



The Implementation of Information Technology to Enhance Operational Efficiency: A Case Study at Energy Companies in North Jakarta

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ABSTRACT

This study adopts a descriptive qualitative approach with a purposive sampling technique to explore the implementation of information technology (IT) in enhancing operational efficiency at Energy Companies Trijaya, a leading retail company in Indonesia. Data were collected through in-depth interviews, direct observations, and documentation analysis, focusing on the maintenance department's processes, particularly in the areas of information distribution and complaint handling. The primary variable examined is the implementation of information technology, while infrastructure limitations and human resource (HR) competencies are analyzed as moderating variables that influence the effectiveness of IT adoption. The study also utilizes secondary quantitative data to support findings, particularly in tracking complaint handling times and operational uptime before and after IT implementation. Two moderating variables were analyzed: technological infrastructure and human resource competency. The study investigates how these factors interact to impact operational efficiency and employee productivity. Findings reveal that IT plays a crucial role in accelerating workflows, reducing manual errors, and increasing coordination between departments. However, constraints such as inadequate infrastructure and limited digital competencies among staff present challenges to optimal system utilization. To address these issues, the study proposes the design of an integrated information system tailored to the company's operational needs. Recommendations include the enhancement of training programs, investment in IT infrastructure, and a strategic roadmap for digital transformation. These measures are expected to support greater process integration, streamline maintenance operations, and ultimately improve organizational performance.



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INTRODUCTION

The development of information technology (IT) has brought substantial transformation across various industrial sectors, including the retail industry in Indonesia. Digitalization initiatives such as cloud-based point-of-sale (POS) systems, automated inventory management, and omnichannel platforms have not only expanded market reach but also significantly enhanced operational efficiency in response to increasingly intense competition. Energy Companies, one of Indonesia's largest retail enterprises operating under the Alfamart brand particularly in the North Jakarta region faces the ongoing challenge of improving productivity and customer satisfaction (Rew et al., 2020). Within this context, the strategic implementation of IT becomes essential (Holtshouse, 2013), particularly in optimizing the distribution of information and complaint resolution processes. The maintenance department, which plays a vital role in ensuring store operations run smoothly, benefits directly from the adoption of information systems that streamline coordination and minimize operational disruptions (Sinaga, 2023; Pratam, 2023).

However, the success of IT implementation does not depend solely on the technology itself (Holtshouse, 2013), but also on the supporting infrastructure and the competencies of human resources (HR). This study aims to evaluate how IT impacts operational efficiency (Aral et al., 2012), identify

constraints, and offer strategic recommendations for system and competency improvement. An integrated information system plays a critical role in enabling real-time data processing, expediting managerial decision-making, and minimizing manual errors that often disrupt business operations. In the context of modern retail enterprises, such as Energy Companies, the successful implementation of information technology is key to maintaining competitive advantage and operational continuity. However, this process is not without challenges (Santoso & Legowo, 2014).

Limitations in technological infrastructure, insufficient human resource competencies in operating digital systems, and resistance to organizational change remain significant barriers to optimal IT utilization (Lestari, 2023; Prihandono, 2023). To address these issues, continuous training and capacity-building initiatives are imperative to ensure that employees can effectively adopt and adapt to technological tools. Moreover, the development and deployment of a well-designed, integrated information system is essential to support the complexity and dynamism of retail business processes, especially in large-scale operations. Such systems enhance not only operational efficiency but also organizational responsiveness and agility in a rapidly changing market environment (Voets et al., 2023).

Advanced technologies such as the Internet of Things (IoT), big data analytics (Indarto & Santoso, 2024), and artificial intelligence (AI) are increasingly being adopted in the retail sector to enhance various operational aspects, including supply chain management, inventory control, and customer experience (Musytari, 2024). The implementation of modern POS systems integrated with digital inventory and payment platforms has enabled faster, more accurate, and more convenient transaction processes. This not only improves operational efficiency but also enhances customer satisfaction, which is critical in a highly competitive and digitally driven market environment (Baltzan, 2019; Saleh, 2023).

