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E-Government Implementation in Urban Parking Management: A Study of the Palembang Parking Information Application System (SIAPP)

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Abstract

This study examines the implementation of the Palembang Parking Information Application System (SIAPP) as an e-Government initiative in urban parking services. Existing research on digital and smart parking systems has largely focused on their technical design and performance, with limited insight into how they are implemented and maintained within local government institutions. To address this gap, this study analyzes the institutional, organizational, and managerial factors that shape SIAPP's effectiveness. A qualitative descriptive approach was employed, using in-depth interviews, field observations, and document analysis to capture the dynamics of implementation in practice. The findings indicate that SIAPP has facilitated a shift from manual to ICT-based parking management, thereby improving operational efficiency, transparency, and accountability, and increasing local government revenue. Digital record-keeping and information accessibility have strengthened oversight and helped reduce illegal parking practices. However, the results also reveal uneven implementation outcomes. Institutional and policy support emerged as key enabling factors, while limited human resource capacity and the continuation of partially manual administrative processes limited the system's performance despite adequate technological infrastructure. The study further demonstrates that SIAPP generates value for both the government and citizens, particularly through improved revenue control and increased service trust. These findings underscore that effective e-Government implementation in urban services depends not only on technological readiness but also on sustained institutional commitment, capacity building, inter-agency data integration, and public engagement, which offer relevant policy insights for urban digital governance.

Keywords: *E-Government, Parking Management, SIAPP, Palembang City*

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INTRODUCTION

The rapid development of information and communication technology (ICT) has fundamentally transformed public administration, specifically in how governments manage administrative processes and deliver public services (Idzi & Gomes, 2022; Latupeirissa et al., 2024; Ncamphalala & Vyas-Doorgapersad, 2022).

In the digital era, governments are required to provide services that are not only fast and efficient but also transparent, accountable, and accessible to the public (Hochstetter et al., 2023). These demands have positioned digital transformation as a central component of contemporary public sector reform.

In addition, one of the most prominent responses to this transformation is e-Government, defined as the use of ICT-based systems to support government administration and enhance public service delivery (Hasanah et al., 2024; Likuwatan Werang et al., 2025; Werang, Werang, & Rizki, 2025). Beyond enhancing service accessibility, e-Government contributes to institutional efficiency, strengthens accountability mechanisms, and supports the development of public trust in government.

Consequently, the actualisation of e-Government has become an essential indicator of progress in administrative reform globally, with digital systems increasingly applied in sectors such as taxation, licensing, public complaints, transportation, and urban infrastructure management, such as parking systems (Olmos Medina et al., 2025; Sikarwar et al., 2024; Venkata Sudhakar et al., 2023).

In Indonesia, e-Government initiatives gained momentum following the reform era, driven by efforts to improve public service quality and institutionalize good governance principles. Both central and local governments have developed ICT-based applications to enhance transparency, accountability, and public access to services (Addink, 2019; Nag, 2018; Pomeranz & Stedman, 2020). This policy direction is reinforced by Law Number 11 of 2008 on Information and Electronic Transactions, which provides a legal foundation for electronic systems, and by Law Number 25 of 2009 on Public Services, which mandates transparency, accountability, public participation, and non-discrimination in service delivery. Within this national context, urban transportation and parking management have emerged as increasingly critical public service issues, particularly in rapidly growing cities (Werang, Werang, & Putri, 2025).

Moreover, parking systems constitute an essential component of urban transportation management, as nearly all private vehicle trips begin and end at parking facilities. The steady growth of private vehicle ownership in urban areas has intensified demand for parking spaces and placed pressure on existing infrastructure. Inefficient parking management can contribute to traffic congestion, reduced road capacity, and persistent losses in local government revenue. Manual parking systems are often associated with long queues, weak supervision, inaccurate revenue recording, and a high risk of leakage in parking retribution collection. These challenges are clearly reflected in Palembang City, the capital of South Sumatra Province.

