Eduvest – Journal of Universal Studies
Volume 5 Number 12, December, 2025
p- ISSN 2775-3735- e-ISSN 2775-3727

Government Resource Planning-Based Transformation Strategy for Budget Planning System in Planning Division Directorate General of Sea Transportation

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ABSTRACT

The fragmentation of planning and budgeting systems in government institutions poses significant challenges to operational efficiency and strategic decision-making. This research develops a comprehensive transformation strategy for the budget planning system at the Directorate General of Sea Transportation, Ministry of Transportation, Indonesia. Using As-Is Analysis and Soft System Methodology (SSM), the study examines current system conditions and identifies transformation requirements. The analysis reveals critical challenges including the operation of three separate systems (E-Planning, KRISNA, and SAKTI) without integration protocols, dominance of manual processes in budget calculations for 302 work units, and absence of standardized digital infrastructure. Through SSM implementation, two conceptual models were developed addressing digital transformation and system integration requirements. Gap analysis between conceptual models and reality identified deficiencies across six dimensions: stakeholder engagement, system architecture, performance management, technical design, implementation strategy, and risk management. The research proposes Government Resource Planning (GRP) implementation through four integrated strategies: developing integrated system architecture with modular design principles, implementing organizational change management addressing human and institutional factors, establishing interoperability protocols for seamless data exchange, and creating comprehensive evaluation and risk mitigation frameworks. A phased implementation roadmap spanning 18 months provides a pragmatic approach to transformation. This research contributes to digital government literature by demonstrating the effectiveness of combining As-Is Analysis with SSM in addressing complex socio-technical challenges, while offering practical frameworks for government agencies pursuing similar transformations. The findings have significant implications for Indonesia's digital government initiatives and public sector modernization efforts.

KEYWORDS *As-Is Analysis; Budget planning; Digital transformation; Government Resource Planning; Soft System Methodology; System integration.*

INTRODUCTION

The planning and budgeting process in government agencies, particularly in the Directorate General of Sea Transportation, faces significant challenges due to system fragmentation and lack of integration. Currently, the Sea Transportation Sub-Sector Planning Division operates with three separate application systems: E-Planning Application (internal to the Ministry of Transportation), KRISNA Application (Ministry of National Development Planning/Bappenas), and SAKTI Application (Ministry of Finance). This fragmentation creates several critical problems, including repetition in data input processes requiring operators to enter the same data on different platforms, difficulties in data synchronization between systems due to differences in data structure and format, potential information inconsistencies across these systems, and inefficiency in time and resource utilization for data management (Bryukhanova, Grigoryeva, & Dynnik, 2021; Sopamena, 2024; Sumirah & Zohri, 2016). Furthermore, the manual process that remains dominant and prone to errors in several critical

stages of budget preparation presents significant challenges. Analysis found that the preparation of budget ceilings for 302 Work Units is still carried out manually using Microsoft Excel applications, which has the potential to cause calculation and recording errors, especially when dealing with large and complex data volumes (Santos & Pessoa, 2024).

The utilization of information and communication technology as a supporting function for government management activities is expected to increase the effectiveness and efficiency of administrative activities and public services. In achieving this goal, technology utilization has become an essential pillar in supporting government operations and public service delivery (Mittal, 2020; Muksin et al., 2024). The concept of digital government currently being implemented by various central and regional government institutions aims to create a more responsive and transparent governance system (Provost, 2022). However, the maturity of Electronic Government System (SPBE) development and implementation still varies across public administrations, creating challenges in establishing synergy in national planning and budgeting processes (Yao, 2024).

Previous studies have explored various approaches to digital transformation and system integration in the public sector. Research on Government Resource Planning (GRP) has demonstrated its potential in enhancing operational efficiency. For instance, a case study in Tanzania showed that implementing a web-based planning and budgeting system (PlanRep) reduced operational costs by 53% and improved time efficiency from 87 days to just 8 days in local government processes (Ruhago et al., 2022). In the Indonesian context, Hany (2015) documented the successful implementation of a Government Resource Management System (GRMS) in Surabaya, which improved transparency and accountability in public financial management through integrated systems (Hany, 2015). Studies on Enterprise Resource Planning (ERP) in the public sector, such as those by Watson et al. (2003) and Fernandez et al. (2018), highlight that success depends heavily on organizational readiness, change management, and the adaptation of technology to bureaucratic culture and complex structures (Fernandez, Zaino, & Ahmad, 2018). Furthermore, research employing Soft System Methodology (SSM) and As-Is Analysis, conducted by Hardjosoekarto (2012) and Krisbiantoro et al. (2015), validates the effectiveness of these methodologies in diagnosing complex socio-technical problems and designing transformation pathways in government settings (Hardjosoekarto, 2012).

However, despite these advancements, a significant research gap persists. Most existing studies focus either on isolated system implementations, high-level policy analysis, or private-sector-derived ERP models without sufficiently addressing the unique, intertwined challenges of multi-system fragmentation, deep-seated institutional path dependencies, and complex inter-ministerial coordination within the specific context of Indonesian central government budgeting. Studies like those by Siti-Nabiha et al. (2023) and Widiaryanto (2020) touch on institutional fragmentation but do not provide integrated strategic frameworks that simultaneously tackle technical integration, organizational change, and political-institutional alignment for a core function like budget planning (Siti-Nabiha et al., 2023: Widiaryanto, 2020). There is a lack of comprehensive research that combines a detailed diagnostic of the current state (As-Is) with a participatory, holistic design approach (SSM) to formulate a

actionable GRP-based transformation strategy specifically for a technical directorate general navigating multiple external system mandate.

