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INFORMATION SYSTEM STRATEGIC PLAN DESIGN: A CASE STUDY OF PT JASA MARGA TOLLROAD OPERATOR

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ABSTRACT

This study aims to design a comprehensive information system strategy for PT Jasamarga Tollroad Operator (JMTO) to enhance operational efficiency, optimize application usage, and support the transition from human-based to technology-based business processes. The research identifies key technology needs within the company through internal and external analyses, including SWOT, Value Chain, and McFarlan's quadrant. The findings suggest that PT JMTO's current IT infrastructure and application development processes require improvement to align with long-term business objectives. Using thematic analysis, the study recommends strategies for improving IT governance, data integration, and the development of applications that support operational sustainability. The proposed strategic plan highlights the importance of aligning information system strategies with JMTO's corporate goals, advocating for better utilization of technology, and providing actionable steps for implementing a more efficient and sustainable IT framework. The implications of this research are significant for PT JMTO as it seeks to modernize its operations, improve service quality, and strengthen its position in the toll road industry. The study also contributes to the field of strategic information systems planning by addressing the challenges of technology adoption in the toll road sector. For future research, examining the effectiveness of these strategies post-implementation and exploring additional external factors impacting digital transformation could provide valuable insights for broader applications in the transportation sector.

KEYWORDS *Information system strategy, operational efficiency, digital transformation, information technology, data integration, risk management*

INTRODUCTION

The construction of toll roads in Indonesia began in 1978 and the Jakarta Bogor Ciawi section was the first section to be built driven by the Jasa Marga

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Bureau under the Ministry of Transportation (Butar Butar & Rahayu, 2023; Isnaeni, 2020; Januardin Manullang dan Hottua Samosir, 2019; Kandiyoh et al., 2022; Wibowo et al., 2021). At that time, the transaction system was still not maintained by *barriers* or barrier portals, while the transaction tool only used tickets printed by special toll road ticket printing machines (Ikhsan & Suhardi, 2022; Khasanah et al., 2017; Ward & Peppard, 2016). The payment is made manually by being served by officers at the toll booth. Moving on to 1990, Jasa Marga began to develop its transaction system, namely by starting to implement a portal to avoid road users who are reluctant to pay for toll roads. The proof of payment is still using KTM or Toll Entry Card.

The development period from 1990 to 2017 was focused on expanding toll road sections spread across the islands of Sumatra and Java. In order to take advantage of the business opportunities that arise due to the construction of many toll roads, a company was established that specifically focuses on the operation of toll roads. PT Jasamarga Tollroad Operator (JMTO) was officially established on August 21, 2015 with the initial name PT Jasa Perkhidmatan Operasi (JLO), in accordance with the Deed of Establishment No. 07 which was ratified by Notary Rina Utami Djauhari. This company has also obtained approval as a legal entity from the Minister of Law and Human Rights of the Republic of Indonesia through Decree No. AHU-2452733. AH.01.01 of 2015 on August 25, 2015 (JMTO., n.d.).

On January 24, 2018, through Deed No. 19 made before Notary Amriyati A. Supriyadi, PT Jasamarga Tollroad Operator underwent a change of name from PT Jasa Perkhidmatan Opera. This amendment was approved by the Minister of Law and Human Rights of the Republic of Indonesia through Decree No. AHU-0001660. AH.01.02.Year 2018, which was issued on January 24, 2018 (JMTO., n.d.). JMTO is part of the business group of PT Jasa Marga (Persero) Tbk, with a share composition of 99.9 percent owned by PT Jasa Marga (Persero) Tbk, and the remaining 0.1 percent owned by the Parent Employee Cooperative of Jasa Marga (JMTO., n.d.).

In its development, the birth of PT JMTO is a commitment of the company to continue to adapt to the dynamics of the toll road industry, in addition, this is also a strategic step in facing changes in the needs of increasingly complex information technology, especially technology related to toll roads, such as traffic technology, transaction technology, and monitoring technology.

In an effort to answer the challenges faced, the Information System Strategic Plan was initiated to provide a solid, adaptive, and proactive technology foundation and in accordance with the RJPP owned by the company. As an integral part of the PT Jasa Marga (Persero) Tbk business group, JMTO plays a strategic role in providing reliable and efficient toll road services throughout Indonesia

By *Fishbone Diagram* that has been compiled, several key areas have been identified as the root of the problem. This area includes *Browse*, *Technical*, *Organizational*and *Process*, with the explanation of each domain as follows:

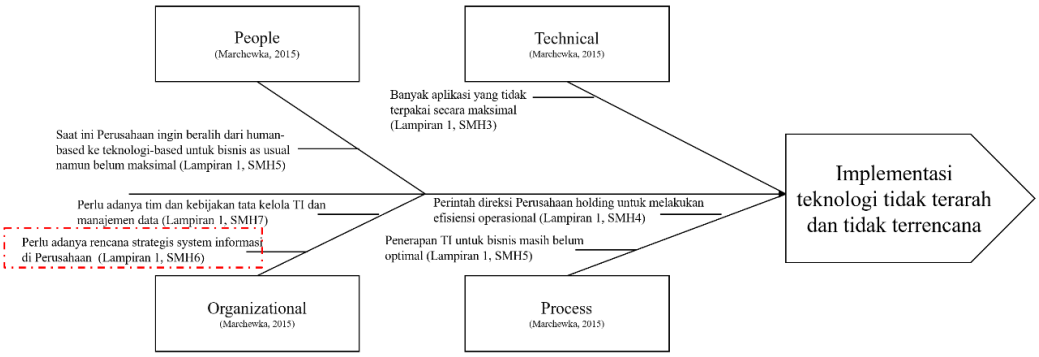

Figure 1 Problem Mapping in Fishbone Diagram

Based on the Fishbone Diagram that has been prepared, several main root problems in PT Jasamarga Tollroad Operator (JMTO) have been identified, including People, Technical, Organizational, and Process aspects. In the People aspect, the business transition from human-based to technology-based has not been supported by the well-planned application of information technology. In the technical aspect, the company's applications are not used optimally due to less accommodating needs and the development process is often delayed. The Organizational aspect shows the lack of an implementable information system strategic plan, so that the application of information technology is not optimal even though there is a governance policy from the parent company. Meanwhile, in the Process aspect, operational efficiency that requires the application of information technology has not been fully carried out according to the holding company's policy. These factors cause the implementation of technology to be undirected, so a clear information system strategic plan and concrete steps are needed to make it happen.