The continued increase in private vehicle ownership, particularly cars, has resulted in growing parking demand across commercial and public service areas, exacerbating congestion and complicating parking control.

Administratively, parking management in Palembang is divided into four operational zones: South, North, West, and East, each with distinct characteristics and varying levels of demand. This zoning structure increases managerial complexity and underscores the need for an integrated, technology-

supported parking management system.

In line with national e-Government policy and local transportation challenges, the Palembang City Government, through the Department of Transportation, launched the Palembang Parking Information Application System (*Sistem Informasi Aplikasi Perparkiran Palembang*-SIAPP) in 2019. The application was intended to optimize local revenue (*Pendapatan Asli Daerah*/PAD) while improving the quality and transparency of public parking services through ICT-based monitoring and information systems. SIAPP represented a concrete implementation of e-Government in the urban parking sector. However, despite its intended objectives, SIAPP operated for only approximately one year before ceasing to function and has not been effectively utilized since.

This condition highlights a central problem in local e-Government implementation: although digital systems are formally introduced and supported by policy frameworks, their sustainability and effectiveness in practice remain uncertain. The discontinuation of SIAPP raises critical questions regarding institutional readiness, inter-agency coordination, technological infrastructure, human resource capacity, and policy assistance at the municipal level.

Previous studies on smart parking systems and IoT-based parking management, both in Palembang and other regions, indicate that digital parking systems can provide real-time information, improve parking space utilization, and support more efficient management.

Research on smart parking projects in Palembang, web-based parking information systems in universities, and IoT-based parking monitoring systems generally reports positive outcomes in terms of usability and technical efficiency. But these studies predominantly focus on system design, technical performance, or simulation-based results. There remains limited empirical analysis of the actual implementation process of e-Government systems within government institutions, particularly in cases where digital applications fail to operate sustainably.

Ultimately, this study focuses on analyzing the implementation of e-Government in the Palembang Parking Information Application System (SIAPP) within the Department of Transportation of Palembang City.

In short, the study aims to examine how e-Government was implemented in the parking information system and to identify the key factors influencing its implementation and sustainability. By emphasizing institutional practices and local administrative context, this research seeks to provide empirical evidence on the challenges of e-Government implementation at the municipal level, particularly in urban parking management.

RESEARCH METHODS

This study employs a qualitative case study strategy to examine the implementation of e-Government in the Palembang Parking Information Application System (SIAPP) at the Palembang City Department of Transportation. The case study approach is appropriate because the research focuses on an in-depth investigation of a single, bounded system, SIAPP, as a real example of e-Government implementation within a specific institutional and administrative context. A qualitative design is suitable for understanding processes,

experiences, and organizational practices related to the application of ICT-based systems in public services.

Henceforth, qualitative research enables an in-depth exploration of social realities and facilitates the interpretation of meanings from the perspectives of individuals directly involved in the implementation process (J. Moleong, 2018). This approach seeks to describe systematically and accurately the conditions, situations, and phenomena encountered in the field without manipulating the research setting (Creswell & Clark, 2017).

Through a descriptive and interpretive analysis, the study aims to capture how e-Government was implemented through SIAPP and to identify the factors influencing its performance and sustainability. Emphasis is placed on understanding context, institutional dynamics, and implementation processes rather than on numerical measurement. Nevertheless, data collection was conducted using multiple techniques to ensure depth and comprehensiveness. Primary data were collected through in-depth, semi-structured interviews with key informants purposively selected based on their roles and involvement in SIAPP. Informants included officials and staff of the Palembang City Department of Transportation who were responsible for policy formulation, system planning, operational management, and day-to-day implementation of the parking application.

The interview scope covered themes such as system objectives, implementation processes, coordination mechanisms, technical constraints, human resource capacity, and reasons for the discontinuation of SIAPP. The semi-structured format allowed informants to elaborate on their experiences while remaining aligned with the research objectives.

In addition to interviews, direct observation was conducted to understand existing parking management practices and the current use of information technology in the field. Observations focused on parking operations, supervision mechanisms, and the extent to which digital systems were integrated into daily practices.

