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Improvement Operational Business Process in Logistic Companies Using Model-Based and Integrated Process Improvement

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Abstract
The logistics business sector is experiencing increasingly competitive and complex developments, requiring enhancements to remain competitive. The method used in this research is the Model-Based and Integrated Process Improvement (MIPI) method, and business process mapping using Business Process Model and Notation. The MIPI method consists of four stages: Understand Business Needs, Understand the Process, Model and Analyze Process, by conducting activity analysis using Value-Added Analysis and Cause and Effect Analysis to identify problem causes, and the final stage is Redesign Process. Value-Added Analysis indicates that in the outbound process, there are 21 activities, comprising 4 Real Value Added, 15 Business Value Added, and 2 Non-Value Added. In the inbound process, there are 21 activities with a composition of 2 Real Value Added, 16 Business Value Added, and 3 Non-Value Added. Based on Cause and Effect Analysis, customer complaints were found to be related to delayed delivery of goods, with root causes identified in planning, methods, equipment, and human factors. Based on these findings, a proposal for a new business process design is made, including the elimination of Non-Value Added activities and parallelism in some activities to simplify Business Value Added activities. Recommendations for these issues include expanding partnerships and collaboration with vendors, increasing fleet size, and providing employee development training.

Keywords: Business Process Improvement; MIPI Method; Value Added Analysis; Cause and Effect Analysis; Business Process Management Notation

INTRODUCTION

The business development in the logistics world is currently becoming more competitive and complex, playing a vital role in supporting economic growth (Tongzon J., 2012). Alongside the deepening economic globalization, it is increasingly recognized that logistics, referring to the planning, implementation, and management of the movement and storage of raw materials, components, finished goods, and related information from the point of origin to the point of consumption, has become an increasingly important component in today's contemporary production system (Coe, 2013). Logistics not only

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aids in supply procurement but also plays a crucial role in assembly, storage, and distribution processes. Logistics serves as a link between society and the market through a physical network that is as crucial as the internet (Ceniga & Sukalova, 2015).

Based on a survey conducted by the BPS-Statistics Indonesia (2023), the growth in the logistics sector in Indonesia is 15.28%, higher than other sectors. This makes the logistics sector worthy of attention as a potentially significant economic sector. According to Firdausy (2021), logistics has positive impacts on macroeconomic levels, such as increasing national income, supporting economic growth, expanding and creating job opportunities, promoting investment and trade inflows, and enhancing company competitiveness at the microeconomic level. Logistics sector in Indonesia in 2023 has significant opportunities to continue growing and enhancing national economic growth.

The advancement and competitiveness of the logistics industry demand companies to operate strategically, effectively, and efficiently in enhancing their success and competitiveness (Ceniga and Sukalova, 2020). This is crucial considering that companies not operating efficiently will struggle to compete and retain their customers. As expressed by Kherbach and Mocan (2016), logistics companies must be able to execute operational activities effectively and efficiently to adapt to dynamic business changes, enabling them to endure global competition. Therefore, companies are required to formulate appropriate strategies to achieve their intended goals. Companies need to improve their business processes to avoid delays in product delivery and transportation management. They plan and schedule shipments to fulfill customer satisfaction based on what customers need, ensuring easy, secure delivery and increasing loyalty to the logistics service provider (Gohoho et al., 2022).

The subject of this research is an organization operating in the small to medium-scale logistics services sector, providing project logistics and general freight services in the storage and delivery of goods in Java, Sumatra, and Kalimantan regions. The company is a third-party logistics service provider with expertise in various areas, including cargo delivery, warehousing, and supply chain management. They serve deliveries between cities and provinces in Indonesia. In their business operations, the company collaborates with various stakeholders, especially in meeting the transportation needs by working with transportation vendors for the fulfillment of cargo deliveries. The logistics system primarily aims to facilitate the management of the flow of finished products, financial resources, information, equipment, labor, and others to meet the needs of all parties involved in the logistics process, as well as the served customers (Grabara, 2009).

In carrying out their operational activities, the company establishes key performance indicators set by management to achieve customer satisfaction as per the business agreement with customers. However, particularly in operational activities, issues such as delays in delivering goods to customers persist, leading to customer complaints. Additionally, there are other issues, such as prolonged loading and unloading processes, delays in delivering goods to customers, and information flow on the availability of transportation fleets for delivering goods to customers.