As part of harmonization efforts, policy coordination enhancement between agencies, and synchronization of planning and budgeting processes through existing policies, digital government is expected to contribute to governance efficiency and effectiveness in central and regional governments (Gao, 2024; Latupeirissa et al., 2024). According to Government Regulation Number 17 of 2017 concerning Synchronization of National Development Planning and Budgeting Process, the Government Work Plan (RKP) will be implemented through planning and budgeting synchronization in four ways. First, strengthen program management with emphasis on priorities set at the project level to facilitate development planning management and implementation. Second, consolidating funding sources including the consolidation of funding source utilization plans (both central expenditure and transfers to regions and non-state budget funding sources) to increase the effectiveness of priority fund usage (Espinal-Carrillo & Toaza-Tipantasig, 2024). Third, strengthening inter-agency and central-regional coordination to enhance synergy between programs and development actors while establishing existing priorities (Krynytsia, 2024). Fourth, system and document integration, including the integration of electronic planning, budgeting, and performance assessment systems (Maliarchuk, 2024).

Government Resource Planning (GRP) represents a promising solution to these challenges. GRP is a set of application modules designed to support internal functions and public services of government organizations, manage government resources, integrate government bureaucratic activities from upstream to downstream (from planning, spending, program implementation, to evaluation), and facilitate integration within a single information system (Susanto, Samopa, & Wibowo, 2018). The implementation of GRP has shown significant potential in improving government planning and budgeting efficiency. A case study in Tanzania demonstrated that implementing a web-based planning and budgeting system through PlanRep successfully reduced operational costs by 53% and improved time efficiency from 87 days to just 8 days in the local government planning and budgeting process. This achievement indicates the potential for efficiency improvement through digital integration (Nose, 2023).

Based on the phenomena and theories presented above, this research aims to analyze and synergize the systems within internal agencies to meet the budgeting process needs, clarify workflow stages in the budgeting process, and subsequently synchronize with external agency systems to make the system more effective and efficient in the budgeting process. By using Government Resource Planning (GRP), which is a set of application modules supporting internal functions and public services of government organizations, managing government resources, integrating government bureaucratic activities from upstream to downstream, and facilitating integration within a single information system, this research seeks to develop a transformation strategy for the budget program preparation system in the Planning Division of the Directorate General of Sea Transportation.

METHOD

This research employs a comprehensive analytical approach combining qualitative and quantitative methods to address the four research objectives. The study was conducted from June 2023 to November 2024 in the Planning Division of the Directorate General of Sea Transportation, Ministry of Transportation. The research process consists of four main categories: comprehensive analysis of internal and external situations, conceptual needs analysis for system transformation and integration, transformation and integration model design, and transformation strategy formulation for planning and budgeting integration.

The research methodology follows a systematic approach designed to address four specific objectives through corresponding analytical methods. The complete research process flow can be seen in Figure 1. For the first objective of understanding the current planning and budgeting system conditions, this research utilizes As-Is Analysis. This method provides a comprehensive overview of the existing situation, business processes, and currently operating systems within the unit, enabling identification of existing strengths and weaknesses. The As-Is Analysis involves systematic documentation of current processes, identification of stakeholders and their roles, mapping of information flows between systems, and assessment of technological infrastructure and capabilities.

For the second objective of analyzing factors influencing transformation and system synchronization, the research applies Soft System Methodology (SSM) stages 1-4. These stages include identifying problematic situations, creating rich pictures for system condition visualization, formulating root definitions, and developing conceptual models. This approach enables researchers to understand system complexity and explore diverse stakeholder perspectives. The SSM implementation involves workshops with key stakeholders, structured interviews to capture different viewpoints, collaborative development of system representations, and iterative refinement of understanding through stakeholder feedback.

For the third objective of analyzing implementation gaps with transformation strategy plans, the research utilizes SSM stage 5. This stage focuses on comparing conceptual models with reality, resulting in gap identification and system improvement potential. The gap analysis provides a strong foundation for formulating targeted improvement strategies. This comparative analysis includes systematic comparison of ideal models with current practices, identification of discrepancies in processes and outcomes, assessment of resource and capability gaps, and evaluation of organizational readiness for transformation.

For the fourth objective of recommending transformation strategies, the research synthesizes the entire research process to produce an implementation roadmap. This roadmap provides a strategic framework with concrete stages, timeline, and success indicators for effective and efficient planning and budgeting system transformation. The synthesis process involves integration of findings from all previous analyses, prioritization of transformation initiatives based on impact and feasibility, development of phased implementation plans, and establishment of monitoring and evaluation mechanisms.

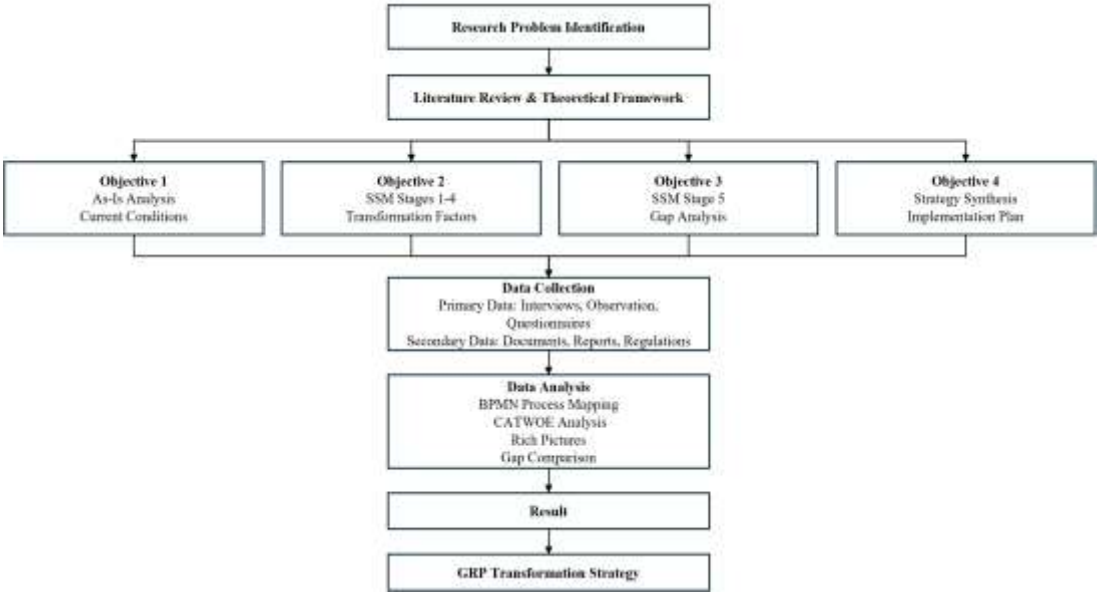

Figure 1. Research Process Diagram
Source: Data processed by the researcher (2024)

This research employs multiple data collection methods to ensure comprehensive understanding of the phenomenon under study. The triangulation of methods enhances the validity and reliability of research findings.