Secondary data were collected through documentation studies, including government regulations, official reports, policy documents, internal records, and written materials related to parking management, e-Government policies, and the development of SIAPP. Document analysis was used to contextualize interview data and to trace formal policy intentions and institutional arrangements.

Nonetheless, data analysis was conducted through a systematic qualitative analysis. Interview transcripts, observation notes, and documents were first organized and read repeatedly to gain a comprehensive understanding of the data. The researcher then conducted data reduction by coding relevant information and grouping it into thematic categories related to e-Government implementation, such as institutional readiness, technological infrastructure, coordination, human resources, and policy support. These themes were compared across data sources to identify patterns, relationships, and explanatory factors.

The analytical process followed an iterative approach, allowing emerging findings to be continuously refined and interpreted in relation to the research objectives.

To enhance the trustworthiness of the findings,

several data validation strategies were applied. Data triangulation was conducted by comparing information obtained from interviews, observations, and documentary sources to ensure consistency and reduce potential bias (Miles; Huberman, 1992).

In addition, the researcher carried out repeated reviews of interview transcripts and field notes to ensure that interpretations accurately reflected informants' statements and observed conditions. Where necessary, clarification was sought from informants to confirm key points and reduce misinterpretation. Continuous reflection throughout the research process further supported analytical rigor.

RESULT AND DISCUSSION

This section discusses the implementation of e-Government in the Palembang Parking Information Application System (SIAPP) by examining empirical findings through four key dimensions: automation of public services, transparency and accountability, public participation, and integrated data management.

These dimensions reflect widely accepted indicators of e-Government practice and provide an analytical scheme for assessing how digital governance operates in a municipal parking context. Here, the researcher breaks down the main point of empirical analysis:

Automation of Parking Services

The findings indicate that automation represents the most prominent and tangible aspect of SIAPP implementation. Before the introduction of SIAPP, parking management in Palembang was largely conducted manually. Informants consistently described these procedures as administratively complex, time-consuming, and vulnerable to irregularities, particularly in relation to parking retribution collection and reporting.

Manual cash handling requires significant human involvement at multiple stages, increasing the likelihood of recording errors, delays in reporting, and potential revenue leakage. SIAPP was introduced to replace these manual processes with a digital system. Through the application, several operational functions were automated, including parking location determination, parking zone categorization, and daily retribution deposit recording.

The system enabled parking activities to be monitored more systematically, allowing the Department of Transportation to access routine revenue data daily, weekly, and monthly. Yet, the findings also display that automation remains partial. Administrative processes for the recruitment, registration, and supervision of parking attendants are still partially manual, limiting the scope for automation. From an e-Government perspective, these findings support the argument that automation can improve efficiency and strengthen administrative control by reducing procedural complexity and reliance on discretionary human intervention (Alhosani & Alhashmi, 2024; Cinar et al., 2024; Sønderskov et al., 2022). SIAPP's automation features contributed to more orderly workflows and improved revenue tracking, confirming core assumptions in e-Government theory regarding the role of ICT in service efficiency.

At the same time, the Palembang case differs from studies conducted in cities with fully automated or sensor-based smart parking systems, where digitalization extends to real-time space allocation

and enforcement. SIAPP reflects a more incremental form of automation shaped by institutional capacity and existing organizational routines.

This contextual specificity suggests that automation in local government settings is not solely a technical issue but is closely tied to organizational readiness and the ability to standardize procedures across units. The coexistence of manual and digital practices indicates that automation remains vulnerable to fragmentation when capacity constraints are not addressed.

Transparency and Accountability

The findings illustrate that SIAPP has contributed to increased transparency in parking management. The system provides structured information on parking locations, applicable tariffs, and revenue flows. Interview data indicate that SIAPP regularly produces reports on parking retribution, which are used internally for monitoring and evaluation.

Compared to the previous manual system, these digital records are more consistent, easier to retrieve, and less dependent on individual reporting practices. The availability of digital records enables internal stakeholders to review financial performance and identify discrepancies more efficiently.