One of the quality service assessments in logistics is on-time delivery and effective and efficient delivery processes. However, over the past six months, the company has received many customer complaints about delays in the goods delivery

process, with the delay rate reaching 80%. This delay has a significant impact on the services provided by the company. By analyzing the factors causing delays, the company can meet customer needs more promptly. Some factors affecting delivery timeliness include the time it takes to load goods, the transportation process time from the warehouse to the destination location, and estimated arrival time accuracy and handling at the destination.

To address these business process issues, an evaluation, review, and improvement of the executed business processes are needed. Several methods can be used for business process improvement, one of which is the Business Process Improvement (BPI) approach. This approach focuses on planned and organized business process activities to analyze and continuously improve fundamental business activities within a company. Neubauer (2009) revealed that the BPI method enables companies to adapt more quickly to the changing needs of the market and its customers and focuses on adding value to business processes. According to Griesberger et al. (2011), Business Process Improvement is a methodology designed to make improvements by changing certain parts of existing business processes, enhancing the previous state, and leading to organizational achievements through improvements in business process performance. This method can evaluate with comprehensive steps and provide precise solutions for business process improvement (Adesola and Baines, 2005). The Business Process Improvement method consists of five procedural steps for actions and decisions in improving business process performance: organizing improvement, understanding processes, simplifying processes, measuring and controlling, and continuous improvement. The Business Process Improvement method provides a system to simplify a business process, ensuring that internal and external customers receive better outputs. The development of the Business Process Improvement method to support business process development is also carried out by Adesola and Baines (2005), referred to as Model-Based and Integrated Process Improvement (MIPI). MIPI is a framework developed and used for business process development and reengineering.

Based on this background, this research will discuss the application of the Business Process Improvement method with Model-Based and Integrated Process Improvement on the operational business processes of the company to support the implementation of business process improvement. The current state of the business processes will be qualitatively analyzed through observation and interviews to identify issues in operational processes, with the expectation of enhancing performance, customer satisfaction, and the ability to achieve stable and sustainable business growth.

LITERATURE REVIEW

Model – Based and Integrated Process Improvement

The development of a methodology to support the implementation of business process development was also carried out by Adesola and Baines (2005) in their research, conducted to validate and enhance its effectiveness in a company. The BPI methodology proposed by Adesola and Baines is called Model-Based and Integrated Process Improvement (MIPI). MIPI is a business process development methodology with seven

stages to guide the activities and decisions that need to be examined by the company. This method is a framework developed, not procedural or specific rules that must be followed, as shown in Table 1.

Table 1. Steps and Techniques in Model – Based and Integrated Process Improvement

No	Steps	Steps Description	Techniques
1	Understand business needs	Develop vision and strategic objectives Perform competitor analysis Develop organisational model Evaluate current practices, prioritise objectives Scope change Establish measurable targets Develop process objectives and assess readiness Obtain approval and initial project resource Benchmark the process	Organisation model SWOT analysis Force field analysis Readiness assessment Stakeholder analysis Process prioritisation matrix Pareto analysis Process performance table
2	Understand the process	Identify the business process architecture Scope and define the process Capture and model the AS-IS process information Model the process	XPat process IDEF0 Walkthrough Process flowchart ABC Cause and effect analysis
3	Model and analyse process	Verify and validate the model Measure the existing process performance Analyse the business process	Value added analysis
4	Redesign process	Benchmark the process Identify performance criteria for re-design process Identify focus of re-design activity Model and validate new TO-BE process model Identify IT requirements Estimate performance	Benchmarking Creative silence workshop Brainstorming
5	Implement new process	Plan the implementation Obtain implementation approval Review change management plan Communicate the change Technological development Make new process operational Train staff Roll-out changes	
6	Assess new process and methodology	Conduct process deployment and performance data reflections Revise organisational approach	Action plan Evaluation measurement report Customers measurement survey
7	Review new process	Develop strategic view of the business Set process targets and performance Develop a plan to meet targets Implement plan	Process improvement matrix

Source: Adesola & Baines (2005)

There are seven steps as shown above such as Understand business needs, Understand the process, Model and analyse process, Redesign process, Implement new process, Assess new process and methodology and Review new process. These seven steps of Model-Based and Integrated Process Improvement can be used for both process development and business process reengineering, outlining "what" and "how" a business process should be implemented and its execution methods (Adesola & Baines, 2005). Adesola and Baines also provide a detailed explanation of the activities in each stage and the tools that can be used. They include a clear description of each stage, as well as the techniques or tools used to support the analysis of the business process to be conducted in the complete implementation of Model-Based and Integrated Process Improvement.

