.

LITERATURE REVIEW

1. Information System Success Model in E-Government

The DeLone and McLean (D&M) Information System Success Model provides a comprehensive framework to evaluate the effectiveness of information systems in the public sector. The model conceptualizes system success through interrelated constructs: System Quality, Information Quality, and Service Quality, which influence Use and User Satisfaction, ultimately

leading to Net Benefits. In the context of e-government, the model has been extended to incorporate public value and contextual variables, reflecting the broader societal impact of digital systems beyond organizational efficiency (Wagiman et al., 2023; Owusu et al., 2021; Abdulkareem & Ramli, 2021). Empirical studies consistently demonstrate that system, information, and service quality significantly affect system usage and user satisfaction, which in turn translate into improved efficiency, fiscal accountability, and organizational performance in public institutions (Owusu et al., 2021; Al-Okaily et al., 2023; Al-Zahrani, 2020). Furthermore, moderating factors such as user training and system security have been identified as critical elements in strengthening the relationship between system quality dimensions and successful outcomes in government settings.

2. Technology Acceptance Model and User Behavior

The Technology Acceptance Model (TAM) is widely used to explain user behavior in adopting digital systems, particularly in e-government contexts. TAM posits that Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) are the primary determinants of user attitudes, behavioral intentions, and actual system usage. Comparative studies integrating TAM with IS Success models show that PU and PEOU strongly influence user satisfaction and intention to use, especially in mandatory service environments where compliance is required (Alkraiji, 2020; Wantania et al., 2021; Valsamidis et al., 2019; Mensah et al., 2020). In practical terms, TAM highlights the importance of designing user-friendly interfaces and providing adequate training to enhance usability and perceived benefits. As such, TAM is particularly useful for understanding front-end adoption behavior and guiding interventions aimed at improving user engagement with public information systems.

3. Organizational Readiness and Institutional Context

Organizational readiness plays a critical role in determining the success of digital government implementation. It encompasses technical infrastructure, human resource capacity, top management support, and regulatory frameworks that enable effective system use. The Technology-Organization-Environment (TOE) framework highlights that technological, organizational, and environmental factors collectively influence system adoption and performance outcomes, including transparency, accountability, and service efficiency (Aligarh et al., 2025). Empirical evidence shows that training quality and human resource readiness significantly enhance user satisfaction and mediate the relationship between system quality and net benefits, particularly in government financial management systems (Al-Okaily et al., 2023; Wagiman et al., 2023). However, without adequate infrastructure and interoperability governance, digital initiatives often face bottlenecks, especially when back-end systems such as financial management information systems are not aligned with front-end services (Aquino & Lino, 2025; Frost & Lal, 2018). Additionally, issues of security risk and organizational cynicism can reduce compliance and system trust, highlighting the importance of governance, legitimacy, and IT auditing

mechanisms in ensuring the integrity and effectiveness of digital systems (Choi et al., 2018; Umbet et al., 2025).

4. Institutional Barriers and Research Gap

Despite the potential of digital transformation, institutional barriers remain a major challenge in public sector implementation. These barriers include top-down system design that neglects local learning processes and stakeholder engagement, resulting in policy misalignment and ineffective implementation (Giulio & Vecchi, 2018; Frost & Lal, 2018). Fragmented data systems, lack of inter-agency coordination, and weak regulatory frameworks further exacerbate implementation challenges, while bureaucratic culture, resistance to change, and organizational cynicism hinder operational adoption (Choi et al., 2018). In developing contexts, additional constraints such as limited funding, inadequate technical capacity, unreliable electricity, and weak cybersecurity infrastructure further slow down digital transformation (Gyamfi et al., 2019; Gebeyehu & Twinomurinzi, 2022). Moreover, the absence of structured benefits management and IT accountability mechanisms makes it difficult to measure real outcomes, often leading to stalled reforms (Fernandes et al., 2023; Umbet et al., 2025). Addressing these barriers requires multistakeholder approaches, business process reengineering (BPR), stronger governance frameworks, and targeted capacity-building initiatives (Frost & Lal, 2018; Kasemsap, 2020).