Primary data collection involves direct observation of planning and budgeting processes, distribution of SSM questionnaires to capture stakeholder perspectives, and in-depth interviews with selected respondents. The interview participants are selected using purposive sampling based on their expertise and involvement in the planning and budgeting system (Palinkas et al., 2015). Semi-structured interviews are conducted to allow flexibility while maintaining focus on key research themes.

Secondary data collection includes analysis of planning and budgeting reports from 2020-2024, review of relevant laws and regulations governing government planning and budgeting, examination of internal documents and standard operating procedures, and collection of information from government websites and official publications. Document analysis follows a systematic approach to identify patterns, inconsistencies, and evolution of practices over time.

The research involves two categories of experts selected through purposive sampling. Internal experts comprise personnel from the Planning Division of the Directorate General of Sea Transportation, including division heads, section chiefs, planning staff, and budget analysts. These participants possess intimate knowledge of current systems and operational challenges. External experts include representatives from the Ministry of Finance familiar with SAKTI system operations, Ministry of National Development Planning/Bappenas personnel knowledgeable about KRISNA system, and academics specializing in government planning and budgeting systems. The selection criteria ensure participants have minimum five years of experience in their respective fields and direct involvement in planning and budgeting processes.

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1) As-Is Analysis

As-Is Analysis is conducted systematically to map current conditions of the planning and budgeting system. The analysis process involves process mapping using Business Process Model and Notation (BPMN) to visualize current workflows, stakeholder analysis to identify roles and relationships, system architecture documentation to understand technical infrastructure, and pain point identification through systematic categorization of issues (Dumas et al., 2013). The analysis results are validated through stakeholder workshops to ensure accuracy and completeness.

2) Soft System Methodology (SSM)

SSM is implemented following Checkland's seven-stage model, adapted to the specific context of government planning and budgeting systems. The methodology application includes:

a. Stage 1-2: Problem situation identification and expression through collaborative workshops and rich picture development. Rich pictures are created iteratively with stakeholder input to capture system complexity.
b. Stage 3: Root definition formulation using CATWOE analysis (Customers, Actors, Transformation, Worldview, Owners, Environmental constraints) to ensure comprehensive system understanding.
c. Stage 4: Conceptual model development based on root definitions, creating purposeful activity models that represent ideal system operations.
d. Stage 5: Comparison of conceptual models with reality to identify gaps and improvement opportunities. This comparison utilizes structured matrices to systematically evaluate discrepancies.

3) Gap Analysis

Gap analysis is performed using a structured framework comparing As-Is conditions with To-Be aspirations. The analysis examines technological gaps in system integration and automation, process gaps in workflow efficiency and effectiveness, organizational gaps in skills and change readiness, and regulatory gaps in policy alignment and compliance. Each gap is assessed for its impact on system performance and prioritized for intervention.

To ensure research quality, several measures are implemented. Data triangulation is achieved through multiple data sources and collection methods. Member checking involves returning findings to participants for validation and refinement. Peer debriefing with academic colleagues and practitioners ensures analytical rigor. Audit trails document all research decisions and analytical processes for transparency. These measures collectively enhance the trustworthiness of research findings and recommendations.

The research adheres to ethical principles including informed consent from all participants, confidentiality of sensitive organizational information, anonymity of individual responses where requested, and transparent reporting of findings to stakeholders. Official permissions were obtained from relevant authorities before data collection commenced.

RESULT AND DISCUSSION

The research findings are presented according to the four main objectives, providing comprehensive insights into the current state and transformation requirements of the planning and budgeting system at the Planning Division of the Directorate General of Sea Transportation.

Current Condition Analysis Using As-Is Approach

Planning and Budgeting Framework

The planning and budgeting process at the Directorate General of Sea Transportation follows a hierarchical framework aligned with national development planning documents. At the highest level, the National Long-Term Development Plan (RPJPN) establishes a 20-year development vision, while the National Medium-Term Development Plan (RPJMN) elaborates policy directions in 5-year cycles. These documents serve as primary references in formulating the Ministry of Transportation's Strategic Plan, which is then detailed into the Directorate General of Sea Transportation's Strategic Plan.

The transformation from strategic plans into operational documents is implemented through mechanisms regulated in various technical regulations, including Minister of Transportation Decree Number 186 of 2020 on Technical Guidelines for Work Plan and Budget Preparation, Circular Letter Number 33 of 2015 on RKA Program Proposal Control, and Minister of Transportation Instruction Number 1 of 2016 on Minimum Supporting Data Completeness.

Budget Proposal Administrative Procedures

The operational implementation of budget proposals by Technical Implementation Units (UPT) involves structured administrative procedures. The main administrative documents required include:

a) Official Proposal Letter signed by the Head of UPT/Work Unit as formal legitimacy of the budget request
b) Terms of Reference (KAK) prepared according to Minister of Finance Regulation PMK.208/PMK.02/2019
c) Budget Plan (RAB) detailing all financing components required
d) Absolute Accountability Statement (SPTJM) as commitment declaration from the Unit Head

For physical construction activities, additional specific technical documents are required according to the type of development, including feasibility studies, environmental impact assessments, and land status documentation.

