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Analyzing of ERP Utilization to Assess Production and Inventory Efficiency

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ABSTRACT

Purpose – This paper aims to assess production and inventory efficiency after the ERP system transition from Odoo to INSYS at a food manufacturing company in Indonesia, by applying lean manufacturing indicators. It further analyzes the obstacles encountered during the transition, how these obstacles affect production and inventory efficiency, and provides strategic recommendations for improvement..
Methodology/approach – This research used a qualitative descriptive method. Data were collected through interviews with relevant informant, supplemented by observations and internal company documentation. Analysis was conducted using lean manufacturing waste indicators..
Findings – It was found that. There is no increase in production and inventory efficiency after changing the INSYS ERP system, this is due to several obstacles such as inter-departmental dependencies, INSYS ERP system limitations, adaptation to different systems, lack of training and socialization, human error and employee resistance, mismatch between minimum purchase quantity (MOQ) and actual needs, not integrated with supplier systems that support real-time tracking.
Novelty/value – While numerous studies have focused on ERP success factors, few have explored post-ERP system migration production and inventory efficiencies in the food manufacturing industry and the barriers affecting them. This paper offers contextual insights into ERP-related efficiencies and provides strategic direction specific to the dynamics of perishable goods production.

INTRODUCTION

Operational efficiency in the food manufacturing industry is an important and crucial matter because it can provide many benefits for companies, such as reducing waste and increasing the company's competitive advantage. Operational efficiency, particularly in inventory management and production within the food manufacturing industry, presents a significant challenge because the raw materials used are perishable in nature, thereby requiring timely delivery, accurate inventory management, and a responsive production system with minimal waste. Inventory and production in the food manufacturing industry play a vital and crucial role as they are closely tied to the core process of transforming raw materials into semi-finished or finished products ready for sale. In Indonesia, there are strict regulations governing the food manufacturing industry.

One of the regulations related to this industry is Undang-Undang No. 18 Tahun 2012 tentang Pangan, which emphasizes the importance of systematically and transparently managing raw materials and the supply chain to ensure food safety. This means that production processes must be conducted transparently and traceably. Additionally, other regulations such as BPOM Regulation No. 10 of 2023 require the identification or coding of raw materials, packaging materials, and final products to facilitate traceability. Furthermore, companies must have an effective traceability and product recall system, including simulations in case of food safety issues. International standards such as ISO 22000 on Food Safety Management encourage the implementation of systems that can integrate all production and distribution processes into a unified platform.

Solutions that can be applied to address these challenges and comply with existing regulations include adopting systems that support operational ease and efficiency, such as leveraging information technology like Enterprise Resource Planning (ERP). The use of ERP systems in companies can help manage all operational activities, from inventory, production, to distribution, so the use of ERP is expected to be effective in improving company efficiency and enhancing competitive advantage. A previous study by Wulan et al. (2024) showed that ERP can reduce production time by up to 45.2% and increase inventory management efficiency by 32.8%. However, reality on the ground shows that there are various obstacles that cause ERP implementation to not always go as expected. A study by Mahmood et al. (2023) revealed that 52% of ERP projects in developing countries fail due to a lack of organizational readiness and technical challenges in adopting this system.

Food products are perishable, but the rate at which each food item spoils varies depending on the nature of the raw materials and the characteristics of the finished product to be produced. PT. Mulia Cipta Rasa, as a food manufacturing company specializing in frozen foods, particularly sausages, requires complex and stringent management to ensure product quality and safety are maintained in accordance with regulations, from raw material procurement to the product reaching the consumer. A system capable of supporting operational activities and enhancing company efficiency is needed to address the challenges of complexity and stringent regulations. An ERP system is the system the company hopes will meet these needs. PT. Mulia Cipta Rasa was established in 2014 with very low production volumes due to limited demand, and all company administration was still manual and poorly documented. In the following year, due to increased production and operational administration becoming difficult to manage manually, the Odoo ERP system was implemented until 2020. ERP Odoo improved the efficiency and effectiveness of inventory and production administration. PT. Mulia Cipta Rasa transitioned from Odoo ERP to INSYS ERP in 2020 to comply with the system standardization policy enforced by the parent company, PT. Mulia Raya Agrijaya.

The transition from Odoo ERP to INSYS ERP was a complex and intricate process, involving not only data migration but also understanding the new ERP system and adapting to it. Kanchi et al. (2024) state that data migration from the old system to the new system is a fairly complex activity due to challenges such as data quality, incompatibility between the old and new systems, and potential business disruptions. If not handled properly, this can lead to inaccuracies, operational delays, and waste. The productivity of PT. Mulia Cipta Rasa from 2019 to 2023 shows that productivity has remained relatively stable and has not shown a significant increase after switching from the Odoo ERP system to the INSYS ERP system. This indicates that the change in the ERP system has not yet had a positive impact on improving the company's operational efficiency, particularly in the production department, which also affects the inventory department. The absence of this increase raises the suspicion of obstacles hindering the ERP transition process and the implementation of the new system, which could affect the effectiveness of ERP usage in supporting the company's operational performance. This inefficiency will also lead to inefficiency in inventory and production performance. An analysis of the implementation of the INSYS ERP system and identification of obstacles encountered during the implementation of INSYS ERP is needed in order to formulate strategies to overcome these obstacles.

Previous studies have shown that ERP systems can improve operational efficiency, reduce inventory errors, and enhance traceability. ERP has been successfully used in various sectors to automate

processes and increase data accuracy. However, the majority of research has focused on ERP implementation success factors or the benefits of ERP in general. Few studies have addressed post-implementation challenges, particularly after an ERP system migration, and how such challenges may create new inefficiencies. Additionally, there is limited research focused on ERP use in food manufacturing settings, where time-sensitivity and quality control are critical.

A few researchers focused on ERP implementation in large-scale manufacturing and the use of ERP to reduce costs and improve coordination. There have been limited studies concerned on post-implementation efficiency especially in the context of system migration from one ERP platform to another. Therefore, this research intends to assess the production and inventory efficiency after the ERP system transition from Odoo to INSYS at PT. Mulia Cipta Rasa, and to identify the key obstacles that hinder the system's effectiveness.

