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Effectiveness and Efficiency of the Application of Robotic Process Automation

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ABSTRACT

Implementing Robotic Process Automation (RPA) in the shipment handling process at the State-Owned Indonesian Logistics Service Provider (LSP) aims to improve operational effectiveness and efficiency. However, errors in delivery using RPA have been found, resulting in reduced customer satisfaction. These errors are generally related to incorrect shipment data obtained from the website. Therefore, this study focuses on evaluating the effectiveness and efficiency before and after the implementation of RPA. This study aims to analyze the impact of Robotic Process Automation (RPA) on the effectiveness and efficiency of company operations before and after the implementation of RPA at the State-Owned Indonesian Logistics Service Provider, particularly at the Central Post Processing Office. The method used in this study is a qualitative approach. Data was collected from websites related to delivery errors and through observation of the operational department at the State-Owned Indonesian Logistics Service Provider. The analysis was conducted by comparing the level of operational effectiveness and efficiency before and after the implementation of RPA to identify whether the implementation of RPA was in line with the company's expectations. The contribution of this research is to provide insights for State-Owned Indonesian Logistics Service Provider in improving the performance of the RPA system and designing improvement strategies to overcome existing challenges. It is recommended that the State-Owned Indonesian Logistics Service Provider continues to evaluate and develop the RPA system, including improving data quality and integrating supporting technologies to minimize delivery errors and increase customer satisfaction.

I. INTRODUCTION

The reality in the field shows that the State-Owned Indonesian LSP still faces various challenges in freight forwarding operations. Based on data from the Indonesian Logistics Association, demand for courier services has increased by 30-40% since the COVID-19 pandemic (Abdi, 2021) . This increase requires companies to have a faster and more efficient operational system. However, many operational processes at the State-Owned Indonesian LSP are still done manually, such as recording delivery data, sorting packages, and processing late claims. Currently, only about 60% of packages at the State-Owned Indonesian LSP have accurate tracking status in real time, while the rest are caused by delays in the tracking status input process. This indicates an urgent need to improve the effectiveness and efficiency

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of the freight forwarding process. This indicates an urgent need to improve the effectiveness and efficiency of the freight forwarding process.

In addition, delays in delivery are still a major customer complaint. Based on the performance report of the State-Owned Indonesian LSP in 2023, around 15-20% of packages experienced delays due to the suboptimal handling process. Indonesia's 2023 Logistics Performance Index (LPI) ranks Indonesia 63rd out of 139 countries, reflecting that there are still many challenges in logistics efficiency. Based on the Deloitte Study found that logistics companies or companies in other fields that apply automation technology experience reduced costs and improved quality by reducing human error (Acoba *et al*., 2019). Therefore, the application of Robotic Process Automation (RPA) technology can be a solution to overcome delivery delays at The State-Owned Indonesian LSP.

Furthermore, the State-Owned Indonesian LSP also needs to improve system integration with various large marketplaces such as Tokopedia, Shopee, Lazada, and Bukalapak to develop market share to the digital market so that the State-Owned Indonesian LSP can be recognized by marketplace users. Data synchronization that is still done manually causes delays in updating delivery status. Studies show that with RPA, businesses can work faster and more efficiently, including in tracking the delivery status of goods in real time (Geekgarden, 2025).Based on various phenomena that have occurred, the implementation of Robotic Process Automation (RPA) at The State-Owned Indonesian LSP is a strategic step in improving the effectiveness and efficiency as well as the company's competitiveness in the logistics industry. RPA can help in accelerating package processing, improving data recording accuracy, optimizing delivery routes, accelerating customer claim settlement, and improving integration with marketplace systems. Therefore, based on the existing case study at The State-Owned Indonesian LSP, this research will analyze how the implementation of RPA can have a significant impact on digital transformation at The State-Owned Indonesian LSP.