This research aims to design a comprehensive information system strategy for JMTO, in order to improve operational efficiency, optimize the use of applications, and facilitate the transition of business processes from human-based to technology-based. The research also aims to align information system strategies with corporate business goals, encourage the adoption of organizational change, and strengthen information technology governance. With an approach focused on internal and external analysis, the research covers a range of benefits, such as higher operational efficiency, optimal application utilization, and policy development that supports technology sustainability. The scope of the research includes a thorough analysis of the company's business and technology needs, as well as the design of concrete implementation measures to support the sustainability of JMTO's operations in the future. The systematics of this research is designed to provide structured guidance, from introduction to implementation recommendations, in order to answer the problems that have been identified thoroughly.

The study at PT Jasamarga Tollroad Operator (JMTO) focuses on addressing the challenges faced in the transition from human-based to technology-based business processes. Despite technological advancements in toll road management, several issues persist, including inefficient application usage, delayed development processes, and underutilized IT infrastructure. These problems hinder operational

efficiency and the implementation of strategic IT solutions. The company's efforts to enhance operational sustainability through digital transformation are compromised by gaps in technology integration and insufficient application support, resulting in a disconnect between the company's operational needs and its technological capabilities.

Moreover, there is a lack of a comprehensive information system strategy that aligns with JMTO's long-term business goals, contributing to the ineffective deployment of technology. This issue is exacerbated by insufficient governance policies, delayed application developments, and fragmented operational processes, leading to inefficiencies and missed opportunities for improvement. Consequently, the company requires a well-defined and actionable information system strategy to optimize technology usage, improve service quality, and achieve sustainability goals.

This research is critical in light of JMTO's role in supporting the toll road infrastructure and the growing need for digital transformation in the transportation industry. The effective use of technology is essential for improving operational efficiency, customer satisfaction, and overall competitiveness. As JMTO continues to expand and modernize its operations, it is imperative to align its technology strategy with its business objectives to support growth and sustainability. Without a clear and structured information system strategy, JMTO risks falling behind in the digitalization of toll road services, which could impact its ability to innovate and meet industry demands.

Existing literature on strategic information systems planning (SISP) highlights the importance of aligning IT with business strategies to achieve competitive advantages and operational efficiency. Ward & Peppard (2002) emphasized that strategic alignment between IT and business operations is crucial for organizations to leverage technology effectively. This has been supported by various studies that show how comprehensive IT strategies can drive efficiency and support long-term goals. For instance, Mahendra et al. (2022) demonstrated the importance of developing a tailored SISP to foster innovation and maintain a competitive edge in the evolving business environment. Additionally, research by Agustri & Sensuse (2020) highlighted the need for clear governance and strategic frameworks to guide IT development, ensuring it meets both current and future business needs.

However, much of the existing research focuses on the conceptual development of SISP frameworks, with limited application to practical, real-world scenarios such as the toll road industry. PT Jasamarga Tollroad Operator's unique context, which combines operational management with advanced IT needs in the toll road sector, requires a specific strategic approach to optimize the use of technology. Studies such as those by Dombalyan et al. (2020) and Clarke & Braun (2017) have shown that sector-specific applications of information systems planning are essential for maximizing operational efficiency, yet research in the toll road sector remains sparse.

Furthermore, existing research on information system strategy often overlooks the challenges of transitioning from human-based to technology-driven processes, particularly in industries like toll road management. This gap is critical

as PT JMTO faces these very challenges, making it essential to explore how a well-structured information system strategy can drive digital transformation. The lack of a comprehensive strategic framework tailored to the company's operational needs and external environment remains a key challenge in the field.

There is a notable research gap in the application of strategic information systems planning (SISP) within the toll road management sector, particularly for companies transitioning to digital systems. While substantial research exists on general SISP frameworks, few studies address the unique challenges of implementing such strategies in industries with complex, technology-driven operations like toll road management. Specifically, there is limited literature on how such strategies can align with both business processes and governance structures in this industry. This research seeks to fill this gap by developing a comprehensive information system strategy for PT Jasamarga Tollroad Operator, tailored to its operational and technological needs.

The novelty of this study lies in its focus on developing a comprehensive information system strategy specifically for PT Jasamarga Tollroad Operator (JMTO) in the context of toll road operations. While much of the existing literature on SISP addresses broad industries, this study explores the specific requirements of the toll road sector, incorporating elements like traffic management, transaction systems, and monitoring technologies. Additionally, the research uses both internal and external analysis approaches, including SWOT, Value Chain, and McFarlan's quadrant, to map JMTO's technology needs and provide actionable, strategic recommendations that support its digital transformation. The integration of these methodologies within a sector-specific context makes this research unique and highly relevant.

The primary objective of this research is to design a comprehensive information system strategy for PT Jasamarga Tollroad Operator (JMTO) that enhances operational efficiency, optimizes the use of applications, and facilitates the transition from human-based to technology-based business processes. This study aims to identify the company's technology needs, propose implementation steps for integrating IT infrastructure, and ensure that the strategy aligns with JMTO's long-term business objectives. By doing so, the research seeks to provide a solid foundation for JMTO's digital transformation, improving operational sustainability and supporting its competitiveness in the toll road industry.