Budgeting Cycle and Stages

The budget preparation process is implemented in an integrated cycle referring to Government Regulation Number 17 of 2017, applying the Government Budget Planning Structure (RSPP) approach divided into several sequential stages:

a) Stage 1 - Requirement Ceiling (Pagu Kebutuhan): All Technical Implementation Units identify and submit budget requirement estimates for the upcoming period based on operational needs projections and development programs. This stage produces a compilation of total budget requirements from all UPTs.
b) Stage 2 - Indicative Ceiling (Pagu Indikatif): Based on national fiscal policy and budget availability as determined by the Ministry of Finance. The distribution process considers program priorities, followed by activity plan adjustments according to allocated ceilings.
c) Stage 3 - Budget Ceiling (Pagu Anggaran): Finalization after discussions with the House of Representatives. This stage includes activity and budget plan adjustments, RKA-K/L preparation, and review by the Ministry of Finance and Bappenas.
d) Stage 4 - Budget Allocation Ceiling (Pagu Alokasi Anggaran): After State Budget approval by Parliament. This stage involves finalization of allocations, DIPA preparation, approval by the Ministry of Finance, and distribution to all work units.

Identified Gaps and Challenges

Based on observations and analysis of existing conditions, several significant gaps and challenges were identified:

a) Information System Fragmentation: Three main application systems operate separately - E-Planning (internal Ministry of Transportation), KRISNA (Ministry of National Development Planning/Bappenas), and SAKTI (Ministry of Finance). This fragmentation causes data input repetition, synchronization difficulties, potential information inconsistencies, and time and resource inefficiency.
b) Regulatory Misalignment: Two main regulatory frameworks with different orientations - Law Number 25 of 2004 on National Development Planning System (program-based) and Law Number 17 of 2003 on State Finance (function-based). This difference creates complexity in inter-agency coordination.
c) Manual Process Dominance: Budget ceiling preparation for 302 Work Units is still performed manually using Microsoft Excel, creating potential for calculation errors. Data consolidation and budget allocation adjustments are also manual, impacting efficiency and hindering comprehensive analysis.
d) Time Constraints and Uncertainty: Very tight schedules from the Ministry of Finance and Bappenas, combined with sudden fluctuating ceiling changes, require rapid budget posture adjustments with limited time, affecting planning quality.
e) Absence of Integrated Internal System: No comprehensive system manages all aspects of planning and budgeting, resulting in difficulties building integrated long-term planning databases, limitations in systematic planning support data management, lack of synchronization between strategic and operational documents, and difficulties developing consistent program priorities.

Analysis of Factors Influencing System Transformation and Synchronization

Stage One SSM: Problematic Situation Identification

Six main stakeholders significantly influence the transformation process: the Ministry of Sea Transportation with policy authority, Technical Implementation Units as data providers and

executors, the Ministry Planning Bureau for strategic coordination, the Inspectorate General for oversight, Bappenas for national planning coordination, and the Ministry of Finance for budget control. Each stakeholder brings distinct perspectives and constraints that shape transformation approaches.

Organizational social analysis reveals expectations for systematic, transparent, and accountable processes. However, implementation faces challenges from fragmented systems and complex inter-institutional coordination. Core values of efficiency, accountability, transparency, and compliance are articulated in planning documents but face actualization barriers due to limited integrated information systems. VRIO analysis demonstrates that the Directorate possesses valuable resources in SDM capabilities and specialized sea transportation expertise. The combination of institutional experience and sector-specific knowledge provides competitive advantages difficult to replicate. The organizational structure supports inter-unit coordination, though optimization requires enhanced system integration.

Stage Two SSM: Rich Picture Development

The Rich Picture development revealed critical system interconnections and problematic areas. Figure 2 illustrates the complexity of relationships between internal units, external institutions, and information flows, highlighting fragmentation points and manual process dependencies.

Two relevant systems were identified for transformation focus. System I addresses Digital Planning and Budgeting System Transformation with the root definition: "A system to transform planning and budgeting processes through integrated digital implementation connecting strategic planning to operational budgeting, creating effective, efficient, and transparent resource allocation."

System II focuses on Integration Transformation with the root definition: "A system to transform data integration through GRP platform implementation and interoperability protocols, creating synchronized data flows that minimize redundancy and facilitate evidence-based decisions."

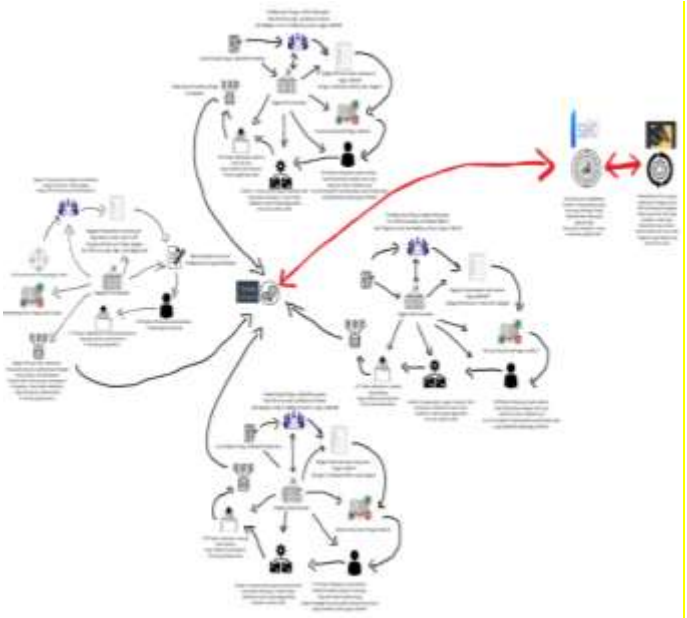

Figure 2. Rich Picture of Current Planning and Budgeting System

Source: Data processed by the researcher (2024)