LITERATURE REVIEW

1. Operation Management

Operations management is an effort to develop, implement, and maintain effective processes related repetitive activities to achieve specific organizational goals (Anderson et al., 2022). Operations management plays a role in transforming inputs into outputs in the form of goods and services, such as human resources, facilities, buildings, equipment, technology, materials, and information ((Kulkarni & More, 2022). Operations management ensures that organizations minimize waste and optimize results and resource utilization for the benefit of customers and all stakeholders (Anderson et al., 2022). The function of operations is to plan and coordinate all the resources needed to design, produce, and deliver goods to various retail locations (Kulkarni & More, 2022). Efficient operations management is a foundation of the manufacturing business, particularly in the food and beverage industry, as it can influence productivity, product quality, customer satisfaction, and company profits (Geminarqi & Purnomo, 2023).

2. Inventory Management

Inventory management is a company's effort to plan and control stock, which is a crucial part that influences the success of supply chain management (Ünal et al., 2023). In the manufacturing industry, production activities transform raw materials into finished products that are then sold, stored in warehouses as inventory, or even reprocessed in subsequent production. For many companies, inventory is an important asset that can account for half of the costs or investment capital (Munyaka & Yadavalli, 2022). Companies can utilize ERP systems to help manage and control inventory more effectively and efficiently to minimize losses, as well as address issues and shortcomings of traditional inventory management (Zhao & Tu, 2021).

3. Lean Manufacturing

Lean Manufacturing is a concept created and developed with the aim of improving efficiency by minimizing waste and maximizing the utilization of resources (Kumar et al., 2022). This concept has been used by many companies, especially in developed countries, and was initially developed by Toyota through the TPS (Toyota Production System) (Habib et al., 2023). The objective of implementing Lean Manufacturing is to create an effective and efficient work environment by understanding the principles, techniques, and applications of Lean Manufacturing (Kumar et al., 2022) Additionally, lean manufacturing plays a crucial role in improving various company performance metrics, making it a critical approach in continuous improvement efforts (Gebeyehu et al., 2022). ERP (Enterprise Resource Planning) can serve as a tool to support more innovative, effective, and efficient operational activities in the implementation of lean manufacturing (Saleem, 2022).

4. Enterprise Resource Planning (ERP)

The origins of ERP can be traced back to MRP (Material Requirements Planning), which emerged in the 1960s and focused on managing production and inventory in manufacturing companies by optimizing material usage. MRP helps plan and manage manufacturing processes more efficiently

(Jawad & Balázs, 2024). Enterprise Resource Planning (ERP) is a system consisting of software components developed from traditional manufacturing resource planning systems for operational purposes (Febrianto et al., 2022). ERP is used to manage and integrate business processes in real time (Katuu, 2020). The Enterprise Resource Planning (ERP) system has various interconnected main components to support efficient and data-driven management. The ERP system itself has strong analytical and reporting capabilities to facilitate users in creating reports, monitoring data, and evaluating company performance with ease (Jawad & Balázs, 2024).

METHOD

This study adopts a qualitative descriptive approach to investigate the production and inventory efficiency that emerged after the ERP transition at PT. Mulia Cipta Rasa, a food manufacturing company specializing in frozen products. The research focuses on how the ERP migration from Odoo to INSYS affected production and inventory efficiency.

Research Object

The object of this research is PT. Mulia Cipta Rasa, a medium-sized frozen food manufacturer located in Indonesia. The company initially implemented the Odoo ERP system in 2015 and later migrated to the INSYS ERP system in 2020 to align with its parent company's digital infrastructure.

Population and Sample

The subjects in this study were selected purposively, namely those who had direct and relevant experience in the ERP implementation process and production and inventory management at PT. Mulia Cipta Rasa. The employees involved consisted of PPIC supervisors, production supervisors, Quality Control supervisors, or other employees who also used ERP. Respondents were selected based on their level of knowledge of the ERP system, their involvement in operational and inventory processes, and their capacity to provide rich and in-depth information. This aims to ensure that the data obtained can provide a comprehensive picture of the obstacles and efficiency strategies post-ERP implementation within the company environment.

Data Collection Techniques

This study uses primary and secondary data to gain an in-depth understanding of the obstacles to inventory and production management efficiency after ERP implementation. Primary data was obtained through interviews with respondents directly involved in the use of ERP in the inventory and production departments, such as production supervisors, PPIC supervisors, and other ERP users in related departments. The interviews were conducted in a semi-structured manner so that the researchers could gather information in a flexible yet focused manner. Secondary data was collected from internal company documents.

Data Analysis Techniques

The data analysis technique in this study uses a descriptive qualitative approach with Miles and Huberman's analysis model, which consists of three stages: data reduction, data presentation, and conclusion drawing. Data reduction is carried out by sorting and simplifying data from interviews and internal company documents to align with the research focus, which is the challenges in inventory efficiency and post-ERP implementation production. Data presentation involves systematically organizing the reduced data into thematic narratives to facilitate the identification of patterns, relationships, and emerging meanings. Conclusions are drawn through data triangulation to ensure the validity of the findings. Through this stage, it is hoped that the analysis results will provide an in-depth and comprehensive picture of the ERP implementation conditions and strategies that can be applied to improve production and inventory efficiency in the company.

RESULT AND DISCUSSION

Implementation of INSYS ERP at PT. Mulia Cipta Rasa

PT. Mulia Cipta Rasa is a food manufacturing company committed to improving the effectiveness and efficiency of its operational performance, one of which is through the implementation of an Enterprise Resource Planning (ERP) system. The Enterprise Resource Planning (ERP) system is used by the company to integrate company data and streamline business record-keeping on a single platform (Jawad & Balázs, 2024). The company initially used the Odoo ERP system, but since 2021 has transitioned to ERP INSYS, developed by the IT team of the parent company, PT. Mulia Raya Agrijaya. This change aims to align information systems across business units within the corporate group. ERP INSYS is used in various departments such as sales support, PPIC, procurement, production, QC, and finance. The system facilitates production planning, recording of raw materials and production outputs, and monitoring of production processes through production orders (SPP) and releases.