Digital transformation is a crucial strategic step for logistics companies to survive and compete amidst the surge in shipping volume due to the growth of e-commerce. Despite having started the digitalization process, it still faces challenges in operational efficiency, delays in the delivery process, and limitations of real-time tracking systems. The application of Robotic Process Automation (RPA) technology is seen as a potential solution to overcome these problems. However, not many studies have specifically examined how the implementation of RPA impacts the effectiveness and efficiency of the shipment handling process at the State-Owned Indonesian LSP. The objectives to be achieved from the implementation of this research are as follows: 1) Knowing the application of Robotic Process Automation (RPA) can increase the effectiveness of the shipment handling process at The State-Owned Indonesian LSP; 2) Knowing the application of Robotic Process Automation (RPA) can increase efficiency in the process of handling shipments at The State-Owned Indonesian LSP.

II. Literature Rewiew

Operation Management

Operations management is a discipline that focuses on managing and optimizing the processes required to produce goods and services. According to Heizer, Render, and Munson (2020), operations management includes various activities ranging from planning, organizing, implementing, to controlling the resources used in the production process. In this context, operations management not only plays a role in ensuring the smooth running of the production process, but also serves as a strategic tool to achieve competitive advantage (Heizer et al., 2020). According to Suryono Efendi, Djoko Pratiknyo, and Edi Sugiono (2019) production is the process of creating goods or services. In addition, production can be understood as an activity or process that converts inputs into outputs. Meanwhile, operational management refers to processes or activities that aim to produce products by transforming inputs into outputs. Production and operations management can also be defined as activities that organize and coordinate the use of various resources effectively and efficiently to produce products or increase the use value of these products (Efendi, 2019).

Operations management is formed from two main concepts, namely management and operations. Operations itself refers to a series of activities that aim to transform inputs into outputs, both in the form of goods and services. Thus, operations management can be defined as a process of organizing or managing various resources involved in these transformation activities, ranging from human resources,

materials, technology, to information, to produce outputs that are in accordance with consumer needs and expectations. The main objective of operations management is to ensure that this transformation process runs efficiently and effectively, so that it can provide added value to customers and meet market demand optimally (Edo & Hendayani, 2023).

Supply Chain Management

Supply Chain Management (SCM) as an integrated system that connects various entities, ranging from suppliers, manufacturers, distributors, retailers, to end customers, with the aim of ensuring the smooth flow of goods and information, optimizing operational costs, avoiding stock imbalances, and improving distribution efficiency and customer (Sutarman, n.d.). According to Abdirad et al. (2021) in an effort to meet market demands, companies should apply the concept of Supply Chain Management. Supply Chain Management is a series of production processes and activities that start from procuring raw materials from suppliers, value adding processes that convert raw materials into finished products, storing inventory, to shipping finished products to retailers and consumers. Effective supply chain management can produce cheap, quality, and timely products, so as to meet market targets and provide benefits for the company. In addition, Dumitrascu et al. (2020) state that in a supply chain network there are three types of flows that need to be managed. The first is the flow of goods moving from upstream to downstream (Yusuf Muhammad & Soediantono, 2022).

SCM is a strategic approach to managing resources, production, distribution, and delivery of goods and services to increase value for customers and reduce operating costs. This perspective highlights the role of SCM in creating added value for customers and increasing the competitiveness of the company(Heizer *et al*., 2020). good SCM, companies can reduce production costs, increase distribution speed, and optimize inventory management. For example, companies such as Amazon and Toyota have successfully implemented effective SCM so that they can meet market demand quickly and efficiently. In addition, SCM also helps companies deal with global challenges, such as fluctuating raw material prices, supply chain disruptions, and volatile market demand. With digital technologies such as Big Data, Internet of Things (IoT), and Artificial Intelligence (AI), SCM is evolving to provide more adaptive and innovative solutions (Heizer *et al*., 2020).

Information accuracy and visibility in the supply chain are also two key interrelated factors, where high accuracy ensures the precision and reliability of the data exchanged, while good visibility enables the tracking and observation of all activities and processes in real-time, thus improving coordination, reducing errors, and enabling the identification and handling of disruptions more effectively (Azis & Irjayanti, 2024). Supply chain management (SCM) practices refer to approaches used to align the various parties in the supply chain, such as suppliers, manufacturers, distributors, and retailers, to ensure products or services can reach the end consumer efficiently. Effective SCM practices can improve operational efficiency, reduce costs, and increase customer satisfaction (Widyanesti & Masyithah, 2018).