Existing studies predominantly focus on citizen-facing services, quantitative adoption models, or contexts with relatively stable infrastructure. There is limited research examining internal government systems operating in constrained environments, particularly in remote or 3T regions where hybrid practices, institutional routines, and infrastructural limitations intersect. This study positions itself within this gap by analyzing the effectiveness of an operational government information system through a socio-technical lens that integrates system quality, organizational readiness, and user perception in a context-specific setting.

METHODOLOGY

1. Research Design

This study employs a qualitative case study design to evaluate the implementation of the SISFOANGUD Perintis system at the Gunungsitoli Regional Coordination Office. A qualitative case study is appropriate for examining socio-technical phenomena involving multi-level actors, institutional dynamics, and contextual constraints that are often overlooked in quantitative approaches (Duisenkul et al., 2023; Bojović et al., 2023; Wagiman et al., 2023). This approach enables an in-depth understanding of the misalignment between system design and operational realities, particularly in public sector environments characterized by hybrid workflows and infrastructure limitations. Furthermore, qualitative case studies allow for the integration of multiple data sources, including interviews, documents, system logs, and observations, which is recommended in e-government research to capture stakeholder responses, institutional barriers, and evolving local practices (Bojović et al., 2023; Marienfeldt, 2021; Owusu et al., 2021).

2. Data Sources and Collection Procedures

Data were collected from both primary and secondary sources. Primary data were obtained through in-depth and semi-structured interviews with key actors involved in the SISFOANGUD reporting process, including the Regional Head (KPA), Commitment Making Officer (PPK), supervisors, operators, and airline representatives. Secondary data included contractual documents, flight logbooks, passenger manifests, Aircraft Flight Maintenance Logs (AFML), and financial reports related to subsidy disbursement.

Data collection procedures involved three main techniques: observation, interviews, and document analysis. Observations focused on the workflow of contract input, logbook entry, and verification processes. Interviews explored user experiences, perceived system benefits, operational challenges, and adaptation strategies. Document analysis was conducted to verify the consistency between digital records and physical documentation.

Table 3.1. Summary of Data Sources and Collection Techniques

Data Type	Source	Technique	Purpose
Primary	System operators	In-depth interviews	Identify user experience and system challenges
Primary	Regional officials	Semi-structured interviews	Examine governance and coordination
Secondary	Contract documents	Documentation	Verify system input accuracy
Secondary	Flight logbooks	Observation & documentation	Analyze operational data consistency
Secondary	Manifest & AFML	Documentation	Validate supporting documents
Secondary	Financial reports	Documentation	Assess accountability and subsidy reporting

3. Data Analysis

Data were analyzed using thematic analysis to identify patterns of system use, implementation barriers, and effectiveness outcomes. Thematic analysis is particularly effective in capturing context-specific meanings and uncovering design–practice gaps in digital system implementation (Sabani et al., 2018; Menezes et al., 2022). The analysis process involved coding data into key categories: organizational readiness, system quality, and user perception.

These themes were further mapped to operational processes to support recommendations for workflow redesign and technical-organizational interoperability (Kasemsap, 2020; Bojović et al., 2023). Additionally, thematic findings can be extended through text analytics approaches, such as topic modeling, to enhance scalability and generalizability of insights (Risal et al., 2023; Madyatmadja et al., 2022). The outputs of thematic analysis are directly actionable, enabling policy-oriented recommendations such as standard operating procedures (SOPs), training programs, user interface improvements, and system integration strategies (Menezes et al., 2022; Sabani et al., 2018).

4. Validity and Ethical Considerations

To ensure validity, this study applied data triangulation by cross-verifying findings from interviews, observations, and documents. Triangulation reduces single-source bias and strengthens the credibility of causal inferences by confirming evidence across multiple sources (Choi et al., 2018; Frost & Lal, 2018). It also helps detect inconsistencies between policy declarations and operational data, thereby improving the reliability of system evaluation, particularly in terms of accountability and security risks (Choi et al., 2018; Gyamfi et al., 2019; Owusu et al., 2021).

Ethical considerations include maintaining respondent anonymity, ensuring confidentiality of operational data, and using all collected information solely for academic purposes. The study adheres to ethical research standards by protecting sensitive institutional information while ensuring transparency in analytical procedures.