METHODOLOGY

The data collection stage is conducted by gathering all the necessary data in the modeling process. This includes observing operational activity, analyzing delivery fulfillment, and conducting interviews with parties involved in the inbound-outbound operational business process. The collected data is then processed according to the needs based on the issues occurring in the business process to support the identification of business processes in the 4 stages of the MIPI process as follow: Understand The Business Needs. Understand The Process, Model & Analyze Process, and Redesign Process.

(1) Step 1: Understand Business Needs
In the initial stage, an analysis will be conducted to understand the business management structure as well as the company's vision and mission in conducting business. This serves as the foundation of knowledge to determine the goals and objectives of the company so that the proposed business process improvements are targeted accurately. This involves conducting interviews with stakeholders, customers, and operational implementers.

(2) Step 2: Understand The Process
In this stage, an analysis of both inbound and outbound operational business processes will be conducted, which will then be organized into a sequence of the current "as-is" business process model. This data is obtained through interviews with operational implementers and observations of inbound and outbound process activities. The modeling of inbound and outbound business processes is done using Business Process Model Notation (BPMN). The business process models for inbound and outbound are created in the form of process models with symbols representing activities, flows, and annotations for each stage. Activities are depicted using the BPMN model based on the activity data collected during the data collection phase.

(3) Step 3: Model & Analyze Process
After identifying the activities of the "as-is" business process, a qualitative analysis will be conducted based on the existing data. This stage involves observing issues occurring in the current ongoing business process using value-added analysis and cause-and-effect analysis. The classification of activities in

inbound and outbound processes is based on the efficiency of the business process. Observations are made for all mapped activities, followed by in-depth analysis and validation from the perspective of operational implementers and customers for each activity. Business process activities will be categorized into three types based on value-added analysis as follows:

- Real Value Added (RVA)
  Real Value Added is an activity that directly contributes to meeting customer needs. This process has a positive impact on consumers and provides tangible value to consumers.
- Business Value Added (BVA)
  Business Value Added is an activity that plays a crucial role in operations and meets business needs. Activities that do not directly add value to consumers but are still essential in the business flow as supporters of the main process.
- Non-Value Added (NVA)
  Non-Value Added is a process activity that does not add value to consumers and is not highly needed in the company's business process. This process can be considered as not providing benefits to the company.

Elimination is performed on impractical, time-consuming, and non-value-added activities for customers, as well as parallelism to simplify activities that can be performed simultaneously. In Lean tools, activities that do not add value (Non-value added) directly make the business process impractical, wasteful, and time-consuming, also known as waste. There are seven wastes according to Hines and Taylor (2000) in the Lean approach such as, Excessive Transportation, Waiting, Over Production, Defects, Unnecessary Inventory, Unnecessary Movement, Inappropriate Processing.

(4) Step 4: Redesign Process
In this stage, the proposal for process improvement will be designed based on the previously obtained analysis data. A new business process model (to-be) will be created using BPMN based on the performance of the business process. There are several performance parameters for business processes according to Kallio et al., (2000) such as Cost, Service, Customer Value, Efficiency, Flexibility, Reducing process time. etc. In this study, the performance parameters for business processes are tailored to the type of business under investigation. According to Marchesini and Akantara (2016), logistics businesses can create customer value through efficiency, effectiveness, and/or differentiation. In this research, the performance parameter for business processes that will serve as the basis for proposing process improvements in efficiency. Efficiency in this study is based on the categorization of activities previously analyzed within a process by conducting interviews and validation with operational implementers in inbound and outbound process activities. Activities that do not add value to the business process will be

eliminated or merged with other activities where possible. Activities that may cause or allow delays in the delivery process will be subsequently eliminated or alternative activities will be sought that can replace the initial activities adjusted to the company's capabilities.