Robotic Process Automation (RPA)

Robotic Process Automation (RPA) is an automation technology designed to mimic human interaction with a desktop user interface (GUI). RPA is robotic software that is used to perform computer tasks that are structured, routine, and repetitive. RPA utilization becomes more optimal when applied in large volumes. Although RPA is a new technology with unrealized potential, it is capable of mimicking human activities on a computer with higher speed and 100% accuracy. These robots can work non-stop 24 hours a day and 7 days a week without experiencing fatigue or performance degradation. RPA enables replication of the way humans perform repetitive tasks in an application, such as entering data or handling transactions. However, the goal of RPA is not to replace the role of humans in an industry or company, but rather to improve employee output. As such, RPA serves as an effective and powerful assistant to humans (Fernando & Harsiti, 2019).

Robotic Process Automation (RPA) is a new perspective in the world of transportation and logistics. Robots are smart machines that are applied in various industrial sectors, especially in automated

manufacturing plants. They not only reduce human workloads and create skill standards and cutting-edge methods in business processes, but also provide effective solutions for the transportation field. The complex business market situation makes the transportation industry in the supply chain face pressure to provide international standard services at an affordable cost. The combination of RPA and artificial intelligence (AI) can replace manual processes through the use of software robots. AI has the ability to learn and speed up the classification process by analyzing unstructured data, while RPA operates in a more organized manner (Gružauskas & Ragavan, 2020).

RPA is capable of automating a variety of manageable tasks and allows AI to access vast data sources. This technology is not only applied in warehouses and production lines, but also in logistics administration offices, providing added value in the delivery process. "RPA is a future technology that can be used to automatically process repetitive or large-volume tasks." RPA is often associated with AI because of its ability to complete a series of tasks and parts of work quickly and precisely, while robotic processes help address issues in transportation and logistics. To stay competitive in the market, every company must invest in new technologies and applications that can improve efficiency and agility in their business processes. RPA is not just a technology, but also facilitates a deep understanding of business processes and removes constraints in global-standard business operations. Transportation companies managing global supply chains in a constantly evolving and dynamic business environment are faced with immense pressure to provide high-quality services at low costs. However, operational processes within the organization, such as accounting, human resource management, shipping and more, are often filled with document-focused tasks (Gružauskas & Ragavan, 2020).

III. Research Methodology

The method used in this research is qualitative which is based on the philosophy of interpretivism, focusing on understanding the meaning and experience of individuals in their context, namely describing and analyzing phenomena from the point of view of the people involved. In this study, data collection techniques were carried out through secondary data, such as documents, reports, and other written sources relevant to the implementation of Robotic Process Automation (RPA). Secondary data was collected to analyze the impact of Robotic Process Automation (RPA) implementation on the effectiveness and efficiency of goods delivery. Five indicators were used to measure the level of effectiveness and efficiency of goods processing before and after the implementation of RPA. In this study, there are 2 main variables, namely RPA effectiveness and RPA efficiency variables as the basis for indicators for data collection, which are presented in Table 1 below:

Table 1 Variable Operational Table

Variabel	Indikator	Definisi Operasional
RPA Effectiveness	Number of HR to Process Goods	Number of human resources who perform the task of sorting goods
	Shipment Data Irregularity	Number of errors that occur due to human error before implementation and after RPA
	Shipment Data Production	Number of deliveries that have been produced before and after RPA implementation
Efisiensi RPA	Task Completion Time	Time taken to complete tasks before and after RPA implementation
	HR Costs Process Goods	Costs required to pay for human resources required to process goods

Variable Operational Table

The stages in qualitative research consist of several steps that are generally followed in the research process (Creswell & Creswell, 2022), here are the stages:

1. Formulating research questions: The first step in qualitative research is to formulate research questions that are relevant and in line with the research objectives. These questions will guide the data collection and analysis process.
2. Designing the study: After establishing the research questions, the researcher needs to design an appropriate research design. Qualitative research designs can be case studies, ethnography, phenomenology, grounded theory, or any other approach that suits the research objectives.
3. Collecting data: This stage involves collecting data directly through techniques such as interviews, observation, or document collection. Researchers may also apply triangulation techniques, which involves using multiple sources of data to gain a more thorough understanding.
4. Analyzing data: After the data was collected, the researcher analyzed the data systematically. Qualitative data analysis includes organizing, coding, and thematizing data to identify patterns, themes, or concepts that emerge from the data.