RESULTS

1. Actor Characteristics and Data Context

The study involved key actors across the reporting chain of the SISFOANGUD Perintis system, enabling a comprehensive understanding of both managerial control and operational execution. Informants included the Regional Head (KPA), Commitment Making Officer (PPK), supervisors, system operators, and airline representatives as primary data producers.

Table 4.1. Characteristics of Key Informants

Code	Role	Institution	System Involvement	Main Function
INF-01	Regional Head (KPA)	Korwil Gunungsitoli	Final validation & locking	Accountability and reporting control
INF-02	PPK	Korwil	Initial verification	Data consistency checking
INF-03	Supervisor	Korwil	Verification stage 1	Data validation
INF-04	Operator	Operational unit	Data input & upload	Data production
Airline	External actor	Airline	Logbook submission	Primary data source

The involvement intensity varies across roles, with operators and airlines engaged daily, while managerial actors focus on validation and reporting cycles.

2. Workflow and System Operation

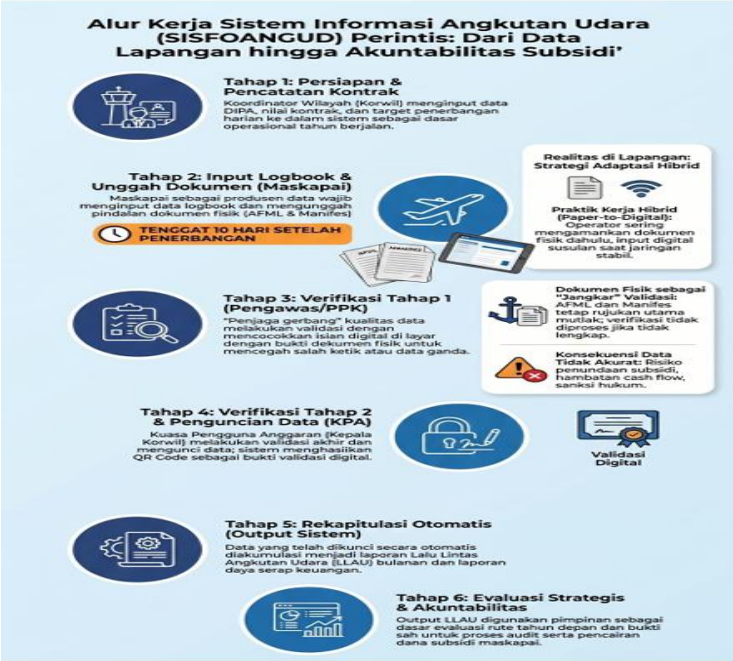

Figure 1. SISFOANGUD Reporting Workflow

The system operates through six sequential stages: (1) contract input, (2) logbook entry and document upload, (3) first-stage verification, (4) second-stage validation and locking, (5) automated recap generation, and (6) reporting and evaluation.

Operational findings show that although the workflow is formally linear, actual execution involves iterative corrections and repeated validation cycles due to data inconsistencies and technical constraints.

3. Actual Usage Patterns in Limited Infrastructure

In practice, system usage exhibits a hybrid pattern. Users rely on digital processes when network conditions are stable but revert to manual procedures when connectivity is unreliable. This aligns with findings that facilitating conditions and infrastructure readiness strongly determine actual system uptake (Gebeyehu & Twinomurinzi, 2022; Gyamfi et al., 2019).

Operators frequently delay data input and upload until connectivity improves, resulting in non-real-time reporting. Additionally, manual verification through phone calls or physical documents remains essential to ensure data accuracy. This reflects the continued reliance on hybrid workflows in environments with unstable infrastructure (Al-Bayari et al., 2020; Bojović et al., 2023; Purwandari et al., 2019).

4. User Satisfaction Dynamics

User satisfaction is generally low and fluctuates over time. The primary drivers include inconsistent system performance, failed uploads, repeated data entry, and integration issues. These findings are consistent with IS Success Model studies, which highlight system quality, service quality, and training as key

determinants of satisfaction (Wagiman et al., 2023; Wantania et al., 2021; Alkraiji, 2020; Al-Okaily et al., 2023).