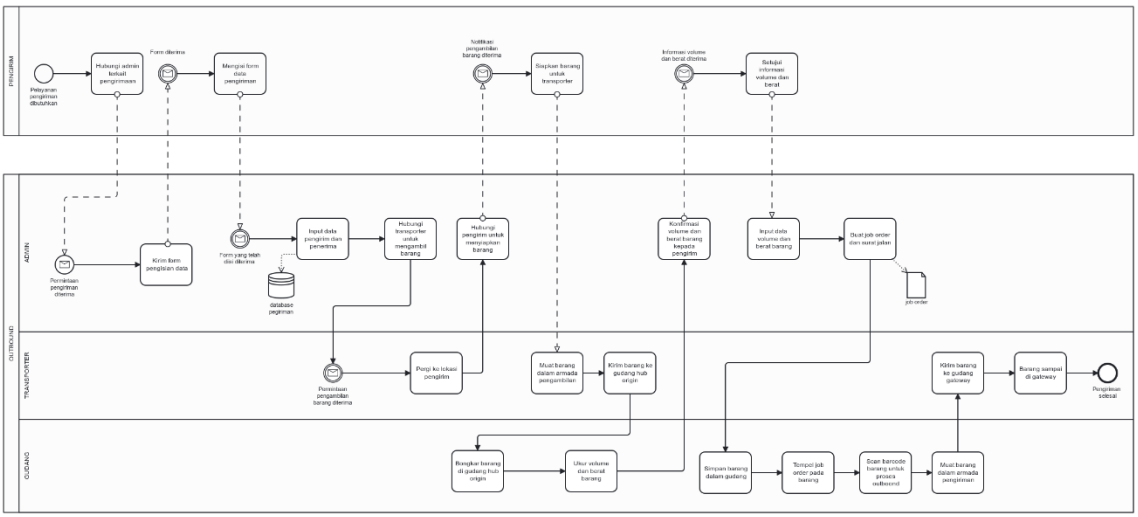
RESULTS

Based on the results of observations and interviews conducted with managers and operational staff, a common complaint from customers is the occurrence of delays in the delivery of goods. The business process involved in the delivery of goods, which is the main process to be analyzed, includes both outbound and inbound processes—the primary processes in the services provided by the company, as follows:

- Outbound Process

  The outbound goods process begins with receiving logistic service orders from customers. These requests may involve delivering goods to specific destinations, which will then be processed for retrieval from the customer's warehouse location according to the received order. Goods retrieved from the sender are processed upon entry into the gateway for further processing.

Figure 1. BPMN Model of Outbound Process

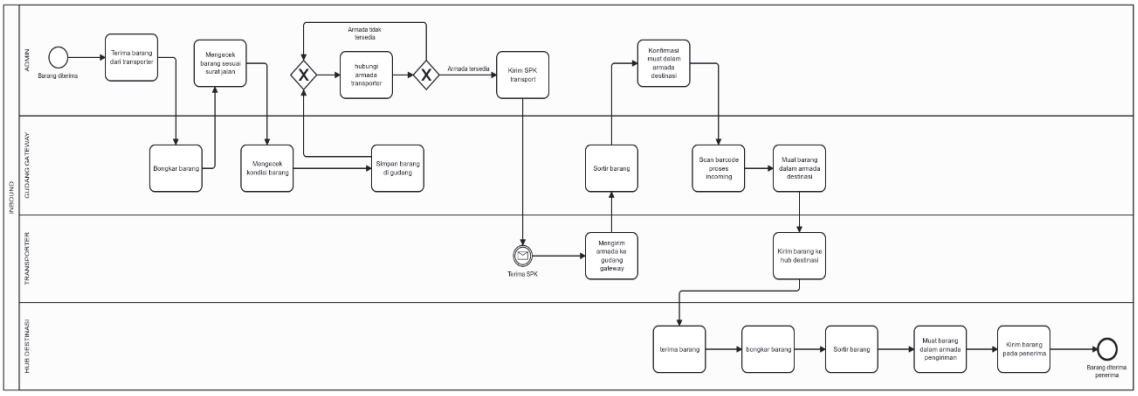


Source: Author own analysis (2024)

- Inbound rocess

  The inbound process starts when goods from the sender have been received at the gateway. Subsequently, the goods are stored in the gateway for sorting and checking their condition until they are delivered to the destination hub and finally reach the recipient.