An information system is a collection of interrelated components to collect, process, store, and distribute information to support decision making (Morewedge et al., 2015; Montori et al., 2017) and control in an organization (Antari, 2014). In the retail business, an effective information system can speed up the transaction process, reduce manual errors, and improve coordination between departments (Dinasti, 2019). The use of cloud technology and ERP (Enterprise Resource Planning) systems helps integrate various business functions so that operations become more efficient and responsive to market changes (Antari, 2014). However, IT implementation faces challenges such as high investment costs, user resistance, infrastructure limitations, and data security risks that must be managed properly (Musytari, 2024; Dinasti, 2019). Human resource competence also greatly determines the effectiveness of the application of this technology (Lestari, 2023).

Previous research shows that the use of information technology and human resource competence has a positive effect on the effectiveness of the accounting information system at Energy Companies Trijaya (Arnita, 2018). This emphasizes the importance of technology integration and HR development to achieve optimal operational efficiency (Santoso, 2025). With good system integration, companies can improve collaboration between departments, accelerate information flow, and support more precise and faster decision making (Arnita, 2018; Sori, 2023).

Research on large energy companies such as PT Pertamina shows that the implementation of IT has a significant positive impact on operational efficiency, as seen from increased productivity, reduced operational costs, and improved service quality (Asnada, 2024). In addition, obstacles such as limited infrastructure and human resource competencies are moderating factors that need to be overcome so that IT implementation can run optimally (Suryani et al., 2022).

In the context of operations management, information technology plays a critical role in enhancing visibility and control over operational processes in real time. This capability allows companies to respond swiftly and efficiently to dynamic market changes, thereby improving decision-making (Morewedge et al., 2015; Montori et al., 2017) and operational agility. When implemented effectively, information systems can support the integration of business processes, accelerate the flow of information across departments, and improve complaint handling mechanisms outcomes that are particularly relevant to the case of Energy Companies, as highlighted in the present study (Voets et al., 2023; Aral et al., 2012).

This study is guided by the following research questions: (1) To what extent is the implementation of information technology effective in enhancing operational efficiency at Energy Companies, particularly in terms of information distribution and complaint handling within the maintenance department? (2) What are the key obstacles and challenges encountered by Energy

Companies in implementing information technology? This includes challenges related to employee training, user comprehension, and the adequacy of technological infrastructure that supports day-to-day operations. (3) How can an optimally designed information system contribute to the integration of business processes at Energy Companies, with the objective of improving productivity and customer satisfaction through the strategic use of information technology?

This study is limited to the implementation of information technology in enhancing operational efficiency at Energy Companies, specifically located in North Jakarta City. The focus is placed on two key operational aspects within the maintenance department: (1) the process of information distribution, and (2) complaint handling mechanisms. Additionally, the study explores the challenges and constraints faced during IT implementation, including infrastructure, user competency, and system readiness. It also includes the design of an information system model that supports the integration of business processes across the organization. This research is expected to provide a comprehensive understanding of the urgency and strategic importance of IT utilization in enhancing efficiency and competitiveness in modern retail enterprises (Santoso et al., 2024).

Based on the background and the formulation of the research problem, this study aims to: (1) Analyze the effectiveness of information technology implementation in improving operational efficiency at Energy Companies, particularly in the areas of information distribution and complaint handling within the maintenance department. (2) Identify the key obstacles and challenges faced by the company in implementing information technology, including issues related to employee training, user proficiency, and the availability and adequacy of technological infrastructure that supports day-to-day operations. (3) Design an optimal information system that supports the integration of business processes at Energy Companies, with the goal of enhancing productivity and customer satisfaction (Goshime et al., 2019) through the strategic use of information technology.

This study is specifically focused on the implementation of information technology (IT) in enhancing operational efficiency at Energy Companies, located in North Jakarta City. The research concentrates on two primary operational aspects (Rew et al., 2020) the distribution of information and the handling of complaints within the maintenance department.