Additionally, satisfaction is influenced by responsiveness to user feedback and infrastructure fragility, leading to unstable user experiences (Yuhefizar et al., 2024; Abdulkareem & Ramli, 2021; Choi et al., 2018).

Table 4.2. User Satisfaction Factors

Factor	Condition	Impact
System Quality	Unstable	Low satisfaction
Service Quality	Limited support	Frustration
Infrastructure	Weak	Delays
Training	Insufficient	Misuse/errors

5. Perception Differences Across Actors

Differences in perception across actors significantly affect implementation effectiveness. Managerial actors perceive the system as beneficial for control and accountability, while operational users focus on workload and technical challenges. This divergence creates misalignment between system design and operational realities (Frost & Lal, 2018; Ngonzi & Sewchurran, 2019).

Top-down implementation without sufficient local adaptation limits flexibility and slows adoption. Studies show that involving local actors improves policy implementation and system alignment (Giulio & Vecchi, 2018; Kasemsap, 2020).

Organizational cynicism and low trust further reduce compliance and functional usage, especially when users perceive high risks associated with data errors or audits (Choi et al., 2018; Frost & Lal, 2018).

Table 4.3. Cross-Actor Perception Differences

Actor	Focus	Perception	Challenge
Management	Output control	Positive	Delayed data
Operator	Task execution	Negative	Workload & errors
External	Data submission	Moderate	Connectivity

6. Output vs Operational Effectiveness

The system demonstrates strong effectiveness at the output level but weak performance at the operational level. While reports and recaps are successfully generated, daily workflows remain inefficient and dependent on manual intervention.

This condition arises from misalignment between front-end systems and back-end processes, as well as insufficient business process reengineering (Aquino & Lino, 2025; Chakiri et al., 2020). The absence of structured benefits management also limits the translation of strategic gains into operational improvements (Fernandes et al., 2023).

Infrastructure limitations, human resource constraints, and usability issues further reduce operational effectiveness despite successful output generation (Gyamfi et al., 2019; Kasemsap, 2020; Valsamidis et al., 2019).

Table 4.4. Effectiveness Comparison

Dimension	Output Level	Operational Level
Performance	High	Low
Efficiency	High	Low
Reliability	Moderate	Low
Dependency	Low	High (manual support)

Overall, the findings indicate that SISFOANGUD functions effectively as a reporting and accountability tool but remains limited as an operational system due to infrastructure, organizational, and behavioral constraints.

DISCUSSION

1. Interpretation of Findings in Relation to Theory

The findings of this study reinforce the continued relevance of the DeLone and McLean (D&M) Information System Success Model in explaining e-government effectiveness, while also revealing its limitations in constrained operational contexts. Consistent with prior studies, system quality, information quality, and service quality influence system use, user satisfaction, and net benefits (Wagiman et al., 2023; Owusu et al., 2021). In the case of SISFOANGUD, these relationships are evident at the managerial level, where system outputs such as LLAU reports and subsidy accountability are effectively produced. However, the study also demonstrates that D&M alone is insufficient to explain operational realities. Factors such as trust, perceived risk, training, and infrastructure conditions significantly mediate these relationships, confirming the need to extend D&M with contextual variables in public sector environments (Abdulkareem & Ramli, 2021; Sorongan & Hidayati, 2020; Al-Okaily et al., 2023).

Similarly, the Technology Acceptance Model (TAM) remains useful in explaining user behavior, particularly through perceived usefulness and perceived ease of use. The findings show that perceived usefulness is strong at the managerial level, sustaining system usage despite operational difficulties. However, perceived ease of use is weakened by technical instability, and its explanatory power is overshadowed by trust and perceived risk. This aligns with studies suggesting that TAM requires integration with facilitating conditions and trust variables to explain continuance and satisfaction in public sector systems (Alkraiji, 2020; Wantania et al., 2021; Al-Zahrani, 2020).

2. Theoretical Implications: Integrating Organizational Readiness

A key theoretical contribution of this study lies in demonstrating the central role of organizational readiness as both an antecedent and moderator within IS success frameworks. Organizational readiness—comprising infrastructure, human resources, training, interoperability, and top management support—shapes the strength of relationships between system quality and outcomes such

as use, satisfaction, and net benefits (Aligarh et al., 2025; Al-Okaily et al., 2023; Fernandes et al., 2023; Frost & Lal, 2018).