IV. Result / Finding

In this study, the author collected secondary data, which became the main source of data to determine the effectiveness and efficiency of RPA implementation at the State-Owned Indonesian LSP. Secondary data is data collected by researchers from various existing sources (researchers act as a second party) (Harahap & Tirtayasa, 2020). Secondary data can be obtained from various sources, such as books, reports, and journals.(Oktavia, 2021). According to Wulandari & Taufik (2020), secondary data generally consists of evidence, records, or historical reports that have been compiled in published and unpublished archives (documentary data) (Novelni & Sukma, 2021). Data collection in qualitative research is holistic, in-depth, and contextual. Data is obtained through techniques such as in-depth interviews, participatory observation, document studies, and field notes. For data collection, the researcher conducted observations of the State-Owned Indonesian LSP to obtain data on the number of human resources involved in the goods shipment process, as well as the time required to process a shipment by comparing data from 2023 and 2024.

Meanwhile, production data, irregularity data, and human resource cost data used at the State-Owned Indonesian LSP were obtained through an internal website that facilitates data retrieval. Production data and irregularity data were collected over a six-month period, from January to June in 2023 and 2024, to determine the effectiveness of RPA use at the State-Owned Indonesian LSP. The data is presented in tabular form.

After the data is obtained, data reduction is performed. Data reduction refers to a series of actions to filter, group, focus, and remove irrelevant information, as well as organize the data in such a way as to enable the drawing of conclusions and verification of the final results. In qualitative research, data reduction is carried out by the researcher through various forms of transformation, such as selective data selection, grouping into general patterns, and other techniques. This study performs data reduction by grouping and sorting data relevant to the final results of the research, so that unnecessary data is deleted. Thus, the secondary data that has been obtained and reduced is presented in the sentence below:

Secondary Data

In collecting secondary data in this study, the authors conducted observations to collect data on the number of human resources needed, HR costs, and the length of time to process shipments before and after using RPA. Then for production data and irregularity data, the authors collect data through internal sites and are presented in table 2 below:

Table 2 National Production & Irregularity Table

National Production			Irregularity		
Month	**Production 2023**	**Production 2024**	**Bulan**	**2023**	**2024**
January	11.784.965	12.552.693	January	40	67
February	10.611.713	11.268.120	February	38	47
March	13.302.195	14.022.076	March	47	52
April	11.007.147	11.054.349	April	37	46
May	11.410.173	12.146.486	May	32	41
June	10.736.162	12.396.102	June	16	47
TOTAL	**68.852.355**	**73.439.826**	**TOTAL**	**210**	**300**

National Production & Irregularity Table

Meanwhile, the field observation stage was carried out to collect data on the number of human resources, the length of time for the delivery process, and the cost of human resources when using RPA and before using RPA, the data is available in table 3.

Table 3 Observation Data

COMPARATIVE DATA		
Data	**2023**	**2024**
Number of HR on duty	70 people	24 people
Length of time for processing goods	8.4 seconds/item	1.2 seconds/item
Human resource costs per month	Rp 466.667.000	Rp 191.667.000
Human resource costs per year	Rp 5.600.000.000	Rp 2.300.000.000

Observation Data

Data Reduction

In the reduction of production data in 2023 with the period January to June, the data has been adjusted to the office that uses RPA but in 2023 it still uses human labor to process goods and for the reduction of production data in 2024 the office has used RPA as a tool that helps process goods, the data is available in table 4.

Table 4 Production Data Reduction

Production		
Month	**Production 2023**	**Production 2024**
January	1.387.610	1.056.166
February	1.157.120	869.956
March	1.419.148	1.070.833
April	1.203.650	862.351
May	678.040	910.594
June	1.136.795	1.008.998
TOTAL	**6.982.363**	**5.778.898**

Production Data Reduction

Reduction of irregularity data in 2023 with the period January to June, irregularity data has been adjusted to the data needed, namely misdirected shipments and under-delivery differences, while reduction of irregularity data in 2024 with the period January to June, irregularity data has been adjusted to the data needed, namely misdirected shipments and under-delivery differences. The data is presented in table 5.

