Design On Improvement of Distribution Process in Logistic Service Provider Companies Using Business Process Reengineering Approach

M.Dachyar and Gabriella Septiani Miranda
Department of Industrial Engineering
Universitas Indonesia
Depok, 16424, Indonesia
mdachyar@yahoo.com, mgabriellaseptiani@gmail.com

Abstract

Recently, companies have chosen to outsource their logistics services. These practices are carried out to achieve the most efficient distribution system. In the downside, there's a certain drawback. By outsourcing logistics service, the goods delivered are most likely to come late and these could lead to customers' dissatisfaction. In order to guarantee the goods arrive on time with minimal costs, redesigning distribution processes is necessary to improve the efficiency and effectiveness of the logistics system. This study aims to design the distribution process improvement in one of logistics service providers in Indonesia to increase the logistics performance of the company by streamlining the distribution process time of goods. Business Process Reengineering method is used in this study, by conducting observations and interviews with dairy companies and logistics service provider companies, then the current distribution process is modeled and simulated using Igrafx BPMN software. Improvement of the distribution process is designed to generate the most efficient strategy which is a simulation model with a strategy of rearranging orders on Warehouse Management System (WMS) and the application of Radio Frequency Identification (RFID), using more than one shipping vendor, and using information and tracking systems for distributors that achieve time efficiency by 49,6%.

Keywords
Logistics, Distribution Process, Business Process Reengineering, Logistics Service Provider.

1. Introduction

Currently, companies have outsourced logistics to logistics service providers in running logistics and distribution systems. Third Party Logistics (3PL) is one kind of logistics service provider which specialized in logistics intermediary that provides full or partial logistics services to companies. 3PL companies manage almost all the functions of supply chain and long-term cooperation to provide effective solutions and improve the quality of the company's supply chain as a whole. The business growth of 3PL companies in Indonesia continues to increase year by year, as indicated by the projection of the use of logistics providers / 3PL services will continue to increase each year and 3PL business revenues will also continue to increase. The company uses 3PL in managing supply chain activities such as material management from suppliers to product distribution to consumers. Based on a survey conducted on 3PL business about the important criteria for the customer, 71% of 3PL business choose that it is very important to improve process quality and performance to satisfy customers.

3PL is also used by a Dairy Company in Indonesia for storing finished products (warehousing) and delivering products (delivery). Distribution of milk products of this company is divided into general trade (shipping to agents/distributors throughout Indonesia) and modern trade (shipping to modern markets). The shipping process for this company consists of the lane, which is shipping by land, and also sea freight, which is shipping by sea. Yet, problems are still found in the distribution management of dairy companies, namely in-time delivery of products to distributors, this shows that there is still inefficient activity in the distribution system. In the delivery performance of Dairy Company products conducted by 3PL during January to June 2018, where there were 1344 shipping orders from a total of 2407 orders that were not delivered on time (exceeding the target set by the Milk Company), which resulted in delivery performance reaching only 44%.

2. Literature Review

2.1. Logistics

Supply Chain does not only consist of producers and suppliers, but the supply chain consists of all participating parties to meet customer demand (Chopra & Meindl, 2015). Therefore, the supply chain can be referred as a series of processes and entities (suppliers, customers, factories, distributors and retailers) that aim to fulfill customer orders (Abdel-basset, Manogaran, & Mohamed, 2018). Logistics is part of supply chain management which is activities that facilitate the movement and coordination of supply and demand in the creation of time and place utility (Hesket, J.L., Glaskowsky, N.A., Ivie, 1973). Logistics management is efficient, effective planning, implementation, and control that moves forward and backward and in storing goods, services, and information related to the point of origin and consumption point to satisfy customers (Council of Supply Chain Management Professionals, 2006).

2.2. Third Party Logistics (3PL)

At present, many companies have chosen to outsource their logistics operations called Third Party Logistics Service Providers (LSPs) that introduce product and service innovations more quickly to markets (Lai, 2004). Outsourcing means organizations hire outside organizations to provide goods or services that have traditionally been given themselves because these third parties are "experts" in delivering goods or services efficiently, while the organization itself may not be able to do so (Lambert, Stock, & Ellram, 1998). The form of Logistics Service Provider (LSP) is the Thirds Party Logistics (3PL). 3PL vendors are defined as logistics-specific intermediaries that provide full or partial logistics services to companies, from providing transportation to designing, implementing, and operating the entire distribution system and other logistical interests in a certain period of contract form (Duo, 2000). Third-party logistics has an important role in reducing production costs and increasing customer satisfaction, which works as a liaison between producers (companies) and customers. 3PL consolidates transportation and warehousing and offers these services to managers who want to reduce operating costs (Sheikh & Rana, 2012).