This research provides significant theoretical and practical benefits. Theoretically, it contributes to the development of SISP by offering a detailed, industry-specific framework for the toll road sector. Practically, the research offers PT Jasamarga Tollroad Operator actionable recommendations to optimize its IT infrastructure, improve application usage, and enhance operational efficiency. The study's findings will be valuable not only for JMTO but also for other companies in the transportation sector facing similar challenges in adopting and optimizing information technology. By aligning IT strategies with business goals, the research aims to support JMTO in its transition to a more efficient, technology-driven operation, ensuring long-term sustainability and improved service delivery.

RESEARCH METHOD

The research methodology in designing an information system strategy for PT Jasamarga Tollroad Operator (JMTO) uses a qualitative approach with a thematic analysis method. The initial step begins with the collection of data from primary sources, such as in-depth interviews with company stakeholders, and secondary data, such as the company's internal documents, including the Company's Long-Term Plan (RJPP). This process is followed by a literature study using the PRISMA method to develop a relevant theoretical framework. The data obtained was processed using thematic analysis to identify key themes related to the company's SI/IT strategic needs. This analysis is supported by various frameworks, such as Ward and Peppard, SWOT, Value Chain Analysis, and McFarlan's quadrant to map the internal and external conditions and information system needs of companies.

The next stage is a gap analysis that identifies the difference between the current SI/IT conditions and the ideal conditions required. The results of this analysis are the basis for the preparation of the SI/IT strategy design which includes concrete steps for implementation. The draft is validated through interviews with stakeholders to ensure its relevance and feasibility. This methodology ensures that the resulting strategy is not only data-driven but also reflects the organization's real needs, supporting operational efficiency, risk management, and sustainable technology adoption.

RESULTS AND DISCUSSION

PT Jasamarga Tollroad Operator (JMTO) is a company established on August 21, 2015 with the aim of taking advantage of business opportunities in the rapidly growing toll road construction sector in Indonesia. As a subsidiary of PT Jasa Marga (Persero) Tbk, JMTO has a strategic role in the management of toll road operations, including toll road operation services, the implementation of electronic transaction systems (ETC), and the provision of information technology (IT) solutions. Through its vision of "Driving the Future of Toll Road Operations," JMTO is committed to becoming a pioneer in the modern and innovative toll road industry, by leveraging the latest technologies such as big data and artificial intelligence-based systems. JMTO's organizational structure is designed to support operational efficiency, data-driven traffic management, and improve the quality of service to toll road users

In this analysis, various frameworks are used to evaluate the internal and external conditions of the company. An analysis of the internal environment of the business is conducted to understand the internal capabilities and assets that are JMTO's competitive advantages, while the analysis of the external environment focuses on factors outside the company that can affect long-term performance and strategy. For the SI/IT aspect, the analysis includes the evaluation of the information systems and technologies used, both from an internal and external perspective, to identify potential improvements and relevant innovations.

1. Analysis of the Company's Internal Business Environment

An analysis of the internal business environment is carried out to understand and get an overview of the business processes at PT Jasamarga Tollroad Operator (JMTO). At this stage, internal conditions will be evaluated through *value chain analysis* to identify key and supporting activities in the organization. In addition, SWOT analysis is used to find out the internal strengths and weaknesses of the organization as well as external opportunities and threats that can affect the company's performance.

a. Analisis Value Chain

Value chain *analysis* is used to identify existing business processes in JMTO, including key and supporting activities that contribute to business operations and sustainability. Mapping activities in the *value chain* will provide an in-depth understanding of the important functions in a company.

The Value Chain Analysis aims to identify the key and supporting activities that contribute to the achievement of PT JMTO's strategic objectives. The inputs of this analysis are data on key operational activities (such as toll transactions, traffic monitoring) and supporting activities (such as HR and IT management). The analysis process is carried out using Porter (1985) Value Chain framework to determine which activities are strengths or weaknesses. The output of this analysis is the findings that form the basis for the formulation of strengths and weaknesses in the next sub-chapter. The results of this analysis are shown in Figure 2.

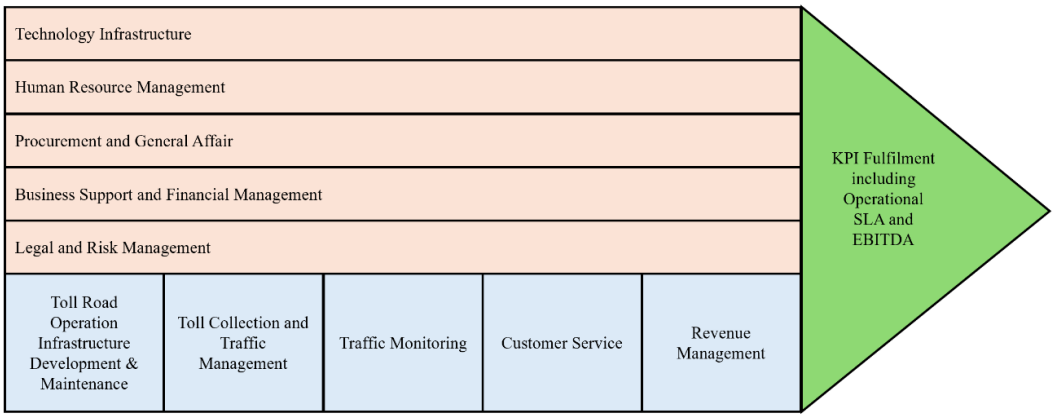

Figure 2. Value Chain PT JMTO

An analysis of the *Value Chain* of PT Jasamarga Tollroad Operator (JMTO) was carried out to understand the main and supporting activities that provide added value for the company in achieving its goals. As a toll road operator that prioritizes innovation and efficiency, JMTO has a value chain that not only focuses on toll road operations, but also supports aspects of technology, customer service, and revenue management.