Table 5 Irregularity Data Reduction

	Irregularity	
Month	**2023**	**2024**
January	33	56
February	34	37
March	38	38
April	31	32
May	21	36
June	7	34
TOTAL	**164**	**233**

Irregularity Data Reduction

During 2023, production data showed significant fluctuations despite reductions and adjustments made by offices implementing Robotic Process Automation (RPA). The goods processing process still relies on human labor, which may affect production instability. Production started strongly in January with 1.3 million items. However, February saw a 15% decline to 1.1 million items. In March, there was a recovery with a 27% increase (1.4 million items), setting a record high for this period.

This positive trend did not continue in April, when production fell by 14% (1.2 million items), followed by a drastic decline in May—only 600,000 items (50% of April's total). June showed improvement with an increase in production, although it did not reach March's level. These fluctuations indicate a reliance on human labor as a risk factor, while the adoption of RPA may not yet be fully integrated into physical production processes. Further analysis is needed to identify the causes of the decline in productivity, particularly in May, as well as strategies for stabilizing production moving forward. In 2024, the implementation of Robotic Process Automation (RPA) has been fully applied in goods processing, resulting in a more stable production pattern but with lower volumes compared to 2023. During the period from January to June 2024, production ranged from 800,000 to 1 million items per month—far below the previous year's peak of 1.4 million items in March 2023.

During the period January–June 2023, reduced and adjusted irregularity data—including misrouted shipments and short shipments—showed a total of 164 cases. The highest error rate occurred in March, while June had the lowest irregularity rate. In 2024, although the total number of irregularity cases remained the same (164), the distribution pattern differed. January had the highest number of errors, while April recorded the lowest. Interestingly, 2024 saw an increase in irregularities compared to 2023 when viewed from the monthly distribution, despite the total number of cases being the same.

V. Discussion

Shipping goods at the State-Owned Indonesian LSP is a critical process involving a series of steps to ensure that packages arrive at their destination safely and on time. One of the most important steps is the processing of shipped goods, where the destination must be determined based on the postal code, the route must be selected, and the transportation must be adjusted according to the product paid for by the sender. This stage is prone to errors, particularly misrouting of shipments and discrepancies in shipment quantities, which often occur due to human error or data inconsistencies. To address these issues, the State-Owned Indonesian LSP has implemented Robotic Process Automation (RPA) as a tool

to assist staff during the shipment processing stage. RPA is designed to minimize errors by automating data verification, route selection, and shipment calculations, thereby improving operational accuracy and efficiency.

This study aims to analyze the extent to which RPA has proven to be effective and efficient in reducing delivery errors. The data used has undergone a reduction process to ensure that it only covers offices that have adopted RPA. The results of the analysis show that although RPA has the potential to reduce human error, error patterns are still fluctuating, with some offices experiencing a decrease in irregularities, while others have not shown significant improvement. These findings indicate that the success of RPA depends not only on the technology itself, but also on infrastructure readiness, staff training, and optimal system integration. Therefore, the State-Owned Indonesian LSP needs to conduct a comprehensive evaluation of RPA implementation, including a review of workflows and an increase in human resource capacity, so that automation can truly minimize errors and improve the reliability of delivery services.

Robotic Process Automation (RPA) Effectiveness

Based on theoretical studies, the effectiveness of a system is measured by its ability to achieve predetermined objectives. In the context of implementing Robotic Process Automation (RPA) at the State-Owned Indonesian LSP, there are two main objectives: first, to minimize human error in the goods delivery process, and second, to reduce the operational burden through the efficient use of human resources in the goods processing department. To assess the extent to which RPA has succeeded in achieving these objectives, the data presented in Figures 1 and 2 form the basis for analysis.