One informant stated, "*In my experience with both systems, Odoo and INSYS, INSYS is simpler and easier to use. However, in terms of detail, Odoo is more detailed*." (Informant 1). This indicates that INSYS is a more structured and integrated system between modules, but with the consequence of a more rigid workflow, which requires more disciplined coordination between departments. The same informant also stated, "*With INSYS, the departments that are interconnected actually have other tasks. So it hasn't been done yet, so it's delayed. So my work is also automatically delayed*." (Informant 1).

Although the INSYS ERP aims to create uniformity and visibility of data across the board, this system change also poses new challenges in terms of employee adaptation, workflow changes, and technical operational management that are not yet fully optimized on the ground. This aligns with the opinion of Harb et al. (2022), who state that system changes in a business, especially ERP systems, can create challenges and affect how employees perform their work in the company.

1. Production Defects

Defects are one of the indicators that can determine production efficiency, the lower the defects or rework, the higher the production efficiency. Defects are defined as the result of shortcomings or errors in performance (Setianandha et al., 2024). Dewi et al. (2021) state that defects are categorized in lean manufacturing as one of the types of waste that must be minimized because they can lead to rework activities, increase production time and costs, and disrupt the overall process flow. The following is defect data for the years 2019-2023:

Table 1. Defect Frequency Data for 2019-2023

Tahun	Frequency of defects/rejects due to contamination	Percentage of defects/rejects due to non-compliance with standards per day
2019	2	3,0%
2020	2	3,2%
2021	3	3,0%
2022	3	3,1%
2023	4	3,2%

Source: PT. Mulia Cipta Rasa 2019-2023, processed

From the production defect data for 2019-2023, PT. Mulia Cipta Rasa shows an increase in annual defect frequency since the ERP system was changed from Odoo to INSYS, although the daily percentage of defects due to non-compliance with visual and size standards has remained stable. Based on the interview results, the informant stated, "*If the cause was input errors, that has never happened. Because once the SPP is issued, it is usually double-checked and confirmed by QC, the warehouse, and production as well. So, if the cause is input errors, that's never happened. If it's not input errors, then human errors on-site have happened. In Odoo, that's never happened*" (Informant 1). Another informant also stated the same thing: "*Defects due to input errors have never happened; it's more likely due to human error, contamination, or machine damage. In Odoo, it's the same as that*" (Informant 2)

"*In production, product defects have never been caused by input errors or system issues; it's more likely due to other factors*" (Informant 3). Product defects caused by contaminants can be physical contamination, chemical contamination, or biological and microbiological contamination. Factors influencing this can originate from raw materials, humans, or production equipment or machinery. Before starting the production process, it is important to check that these defect-causing factors are truly absent. This aligns with the opinion of Sarkar & Fu (2022), who state that ensuring the absence of contaminants is a critical operational step requiring attention, as it can impact product quality. This increase in defects highlights two important issues: the stability of quality control on-site and the limited role of the ERP system in preventing or minimizing defects. ERP INSYS has not yet played a strategic role in actively preventing defects. The INSYS system is not yet integrated in real time with the quality control module for visual non-conformance reporting. This makes the system function only as a passive recorder, not as a preventive tool or root cause analysis tool. This increase in defects also necessitates rework to handle defective products. Rework is a wasteful activity carried out to repeat an activity that was previously performed incorrectly or improperly (Setianandha et al., 2024). Thus, the INSYS ERP system has not played a role in improving production efficiency. Improvements are still needed to optimize ERP usage and increase production efficiency.

2. Waiting Time Production

Waiting time production is also one of the indicators that can determine production efficiency, the lower the waiting time, the higher the production efficiency. This is in line with the opinion of Irjayanti et al. (2025), who state that reducing waiting time or idle time and preventing delays can increase efficiency in the production line. Dewi et al. (2021) state that waiting time is categorized in lean manufacturing as one of the types of waste that must be minimized because it causes process delays and production costs, and can disrupt the overall process flow. Waiting time is the time when a process cannot be performed due to waiting (Ali et al., 2025). The following is a figure of operator overtime frequency from 2019 to 2023:

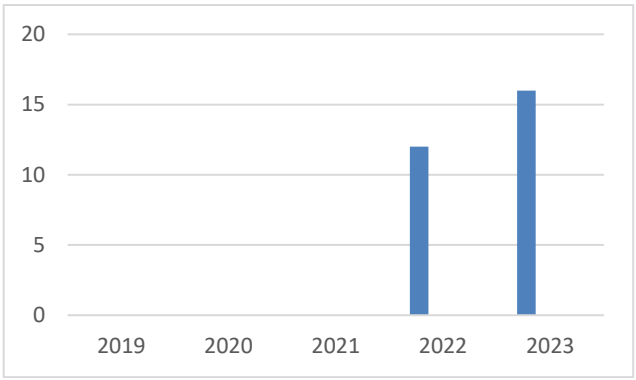

Figure 1. Operator Overtime Frequency for 2019-2023

Figure 1 show The increase in annual overtime, as shown in Figure 4.1. Operator Overtime Frequency for 2019-2023, indicates that regular working hours are insufficient to complete the production process, suggesting that waiting time has not been effectively addressed. This aligns with the opinion of Naibesi et al. (2024), who state that overtime is work performed outside of normal working hours due to tasks that cannot be completed during regular working hours. This may be caused by high waiting times in the production process. Based on the interview results, the informant stated, "*If there is a shortage of raw materials, then it usually takes a bit longer. There might be delays due to warehouse operators being busy with other tasks or something. We usually inform the group and then create a raw material replenishment form. The waiting time is usually around 10 minutes, but it can take up to 30 minutes at most*." (Informant 1). Another informant also stated the same thing: "*We don't wait, usually it's immediate. If there's a shortage, we just request it again from the warehouse operator, depending on*