By identifying key and supporting activities in the *value chain*, an overview of the role of each function in creating competitive advantage and supporting the fulfillment of the company's KPIs can be obtained, including operational SLAs and EBITDA financial targets. This analysis provides a comprehensive view of the

contribution of each activity to the company's success in providing optimal toll road services for users.

Primary Activities

This main activity is operational activities that are directly related to toll road services and have a great influence on customer satisfaction and company revenue. The following are the main activities at PT JMTO (1) *Toll Road Operation Infrastructure Development & Maintenance, (2) Toll Collection and Traffic Management, (3) Traffic Monitoring, (4) Customer Service, and (5) Revenue Management,*

Support Activities

Supporting activities function to support the efficiency and effectiveness of the main activities. Although not directly related to toll services, this activity is important for the smooth operation of the whole.here are some of the supporting activities at PT JMTO (1) *Technology Infrastructure, (2) Human Resource Management, (3) Procurement and General Affair, (4) Business Support and Financial Management, (5) Legal and Risk Management.*

Output: KPI Fulfillment including Operational SLA and EBITDA

All of the above activities contribute to the achievement of **JMTO's key KPIs**, namely the fulfillment of *operational Service Level Agreements* (SLAs) that ensure services run according to set standards, and the achievement of **EBITDA** as an indicator of financial success. The information and technology needs to meet this value chain are:

Table 1 Value Chain Needs Analysis

It	Activity	Information and Technology Needs
1	Toll Road Operation Infrastructure Development & Maintenance	Infrastructure maintenance data, asset condition monitoring system, and inspection schedule
2	Toll Collection and Traffic Management	Electronic transaction systems, transaction volume data, traffic sensors and controllers
3	Traffic Monitoring	CCTV system and traffic sensors, real-time data from ITA (Intelligent Traffic Analysis)
4	Customer Service	Customer complaint data, complaint data, complaint chatbot, and Travoy application
5	Revenue Management	Financial management systems, income reports
6	Technology Infrastructure	Fiber optic networks, data center servers, and cybersecurity systems
7	Human Resource Management	Employee competency data, training systems, and HR databases
8	Procurement and General Affair	Vendor data, goods/services catalogs, and procurement management
9	Business Support and	Financial systems, budget control, and

It	Activity	Information and Technology Needs
	Financial Management	financial reporting
10	Legal and Risk Management	Regulatory compliance data, risk management, legal documents

b. Analisis SW (*Strength – Weakness*)

In this analysis, the internal strengths and weaknesses owned by PT Jasamarga Tollroad Operator (JMTO) will be described. This analysis is important to understand the internal factors that can support or hinder the company in achieving its vision as a leader in technology-based toll road operations.

Based on the data that has been obtained and analyzed, PT Jasamarga Tollroad Operator (JMTO) has several main strengths, such as a strong technology infrastructure, the use of electronic payment systems, and competent human resources in technology. This strength supports fast and responsive toll road operations to user needs.

However, there are some drawbacks that need to be considered, such as high dependence on technology, high maintenance costs, and data security risks. Although the potential market for JMTO is still quite large, the number of toll roads currently managed is still limited, indicating that there are growth opportunities that have not been fully exploited.

c. Analisis Critical Success Factors (CSF)

Critical Success Factors (CSF) are key elements that need to be managed to ensure the successful implementation of the information system strategy at PT Jasamarga Tollroad Operator (JMTO). Based on the results of the Value Chain and Strength-Weakness analysis, several critical factors have been identified to support the company's strategic objectives. These factors include aspects of operational efficiency, digital transformation, information technology (IT) governance, and human resource development (HR).

2. Analysis of the Company's External Business Environment

In this sub-chapter, an analysis of the external business environment of PT Jasamarga Tollroad Operator (JMTO) is carried out to understand factors outside the company that can affect its performance and business strategy. Given that JMTO operates in the toll road industry which is influenced by various political, economic, social, technological, environmental, and legal aspects, a deep understanding of these factors is essential for companies to respond quickly and appropriately to changes.

This external environment analysis uses an approach by understanding the *Opportunities* and *Threats* factors from this analysis, JMTO can also develop adaptive and effective strategies to maintain competitiveness, ensure optimal operations, and support the achievement of the company's strategic goals.

a. Opportunity and Threats Analysis

OT (*Opportunities* and *Threats*) analysis was carried out to identify external factors that are opportunities and threats for PT Jasamarga Tollroad Operator (JMTO) in the application of Information and Technology Systems (SI/IT) in the field of toll road operations. With this analysis, it is hoped that JMTO can develop

an SI/IT strategy that is more targeted and in accordance with the company's conditions. Based on the results of the study with related parties and supported by internal documents, this analysis is presented in the form of a table to provide a clear understanding of the opportunities and threats that exist.

Based on OT data and *analysis*, PT Jasamarga Tollroad Operator (JMTO) has various opportunities that can be used to improve operational efficiency and expand technology-based services. Government support, technological developments, and public preferences for digital services provide opportunities for JMTO to continue to innovate and add value for toll road users. However, the JMTO also faces a number of threats, both from regulatory factors, competition, and security risks that need to be properly anticipated.

By understanding these opportunities and threats, JMTO can design the right strategy to maximize growth potential while mitigating existing risks. The company's success in responding to these external dynamics will be the key to achieving its vision as a leader in technology-based toll road operations in Indonesia.

b. TOWS Analysis

Based on the SWOT analysis that has been conducted, four categories of strategies are formulated as a combination of each element of strengths, weaknesses, opportunities, and threats. These strategies are designed to maximize excellence and address the challenges faced by the JMTO. Through this TOWS analysis, PT Jasamarga Tollroad Operator (JMTO) has succeeded in formulating various strategies that utilize internal strengths and external opportunities to achieve the company's vision, as well as strategies to overcome weaknesses and threats that exist in its business environment. The S-O, W-O, S-T, and W-T strategies that have been designed are expected to strengthen JMTO's position as a leader in technology-based toll road operations in Indonesia, as well as ensure efficient, safe, and innovative operational sustainability.