The findings suggest that without sufficient readiness, strong system outputs do not translate into operational effectiveness. This supports the argument for multi-level models that integrate technical, organizational, and environmental dimensions. Moreover, the absence of structured benefits management and process alignment explains why strategic gains remain disconnected from daily workflows (Fernandes et al., 2023; Roach & Davis-Cooper, 2020). Thus, the study advances IS research by highlighting the need to move beyond linear causal models toward context-sensitive, socio-technical frameworks.

3. Practical Implications for 3T Regions

From a policy perspective, the findings highlight the importance of prioritizing organizational readiness in implementing e-government systems in 3T regions. Infrastructure investment alone is insufficient; it must be accompanied by lightweight interoperability models, continuous training programs, and strong local management support to ensure sustainable system use (Frost & Lal, 2018; Chakiri et al., 2020; Gebeyehu & Twinomurinzi, 2022).

The persistence of hybrid practices indicates the need for business process reengineering (BPR) and business process management (BPM) to align system design with operational workflows. Without such alignment, parallel manual-digital processes will continue, reducing efficiency and increasing workload (Kasemsap, 2020; Fernandes et al., 2023).

In geographically and linguistically diverse contexts, hybrid system architectures—such as offline-first or synchronization-based models—should be adopted to accommodate infrastructure constraints. Additionally, incorporating contextual feedback mechanisms, including text analytics and citizen feedback systems, can enhance accountability and improve service responsiveness (Madyatmadja et al., 2022; Chakiri et al., 2020; Choi et al., 2018).

4. Contribution to Context-Sensitive IS Research

This study contributes to the literature by extending IS Success and TOE perspectives through a context-sensitive analysis of internal government systems in a 3T region. It demonstrates that organizational readiness acts as a critical moderator between system quality and public value outcomes, reinforcing the need for multi-level evaluation models (Aligarh et al., 2025; Chakiri et al., 2020; Madyatmadja et al., 2022).

Methodologically, the study highlights the value of integrating benefits management and participatory design approaches to bridge the gap between system design and operational practice. By focusing on real-world workflows and user adaptation strategies, the research provides a more nuanced understanding of digital transformation in constrained environments (Fernandes et al., 2023; Frost & Lal, 2018).

5. Limitations and Transition to Conclusion

Despite its contributions, this study has several limitations. First, it is based on a single case study, which may limit generalizability to other regions or systems. Second, the qualitative approach, while providing depth, does not allow for statistical generalization. Third, limited quantitative operational data restricts the ability to measure efficiency gains numerically.

Future research should adopt mixed-method approaches to validate and extend these findings across different regional contexts, particularly by comparing 3T and non-3T environments. Such studies can provide a more comprehensive understanding of how contextual factors shape the effectiveness of public sector information systems.

These limitations and opportunities indicate the need for further synthesis, which is addressed in the following section.

CONCLUSION

This study concludes that the implementation of SISFOANGUD Perintis demonstrates a dual character of effectiveness. At the organizational level, the system is effective in producing outputs such as LLAU reports, improving transparency, and supporting subsidy accountability. These findings confirm the relevance of the DeLone and McLean model in explaining system success through use, user satisfaction, and net benefits.

However, at the operational level, the system remains fragile. Infrastructure limitations, repeated verification processes, and dependence on physical documents result in hybrid workflows that reduce efficiency. User satisfaction is inconsistent, and system use is shaped more by perceived risk and trust than by ease of use. This indicates that technical system quality alone is insufficient to ensure effective implementation.

The study highlights the critical role of organizational readiness—including infrastructure, human resources, training, and governance—in bridging the gap between system design and operational practice. Without sufficient readiness, the benefits of digital systems cannot be fully realized in daily workflows.

Overall, the findings emphasize the need for context-sensitive approaches to digital government, particularly in remote regions. Future efforts should focus on aligning system design with operational realities through process reengineering, infrastructure improvement, and capacity-building initiatives to achieve sustainable and effective digital transformation.

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