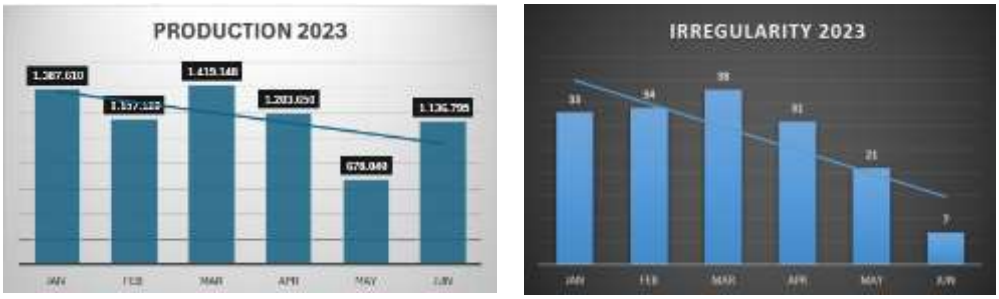

Figure 1 2023 Data Diagram

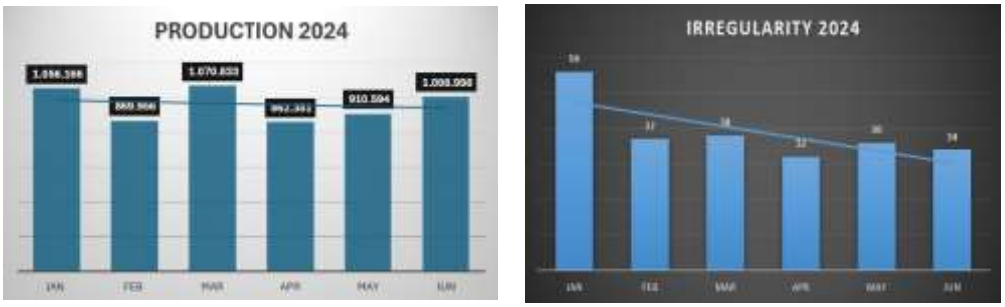

Figure 2 2024 Data Diagram

Based on the data presented, there is an interesting paradox in the implementation of Robotic Process Automation (RPA) at the State-Owned Indonesian LSP. In 2023, with a production volume of 6,982,363 units and 70 human resources in the goods processing department, there were 164 cases of irregularities. Meanwhile, in 2024, after the implementation of RPA, with a lower production volume (5,778,808 units) and the workforce reduced to 24 people, there was an increase in irregularities to 233 cases.

Robotic Process Automation (RPA) fficiency

The implementation of Robotic Process Automation (RPA) at the State-Owned Indonesian LSP aims to create operational efficiency, which is theoretically defined as an effort to achieve optimal results with minimal use of resources. In this context, RPA is expected to accelerate processes, reduce costs, and increase productivity. Based on the data presented, there are two main indicators that demonstrate the level of efficiency after the implementation of RPA, namely processing time per item and human resource expenditure.

First, in terms of process speed, there was a significant improvement after the implementation of RPA. In 2023, the time required to process one item reached 8.4 seconds, whereas in 2024, this time dropped dramatically to just 1.2 seconds. This substantial difference demonstrates that RPA has successfully accelerated workflows dramatically, enabling faster processes and better responses to service requests. Second, in terms of operational costs, the State-Owned Indonesian LSP managed to significantly reduce monthly expenses. In 2023, human resource costs amounted to Rp466,667,000 per month, while in 2024, these costs decreased to Rp191,667,000. As a result, there was a savings of Rp275,000,000 per month, reflecting very high cost efficiency following the implementation of RPA. This cost reduction was not only due to a decrease in the number of employees but also from process optimization that reduced resource waste.

From these two indicators, it can be concluded that RPA has brought about real efficiency gains for the Indonesian State-Owned LSP, both in terms of process speed and cost savings. However, while RPA has proven to be efficient in this context, other aspects such as output quality and the long-term impact on overall organizational performance must also be considered. Efficiency is not only measured by speed and cost reduction, but also by the consistency of service quality and the ability to adapt to future changes. Therefore, although RPA has shown positive results, regular evaluations are still necessary to ensure that its implementation remains aligned with the company's strategic objectives.