With the support of a strong technology infrastructure, integrated digital services, and a commitment to internal capabilities and collaboration with external parties, JMTO is ready to face the challenges and seize opportunities for future growth. The implementation of this strategy is also in line with JMTO's mission to provide the best services supported by the latest technology, pay attention to good governance, and increase value for shareholders.

3. SI/IT Internal Environment Analysis

The analysis of the internal environment of SI/IT aims to understand the current conditions owned by PT Jasamarga Tollroad Operator (JMTO) in supporting technology-based operations and decision-making. Some of the aspects that will be discussed include the current state of the information system, the information technology infrastructure that supports it, and the SI/IT management implemented in the company. Each of these aspects will be further elaborated in the following sections.

a. Current State of Information Systems

Based on the results of document analysis and observations, it was found that PT Jasamarga Tollroad Operator (JMTO) has various information system

applications that are used to support overall business activities. Details related to the list of applications of this information system can be seen in Table 2.

Table 2. JMTO Application List

It	App Name	Constraints/Problems
1	Accounting	The app is no longer in use
2	Eproc	No procurement evaluation analysis, No vendor management
4	Letter	The application only records the letter number
5	Website JMTO	Company profile portal only
6	SPPD	The application runs independently, is not integrated and is only limited to the recording process without providing input as analysis material for decision support
7	My-Data-ops	
8	CIM	
9	HRMS	
10	Recruit	
11	Monitoring MCS Web	Officer operational application, only recording, Complaint data is not processed
12	SAP-PO Regional	3rd party app, runs well
13	SAP-PO Cluster 3	3rd party app, runs well
14	TRACE	Officer operational application, only recording, Complaint data is not processed
15	Getoll	The application runs well, but there are still few users
16	Getpay	
17	Derek Online	
18	Getpark	The application is running well and is a *new revenue generator* for JMTO
19	Travoy	An app for road users, Travoy serves as an information center,
20	FLO	Flo as a toll road transaction application, Both applications can be combined to be efficient for road users, and can add downloaders
21	SMT	The condition of the app is running fine
22	Lattol App	The condition of the application is running well but will be replaced if MLFF is required
23	Mobile Reader Application	
24	Lattol Reporting Terminal App	
25	Lattol Operational Terminal Application	
26	*Intelligence Traffic Analysis*	The application has run well, but the data is still on its own, not yet utilized
27	PROLA	
28	Incident Management System	

b. Mapping the McFarlan Strategic Grid on Current Information Systems

The mapping of the information system applications listed in Table 5.8 is carried out with reference to the McFarlan Strategic Grid. This mapping aims to classify each application into strategic, *high potential*, *key operational*, or *support categories*, according to its role in supporting JMTO operations. This mapping process uses guidance from the indicators that have been carried out, which serves as a reference in assessing the relevance and contribution of each application to the company's operational goals and needs.

Any information system application currently operating in the JMTO will be evaluated using the formulated indicators. This assessment was carried out to determine the application category based on its role in supporting the company's operations and strategy. The results of this assessment can be seen in Table 5.10, which maps these applications according to their contribution to the operational and strategic needs of the JMTO.

Table 3. Application Assessment in McFarlan Quadrant

No	App Name	a	b	c	d	and	f	g	Mapping Results
1	Accounting			✓	✓	✓			Support
2	Eproc		✓	✓	✓				Key Operational
3	Pana-Eproc		✓	✓	✓				Key Operational
4	Letter					✓			Support
5	Website JMTO					✓			Support
6	SPPD					✓			Support
7	My-Data-ops		✓	✓	✓				Key Operational
8	CIM		✓	✓	✓				Key Operational
9	HRMS					✓	✓		Support
10	Recruit					✓			Support
11	OSTICKET			✓	✓				Key Operational
12	Monitoring MCS Web		✓	✓	✓				Key Operational
13	SAP-PO Regional		✓	✓	✓				Key Operational
14	SAP-PO Cluster 3		✓	✓	✓				Key Operational
15	TRACE		✓	✓	✓				Key Operational
16	Getpay	✓	✓						Strategic
17	Derek Online		✓	✓	✓				Key Operational

18	Getpark	✓	✓				Strategic
19	Travoy	✓	✓			✓	Strategic
20	Let It Flo	✓				✓	High Potential
21	SMT		✓	✓	✓		Key Operational
22	Lattol App		✓	✓	✓		Key Operational
23	Mobile Reader Application		✓	✓	✓		Key Operational
24	Lattol Reporting Terminal App		✓		✓		Support
25	Lattol Operational Terminal Application		✓	✓	✓		Key Operational
26	ITA	✓				✓	High Potential
27	PROLA	✓	✓		✓		Strategic
28	Incident Management System	✓	✓	✓	✓		Strategic

Based on the results of the evaluation in Table 5.10, the current information system applications are mapped into the *McFarlan Strategic Grid*. The results of the mapping can be seen in Table 4.

Table 4. Mapping Applications into McFarlan Quadrants

Strategic	***High Potential***
• Getpay• Getpark• Travoy• PROLA• Incident Management System	• Let It Flo• ITA
Key Operational	***Support***
• Eproc• Committee-Eproc• My-Data-ops• CIM• OSTICKET• Monitoring MCS Web• Regional SAP-PO• SAP-PO Cluster 3• TRACE• Online Crane• SMT• Lattol Application• Mobile Reader Application• Lattol Operational Terminal Application	• Accounting• Letter• JMTO Website• SPPD• HRMS• Recruit• Lattol Reporting Terminal Application

c. Current State of IT Infrastructure

The Information Technology (IT) infrastructure at PT Jasamarga Tollroad Operator (JMTO) plays an important role in supporting toll road operations efficiently and responsively. This infrastructure consists of several main components that include communication networks, data centers, servers, data storage, and security systems. The communication network uses fiber optic technology that allows fast and reliable connections between JMTO's operational locations. The summary of the current IT condition is as follows.