Furthermore, the study examines the challenges and obstacles encountered during the IT implementation process, including issues related to technological infrastructure, employee competency, and training. It also seeks to develop an optimal information system design that supports the integration of business processes within the company (Santoso et al., 2024).

The findings are expected to provide a comprehensive understanding of the urgency and strategic importance of utilizing information technology to improve operational performance, particularly in the context of modern retail enterprises.

RESEARCH METHODS

This study adopts a descriptive qualitative approach, with purposive sampling techniques to select key informants directly involved in the implementation and use of information systems within the maintenance department of Energy Companies Trijaya. Data collection methods include semi-structured interviews, direct observations, and documentation analysis. These methods are used to capture a holistic view of how information technology contributes to operational efficiency (Santoso, 2025), as well as to identify barriers related to infrastructure and human resource competencies.

The primary unit of analysis is the maintenance department, which is essential in ensuring the uninterrupted functionality of store infrastructure. Interviews were conducted with maintenance staff, IT system users, and department supervisors to explore their experiences, perceptions, and challenges in adopting the current system. Observations were focused on the flow of information, complaint handling procedures, and system usage in daily operations. Documentation includes standard operating procedures (SOPs), system reports, and training records.

In this study, data were obtained through an in-depth literature review, involving the collection of information from various written sources such as books, academic journals, company reports, and other relevant documents. These literature sources were then analytically developed to extract holistic and contextual insights related to the phenomenon under investigation. This approach allows the researcher to understand the context and dynamics of information technology implementation comprehensively, based on existing and credible sources.

After the literature data is collected, the data processing stage involves data reduction, which includes sorting and selecting information that is relevant to the research focus. The selected data is then analyzed using a descriptive qualitative approach (Santoso et al., 2024) to interpret meanings and identify emerging patterns related to operational efficiency at Energy Companies. The study also utilizes secondary quantitative data to support findings, particularly in tracking complaint handling times and operational uptime before and after IT implementation. Two moderating variables were analyzed: technological infrastructure and human resource competency.

The results of the analysis are presented narratively, aiming to provide a comprehensive overview of the application of information technology within the company's operational context. Thus, the data collection and analysis process in this study is based entirely on critical and systematic literature review, enabling an in-depth understanding of the studied phenomena without direct field intervention.

RESULTS AND DISCUSSION

The results of observations and document analysis indicate that the implementation of information technology at Energy Companies has positively contributed to operational efficiency, particularly in the distribution of information and handling of complaints within the maintenance department. The integrated information system adopted by the company facilitates real-time data transmission, enabling maintenance-related complaints and repair needs to be communicated and addressed without delay.

This responsiveness significantly accelerates the repair process and reduces equipment downtime, which in turn ensures smoother store operations. The system's ability to streamline communication between departments enhances coordination, reduces manual reporting errors, and supports timely decision-making. These improvements reflect the essential role of IT in minimizing operational disruptions and optimizing resource utilization, thereby contributing directly to the company's overall efficiency and service quality.

This finding aligns with Antari (2014), which emphasizes that the implementation of an effective information system can accelerate workflow and enhance inter-unit coordination within an organization. Furthermore, studies conducted by Sinaga (2023) and Pratam (2023) reinforce this assertion by demonstrating that mobile-based information technology and transaction data processing systems significantly improve the accuracy and speed of business operations. At Energy Companies, the application of information technology has proven instrumental in reducing manual errors during data recording and reporting processes. This, in turn, minimizes the risk of operational disruptions caused by human error, thereby supporting overall efficiency and business continuity.

Furthermore, the integration of an information system enhances transparency and accountability within the maintenance process (Utama et al., 2024). By centralizing data and ensuring real-time accessibility, management is equipped to monitor the status and progress of complaint handling more effectively. This real-time oversight facilitates faster and more informed decision-making (Higgins et al., 2013; Gorzeń-Mitka et al., 2013), enabling swift responses to operational issues. As a result, the implementation of an integrated information system directly contributes to improving the productivity of the maintenance department and elevating the overall quality of service delivered to customers.