Figure 2. BPMN Model of Inbound Process



Source: Author own analysis (2024)

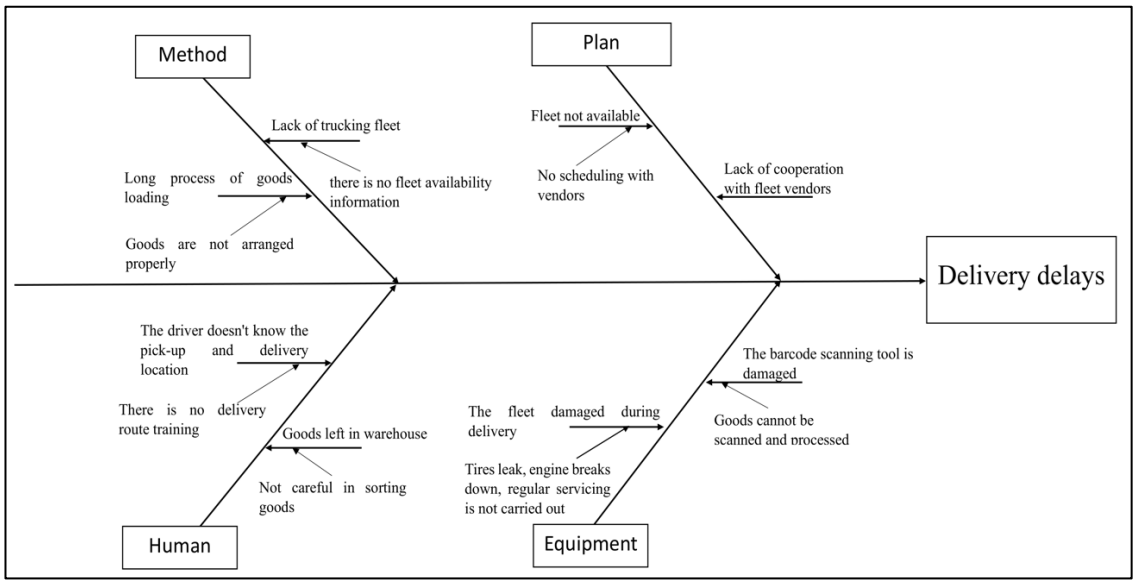
Value Added Analysis

An analysis of each process activity was conducted using value-added analysis to identify activities that do not add value to the outbound and inbound processes. The categorization of each modeled activity is based on findings of activities that do not add value to customers and do not contribute value to the implementation of inbound and outbound processes. In this study, value-added activities are defined as activities directly related to customers, providing them with practical and fast delivery services. Non-value-added activities are those that hinder the acceleration of the goods delivery process and activities that consume time to process goods for the subsequent stages. Based on the analysis and classification of activities based on the added value they provide, in the outbound process, 21 activities were identified, comprising 4 Real Value Added, 15 Business Value Added, and 2 Non-Value Added. In the inbound process, there are 21 activities with a composition of 2 Real Value Added, 16 Business Value Added, and 3 Non-Value Added.

Cause and Effect Analysis

In this stage, the identification of problems is carried out through observation and interviews with operational implementers to understand constraints and complaints directly related to the outbound and inbound goods processes. It is known that the issue of delivery delays is a recurring complaint received by operational implementers. In this stage, an analysis will be conducted to identify the root cause of this complaint through observations and interviews with operational implementers. The results are illustrated in a fishbone diagram, as shown in Figure 3 below.

Figure 3. Fishbone Diagram



Source: Author own analysis (2024)

In the above fishbone diagram, four main aspects of the analyzed complaints can be identified: planning, equipment, methods, and human factors. The root problem arising from the planning aspect is a lack of communication and collaboration with vendors, which can hinder the delivery process. Another issue is the unavailability of fleets when needed, caused by the absence of scheduling with third parties or fleet vendors, leading to delays. Meanwhile, the root problem from the equipment aspect is fleet damage during delivery, causing significant delays. This issue arises due to poor vehicle maintenance, resulting in unforeseen damage that obstructs the delivery process. Additionally, barcode scanning equipment damage hampers the verification and sorting of goods, preventing them from being scanned and processed. The root problem from the method aspect is the prolonged loading process due to irregular arrangement of goods in the fleet, wasting a considerable amount of time reloading goods. Another problem is inadequate fleets for loading and transporting goods, requiring some items to be stored in the warehouse until fleet availability. The root problem originating from the human aspect is goods left in the warehouse due to negligence and errors in sorting by workers. Another problem is the lack of knowledge among drivers about pickup and delivery locations, attributed to the absence of training on route locations and inadequate knowledge of GPS system usage. All these factors contribute to the main problem, which is the delay in delivering goods. To address this issue, an evaluation of each cause of delay is necessary, ranging from resource deficiencies to inefficient internal processes.