2.3. Business Process Reengineering (BPR)

A business process is a collection of activities that require one or more types of inputs and produce output that has value to customers (Hammer & Champy, 1993; Paul, Hlupic, & Giaglis, 1998; Vergidis, Tiwari, & Majeed, 2008). The purpose of business processes is to solve business problems (Havey & Reilly, 2005). Improvement methods are ways in which different business activities are designed or managed (Islam,S., & Daud Ahmed, 2012). To improve business processes and to overcome business problems business process reengineering (BPR) can be carried out. Business Process Reengineering (BPR) was first introduced in 1990 by Davenport and Short and Hammer. Business Process Reengineering (BPR) is defined as an effort to improve fundamentals and radical redesign of business processes to achieve increased efficiency of important steps such as cost, quality, service and speed (Hammer & Champy, 1993). Many companies have implemented BPR as a quality improvement tool to reduce costs, cycle times & improve quality such as - Mahindra & Mahindra Ltd., General Motors Corporation, Michael Dell, and Ford Motor ITC L & T, Siemens, Crompton Greaves (CG) etc (Bhaskar, 2018). In addition, in the research of the manufacturing industry sector in Indonesia, one of the companies in the Indonesian dairy industry conducts BPR in their companies to improve their business processes and produce improvement Strategy for the timeliness of finished products (Dachyar & Christy, 2014).

The BPR framework used consists of 4 phases (N. Lowental, 1994):

1. Preparation of Change
2. Change Planning
3. Design Change
4. Evaluation of Changes

Business process management (BPM) provides governance of the business process environment to improve agility and operational performance. This is a systematic approach to improve an organization's business processes. Business Process Modeling is defined as a period of time when a manual and/or automatic description (workflow) of a process. Business Process Modeling and Business Process Management, both have the same acronym (BPM), Business Process Modeling is an activity that represents the process of a company, so that the current process ("as-is") may be analyzed and corrected in the future ("to be"). Business Process Modelling is usually used by analysts and business managers who try to improve the efficiency and quality of the process. Business Process Modeling (BPM) is focused on optimizing business processes and can eliminate or simplify processes that require change. Many techniques are used to model processes such as BPMN, IDEF, DFD, and also Value Stream Mapping.

3. Method

Data collection and processing is done by observing the distribution process carried out by logistics service providers that deliver products from one of the Dairy Companies in Indonesia. First of all, interviews with stakeholders involved in the distribution process were carried out then direct observation was conducted to third-party logistics companies (3PL), to understand the whole distribution processes and observe the time needed in each process. After understanding the distribution process, the existing process is modeled on the Igrafx BPMN software and includes time data to simulate the entire process until it gets the total time of the distribution process. Then the author conducts problem analysis to generate alternative solutions, and the new distribution process is modeled again in Igrafx BPMN software to get the total distribution process time that has been improved by the process.

Based on data for a delivery performance carried out by 3PL, the milk product is distributed to Sumatra and Eastern Indonesia. Distribution of goods with a destination in Sumatra is performing better than it is in East Indonesia. Even so, the distributors in Sumatra which consist of distributors in Medan still has a lower performance than East Indonesia, where delivery performance is only 36%. In this study, Medan Area became the object of research to redesign the distribution process of goods carried out by 3PL.
In carrying out the logistics function which consists of warehousing and transportation activities, a company has a target time for 3PL in the delivery of goods to consumers, called Turnaround Time (TAT), where not all areas have the same TAT. The TAT given to 3PL is 12 days for Medan Area, which consists of 3 lead times, including:
- Lead Time 1 (4 days): Pickup goods in the warehouse until the ship departs
- Lead Time 2 (4 days): Ships Departing until Ships arrive at Medan
- Lead Time 3 (4 days): The ship arrived at Medan until the goods were unloaded at the Distributor

Third Party Logistics (3PL) handles warehousing and distribution services for Dairy Companies, which consist of:
- Inbound Process: the process of entering goods into the warehouse
- Outbound Process: the process of releasing goods from the warehouse
- Delivery Process: the process of shipping goods from the warehouse to the distributor

Observations are conducted to find out the time for each process. The normal time is obtained based on the results of time study through observation, then the standard time results are obtained by adding an allowance factor of 10% through the following formula:

$$ST = NT\ x(1 + allowance)$$

ST = Standard Time
NT = Normal Time
Allowance = 10 %

4. Results and Discussion

After studying and reviewing the current distribution process, then the author conducted modeling of the current distribution business process as a whole from the order made until the order is received by the consumer (distributor), as shown in Figure 1.