Informants noted that the system facilitates supervision by providing a documented transaction trail, thereby reducing ambiguity in revenue reporting. These findings align with the governance literature, which positions transparency as a central outcome of e-Government implementation (Bisogno & Cuadrado-Ballesteros, 2022; Bustamante et al., 2022; Manoharan et al., 2023). By making operational and financial information more accessible, SIAPP strengthens the technical foundations for accountability and reduces opportunities for irregular practices. But the Palembang case also illustrates that transparency alone does not automatically produce accountable governance. While data are available within the system, their effectiveness depends on consistent use, managerial oversight, and enforcement mechanisms. Without follow-up actions based on system outputs, transparency risks becoming procedural rather than substantive.

This finding diverges from studies that report more direct accountability gains from digital platforms, highlighting the importance of institutional behavior in shaping governance outcomes. In this sense, SIAPP demonstrates that transparency is a necessary but insufficient condition for accountability.

Public Participation

Public participation within SIAPP is reflected in both operational and communicative dimensions. Operationally, parking attendants are integrated into the system through barcode identification, which formally registers them as authorized service providers. This mechanism allows users to verify the legitimacy of attendants and reduces the presence of illegal parking operations. SIAPP provides channels for public feedback, including complaints, suggestions, and criticisms regarding parking services. Despite these features, participation remains uneven. Informants reported that not all citizens are aware of the application's participatory functions, and that the use of feedback channels is relatively limited.

Similarly, while the barcode system enhances control, its effectiveness depends on the public's willingness to verify and report

irregularities. The findings partially support e-Government theories that emphasize participation as a means of fostering interactive governance. Consistent with other smart parking studies, SIAPP demonstrates how digital tools can facilitate citizen involvement and community oversight. However, the Palembang case also highlights contextual constraints. Participation is influenced not only by system availability but by public awareness, digital literacy, and socialization efforts. This finding diverges from cases in which digital participation is embedded within broader civic engagement strategies.

In Palembang, participatory features exist but are not fully institutionalized through outreach or education. As a result, participation remains supplementary rather than transformative. It suggests that participation in e-Government systems cannot be assumed to emerge organically from technological provision alone.

Integrated Data Management

The study reveals that SIAPP has introduced limited data integration, particularly through its linkage with Bank Sumsel for direct retribution deposits. This arrangement minimizes cash-based transactions and improves the traceability of parking revenues.

Informants emphasized that banking integration enhances financial accountability and reduces opportunities for manipulation. The system also incorporates data backup mechanisms to protect information from loss. However, SIAPP is not fully integrated with Palembang's broader Smart City infrastructure or other municipal information systems. As a result, data generated by SIAPP are not systematically shared across sectors.

Integrated data management is widely recognized as a cornerstone of effective e-Government. SIAPP's partial integration represents progress toward accountable financial management, yet its standalone operation limits strategic data use. Compared to smart city initiatives that emphasize interoperable platforms, SIAPP reflects an incremental approach shaped by institutional and infrastructural constraints. This finding underscores that data integration is not merely a technical challenge but an organizational one.

Without cross-sector coordination and shared governance frameworks, digital systems risk operating in isolation, reducing their contribution to comprehensive urban management. Using the framework proposed by Heeks and Molla (2009), the findings suggest that institutional support, capacity, and value creation collectively shape SIAPP implementation. Institutional support emerged as a facilitating factor, as leadership commitment enabled the system's development and initial adoption. Capacity remains uneven, particularly in human resources, where limited technical skills constrain optimal utilization. Value creation is the strongest dimension, as SIAPP delivers benefits to both government and citizens by improving revenue control, transparency, and service legitimacy (Makani et al., 2022; Todorović et al., 2022; Yigitcanlar et al., 2024).

Similarly, automation, transparency, participation, and data integration reveal SIAPP as a meaningful yet incomplete realization of e-Government. Automation improved efficiency but remains dependent on organizational capacity; transparency enhanced data

availability without guaranteeing accountability; participation mechanisms exist but are unevenly used; and data integration strengthened financial control while lacking systemic interoperability.