Table 5 State of IT Infrastructure Now

No	Infrastruktur TI	Current Conditions	Requirement Code
1	Jaringan	- There are often network problems caused by broken FO cables	**TI01**
		- Connections between areas still depend on the local network using FO.	**TI02**
2	Server Devices	- Servers are in internal data centers with capabilities that are currently often *overloaded*.	**TI03**
		- There is no support for high workload processing yet, especially for Big Data.	**TI04**
3	Information Security	- Network protection using a basic firewall, there was a data leak.	**TI05**
4	Storage	- Centralized storage in an internal data center with limited capacity.	**TI06**
5	Big Data and AI Technology	- There is no specific framework for predictive analytics yet.	**TI07**
6	System Interoperability	- Manual integration system through connections between databases.	**TI08**

d. SI/IT Management Conditions

The analysis of the condition of SI/IT management at PT JMTO is based on the results of interviews with key speakers and a study of various documents related to the company's information technology policies and governance. This analysis includes aspects of policy & regulation, IT governance, and IT management and auditing. Each category describes the SI/IT management practices currently implemented in the company, including the challenges faced and the steps taken to address limitations in terms of capabilities and compliance with standards. The following table summarizes the conditions of SI/IT management at PT JMTO.

Table 6 Management Analysis IS/TI

It	Category	Current Conditions	Code
1	Policies and Regulations	- There is no master policy that is the basis for the SOP under it	**MI01**
		- There is no specific policy regarding information security yet	**MI02**
2	Tata Kelola TI	- IT governance based on COBIT 2019 is still at level 1.6.	**MI03**
		- There is no regular oversight of the IT risk management process.	**MI04**
3		- There is no formal SOP mechanism related to SI/IT management.	**MI05**

It	Category	Current Conditions	Code
	IT Management and Audit	- Difficulty in determining the allocation of sufficient human resources for SI development.	**MI06**
		- The audit is carried out reactively, unscheduled.	**MI07**
4	Organization	- Currently, the number of IT Development team personnel is still not able to meet the needs of application development - Currently, an IT Steering Committee has not been formed so decisions regarding IT needs are still decided by the IT Director	**MI08**

4. SI/IT External Environment Analysis

The analysis of the external environment of SI/IT serves to identify external factors that affect the planning and implementation of information systems and information technology at PT JMTO. This understanding of the external environment provides a basis for the JMTO to formulate relevant and accurate strategic measures.

Along with the advancement of information and communication technology, various latest technology trends are increasingly being applied in the transportation sector, especially in the management of toll roads. PT Jasamarga Tollroad Operator (JMTO) has begun to adopt some of these technologies to improve operational performance, safety, and comfort for toll road users. The following table presents some of the key technology trends that are being implemented or in the exploration stage by the JMTO, complete with a brief description and their application. This analysis will have an effect on IT recommendations for the JMTO.

Table 7 Technology Trend Analysis

Code	Technology	Description
ET-01	Internet of Things (IoT)	A technology that allows interconnected devices to share data in real-time over the internet.
ET-02	Artificial Intelligence (AI)	Artificial intelligence technology that can automatically analyze data to generate insights or decisions based on intelligent algorithms.
ET-03	Cloud Computing	Flexible and cost-effective cloud-based data storage and processing technology.
ET-04	Single Lane Free Flow (SLFF)	Technology that allows toll users to make transactions without stopping at toll gates, supports operational efficiency.

5. Analysis of Future SI/IT Needs

At this stage, an analysis is carried out to determine the needs of SI, IT, and management at PT JMTO in the future in order to support the achievement of the company's vision, mission, and strategic goals.

a. SI Needs Analysis

Based on the results of the analysis of the value chain, CSF, and TOWS strategy, it was found that the need for information systems (SI) has not been fully

accommodated by the SI application currently used at PT JMTO. From the SI needs that have been collected, it can be seen that most of the internal and external strategic needs still require the development of new systems or the improvement of existing systems. The main focus of the development includes real-time data processing, big data integration, and improving road user services through applications and dashboards. With proper implementation, this need is expected to significantly increase operational efficiency, safety, and satisfaction of toll road users.

b. IT Needs Analysis

In order to support the information system development strategy at PT Jasamarga Tollroad Operator (JMTO), the need for information technology (IT) is one of the main pillars that must be carefully planned. A reliable and scalable IT infrastructure is needed to ensure smooth internal operations and improved services to road users. The following is an analysis of IT needs designed to answer future challenges, while supporting the implementation of digital strategies in the enterprise. This IT needs analysis is expected to be the foundation for the development of technology infrastructure that supports operational efficiency, information security, and data-based services at PT JMTO. With the right implementation, this need will strengthen the foundation of the company's digital transformation.

c. SI/IT Management Needs Analysis

Information Systems and Information Technology (SI/IT) Management plays an important role in ensuring the successful implementation of digital strategies at PT Jasamarga Tollroad Operator (JMTO). Effective SI/IT management includes not only planning and controlling, but also monitoring system performance to ensure alignment with the company's vision and mission. The following SI/IT management needs analysis is compiled to identify critical elements that must be strengthened to support operational efficiency and continuous innovation. This analysis of SI/IT management needs shows the importance of strengthening policies, governance, and structured audit processes to support digital transformation at PT JMTO. With proper implementation, this need is expected to be able to improve operational efficiency, risk mitigation, and the company's competitiveness in facing future technological challenges.