Stage Three SSM: Root Definition Formulation and CATWOE Analysis

Based on the root definitions, two conceptual models were developed to represent the purposeful activities required for transformation. The Conceptual Model for System I encompasses seven interrelated activities designed to achieve comprehensive digital transformation. The model begins with analyzing actors and factors that influence the transformation context, providing foundational understanding of stakeholder dynamics and environmental constraints. This flows into analyzing existing planning and budgeting system conditions to establish baseline understanding. The third activity involves conducting managerial evaluation to assess organizational readiness and capability gaps. These analytical activities inform the development of internal digital system transformation design, which serves as the blueprint for change. The model then progresses to formulating transformation strategy that operationalizes the design through concrete implementation steps. Critical to success are the final two activities: designing measurement mechanisms to track transformation progress and conducting risk mitigation to address potential implementation challenges. Figure 3 visualizes these interconnected activities and their logical flow. The Conceptual Model for System II consists of six main activities focused specifically on achieving system integration. The model initiates with analyzing actors and factors within the integration context, recognizing that integration challenges differ from general digital transformation. The second activity involves evaluating and compiling data from master plans, strategic plans, and budget programs across different units, establishing the data landscape requiring integration. This leads to the core integration activities: first integrating internal data sources to create coherent information flows within the organization, then extending integration to connect internal systems with external platforms like SAKTI and KRISNA. The model includes measuring GRP transformation success levels through defined metrics and conducting risk mitigation specific to integration challenges such as data inconsistencies and system incompatibilities. Figure 4 illustrates how these activities create a comprehensive approach to system integration.

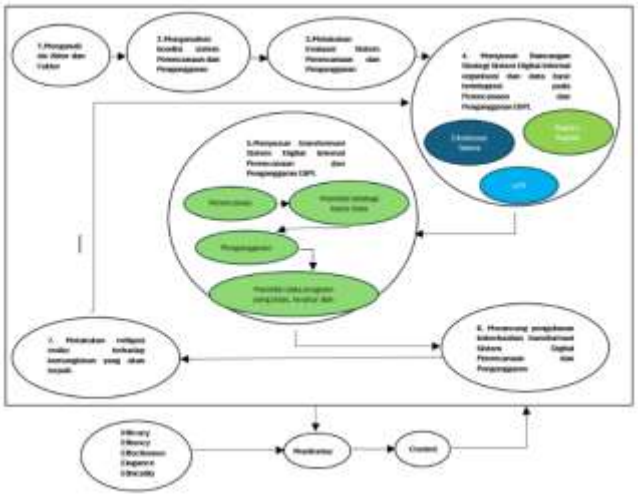

Figure 3. Conceptual Model System I - Digital Transformation

Source: Data processed by the researcher (2024)

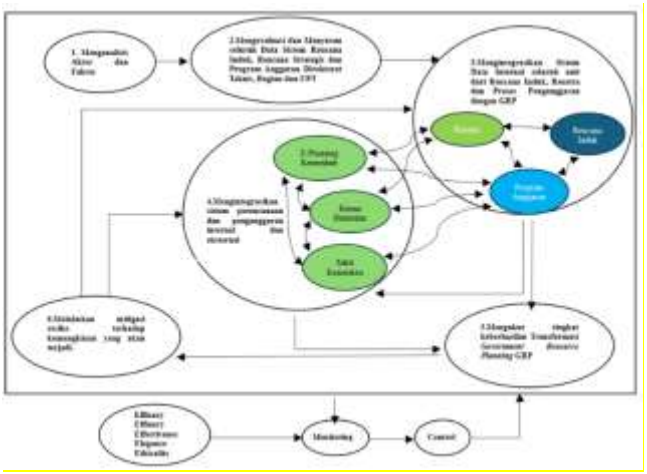

Figure 4. Conceptual Model System II - Integration Transformation

Source: Data processed by the researcher (2024)

Both conceptual models were evaluated using five performance criteria to ensure comprehensive assessment. Efficacy measures whether the models achieve intended transformation objectives. Efficiency evaluates resource utilization and process optimization. Effectiveness assesses the models' contribution to improved planning and budgeting outcomes. Elegance considers the simplicity and user-friendliness of proposed solutions. Ethicality ensures the models promote transparency, accountability, and good governance principles. These criteria provide a multidimensional framework for evaluating transformation success beyond purely technical metrics.

Gap Analysis Results

Systematic comparison between conceptual models and reality reveals significant gaps across multiple dimensions. The comparative analysis identified specific discrepancies between the ideal conceptual models and current operational conditions, as summarized in Tables 1 and 2.

Table 1. Gap Analysis for System I - Digital Planning and Budgeting System Transformation

No	Conceptual Model Activity	Current Reality (As-Is)	Gap Identified	Operational Impact
1	Analyzing actors and factors in transformation context	• Incomplete documentation of stakeholder roles • Limited stakeholder engagement mechanisms • Ad-hoc participation processes	• Lack of comprehensive actor mapping • Insufficient stakeholder data • Suboptimal involvement in analysis	• Misaligned expectations • Resistance to transformation • Delayed decision-making
2	Analyzing existing planning and budgeting system conditions	• Three separate systems operating independently • Manual processes using Excel for 302 units • No centralized data repository	• Absence of integrated digital system • Data scattered across work units • Heavy reliance on manual processes	• Data inconsistencies • Time-consuming operations • Error-prone calculations
3	Conducting managerial evaluation of systems	• Quarterly manual performance reports • Limited performance indicators	• No standardized evaluation framework • Manual evaluation processes	• Delayed problem identification • Reactive management