This study reveals the dual impact of implementing Robotic Process Automation (RPA) at the State-Owned Indonesian LSP, with different results in terms of effectiveness and efficiency. In terms of effectiveness, RPA has successfully achieved its target of reducing dependence on human resources, as evidenced by a decrease in the number of employees in the goods processing department from 70 (2023) to 24 (2024). However, this technology has not yet been optimized to minimize operational errors, as evidenced by an increase in irregularities from 164 cases (2023) to 233 cases (2024), despite a decrease in production volume from 6,982,363 to 5,778,808 units. These findings indicate the need for system design improvements and enhanced data input quality to maximize the effectiveness of RPA. In terms of efficiency, RPA has shown very positive results. The processing time per item has accelerated significantly from 8.4 seconds to 1.2 seconds, dramatically improving service speed. From a financial perspective, the company has successfully reduced monthly operational costs by Rp275 million (from Rp466.6 million to Rp191.6 million), demonstrating RPA's ability to optimize resource utilization. This achievement underscores that RPA is an effective solution for enhancing process speed and cost efficiency.

Overall, the study confirms that the implementation of RPA at the State-Owned Indonesian LSP has provided strategic value in digital transformation, particularly in terms of operational efficiency. However, to achieve maximum benefits, the company needs to refine the system with a focus on improving accuracy and output quality. A holistic approach that combines the advantages of RPA with process improvements will be the key to the success of the company's digital transformation in the future.

VI. Conclusion and Recommendation

The implementation of Robotic Process Automation (RPA) at the State-Owned Indonesian LSP showed complex and multidimensional results, especially in terms of the effectiveness of shipment handling. RPA proved effective in reducing dependency on human resources, with the number of employees dropping from 70 to 24. However, effectiveness in improving accuracy remains a challenge, with the number of irregularities increasing despite a decrease in production volume. This indicates possible problems with workflow design, data input validation, and system adaptation. Operational

efficiency has improved significantly. Processing time per item dropped from 8.4 seconds to 1.2 seconds, and labor cost savings reached Rp275 million per month. This efficiency is driven by RPA's ability to work continuously without pause and with high consistency. In addition, the cost reduction also includes aspects of recruitment, training, and use of physical facilities. However, to ensure sustainability and long-term impact, the State-Owned Indonesian LSP needs to build a more comprehensive performance evaluation system, covering aspects of customer satisfaction, company reputation, innovation, and readiness for digital transformation. With such a holistic approach, RPA can act as the main motor in a more strategic and sustainable digital transformation for the organization.

The implementation of RPA at the State-Owned Indonesian LSP has shown mixed results. Although it has succeeded in improving efficiency with a 59% reduction in costs and an 85% acceleration in processes, its effectiveness in reducing errors has actually decreased (irregularities increased by 42%). To address this, the company needs to take four strategic steps. First, conduct a comprehensive evaluation of RPA workflows to identify the root causes of increased errors. Second, establish a real-time monitoring system with automatic escalation mechanisms. Third, enhance human resource capacity through comprehensive training that covers technical skills and change management. Fourth, consider integrating with AI/ML for development toward hyperautomation. These steps are designed to optimize RPA while preparing for a more comprehensive digital transformation. With this structured approach, companies can maximize the benefits of automation while minimizing its negative impacts, laying a strong foundation for future digital evolution.

For further research on hyperautomation in the logistics industry, it is necessary to develop a comprehensive evaluation framework that covers three main dimensions: operational performance (efficiency and productivity), strategic impact (customer experience and business innovation), and technical aspects (system integration and data security). This holistic approach is important for measuring the true value of a company's digital investments. At the technical level, research should focus on optimizing the integration of RPA with supporting technologies such as AI, NLP, and IoT. Experiments with various implementation scenarios are needed to find the model that best suits the operational characteristics of the State-Owned Indonesian LSP, while ensuring system security in an increasingly complex work environment. The aspect of human resource transformation requires a special approach by developing a competency-based digital training model and redesigning an adaptive organizational structure. Comparative studies with best practices in global logistics companies will provide valuable insights for accelerating digital transformation. For long-term preparation, predictive research on the evolution of hyperautomation technology and its impact on future logistics business models is crucial. Systemic analysis is needed to understand the dynamics of interaction between technology, business processes, and human factors in an ever-evolving digital ecosystem.

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