This synthesis demonstrates that e-Government effectiveness depends on the alignment between technological systems and institutional readiness.

In sum, SIAPP illustrates both the promise and the limitations of digital governance in municipal parking management. While the system demonstrates how e-Government can improve service governance, it also shows that technological solutions must be accompanied by sustained institutional support, capacity development, and integration to achieve lasting administrative change.

Key Factors Affecting the Implementation of E-Government in the Parking Information System (SIAPP)

This part examines the implementation of e-Government in the Palembang Parking Information Application System (SIAPP) by analyzing the factors that shape its effectiveness and sustainability.

Institutional Support

The findings indicate that institutional support played a decisive role in initiating SIAPP. The Palembang City Department of Transportation acted as the principal driver of digital reform in parking services, framing SIAPP as a policy instrument to improve transparency and control over parking retribution. Institutional support was evident through formal authorization, the assignment of responsibilities to relevant units, and coordination with external actors, such as Bank Sumsel, for financial transactions. These measures provided legitimacy to SIAPP and facilitated its adoption during the early stages of implementation. However, empirical evidence also shows that institutional engagement declined after the initial rollout. While SIAPP was launched as a strategic innovation, systematic follow-up in the form of continuous evaluation, system updates, and inter-agency coordination was limited.

Support remained largely confined to the Department of Transportation, with minimal integration into broader municipal digital governance initiatives, including Smart City programs. These confirmations are consistent with Heeks and Molla's argument that strong political and organizational backing is a prerequisite for successful e-Government implementation. Similar studies on municipal e-Government initiatives report that leadership commitment is often strongest during project initiation but weakens during routine operation, affecting sustainability. In contrast to cases where digital systems are embedded within cross-sector governance structures, SIAPP illustrates a more fragmented pattern of support. This contextual specificity suggests that institutional commitment must be sustained and distributed across agencies to move e-Government beyond pilot-stage innovation toward long-term institutionalization.

Implementation Capacity

Implementation capacity emerged as a critical constraint affecting SIAPP performance. From a technological perspective, SIAPP is functionally adequate: the application is accessible online, supports digital reporting, provides information on parking locations, and facilitates non-

cash financial transactions. These features enable basic automation and data recording in parking management. In contrast, human resource capacity remains uneven.

Several administrative processes, particularly those related to the registration, validation, and supervision of parking attendants, continue to rely on manual procedures. Parking attendants are digitally identified through barcode systems, yet their operational monitoring still depends heavily on administrative oversight.

Interview data also indicate limited technical skills and insufficient training among some staff and frontline actors. Financial capacity was not identified as an immediate obstacle, but long-term funding for system maintenance and upgrading remains uncertain. These justifications reinforce the argument that e-Government failure often results from gaps between technological design and organizational readiness rather than from technical deficiencies alone. While SIAPP aligns with other smart parking initiatives in providing basic automation, it diverges from cases in which digital systems are fully embedded in organizational routines through comprehensive capacity-building. The coexistence of manual and digital practices reflects a partial transition to e-Government, shaped by limited skills, training, and procedural standardization. It highlights the contextual importance of human and organizational capacity in determining how far automation and data integration can be realized in practice.

Perceived Value

The findings display that SIAPP generates value for both government institutions and the public. For the local government, the primary value lies in improved control over parking retribution and enhanced revenue accountability. Digital recording and direct bank deposits reduce opportunities for leakage and support more transparent financial management. For citizens, SIAPP provides access to official parking information and mechanisms to verify the legitimacy of parking attendants, offering protection against illegal parking practices.

SIAPP also contributes to improved social order by formalizing the role of parking attendants through digital identification. However, the perceived benefits are unevenly distributed. While institutional actors experience clear gains in revenue management, some parking attendants perceive limited direct improvement in income stability or working conditions. This condition aligns with Heeks and Molla's theoretical value creation, thereby strengthening the legitimacy of e-Government initiatives. SIAPP confirms findings from other e-Government and smart parking studies that emphasize revenue optimization and service transparency as key benefits.