Redesign Outbound Process

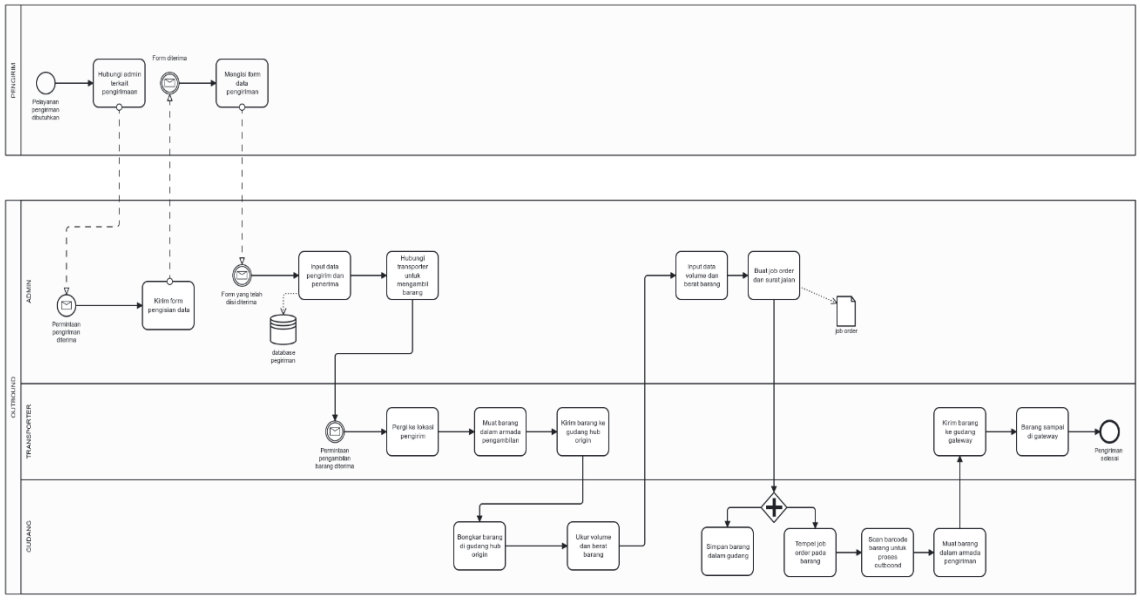
In the proposed redesign of the new outbound goods process (to-be), there are several differences in activities compared to the outbound process model. These differences are found in the following activities:

- Contacting the sender to prepare the goods

In the current process (as-is), admins often have to contact the sender to prepare the goods. This activity is time-consuming for both the admin and the sender. In the new outbound process (to-be), this activity can be eliminated. Admins can add a pickup time field in the shipment data form that the sender can fill out. This way, contact with the sender can be reduced. With the redesign diagram in place, direct contact with the sender, which does not add value, can be minimized, allowing the subsequent process to proceed more quickly.

- Confirming the volume of goods with the sender
  In the current process (as-is), admins contact the sender to provide information about the volume and weight of the goods. In the new outbound process (to-be), this activity can be eliminated. Admins can add an estimated weight field in the shipment data form so that the sender can also estimate the cost based on the weight of the goods being sent. In this case, admins do not need to repeatedly confirm with the sender because it is already stated in the approved shipment form.
- Storing goods in the warehouse and attaching job orders to goods (parallelism)
  In the current process (as-is), after creating a job order and delivery note, operations store the goods in the warehouse and then attach the job order to the goods. In the new outbound process (to-be), this activity can be parallelized. Warehouse operations can perform this activity in parallel once the job order and delivery note have been created. Operations can ensure that all goods are attached to the job order before storing them in the warehouse. This process can maximize the involvement of all operational workers in performing storage and job order attachment activities simultaneously, minimizing the risk of missing goods in attaching job orders. This also minimizes the movement of workers who have to move around when attaching job orders to goods stored in the warehouse.