the warehouse operator's workload. If they're not busy, it's quick, but if they're busy, it can take a while, maybe around half an hour" (Informant 2) *"...if, for example, production is short of a certain amount of materials. Usually, the time between requesting the shortage of raw materials and receiving them depends on the situation; sometimes it's quick, sometimes it can take longer*" (Informant 3).
This issue is caused by the lack of accuracy and consistency between the production plan and the actual availability of materials on the production line. This was also experienced previously when using Odoo, indicating that the waiting time due to raw materials is caused by human error from warehouse operators who are not properly providing materials, leading to waiting time and overprocessing. The contribution of the INSYS ERP system to waiting time cannot be ignored. The interviewee stated, "*Because the departments are interconnected, we can't operate independently. Unlike Odoo before, where we could handle everything from start to finish on our own, with INSYS, we can't do that. The interconnected departments must communicate with each other. So there are tasks from certain departments that are interconnected. They must share information*." (Informant 1). This system uses a modular structure that connects departments, but it lacks supporting features such as automatic notifications, cross-functional dashboards, and real-time warning systems. The interviewee also stated, "*...the release must wait and remind the warehouse department to complete the picklist and approval so I can release the product...*" (Informant 1). Another interviewee also stated, "*Perhaps for production, it's like waiting for each other during the release process while the warehouse completes its part*." (Informant 2).
When warehouse operators are late in completing the picklist, production supervisors cannot release the product because the system locks the next stage. This creates a bottleneck that spreads throughout the entire production process. Unlike the previous ERP system (Odoo), which allowed departments to work more independently, INSYS tightens the workflow and requires more disciplined coordination. However, without supporting systems and further training, this interdependence between modules exacerbates the risk of delays. This aligns with the views of Limon & Sarker (2023), who note that ERP systems that are too rigid and conflict with lean concepts can cause process chaos and become obstacles. The INSYS ERP system is indeed designed to synchronize processes across departments in real time. However, in its implementation, this system actually causes waiting times and is not optimal in supporting time efficiency due to limitations in the system design and a lack of operational readiness on the part of users. As a result, the INSYS ERP system has not yet played a role in improving production efficiency. Improvements are still needed so that ERP use can be more optimal and increase production efficiency.

3. Overprocessing in Production

Overprocessing is one type of waste in lean manufacturing, which occurs when an activity is performed beyond the standard process requirements or repeated without adding direct value to the product. Setianandha et al. (2024) state that NVA (Non Value Added) is an action or activity that does not increase the value of the product and falls under the category of waste. Overprocessing typically manifests as duplicate record-keeping, repetitive manual verification processes, and inefficient system procedures. Based on interviews and observations, overprocessing in the production department at PT. Mulia Cipta Rasa is caused by two factors: raw material shortages during production and limitations in the integration of the ERP INSYS system.
The interviewee stated, "*for Releasement, must wait and remind the warehouse department for the picklist and approval so I can release the product. Additionally, for requests for additional raw materials, it should align with what is in the SPP. However, traceability is challenging because each record must be opened individually*" (Informant 1). "*It's like when there is a shortage of raw materials, we have to keep reminding the warehouse operator to prepare them quickly. Similarly, traceability is usually complicated because each data record must be opened individually*" (Informant 3). The occurrence of raw material shortages during the production process requires operators to manually request additional raw materials, disrupting workflow and causing waiting time. This is caused by human error, specifically the lack of precision by warehouse operators in preparing materials according to the planned material requirements set by the Production Planning and Control Department (PPIC) through the Production Order (SPP) in the INSYS ERP system. This aligns with and is supported by

the opinion of Ikatrinasari & Kosasih (2021), who state that overprocessing can be caused by and related to administrative systems such as poor communication and human error.
Additionally, although it does not directly affect production and production efficiency, the limitations of the INSYS ERP system in supporting the traceability process also cause administrative overprocessing. Srivastava & Dashora (2022) state that traceability is an activity of collecting information about the complete history of a product. This traceability activity is typically conducted to track products due to defects, complaints, or audit requirements with a desired quick turnaround time. However, the use of the poorly integrated ERP INSYS and its limitations make traceability activities time-consuming and lead to overprocessing. The interviewee stated that this did not occur when using ERP Odoo. This indicates that ERP INSYS does not improve process efficiency but rather reduces it. ERP should assist and simplify processes related to production, such as traceability. This aligns with the opinion of Sarkar & Fu (2022), who state that the use of ERP can enhance a company's capabilities, such as improving efficiency, transparency, and traceability.
The use of INSYS ERP does not reduce overprocessing but instead increases it. The overprocessing that occurs at PT. Mulia Cipta Rasa is a combination of human error and system failure. Therefore, the INSYS ERP system has not yet played a role in improving production efficiency. Improvements are still needed to optimize ERP usage and enhance production efficiency.

4. Underutilized Production Skills

Underutilized skills are a form of waste caused by the failure to maximize the abilities and skills of personnel in carrying out operational activities and promoting improvement activities (Rajab et al., 2022). Underutilized skills are included in the waste categories that must be addressed in lean manufacturing. The informant stated, "*So far, there have been no obstacles and production has been running smoothly. The only problem is when there are delays from warehouse operators regarding picklists and the time taken to prepare additional raw materials*." (Informant 3). Another informant also stated something similar "*In my opinion, there are no problems with the production department*." (Informant 2). "*...in my opinion, it is sufficient and there are no problems. Regarding the warehouse department, the discipline in inputting or preparing picklists is a bit slow, it's not done immediately*." (Informant 1).
Underutilized skills at PT. Mulia Cipta Rasa are not a dominant obstacle in the production process, rather, they are caused by another department, namely the warehouse. This can be concluded from the absence of complaints regarding the ability or misuse of ERP by production personnel operating the INSYS ERP system, specifically production supervisors, indicating that system user competencies on the production line are adequate. The informant stated that "*There is socialization. However, it is not conducted in a significant manner, such as through seminars or forums. Instead, it is done step by step. Usually, we are asked to try using it first. Then, if there are any issues, we ask how it should be done. Perhaps during the transition process, there are many things we do not yet know. We also ask a lot of questions to the parties related to the system*" (Informant 3). "*There is a socialization program. The socialization training was not long; it was conducted by Mulia Raya. Here, if there are difficulties, I directly ask the General Manager. The training process is that each department is given socialization according to their needs*" (Informant 1).The personnel selected to be responsible are those who have undergone ERP INSYS training and have proven capable of operating the system effectively. Training is an important process that must be undertaken by the relevant personnel to prevent difficulties in performing tasks related to the system, in this case ERP INSYS. This aligns with the view of Harb et al. (2022), who state that insufficient training and knowledge can lead to difficulties in using the system and cause personnel resistance to the technology. Centralizing ERP responsibilities among competent personnel also offers its own efficiency benefits. This strategy reduces the risk of input errors from other operators who are not familiar with the system, while also showing that the utilization of human resources has been adjusted to their respective capacities and roles. This is in line with the opinion of

Wijaya et al. (2023), that companies need to understand their readiness to implement ERP in order to support the ERP implementation process so that it runs effectively and optimally.