		• No real-time monitoring capability	• Absence of integrated KPIs	• Suboptimal resource allocation
4	Developing internal digital system transformation design	• Legacy system constraints • Limited technical documentation • Unclear system requirements	• Incomplete user requirement specifications • Interoperability constraints • Technical design limitations	• Integration challenges • Development delays • User adoption issues
5	Formulating digital system transformation strategy	• Project-based implementation approach • No formal change management process • Limited strategic alignment	• Lack of comprehensive strategy • Missing change management components • No HR capacity building plan	• Implementation failures • Low adoption rates • Unsustainable changes
6	Designing transformation success measurement	• No defined success criteria • Informal assessment methods • Limited performance tracking	• Absence of standardized indicators • No measurement framework • Inability to track progress objectively	• Unknown transformation impact • Inability to demonstrate value • No continuous improvement
7	Conducting risk mitigation	• Informal risk identification • No documented procedures • Crisis-driven responses	• Minimal risk documentation • Low mitigation awareness • No comprehensive risk framework	• Vulnerability to disruptions • Potential system failures • Unplanned costs

Source: Research analysis results (2024)

For System I (Digital Planning and Budgeting System Transformation), seven critical gaps emerged. The analysis of actors and factors revealed incomplete data and suboptimal stakeholder involvement during the analysis process. Current system conditions show absence of standardized digital systems with data scattered across units and continued reliance on manual Excel-based processes. Managerial evaluation lacks integrated frameworks, while technical design faces constraints in user requirement specifications and system interoperability. Implementation strategies miss crucial change management components, success measurement lacks standardized indicators, and risk documentation remains minimal.

Table 2. Gap Analysis for System II - Integration Transformation

No	Conceptual Model Activity	Current Reality (As-Is)	Gap Identified	Operational Impact
1	Analyzing actors and factors in integration context	• Limited cross-functional collaboration • Unclear integration responsibilities • Siloed operations	• Suboptimal stakeholder involvement • Limited integration planning participation • Weak collaborative mechanisms	• Integration resistance • Conflicting priorities • Slow progress
2	Evaluating and compiling master plan, strategic	• Multiple data formats across directorates • Manual data compilation	• Non-uniform data structures • Absence of shared platforms	• Data quality issues • Integration complexity

	plan, and budget data	• No unified standards	• Inconsistent data formats	• Manual reconciliation needs
3	Integrating internal data from planning documents	• Manual document management • No version control • Disconnected planning cycles	• No automatic integration system • Poor change tracking • Manual consolidation processes	• Version conflicts • Outdated information • Planning misalignment
4	Integrating internal systems with external systems	• Standalone system operations • Manual data transfers • No API framework	• Lack of data exchange protocols • Interoperability problems • System incompatibility	• Data silos persist • Integration failures • Duplicate efforts
5	Measuring GRP transformation success levels	• No integration metrics • Informal assessments • Limited visibility	• Absence of KPI framework • No monitoring dashboard • Lack of performance matrices	• Unknown integration value • No optimization insights • Limited accountability
6	Conducting risk mitigation for integration	• No integration risk assessment • Reactive problem solving • Limited contingency planning	• Unidentified integration risks • No emergency scenarios • Absence of mitigation plans	• Integration disruptions • Data loss risks • Compliance vulnerabilities

Source: Research analysis results (2024)

System II (Integration Transformation) comparison identified six major gaps. Stakeholder involvement in integration analysis remains limited, while data from various directorates exhibits non-uniform formats without shared platforms for integration. The absence of automatic document integration systems creates difficulties in tracking changes and maintaining alignment. Interoperability issues persist due to lack of standard data exchange protocols between internal and external systems. Performance measurement suffers from absence of standard matrices and real-time monitoring capabilities, while comprehensive risk analysis frameworks for integration challenges remain undeveloped. These gaps collectively impede the transformation toward an integrated, efficient planning and budgeting system, necessitating targeted interventions addressed in the strategic recommendations.

The findings of this research reveal critical insights into the transformation requirements for the planning and budgeting system at the Directorate General of Sea Transportation. This discussion interprets the results within broader theoretical frameworks and practical contexts, proposing actionable strategies for system transformation.

Theoretical Implications of System Fragmentation

The identified fragmentation across three separate systems (E-Planning, KRISNA, and SAKTI) represents more than operational inefficiency; it reflects deeper institutional challenges in Indonesian public administration. This finding aligns with institutional theory, which suggests that organizations often maintain suboptimal structures due to institutional pressures and path dependencies (Scott, 2014). The persistence of these separate systems, despite evident inefficiencies, indicates strong institutional forces maintaining the status quo.

This study's findings resonate strongly with Dalimunthe et al.'s study on institutional gridlock in Indonesian food security policy, where they identified that institutional fragmentation, legacy systems, and conflicting interests among government agencies contribute

to policy gridlock, with path dependency and historical layering preventing reforms (Dalimunthe et al., 2024). This directly supports the claim about entrenched fragmentation in Indonesian public administration due to institutional forces. Similarly, Widiaryanto documented path-dependent behaviors in Indonesian ministries, particularly the Ministry of Forestry, which create resistance to reform and favor maintaining legacy systems, validating the concept that institutional forces protect inefficient legacy systems despite modernizing rhetoric.

The fragmentation creates what information systems literature terms "islands of automation" - isolated systems that optimize local processes while impeding enterprise-wide efficiency (Janssen & Zuiderwijk, 2014). Each system likely evolved to meet specific institutional requirements: E-Planning for internal Ministry needs, KRISNA for national development planning alignment, and SAKTI for financial compliance. This evolution pattern is further supported by Siti-Nabiha et al.'s research on performance management systems in Indonesian cities, where despite the introduction of performance management systems, institutional fragmentation persisted due to partial implementation and siloed structures, supporting the argument on "islands of automation" and the normalization of manual reconciliation and inefficiency.

However, this research reveals a unique complexity: the simultaneous operation of three distinct budgeting systems across different ministerial hierarchies creates data redundancy and manual reconciliation that has become normalized practice - a specific manifestation of what Trouvé et al. describe as path dependency in public institutions, where historically entrenched practices and lack of coordination mechanisms prevent institutional evolution or integration.