Despite the significant benefits achieved, the implementation of information technology at Energy Companies still faces several critical obstacles. One of the main challenges is the limitation of technological infrastructure, particularly the unstable internet connectivity in certain operational locations. These connectivity issues disrupt access to the information system, leading to delays in information distribution and complaint handling processes. Such interruptions not only reduce the efficiency of the maintenance workflow but can also impact overall service quality and responsiveness, highlighting the need for infrastructure improvements as part of the IT optimization strategy.

In addition, human resource (HR) competence remains a significant limiting factor in the optimal utilization of information systems at Energy Companies. A considerable number of staff have not yet fully mastered the effective use of the implemented technology, which hinders the system's overall effectiveness. This observation aligns with the findings of Lestari (2023), who emphasizes that training and the development of digital competencies are critical to ensuring the successful adoption of information systems. The lack of technological literacy among employees also contributes to user resistance, resulting in delayed system adaptation and increased potential for operational errors. These

issues highlight the strategic importance of continuous HR capacity-building programs to strengthen digital transformation initiatives in modern retail operations (Windreis et al., 2024).

Another key challenge identified in the study is the lack of management support, particularly in terms of budget allocation for infrastructure upgrades and training initiatives. This limitation hampers the company's ability to enhance its information systems and develop human resources in a sustainable manner (Santoso & Kasih, 2024). As emphasized by Prihandono (2023), the success of IT implementation is closely tied to the commitment of top management in allocating adequate resources. The analysis of the current information systems at Energy Companies underscores that the design and implementation of an integrated system is critical to improving both productivity and customer satisfaction. A well-integrated system encompassing modules for information distribution, complaint handling, and maintenance monitoring enables centralized data storage and real-time accessibility for all relevant stakeholders. This facilitates improved coordination, faster decision-making (Higgins et al., 2013; Gorzeń-Mitka et al., 2013), and more responsive operational performance.

Table 1. Relevance of ERP Concept to Energy Companies IT Implementation

| Aspect | Explanation | Implication for Energy Companies |
|--|--|--|
| ERP Concept (Antari, 2014; Baltzan, 2019) | Integrates business functions into one system for efficiency and coordination | Enables faster response in maintenance & complaint handling |
| Benefits of Integration | Reduces data duplication, increases coordination, streamlines business processes | Maintenance workflow becomes faster, complaint resolution more efficient |
| System Flexibility | Adapts to operational needs and tech developments | Prevents system obsolescence and supports future changes |
| Cloud-based & Mobile Tech | Increases accessibility and real-time data availability | Helps mitigate infrastructure challenges and supports remote access |

The concept of Enterprise Resource Planning (ERP), as proposed by Antari (2014) and Baltzan (2019), is highly applicable to Energy Companies's operational context. ERP enables the integration of multiple business functions into a single digital platform, improving coordination, reducing data redundancy, and accelerating business workflows. For the maintenance department, this means faster handling of complaints and repair requests, enhancing both operational efficiency and service quality.

A critical aspect of system design is flexibility the ability to adapt to dynamic operational needs and evolving technologies. This ensures the system remains sustainable and future-proof, rather than becoming outdated. Additionally, leveraging cloud-based and mobile technologies can address challenges such as accessibility and infrastructure limitations, making the system usable across various operational sites (Santoso & Kasih, 2024).

An optimal information system must emphasize user-friendliness to ensure ease of use, reduce resistance, and accelerate technology adoption. According to Lestari (2023), user training and technical support are crucial to ensuring that system implementation aligns with user capabilities and operational expectations (Windreis et al., 2024). Energy Companies has recognized this need by identifying usability as a strategic factor in system acceptance.