Figure 4. Redesign BPMN Model of Outbound Process



Source: Author own analysis (2024)

Redesign Inbound Process

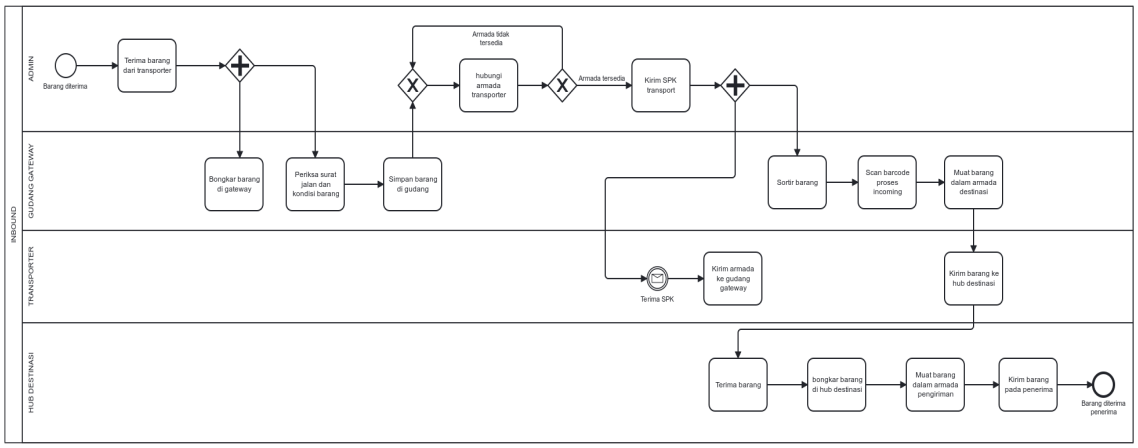
In the proposed redesign of the new inbound goods process (to-be), there are several differences in activities compared to the inbound process model. These differences are found in the following activities:

- Checking the condition of goods
  In the current process (as-is), operations perform a check on the condition of goods, which ideally should be done when receiving the goods according to the delivery note. In the new inbound process (to-be), this activity can be eliminated. Operations can check the condition of the goods during the delivery note check. This also makes it easier for operations to record the condition of the goods, whether they are damaged or not, and ensures that the goods entering the warehouse are in good condition. If there are damaged goods, they can be separated and stored in a designated area. This process will also facilitate the sorting and handling of goods.
- Unloading goods and checking the delivery note and condition of goods (Parallelism)
  In the current process (as-is), operations unload goods from the fleet and then check the goods according to the delivery note. In the new inbound process (to-be), this activity can be parallelized. Warehouse operations can perform this activity in parallel after receiving the goods from the transporter. Operations can unload the goods while checking them against the delivery note brought by the transporter. This process minimizes the risk of goods being missed in the checking process because the activity is performed directly when the goods are unloaded from the fleet. Therefore, no goods are overlooked in the delivery note and condition check. This also minimizes the workers' lack of precision in checking the goods before they are stored in the warehouse.
- Confirming loading in the fleet
  In the current process (as-is), admins still have to confirm the loading in the fleet. In the new inbound process (to-be), this activity can be eliminated. Admins can schedule the estimated time for the fleet to be sent to the gateway warehouse. Therefore, operations do not need to wait for confirmation from admins to proceed to the next process.
- Sending the transport work order and sorting goods (Parallelism)
  In the current process (as-is), admins will send the transport work order (SPK) to the transporter to send its fleet, and then operations will start the goods sorting process. In the new inbound process (to-be), this activity can be parallelized. Admins can send the SPK and communicate with operations regarding the estimated arrival time of the fleet. Therefore, operations can perform the goods sorting process in parallel without waiting for the fleet to arrive at the gateway first because it is ensured that the fleet is available. This process is carried out by two different actors: admins acting as the sender of the SPK and operational staff who can directly process the goods sorting. This minimizes the waiting time for

the transporter and speeds up the subsequent process of scanning goods for the loading process into the fleet.