5. Defect Inventory

Defects in inventory management refer to damage to raw materials and finished products due to accumulation or delays in use caused by inaccurate inventory systems, which impact quality and efficiency. Defects in lean manufacturing are classified as one of the wastes that need to be eliminated or reduced (Dewi et al., 2021).

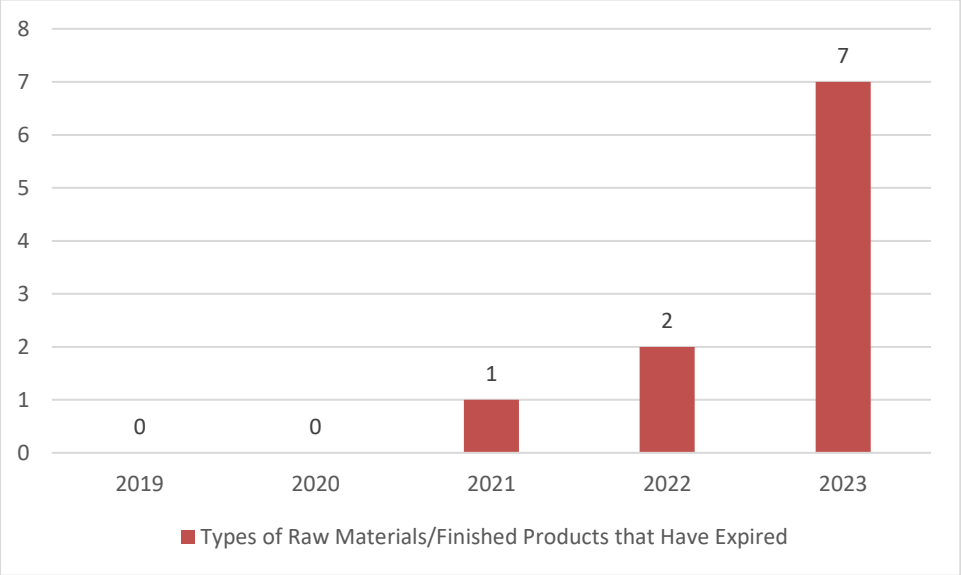

Figure 2. Frequency of Raw Material Expiry

Defect inventory at PT. Mulia Cipta Rasa is characterized by expired raw materials. According to the informant, "*There is no warning in INSYS, but in Odoo there is a warning. So, if it's about to expire, Odoo usually gives a warning. It turns red, meaning it's red. That's what it's called, red. In INSYS, if it's already expired, it needs to be checked. We have to check it frequently.*" (Informant 2). Another informant also stated something similar "*...in Odoo, there is a warning when something is about to expire. In INSYS, there is no warning; you just have to manually check if it has expired or not*." (informant 3). The absence of an automatic notification feature in the INSYS ERP system to monitor expiration dates means that the monitoring of shelf life is still done manually. This issue has never been encountered when using Odoo ERP, as Odoo has a system that alerts users when raw materials are about to expire. This weakness indicates that INSYS does not fully support efficient inventory control practices based on a system. Additionally, the procurement system based on Minimum Order Quantity (MOQ) from suppliers contributes to stock accumulation that does not align with actual needs.

Based on the interview results, the informant stated, "*So, generally, there are two challenges. The first is why we end up with damaged materials or excessive stockpiles. Usually, one reason is that the raw material usage itself is too low, so it becomes slow-moving. The second reason is that the usage is low, combined with the MOQ...*" (informant 2). Such purchasing strategies increase the risk of defective inventory due to the high likelihood of materials remaining unused beyond their optimal shelf life. This aligns with the view of Ikatrinasari & Kosasih (2021) that overstocking or excessive purchasing can lead to inventory waste. The use of ERP INSYS does not reduce defective inventory, the defective inventory at PT. Mulia Cipta Rasa is a result of system limitations (system failure). Therefore, the ERP INSYS system has not yet played a role in improving inventory efficiency. Further improvements are needed to optimize ERP usage and enhance inventory efficiency.

6. Overproduction Inventory

Overproduction is one of the wastes in lean manufacturing that needs to be minimized (Dewi et al., 2021). Overproduction can lead to stockpiling, additional storage costs, and the risk of damage or expiration. The interviewee stated that "*Usually, production is carried out according to the incoming*

purchase orders, so it is already adjusted and not excessive. As for the system, there's nothing yet to help with this because it's just adjusted based on incoming Pos, INSYS or Odoo only help in calculating the raw materials used." (Informant 3). Another informant also stated something similar "*All production activities are based on the number of incoming POs, so there shouldn't be any overproduction. For Odoo and INSYS, it's the same there's no difference.*" (Informant 1). At PT. Mulia Cipta Rasa, overproduction is not a significant obstacle because the production process is based on customer pre-orders recorded at the beginning of the month. The INSYS ERP system helps calculate raw material requirements based on the number of purchase orders, but it does not offer significant advantages over the previous system (Odoo). Both Odoo and INSYS still rely on manual input from purchase orders, without features such as demand forecasting or historical trend analysis that could improve production planning accuracy. According to Limon & Sarker (2023), ERP systems should be able to assist companies in forecasting. Inventory efficiency is more determined by the company's operational patterns than by the advantages of the INSYS ERP system. The INSYS ERP system does not worsen the situation, but it has not brought about any significant improvements in this regard either.

7. Waiting Time Inventory

Waiting time in inventory management is one form of waste in lean manufacturing that can reduce supply chain efficiency if not properly controlled. Dewi et al. (2021) state that waiting time is categorized in lean manufacturing as one of the types of waste that must be minimized because it causes process delays and costs, and can disrupt the overall process flow. Waiting time is the time when a process cannot be performed because of waiting (Ali et al., 2025). A informant stated that "…*Usually, delays occur because raw materials arrive late, so it's from the supplier's side*" (Informant 1). Another source also stated something similar "*Delays in raw material procurement are not usually due to approval factors. It's more because of the delivery schedule set by the supplier to us*" (Informant 2). *"...there have been a few instances of raw material delays, usually because the supplier didn't arrive on time, or it was postponed because the raw materials weren't available yet...*" (Informant 3). Delays in raw material delivery from suppliers can disrupt production schedules and potentially cause idle time and delays in fulfilling customer orders.