Beyond its primary role in enhancing information flow and complaint handling in the maintenance department, document and data analysis reveals that the implemented IT system also improves inventory management. The system generates automatic notifications for the procurement of spare parts and equipment, reducing the risk of stockouts and repair delays. This fosters better coordination between the warehouse, procurement, and maintenance departments, enhancing responsiveness and overall efficiency (Reza et al., 2024).

The use of mobile technology also allows maintenance technicians to report real-time work status directly from the field. Thus, the data entered into the system is always up-to-date, increasing transparency and accuracy of reporting, and accelerating response to complaints. The positive impact

is the reduction of equipment downtime which contributes to the smooth operation of the store and increased customer satisfaction.

The implementation of information technology significantly enhances key maintenance performance indicators, such as mean time to repair (MTTR), equipment uptime, and response time to service requests. At Energy Companies, the use of real-time complaint handling systems and automated maintenance tracking has reduced MTTR and improved overall equipment effectiveness (OEE). The integration of IT systems enables faster identification of issues, streamlined work order management, and better resource allocation, thereby minimizing equipment downtime and supporting continuous operational flow. Additionally, mobile access to maintenance data allows technicians to update progress on-site, accelerating resolution times and increasing accountability. These improvements demonstrate that IT not only supports operational efficiency but also enhances decision-making and performance monitoring across maintenance functions.

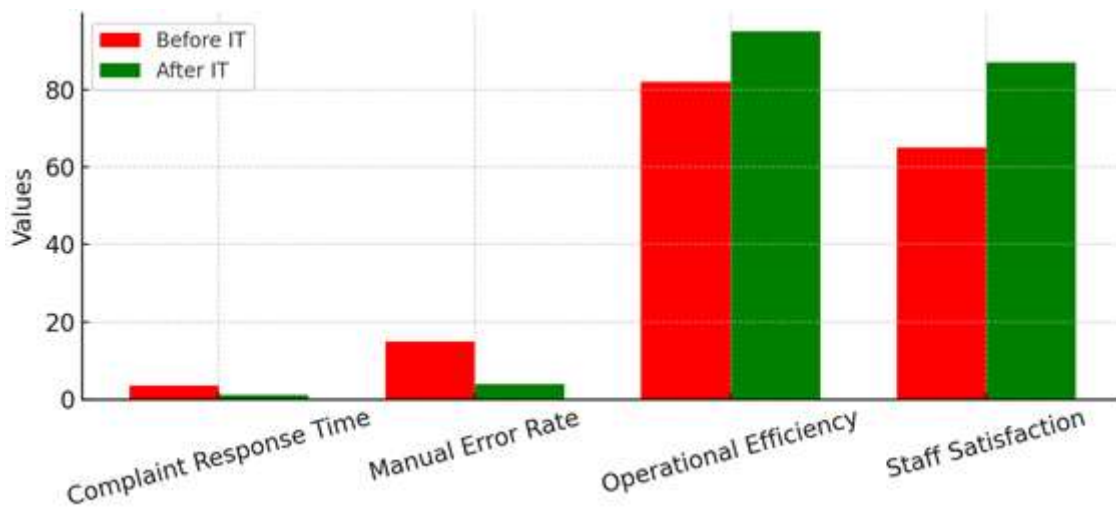


Figure 2. IT Impact on Maintenance Metrics
(Source: Data Processing, 2024)

However, the results of document analysis indicate that the integration between the maintenance information system and other critical systems such as financial management and customer service remains suboptimal. Several operational processes continue to be conducted manually or through disparate applications, thereby limiting the efficiency gains that could otherwise be achieved through full system integration. This observation aligns with the principles of Enterprise Resource Planning (ERP) as articulated by Antari (2014) and Baltzan (2019), which emphasize the strategic importance of consolidating various business functions within a unified digital platform. A fully implemented ERP system would enable Energy Companies to streamline and integrate core processes including procurement (Rahmawati & Agustina, 2021), distribution, maintenance, and financial reporting thereby enhancing coordination, minimizing data redundancy, and accelerating overall operational workflows.