- Sorting goods at the destination hub
  In the current process (as-is), the destination hub performs the sorting process at the destination hub. In the new inbound process (to-be), this activity can be eliminated. Destination hubs can arrange pallets according to the delivery route data sent from the gateway so that when unloading goods at the destination hub, a repeated sorting process is not required. This also minimizes the time goods spend in the destination hub warehouse, speeding up the delivery process to the recipient.

Figure 5. Redesign BPMN Model of Outbound Process



Source: Author own analysis (2024)

Business Process Improvement

Facing the challenges and increasing competition as outlined earlier, recommendations for outbound and inbound process improvements are provided for the company. These recommendations are given after brainstorming with operational personnel. The recommendations that can be implemented are as follows:

(1) Enhancing partnerships and collaborations with vendors
Increasing vertical integration with key partners to optimize the delivery process. Creating supplier performance SOPs related to fleets, conducting performance assessments within a 3-6-month period, and adding new vendors for collaboration. By enhancing partnerships and collaborations with vendors, the company can strengthen its position in the supply chain, improve operational efficiency, and add value for customers. Good partnerships not only reduce operational costs but also enhance the competitiveness and resilience of the logistics company in a competitive market.

(2) Increasing the number of fleets
The company needs to conduct a thorough analysis of the shipment volume and types of goods frequently transported. Identifying demand patterns related to the types of goods and delivery times as a basis for measuring fleet needs. Currently, the management has not conducted periodic demand analysis for shipments made,

so when demand exceeds capacity, the company lacks structured fleet planning. This was also approved by operational personnel when they faced difficulties finding fleets if not available from the current collaborating vendors.

(3) Employee training and development

The company needs to pay special attention to employee career development. Provide clear career development programs and succession plans to ensure that each employee has the opportunity to develop skills and responsibilities over time. Provide training to employees on best practices in supply chain management and ensure that staff have a strong understanding of operational processes and systems used. In addition to providing training and development for employees, the company needs to determine the appropriate workload, considering employee availability as tasks and responsibilities evolve, employment contracts, and job types.

CONCLUSION

Based on the analysis conducted in this study, several conclusions can be outlined as follows: There are two main processes in operational business processes, namely outbound and inbound goods processes. From the results of the value-added analysis, it was found that in the outbound goods process, there are 21 activities consisting of 4 Real Value Added, 15 Business Value Added, and 2 Non-Value Added. In the inbound goods process, there are 21 activities consisting of 2 Real Value Added, 16 Business Value Added, and 3 Non-Value Added. The five Non-Value Added activities are contacting the sender to prepare the goods, confirming the volume of goods with the sender, checking the condition of the goods, confirming loading in the destination fleet, and sorting goods at the destination hub. In the cause and effect analysis, customer complaints were identified, namely "delay in the delivery of goods." The root cause of the problem arises from several main aspects, namely planning, methods, equipment, and human factors.

The root causes of each aspect include a lack of communication and collaboration with vendors hindering the delivery process, no scheduling with third parties or fleet vendors, damage to fleets during delivery, barcode scanner malfunctions, irregular arrangement of goods in the fleet, negligence and errors in sorting goods, and a lack of driver knowledge about route locations. The root cause of complaints identified in this research can be a primary concern for the company to establish stronger cooperation with vendors, add and collaborate with new vendors. This may create potential conflicts or mismatches with some new vendors but strengthens the position in the supply chain and enhances competitiveness. It may also initiate the addition of fleets, so the company needs to seek investors or additional funds to cover the costs of acquiring new fleets in the future to meet the increasing delivery needs. The proposal for redesigning the new business process indicates differences in several activities where improvement opportunities can be achieved by eliminating and parallelizing these activities. Eliminated activities include contacting the sender to prepare the goods, confirming the volume of goods with the sender, checking the condition of the goods, confirming loading in the fleet, and sorting

goods at the destination hub. Parallelized activities include storing goods in the warehouse and attaching job orders to goods, unloading goods and checking waybills and the condition of goods, sending transport work orders and sorting goods at the gateway. Recommendations are also proposed to address the issue of delayed delivery in supporting the implementation of inbound and outbound processes, including enhancing partnerships and collaborations with vendors, increasing the number of fleets, and providing training and development for employees.

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