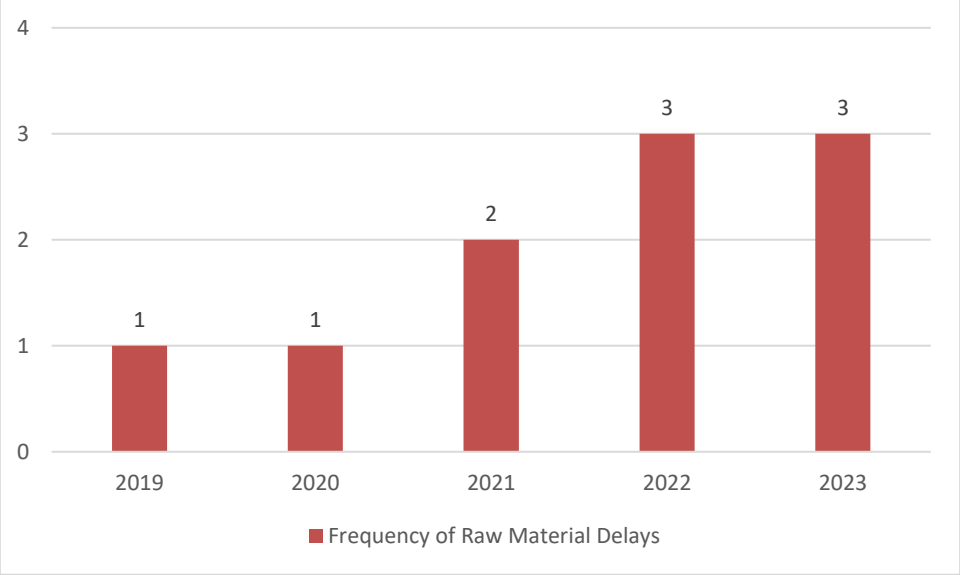

Figure 3. Frequency of Raw Material Delays

Based on Figure 2. Frequency of Raw Material Delays, it can be seen that the frequency of raw material delays shows an upward trend, although it can still be considered relatively constant. The trend in raw material delays indicates that this issue has not been resolved systematically, despite the company using the INSYS ERP system. This suggests that the presence of an ERP system does not automatically

guarantee improved supply chain efficiency if it lacks features aligned with operational needs. INSYS does not yet have real-time shipment tracking integration, so procurement staff still need to communicate manually with suppliers. Tarigan et al. (2021) state that companies implementing an ERP system integrated with suppliers can enhance collaboration with suppliers by sharing real-time data and easily scheduling and monitoring material shipments, thereby improving efficient integration within the supply chain. Thus, INSYS ERP has not yet succeeded in improving efficiency in the raw material procurement aspect due to the lack of shipment tracking features and automatic warning systems. To achieve overall supply chain efficiency, it is necessary to strengthen integration between ERP and external partners (suppliers) and automate the shipment monitoring process.

8. Underutilized Skill Inventory

Underutilized skills are a waste caused by the failure to maximize the use of personnel's abilities and skills to carry out operational activities and encourage improvement activities (Rajab et al., 2022). Based on interviews, the informants stated that "*...warehouse operators are often late in completing picklists, perhaps because they are busy with other tasks. It's just a lack of awareness*" (Informant 1). Another informant also stated something similar "*When it comes to discipline in data entry, it's more about character and habits than skills. So, consistency is actually a big challenge*" (Informant 2). "*...it's just that warehouse operators tend to delay their responsibilities in the system, such as during incoming processes or picklists*" (Informant 3).

This phenomenon emerged after the transition from the Odoo ERP system to INSYS. This was mentioned by a source who stated, "*Because the departments are interconnected, we can't operate independently. Unlike Odoo, where we could handle everything from start to finish on our own, with INSYS, we can't do that. The interconnected departments need to communicate with each other. So there are tasks from certain interconnected departments*." (Informant 1). The internally developed INSYS ERP has a modular structure that is interconnected, unlike Odoo, which is more flexible and less dependent on process order. This has caused disruptions in workflow, particularly among warehouse operators accustomed to the old system. This situation indicates that human resources have not been fully utilized to support the new ERP system. Although initial training on ERP usage was conducted, the lack of follow up training related to ERP INSYS usage, coupled with the absence of automatic notification features in INSYS, exacerbates the situation as coordination between departments still relies on manual communication. This not only reflects underutilized skills but also generates implicit resistance from operators toward the new system, as it is perceived as more complex and requiring higher precision than before. This resistance may stem from a lack of understanding of the benefits of the new system, discomfort with technological changes, or distrust in the effectiveness of INSYS compared to the previous system. This is in line with the opinion of Harb et al. (2022), who stated that a lack of training and knowledge can cause difficulties in use and lead to personnel resistance to the technology system. Wijaya et al. (2023) stated that companies need to understand their readiness to implement ERP in order to support the ERP implementation process so that it runs effectively and optimally.

The INSYS ERP system has not yet succeeded in empowering the potential of the system and users to manage inventory efficiently. Thus, INSYS ERP does not yet fully support improvements in inventory management efficiency, and it is still necessary to strengthen the system's features and improve operator competencies so that ERP functions can be utilized optimally.

Barriers to Inventory and Production Efficiency

As mentioned earlier, based on the factors identified in each indicator of successful ERP implementation based on lean principles, there are seven categories identified that significantly hinder production and inventory efficiency at PT. Mulia Cipta Rasa, "Interdepartmental dependency", "Limitations of the INSYS ERP system", "Adaptation of system differences", "Lack of training and socialization", "Human error & employee resistance", "Mismatch between minimum order quantity (MOQ) and actual needs", "Lack w of integration with supplier systems that support real-time tracking". The following is a discussion of these factors:

1. **Limitations of the INSYS ERP System**

The INSYS ERP system was internally designed by the parent company to align information systems across business units. However, its implementation at PT. Mulia Cipta Rasa has posed several challenges due to its more complex structure and workflow compared to the previous ERP system (Odoo). One example of this complexity is the production release process, which is entirely dependent on the completion of the picklist process by warehouse operators. If the picklist has not been completed, production supervisors cannot proceed with data input into the system, as INSYS automatically locks the next stage until the previous process is finished. This cross-module dependency is not an issue in the Odoo system, as departments can operate more independently. INSYS requires a higher level of process discipline, but unfortunately, this is not balanced by user-friendly features or support tools such as an intuitive interface or automated system notifications. This technical complexity is one of the factors causing bottlenecks in the production process, leading to increased waiting time, idle time, and potential delays in product delivery to customers.