Chief Information Officers (CIOs) must be able to communicate IT implementation plans in clear, non-technical language that is easily understood by all stakeholders (Santoso, & Tarigan, 2020)

. This ensures alignment across departments, fosters collaboration, and facilitates informed decision-making at every organizational level. To ensure the effective utilization of information systems, companies must implement continuous training and competency development programs for all system users, with particular emphasis on personnel within the maintenance department. These programs should extend beyond technical skills to include a comprehensive understanding of technology (Drnevich & Croson, 2013) enabled business processes, thereby equipping users to optimize system functionality.

Furthermore, organizational leadership must reinforce its commitment to digital transformation by adopting a structured change management strategy. This strategy should aim to mitigate user resistance through clear communication, active user engagement throughout the implementation

process, and the provision of incentives that foster motivation and adaptability toward technological change.

Data security is a critical consideration in the adoption of cloud-based technologies within corporate environments. As highlighted by Dinasti (2019), safeguarding both customer and operational data is essential for maintaining stakeholder trust and mitigating the risks associated with data breaches. Accordingly, the implementation of robust security measures such as data encryption, firewalls, and multi-layered authentication protocols is indispensable. From a human resource perspective, empirical findings underscore that user competence is a key determinant of successful information technology adoption (Lestari, 2023). Ongoing training initiatives that encompass not only technical proficiency but also a deep understanding of business processes are vital for enhancing system effectiveness and minimizing resistance to technological change.

In addition, management commitment in providing adequate budget for IT infrastructure development (Drnevich & Croson, 2013) and HR training is a key factor in the success of IT implementation (Prihandono, 2023). Strong management support will ensure the sustainability of system development and increase user competence so that the benefits of technology can be optimized (Santoso & Kasih, 2024).

Overall, the findings and discussion presented in this study reinforce the conclusion that the implementation of information technology at Energy Companies has contributed significantly to improving operational efficiency and service quality. Nevertheless, to fully optimize these benefits, the company must address existing limitations, including inadequate technological infrastructure, suboptimal system integration, and gaps in data security and human resource competencies. A strategically designed information system characterized by integration, flexibility, and user friendliness serves as a critical foundation for supporting sustainable growth and enhancing competitiveness in the increasingly dynamic digital retail landscape.

CONCLUSION

The implementation of information technology at Energy Companies has demonstrated significant effectiveness in enhancing operational efficiency, particularly in the maintenance department's information distribution and complaint handling processes. The deployment of an integrated information system enables real-time data processing, allowing complaints to be received and addressed promptly. This acceleration of the repair process reduces equipment downtime, thereby ensuring smoother store operations. Consequently, information technology plays a critical role in expediting workflows and improving coordination among work units.

Despite delivering considerable benefits, the implementation of information technology at Energy Companies encounters several significant challenges. Firstly, limited technological infrastructure particularly unstable internet connectivity in several locations disrupts access to information systems, resulting in delays in information distribution and complaint handling. Secondly, insufficient human resource competence in effectively operating the system diminishes the overall effectiveness of technology utilization. Thirdly, user resistance to change impedes the smooth adaptation to new systems. Furthermore, suboptimal management support, particularly in allocating budgets for infrastructure upgrades and training programs, presents an additional obstacle that must be addressed.

Energy Companies needs to increase its investment in technology infrastructure, particularly by enhancing the quality of internet networks and upgrading supporting hardware. This will enable the information systems to operate smoothly, minimizing technical disruptions. With reliable infrastructure in place, the processes of information distribution and complaint handling can be conducted in real time, ensuring uninterrupted and efficient operations.

The designed information system must prioritize seamless integration between departments and user-friendliness. An intuitive and easy-to-operate system will enhance user adoption rates and foster effective collaboration across work units. Additionally, the system should be flexible and scalable, allowing it to adapt to evolving technological advancements and changing business requirements.

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