6. SI/IT Gap Analysis

SI/IT gap analysis is an important step to identify the difference between the current state of Information Systems and Information Technology (SI/IT) and the ideal needs needed to support the company's strategy. Through this analysis, PT Jasamarga Tollroad Operator (JMTO) can understand the areas that need to be improved, both in terms of infrastructure, applications, and governance. The results of this analysis are expected to be the basis for formulating more effective IT development and investment priorities to achieve the company's digital transformation vision.

a. SI Application Gap Analysis

In supporting the achievement of the company's strategic goals, the Information System (SI) application used must be able to meet the overall business needs. SI application gap analysis aims to identify shortcomings or gaps between

the current system conditions and the ideal needs that must be met. By understanding these gaps, PT Jasamarga Tollroad Operator (JMTO) can formulate strategic steps to improve the capabilities of SI applications to support more efficient and innovative operations.

This gap analysis shows that JMTO needs to focus on developing information systems that support real-time data-based operations, big data integration, and customer satisfaction. This strategic step aims to improve efficiency, regulatory compliance, and services for toll road users. With the right system implementation, JMTO can be better prepared to face the challenges of digitalization and maintain its position as a leader in toll road management in Indonesia.

b. IT Gap Analysis

An IT gap analysis was conducted to evaluate the existing condition of the information technology infrastructure in JMTO and compare it with the future needs identified from the company's business and operational strategy. This process aims to identify gaps between current IT capabilities and the strategic needs that must be met to support the achievement of JMTO's vision and mission.

Through this analysis, strategic recommendations will be given to overcome existing gaps, both in terms of system development, infrastructure capacity building, and the implementation of new technologies. The results of this analysis are expected to be a reference in compiling IT development steps that are more targeted and in line with the company's strategic goals. An analysis of the IT infrastructure gap in JMTO shows the need for strategic development in various aspects, including networking, server devices, information security, storage, Big Data and AI technologies, and system interoperability. By addressing these gaps through the implementation of relevant technologies, JMTO can strengthen the IT foundation that supports operational efficiency, security, and service innovation. These steps not only ensure alignment with future needs, but also strengthen JMTO's position as a leader in digital transformation in the toll road industry.

c. SI/IT Management Gap Analysis

The SI/IT management gap analysis aims to evaluate the extent to which the current management of information systems and information technology of the JMTO can support the strategic needs of the company. This process includes identifying strengths, weaknesses, and areas that need improvement, both in terms of governance, policy, and operations.

Through this analysis, strategic recommendations will be provided to close existing gaps, with a focus on implementing standard-compliant governance, risk management, and increasing human resource capacity and competence. Thus, the results of this analysis are expected to be a reference in the development of more effective, efficient, and sustainable SI/IT management at JMTO.

In closing, the analysis of the SI/IT management gap in JMTO shows that there are still several areas that need to be improved, especially in policies and regulations, IT governance, and IT management and auditing. By developing more specific policies, improving COBIT-based governance 2019, and optimizing human resource allocation and structured audit schedules, JMTO can build more effective and competitive SI/IT management. These steps are expected to support sustainable

digital transformation and strengthen JMTO's position as an organization that prioritizes innovation and efficiency in the toll road sector.

7. SI/IT Strategic Planning

Based on the results of the gap analysis in the previous chapter, this strategic planning is designed to address key issues, such as low levels of SI/IT governance, limited system integration, and the need to strengthen technology infrastructure. This plan is designed to provide targeted implementation guidance in improving operational efficiency, supporting data-driven decision-making, and encouraging digital innovation relevant to the company's business needs.

Through this planning, JMTO is expected to be able to increase the maturity of SI/IT governance, optimize the use of technology, and strengthen the company's competitiveness in the toll road industry. The implementation of this strategic plan is also projected to provide significant added value for the company's stakeholders.

CONCLUSION

Based on the analysis conducted, this study concludes that the strategic planning of information systems and information technology (SI/IT) at PT Jasamarga Tollroad Operator (JMTO) has a crucial role in supporting digital transformation and improving the company's operational efficiency. Using the Ward & Peppard methodology, the analysis covers various internal and external aspects of the business and IT, resulting in recommendations for SI, IT, and SI/IT management strategies. SI's strategy includes the development of 14 applications, including system merging and updates prioritized in operational and strategic quadrants. The IT strategy focuses on strengthening infrastructure through network development, information security such as SIEM and API Gateway, and support for Big Data and AI. In addition, the SI/IT management strategy emphasizes COBIT-based governance 2019, improving human resources, and preparing SOPs to support implementation. This research emphasizes the importance of integration between SI, IT, and management strategies to ensure JMTO's digital transformation runs effectively and sustainably. Additional advice includes full commitment from management, strengthening organizational readiness, adjusting to regulatory policies, and further studies to ensure this strategic planning is aligned with the company's business needs.

REFERENCES

Agustri, S., & Sensuse, D. I. (2020). Information System Strategy Planning In The Private Universities Of South Sumatera. *Journal Of Physics: Conference Series*, *1500*(1). Https://Doi.Org/10.1088/1742-6596/1500/1/012127

Butar Butar, H. W., & Rahayu, E. (2023). Dampak Sosial Dan Ekonomi Pembangunan Jalan Tol Mktt Terhadap Umkm Pasar Bengkel Kabupaten Serdang Bedagai. *Jisip (Jurnal Ilmu Sosial Dan Pendidikan)*, *7*(1). Https://Doi.Org/10.58258/Jisip.V7i1.4118

Ching, N. T., Ghobakhloo, M., Iranmanesh, M., Maroufkhani, P., & Asadi, S. (2022). Industry 4.0 Applications For Sustainable Manufacturing: A Systematic Literature Review And A Roadmap To Sustainable Development.