In terms of inventory management, INSYS shows several limitations that directly impact work effectiveness and inventory efficiency. One of the most notable weaknesses is the absence of an automatic warning feature for raw materials nearing their expiration date. The absence of this feature forces warehouse operators and the PPIC department to manually check the shelf life of each material, either through the INSYS module or through physical stock taking. Such manual processes not only consume time but are also prone to oversight if personnel do not perform consistent daily checks. ERP should support real-time and predictive data-driven decision-making, including in terms of stock rotation, identifying slow-moving items, and controlling high-risk materials such as perishable products or those with short shelf lives. However, INSYS is not equipped with a stock rotation dashboard or reports on remaining shelf life of materials.

This limitation of INSYS indicates that although the company has transitioned from Odoo ERP to INSYS with the expectation of standardizing information systems, analytical functions and data-driven decision-making in inventory management have become less optimal due to the lack of automation features and comprehensive data visibility. This has become one of the main obstacles in achieving overall inventory efficiency. This aligns with the view of Limon & Sarker (2023), who state that ERP can also introduce complexity and lead to wasteful losses in lean systems if workflows are too rigid and contradict lean principles such as simplicity, adaptability, and frontline decision making.

2. **System Adaptation, Human Error, Employee Resistance, Lack of Training and Socialization**

The transition from the Odoo ERP system to INSYS at PT. Mulia Cipta Rasa requires significant adjustments on the operational side. However, not all personnel, especially at the operator level, can adapt quickly to the new system. Resistance to change does not always manifest explicitly but often takes the form of passive resistance, such as delayed data input and disregard for system procedures. This aligns with the findings of Harb et al. (2022), who noted that passive resistance is not openly expressed as criticism but rather through behaviors or reactions that are difficult to detect. One example is the negligence of warehouse operators in completing picklists on time. In the INSYS system, the release process by the production supervisor cannot be carried out before the warehouse completes the raw material picklist. The raw material picklist should be done after the raw materials are handed over to production. Operators sometimes fail to realize that their tasks are delayed until production delays or complaints from other departments occur. This does not happen when using Odoo, as in the previous system, each department could work more independently without waiting for input from other modules. INSYS, which uses an interconnected module system, requires higher individual discipline and responsibility, and not all personnel are ready for such changes. This resistance shows that the system change was not accompanied by the strengthening of a new work culture, nor was it supported by ongoing training or incentives for consistent and correct use of the system. Harb et al. (2022) state that

resistance can be caused by usability, ease of use, expectations, the magnitude of change, employee behavior, and perceptions of fairness in the ERP implementation process.
This indicates that INSYS requires higher discipline from every staff member, which, in practice, not all are ready to implement. This low level of readiness indicates that the system change has not been accompanied by a change in work culture and a comprehensive understanding of the importance of coordination in an integrated digital system. Wijaya et al. (2023) state that companies need to understand their readiness to implement ERP in order to support the ERP implementation process so that it runs effectively and optimally.

3. **Interdependence between departments**

The INSYS ERP system used at PT. Mulia Cipta Rasa has a mechanism that links modules in a mutually dependent manner. However, this system does not have an automatic notification feature that can alert warehouse operators about activities that must be carried out on a certain day, such as the raw material picklist schedule. There are two important types of picklists that directly impact the smoothness of operational processes. First, the raw material picklist for production, which is a prerequisite before the production supervisor can perform a release in the system. If the picklist is not completed, the production process cannot continue because the ERP system technically locks the release access. Second, the incoming raw material picklist from suppliers, which is a prerequisite for the QC department to perform quality checks on the materials. After the inspection is complete, the warehouse can then receive the materials via the system. The absence of an automated warning system forces warehouse operators to manually monitor picklist requests daily, which is prone to being overlooked, especially during high workloads. This situation causes delays across processes in both production and inventory, and indicates that the limitations of the INSYS design in supporting interdepartmental coordination are one of the barriers to achieving operational efficiency. This aligns with the statement by Tarigan et al. (2021), who assert that a company's technology system should provide benefits such as faster communication, interdepartmental coordination, and real-time data availability.

4. **Lack of integration between ERP and suppliers and mismatch between minimum order quantities (MOQ) and actual requirements**

One of the fundamental weaknesses of INSYS ERP that impacts inventory efficiency is the lack of connection between the system and external parties such as suppliers. The INSYS ERP system is only used internally by units under PT. Mulia Raya Agrijaya and does not yet have automatic system integration with suppliers' information systems. As a result, the process of monitoring the status of raw material shipments cannot be done in real-time. After a Purchase Order (PO) is created and sent through the system, there is no tracking feature or automatic confirmation from the supplier. This necessitates procurement personnel to manually follow up using informal communication channels such as phone calls or personal messages. Tarigan et al. (2021) state that integration with suppliers can improve the efficiency of raw material procurement and the accuracy of raw material delivery. This issue complicates documentation and traceability. This indicates that the INSYS ERP is not yet optimal as a supply chain control system because it only covers internal company processes, not the entire supply chain from upstream to downstream. Additionally, inventory efficiency issues become more complex due to discrepancies between the minimum order quantity (MOQ) from suppliers and the company's actual needs. Many raw materials with low usage are purchased in large quantities due to MOQ requirements. Orders that exceed demand can lead to excess raw materials, while orders that are too small can lead to a shortage of raw materials (Sutarman, 2017).
As a result, these materials accumulate in warehouses, becoming slow-moving items, and even risk expiring before use.