Socio-Technical Complexity in Government Digital Transformation

The research reveals that successful transformation requires addressing both technical and social dimensions simultaneously. The gap between espoused values (efficiency, transparency, accountability) and actual practices reflects what Argyris terms the "theory-in-use" versus "espoused theory" distinction. While policy documents articulate modern governance principles, daily operations remain constrained by legacy systems and traditional practices.

This finding aligns with Watson et al.'s study on ERP implementation in state government, which found that the success of ERP in the government sector depends heavily on organizational readiness for large-scale business change, not just technology adoption. This reinforces the importance of organizational change management in GRP implementation. The complexity is further highlighted by Hurbean's research, which found that ERP implementation in public sector often fails because technology solutions are not adapted to government organizational processes and culture, supporting the point that GRP adoption requires contextual adaptation to bureaucratic culture and political cycles.

The stakeholder analysis revealing six major entities with distinct authorities and perspectives underscores the political complexity of government system transformation. Unlike private sector transformations where hierarchical authority can mandate change, government transformations must navigate multiple power centers with potentially conflicting interests. This complexity necessitates sophisticated change management approaches that build coalitions rather than impose solutions. These findings are corroborated by Fernandez et al.'s investigation

of ERP implementation challenges in Malaysia's public sector, which identified complex work structures and bureaucracy as major implementation challenges - issues very similar to the Indonesian context and reinforcing the need for modular approaches and interoperability frameworks.

Interestingly, Siti-Nabiha et al. found that even limited implementation of shared goals through performance management systems helped align stakeholders and reduce fragmentation in some contexts, suggesting that institutional fragmentation isn't always resistant to reform and that managerial tools may offer partial solutions to the identified challenges.

GRP as a Paradigm Shift in Government Operations

The proposed Government Resource Planning (GRP) implementation represents more than technological upgrade; it signifies a fundamental shift in how government conceptualizes and manages resources. Drawing parallels with Enterprise Resource Planning (ERP) in private sector, GRP promises integrated, real-time visibility across organizational boundaries (Westerman, Bonnet, & McAfee, 2014). However, government contexts present unique challenges including regulatory constraints, political cycles, and public accountability requirements that complicate implementation.

The conceptualization of GRP in this research builds upon Hany's successful implementation of Government Resource Management System (GRMS) in Surabaya, which demonstrated that as a form of ERP for government, GRMS improved transparency and accountability in public financial management through integrated systems. This supports the argument that GRP is not merely technology, but a strategic tool for integrating cross-bureaucratic processes - similar to ERP in the private sector. The transformative potential is further validated by Pontoh et al.'s recent findings that ERP contributes to transparency and accountability in the public sector, though success depends on best practices in project management and stakeholder engagement, supporting the entire strategic framework for transformation (Pontoh et al., 2024).

The success of Tanzania's PlanRep system, achieving 53% cost reduction and 91% time savings, demonstrates GRP's transformative potential. Yet, direct replication is inadvisable given Indonesia's distinct administrative culture and regulatory framework. This cautionary stance is supported by Ahmed et al.'s study of ERP in Pakistan's public sector, which faced high failure risks due to organizational culture, lack of skills, and resistance to change, reinforcing the need for comprehensive risk management and multi-level evaluation frameworks (Ahmed et al., 2024).

Dantes and Hasibuan's Indonesian study provides particularly relevant insights, finding that in Indonesia, ERP had more impact at tactical (operational) levels than strategic levels because companies only implemented partial modules and not always based on business needs (Dantes & Hasibuan, 2010). This demonstrates that GRP success depends on strategic planning and organizational understanding, not merely technology adoption - reinforcing the emphasis on comprehensive strategic frameworks.

The cloud-native architectural considerations in the proposal are informed by Alsharari's research on institutional change in cloud ERP implementation, which found that while cloud ERP provides cost efficiency and flexibility, it can reduce organizational independence if not

managed properly (Alsharari, 2020). This supports the consideration of hybrid deployment models for balancing cloud-native benefits with system security requirements.

Strategic Framework for Transformation

Based on the gap analysis and theoretical insights, four strategic imperatives emerge for successful transformation are as follows.

Integrated System Architecture Development

The fragmentation gap necessitates a unified architectural approach through GRP implementation. This strategy addresses technical integration while respecting existing institutional boundaries. The proposed modular architecture allows incremental migration from legacy systems, reducing transformation risks. Key design principles include service-oriented architecture enabling loose coupling between modules, event-driven integration supporting real-time data synchronization, and microservices approach facilitating independent module evolution.

The architectural approach is informed by the lessons from Fernandez et al.'s Malaysian study, which showed that complex bureaucratic structures require flexible, modular approaches rather than monolithic implementations. The hybrid deployment considerations are particularly relevant given Alsharari's findings on the balance between cloud efficiency and organizational autonomy requirements in government contexts.

The architecture must accommodate both current operational needs and future scalability. Cloud-native design principles offer flexibility and cost-efficiency, though government security requirements may necessitate hybrid deployment models. The abstraction layer concept proves critical for managing interfaces with external systems (SAKTI, KRISNA) that cannot be directly modified.

Organizational Change Management Strategy

The organizational dimension requires equal attention to technical aspects. Research consistently shows that 70% of digital transformations fail due to inadequate change management. Government contexts face additional challenges including civil service regulations limiting incentive structures, risk-averse cultures prioritizing compliance over innovation, and lengthy decision-making processes spanning multiple hierarchical levels.

The change management strategy addresses these challenges through systematic capability building tailored to different user segments, from operational staff to senior decision-makers. This approach is directly informed by Watson et al.'s findings that ERP success in government depends heavily on organizational readiness for large-scale business change, not just technology adoption. Creating change agent networks leverages social influence mechanisms proven effective in bureaucratic contexts. The emphasis on success story documentation serves dual purposes: building momentum and creating institutional memory for sustainability.