Journal Of Cleaner Production, *334*. Https://Doi.Org/10.1016/J.Jclepro.2021.130133

Clarke, V., & Braun, V. (2017). Thematic Analysis. *Journal Of Positive Psychology*, *12*(3), 297–298. Https://Doi.Org/10.1080/17439760.2016.1262613

Dombalyan, A., Shatalova, E., Semchugova, E., & Solodovchenko, I. (2020). Modes Of Operation Of Toll Gate Lanes On Toll Roads. *Iop Conference Series: Materials Science And Engineering*, *1001*(1). Https://Doi.Org/10.1088/1757-899x/1001/1/012103

Eray, E., Candelario, V. M., Boffa, V., Safafar, H., Østedgaard-Munck, D. N., Zahrtmann, N., Kadrispahic, H., & Jørgensen, M. K. (2021). A Roadmap For The Development And Applications Of Silicon Carbide Membranes For Liquid Filtration: Recent Advancements, Challenges, And Perspectives. In *Chemical Engineering Journal* (Vol. 414). Https://Doi.Org/10.1016/J.Cej.2021.128826

Ikhsan, I., & Suhardi, D. (2022). Analisis Risiko Pembangunan Jalan Tol Kediri-Tulungagung. *Seminar Keinsinyuran Program Studi Program Profesi Insinyur*, *2*(1). Https://Doi.Org/10.22219/Skpsppi.V3i1.5028

Isnaeni, D. (2020). Konsep Hukum Pengadaan Tanah Untuk Pembangunan Jalan Tol Dalam Perspektif Hak Menguasai Negara. *Yurispruden*, *3*(1). Https://Doi.Org/10.33474/Yur.V3i1.5014

Januardin Manullang Dan Hottua Samosir. (2019). Pengaruh Pembangunan Jalan Tol Medan-Tebing Tinggi Terhadap Usaha Mikro Kecil Dan Menengah. *Jurnal Ilmiah Akuntansi Dan Finansial Indonesia*, *3*(1). Https://Doi.Org/10.31629/Jiafi.V3i1.1516

Kandiyoh, G. E., Slat, V. B., Tenda, J., & Sumajouw, J. (2022). Perspektif Masyarakat Dalam Pembangunan Jalan Tol Manado-Bitung. *Jurnal Teknik Sipil Terapan*, *4*(1). Https://Doi.Org/10.47600/Jtst.V4i1.318

Khasanah, U., Nugraha, N., & Kokotiasa, W. (2017). Dampak Pembangunan Jalan Tol Solo-Kertosonoterhadap Hak Ekonomi Masyarakat Desa Kasreman Kecamatan Geneng Kabupaten Ngawi. *Citizenship Jurnal Pancasila Dan Kewarganegaraan*, *5*(2). Https://Doi.Org/10.25273/Citizenship.V5i2.1644

Mahendra, I., Ramadhan, A., Trisetyarso, A., Abdurachman, E., & Zarlis, M. (2022). Strategic Information System Planning In The Industry 4.0 Era: A Systematic Literature Review. *2022 Ieee Creative Communication And Innovative Technology, Iccit 2022*. Https://Doi.Org/10.1109/Iccit55355.2022.10119002

Mardon, A. K., Leake, H. B., Hayles, C., Henry, M. L., Neumann, P. B., Moseley, G. L., & Chalmers, K. J. (2023). The Efficacy Of Self-Management Strategies For Females With Endometriosis: A Systematic Review. In *Reproductive Sciences* (Vol. 30, Issue 2). Https://Doi.Org/10.1007/S43032-022-00952-9

Nikiphorou, E., Santos, E. J. F., Marques, A., Böhm, P., Bijlsma, J. W. J., Daien, C. I., Esbensen, B. A., Ferreira, R. J. O., Fragoulis, G. E., Holmes, P., Mcbain, H., Metsios, G. S., Moe, R. H., Stamm, T. A., De Thurah, A., Zabalan, C., Carmona, L., & Bosworth, A. (2021). 2021 Eular Recommendations For The Implementation Of Self-Management Strategies In Patients With

Inflammatory Arthritis. *Annals Of The Rheumatic Diseases*, *80*(10). Https://Doi.Org/10.1136/Annrheumdis-2021-220249

Porter, M. E. (1985). *Competitive Advantage*. Https://Doi.Org/10.1007/978-3-319-54540-0

Urciuoli, L., & Hintsa, J. (2017). Adapting Supply Chain Management Strategies To Security–An Analysis Of Existing Gaps And Recommendations For Improvement. *International Journal Of Logistics Research And Applications*, *20*(3). Https://Doi.Org/10.1080/13675567.2016.1219703

Ward, J., & Peppard, J. (2002). *Strategic Planning For Information Systems* (Vol. 6, Issue 1). Https://Doi.Org/10.1057/Jit.1991.9

Ward, J., & Peppard, J. (2016). *The Strategic Management Of Information Systems*.

Wibowo, S. N., Pujiwati, Y., & Rubiati, B. (2021). Kepastian Hukum Ganti Kerugian Pengadaan Tanah Bagi Pembangunan Jalan Tol Cisumdawu. *Acta Diurnal Jurnal Ilmu Hukum Kenotariatan Dan Ke-Ppat-An*, *4*(2). Https://Doi.Org/10.23920/Acta.V4i2.480

Zheng, C., Zhu, K., De Freitas, S. C., Chang, J. Y., Davies, J. E., Eames, P., Freitas, P. P., Kazakova, O., Kim, C. G., Leung, C. W., Liou, S. H., Ognev, A., Piramanayagam, S. N., Ripka, P., Samardak, A., Shin, K. H., Tong, S. Y., Tung, M. J., Wang, S. X., … Pong, P. W. T. (2019). Magnetoresistive Sensor Development Roadmap (Non-Recording Applications). *Ieee Transactions On Magnetics*, *55*(4). Https://Doi.Org/10.1109/Tmag.2019.2896036

Zillner, S., & Neururer, S. (2015). Technology Roadmap Development For Big Data Healthcare Applications. *Ki - Kunstliche Intelligenz*, *29*(2). Https://Doi.Org/10.1007/S13218-014-0335-Y