Strategies for Overcoming Obstacles in Inventory and Production Efficiency

After ERP System Changes Strategic recommendations for overcoming obstacles in inventory and production efficiency after ERP system changes are based on recommendations from sources and authors, some of which include:

1. **Regular Evaluation of ERP INSYS**

One of the main strategies is the need to conduct regular evaluations of ERP INSYS usage, both from a technical system perspective and user behavior. Puspithasari et al. (2023) state that evaluation is a process conducted to assess something and determine the extent to which objectives have been achieved. This evaluation aims to identify real obstacles faced by users in the field, such as delays in selection lists, underutilization of features, and obstacles in coordination between modules. Evaluations can be conducted through user feedback sessions, direct observation, and system log monitoring. Conducting regular evaluations can help companies understand which functions are less effective and improve them through new feature development or internal process improvements, including in terms of user interface, notification systems, and access speed. This is supported by the opinion of Puspithasari et al. (2023), who state that regular evaluations are necessary to overcome ERP system constraints that hinder personnel performance. Additionally, this evaluation is also useful as a basis for deciding whether the ERP system is suitable for the company.

2. **Improving Communication Effectiveness Among Departments**

The complexity of the INSYS ERP system, which requires processes to be carried out sequentially across departments, makes interdepartmental communication a crucial factor. Currently, communication still relies heavily on manual reminders without system assistance, which often leads to delays or miscommunication. Therefore, the next strategy is to build a more effective and systematic internal communication system, such as using comment or notification features between modules that can provide automatic task reminders. Additionally, the company can implement a daily huddle meeting policy between relevant departments to align daily activities and ensure all departments are on the same page before executing operations.

3. **Considerations for ERP Integration with Supplier Systems or Utilizing Blockchain**

Delays in raw material delivery that frequently occur after ERP system implementation are often caused by the lack of direct connectivity between the company's internal system and the supplier's system. As a result, order or shipment status cannot be monitored in real-time, leading to disruptions in production flow. One long-term strategy to consider is integrating the INSYS ERP system with suppliers' digital systems to automate purchase order status tracking and eliminate reliance on manual communication, which is prone to miscommunication. This aligns with the views of Azis & Irjayanti (2024), who state that integration with suppliers can facilitate companies in enhancing collaboration with suppliers, thereby ensuring a smooth and effective supply chain. Additionally, the use of blockchain technology can also be an innovative and effective solution in building more transparent and responsive traceability. Rahmawati & Subardjo (2023) state that blockchain is a technology that can assist companies in conducting decentralized and interconnected digital recording. Alamsyah et al. (2022) also state that blockchain can store and create data that is immutable, tamper-proof, and consistent across the network. Blockchain can be used to permanently record and share the status of shipments, confirmations of goods received, and transaction histories between parties. The use of blockchain in ERP systems also allows companies and suppliers to collaborate more openly through a secure platform. As a result, information becomes more responsive, transparent, and can be acted upon quickly, especially in situations that require high flexibility, such as sudden changes in production needs.

4. **Application of Value Stream Mapping (VSM) for Process Efficiency**

The application of Value Stream Mapping (VSM) is necessary to identify non-value-added activities in the workflow after ERP implementation. This is in line with the opinion of Marinelli et al. (2021), who state that VSM is an important technique to help companies identify waste and assist in improvement. This is also supported by the statement from Limon & Sarker (2023), who also state that VSM enables companies to map and analyze operational processes to identify bottlenecks and excessive operations that may cause waste. Through this mapping, companies can see the entire flow of processes and

information from start to finish, including waiting times, duplicative activities, and other potential obstacles that may be hidden within the ERP system. VSM helps uncover discrepancies between on-site workflows and ideal procedures within the system, enabling companies to develop more targeted process improvements, such as simplifying work sequences, eliminating unnecessary activities, or optimizing ERP module usage. Additionally, this mapping process should involve cross-functional teams, from operators to ERP teams, to ensure solutions align with real-world conditions.

5. **Implementing the 5S Principles to Improve Operational Discipline**

The implementation of the 5S principles (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) is an important strategy in maintaining discipline and order in the workplace after ERP implementation. A complex ERP system requires support from a neat and structured work culture so that the process flow runs smoothly without obstacles caused by an untidy work environment. Through the 5S principles, each department is encouraged to organize their work area, store items in their proper places, maintain cleanliness, standardize, and maintain discipline consistently. This principle also serves as a foundation for increasing operators' awareness of the importance of timeliness and data input accuracy within the system. When work areas are well-organized, risks of delays due to document searches, input errors, or interdepartmental disorganization can be significantly reduced. The implementation of 5S is also aligned with the lean approach, which promotes waste reduction across all lines. Therefore, this strategy needs to be integrated into daily routines and supported by management to create a productive, disciplined work environment that aligns with the established ERP system.

CONCLUSION

The implementation of the INSYS ERP system at PT. Mulia Cipta Rasa was carried out as part of standardization efforts with the parent company, replacing the previous system, Odoo. Although INSYS was expected to improve production and inventory efficiency, the system has not yet fully succeeded in enhancing production and inventory efficiency. There are still challenges in several indicators, such as production waiting time, production overprocessing, inventory waiting time, underutilized skill inventory, and others. Common obstacles stem from system feature limitations and human resource constraints. Efficiency challenges in production and inventory include interdepartmental dependencies, limitations of the INSYS ERP system, adaptation to system differences, lack of training and socialization, human error and employee resistance, mismatch between minimum order quantity (MOQ) and actual needs, and lack of integration with supplier systems that support real-time tracking. Strategies to address these challenges include: Regular Evaluation of ERP INSYS, Improving Communication Effectiveness Among Departments, Considerations for ERP Integration with Supplier Systems or Utilizing Blockchain, Application of Value Stream Mapping (VSM) for Process Efficiency, and Implementing the 5S Principles to Improve Operational Discipline. This study has several limitations, such as a limited number of respondents and a focus on only one company. Therefore, further research is needed in other sectors or companies, especially those that have undergone ERP system changes, involving more personnel from various departments to gain a broader perspective on production and inventory efficiency. Future researchers are also advised to compare several companies using different ERP systems, whether developed internally or provided by third-party vendors. This aims to provide a more comprehensive picture of the impact of ERP type and design on operational efficiency. Further research could also combine quantitative approaches, such as measuring system performance or cost efficiency before and after ERP implementation, to make the research results more measurable and comparable.

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