On the other hand, the Palembang case demonstrates contextual divergence: value is not uniformly perceived across actors. Where frontline implementers do not experience tangible benefits, compliance and long-term commitment may weaken. It suggests that value creation must be inclusive and socially embedded to sustain digital governance initiatives beyond their technical success.

Actor Interaction and Governance Dynamics

The implementation of SIAPP involves interactions among

institutional actors (government agencies), operational actors (staff and parking attendants), and service users (the public). Institutional actors provided policy direction and legitimacy, operational actors translated digital systems into daily practices, and users influenced utilization through acceptance and feedback. The findings indicate that while institutional support enabled system adoption, capacity limitations among operational actors constrained full implementation. Public acceptance was generally positive, but did not automatically result in sustained or intensive system use.

These dynamics illustrate that e-Government implementation is a negotiated and relational process rather than a linear one. Similar to findings in other municipal e-Government studies, SIAPP shows that technological systems mediate interactions among actors with different interests, capacities, and expectations. In this context, governance outcomes depend on how effectively these actors are aligned through policy, training, incentives, and communication.

Overall, the analysis shows that the implementation of e-Government in SIAPP reflects a partial but meaningful transformation of parking governance in Palembang. Automation improved efficiency but remains constrained by human capacity; transparency enhanced data availability without guaranteeing accountability; participation mechanisms exist but are unevenly utilized; and data integration strengthened financial control while remaining institutionally fragmented.

These findings suggest that SIAPP's effectiveness depends not solely on technological innovation but on the sustained alignment of institutional support, capacity.

CONCLUSION

Overall, this study demonstrates that SIAPP represents a meaningful but incomplete realization of e-Government in urban parking management, where technological advancement has outpaced institutional and human capacity to sustain it.

The findings show that the digitalization of parking management through SIAPP successfully shifted parking services from a manual to an ICT-based system, improving operational efficiency, transparency, and accountability while contributing to increased local government revenue (*Pendapatan Asli Daerah*). The most decisive success factor in this implementation was institutional and policy assistance from the Palembang City Department of Transportation, which enabled system development, formal adoption, and early operationalization. In contrast, the most significant constraint was limited human resource capacity, particularly in administrative and frontline functions that continued to rely on manual procedures, reducing the full effectiveness of automation.

In terms of governance outcomes, SIAPP generated dual value. For the local government, digital recording and non-cash transactions strengthened revenue control and supervision. For the public, access to verified parking information and the formalization of parking attendants reduced illegal practices and increased trust in parking services. Yet, these benefits were unevenly experienced, indicating that technological value does not automatically translate into sustained compliance or system use without inclusive implementation strategies. The policy implications of this study are intended for municipal

governments, transportation departments, digital governance units, and urban revenue authorities. These actors should view e-Government in parking services not merely as a technological intervention but as an institutional reform process.

Sustained leadership commitment, systematic capacity building for staff and parking attendants, cross-agency data integration, particularly with smart city platforms, and continuous public engagement are essential to ensuring long-term effectiveness. Without these elements, digital systems risk remaining underutilized or discontinued despite their technical potential. To strengthen, from a theoretical perspective, this study extends the application of the Heeks and Molla (2009) framework by demonstrating how the interaction between support, capacity, and value shapes e-Government outcomes in a municipal service context. The findings reaffirm that institutional support is a necessary enabler, capacity is a decisive constraint, and value creation determines legitimacy and acceptance.

Importantly, the study highlights that imbalance among these dimensions explains partial success rather than outright failure, contributing to a more nuanced understanding of e-Government implementation at the local level.

Lastly, future research may build on these findings by conducting comparative studies across municipalities to examine how variations in institutional capacity and governance structures affect the sustainability of digital parking systems.

Further research could also explore citizen and frontline worker perspectives in greater depth to better understand how perceived value influences long-term engagement with e-Government services.

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