The strategy must also account for Indonesian cultural factors, particularly the importance of consensus-building processes that Hurbean identified as critical for ERP adaptation to government organizational processes and culture.

Interoperability Protocol Framework

The technical requirement for system integration extends beyond simple data exchange. True interoperability requires semantic alignment ensuring consistent data interpretation across systems. The proposed framework addresses multiple interoperability levels: technical (communication protocols), syntactic (data formats), semantic (meaning consistency), and organizational (process alignment).

API standardization emerges as crucial for sustainable integration. RESTful APIs offer simplicity and widespread support, though government systems may require additional security layers through OAuth 2.0 or similar protocols. The emphasis on comprehensive documentation reflects lessons from failed integration projects where knowledge loss impeded maintenance and evolution (Margetts & Dunleavy, 2013). The framework design considers the lessons from Fernandez et al.'s study, which highlighted the importance of flexible integration approaches in complex bureaucratic environments.

Evaluation and Risk Management Framework

The absence of systematic evaluation mechanisms in current operations represents both vulnerability and opportunity. The proposed framework integrates multiple evaluation dimensions: operational metrics (processing time, error rates), strategic indicators (alignment with policy objectives), and user satisfaction measures. Real-time dashboards provide immediate visibility while periodic deep assessments enable strategic adjustments.

Risk management requires particular attention given potential impacts on public service delivery. The framework must address technical risks (system failures, cyber security), operational risks (process disruptions, data quality), organizational risks (resistance to change, skill gaps), and external risks (regulatory changes, political transitions). This comprehensive approach is informed by Ahmed et al.'s identification of high failure risks in public sector ERP due to organizational culture, lack of skills, and resistance to change. Contingency planning ensures service continuity during transformation phases.

The evaluation framework builds upon Pontoh et al.'s findings that ERP success in public sector depends on best practices in project management and stakeholder engagement, incorporating both quantitative performance metrics and qualitative stakeholder satisfaction measures.

Implementation Considerations and Success Factors

The phased implementation approach reflects lessons from large-scale government transformations worldwide. Quick wins in Phase 1 build credibility and momentum. Pilot implementations in Phase 2 allow learning and adjustment before full rollout. The parallel running approach in Phase 3 minimizes operational risks though it requires additional resources.

Critical success factors emerging from the analysis include sustained leadership commitment transcending political cycles, adequate funding protected from budget fluctuations, skilled project management balancing technical and organizational aspects, and continuous stakeholder engagement maintaining transformation momentum. These factors align with the lessons from Hany's successful GRMS implementation in Surabaya, which demonstrated the importance of systematic integration approaches in government contexts.

The Indonesian context adds specific considerations including "musyawarah" (deliberation) culture requiring consensus-building approaches and regulatory complexity necessitating legal expertise throughout implementation. However, Zhang et al.'s research on

institutional innovation suggests that despite strong path dependency, deliberate policy intervention and inter-jurisdictional cooperation can overcome fragmentation, providing optimism for the proposed transformation strategy (Zhang et al., 2019).

The implementation must also consider Dantes and Hasibuan's warning that partial implementation based on incomplete understanding of business needs leads to suboptimal outcomes, emphasizing the importance of comprehensive strategic planning and organizational alignment throughout the transformation process.

Limitations and Generalizability

Despite its comprehensive scope, this study acknowledges several constraints that may influence the transferability of findings. The research context, confined to a single governmental entity, potentially limits the applicability of results across diverse public sector organizations characterized by varying institutional mandates, organizational scales, and levels of digital maturity. Furthermore, the proposed conceptual models, although grounded in established theoretical frameworks, require empirical validation through actual implementation to confirm their practical efficacy. The dynamic nature of technological advancement presents an additional dimension of uncertainty. Emergent technologies such as artificial intelligence, distributed ledger systems, and Internet of Things architectures may introduce novel transformation pathways beyond the scope of current analytical frameworks. Subsequent investigations should examine these technological innovations' applicability within governmental contexts, while maintaining emphasis on the fundamental integration and organizational transformation challenges delineated in this research.

Contribution to Knowledge and Practice

This research contributes to multiple knowledge domains. For information systems literature, it provides empirical evidence of government system integration challenges in developing country contexts. For public administration scholarship, it demonstrates SSM's utility in navigating complex stakeholder environments. For practitioners, it offers actionable frameworks balancing theoretical rigor with implementation pragmatism. The integration of technical, organizational, and social dimensions advances beyond technology-deterministic approaches dominating early e-government literature. By revealing interconnections between these dimensions, the research supports more nuanced understanding of government digital transformation as socio-technical system change requiring holistic strategies.

CONCLUSION

This research has developed a comprehensive transformation strategy for the planning and budgeting system at the Directorate General of Sea Transportation using As-Is Analysis and Soft System Methodology. The study identifies critical challenges including system fragmentation across three platforms (E-Planning, KRISNA, and SAKTI), manual process dominance, and absence of integrated infrastructure. Through systematic gap analysis, the research reveals deficiencies across stakeholder engagement, system architecture, performance management, technical design, implementation strategy, and risk management dimensions. The proposed Government Resource Planning (GRP) implementation offers a solution through four integrated strategies: system architecture development, organizational change management, interoperability protocols, and evaluation frameworks. The phased implementation roadmap provides a pragmatic approach balancing transformation goals with organizational constraints.

This research contributes to digital transformation knowledge in government contexts by demonstrating the effectiveness of combining As-Is Analysis with Soft System Methodology, while providing actionable frameworks for practitioners. Future research should validate these strategies through pilot implementation and explore emerging technologies' potential in government planning systems. Success requires sustained leadership commitment, adequate resources, and systematic change management. Despite significant challenges, the transformation promises substantial benefits in efficiency, transparency, and resource utilization, contributing to Indonesia's digital government advancement.

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