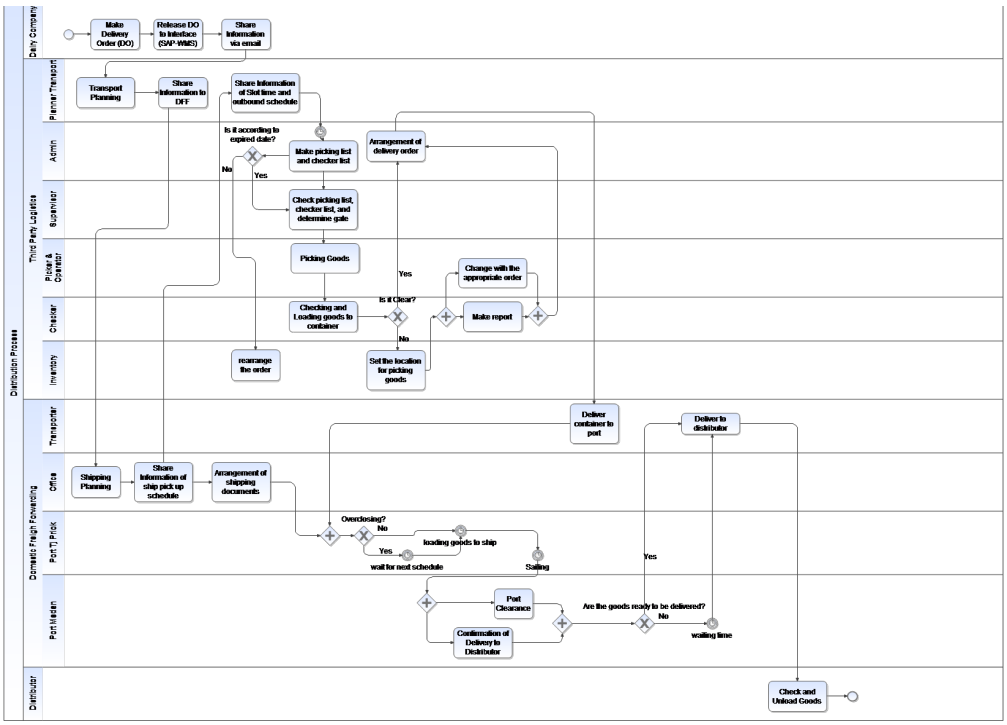

Figure 1. Model of Current Distribution Process

From the distribution process modeling, the simulation of the current distribution process model is conducted to find out the overall total time in delivering goods to the distributor along with the time of each process is conducted, shown in Table 1. The distribution process currently takes 22.06 days, which time exceeds The Company's distribution process target time for 12 days.

The results of the current distribution process are analyzed to determine the cause of the problem from the processing time that exceeds TAT. In the current distribution process model, it is shown that there are 3 main problems that cause long distribution process times and exceed the specified TAT, which are (1) the process in the warehouse takes a long time such as picking and checking and loading the goods, (2) Preparation of shipping process at Tanjung Priok Port, where the waiting time will be longer if there is over closing and the number of containers exceeds capacity so it must change the schedule of the ship and (3) the delivery process to the distributor has a long waiting time to delivering the container to the distributor which cause higher logistics costs.

Table 1. Simulation Process of As is Process

Transactions Statistics (Days)			
	Avg Cycle	Avg Work	Avg Wait
Distribution Process	22,06	10,42	11,64
Detail Transactions (Days)			
Distribution Process/Distributor	0,76	0,13	0,63
Distribution Process / Domestic Freight Forwarding/ Office	3,42	2,53	0,89
Distribution Process / Domestic Freight Forwarding/ Port Medan	16,88	7,43	9,46
Distribution Process / Domestic Freight Forwarding/ Port Tj Priok	8,20	5,44	2,76
Distribution Process / Domestic Freight Forwarding/ Transporter	1,11	0,39	0,71
Distribution Process / Company	0,02	0,02	0,00
Distribution Process / Third Party Logistics/ Admin	0,02	0,02	0,00
Distribution Process / Third Party Logistics/ Checker	0,69	0,06	0,63
Distribution Process / Third Party Logistics/ Inventory	0,00	0,00	0,00
Distribution Process / Third Party Logistics/ Picker & Operator	0,05	0,05	0,00
Distribution Process / Third Party Logistics/ Planner Transport	0,01	0,01	0,00
Distribution Process / Third Party Logistics/ Supervisor	0,01	0,01	0,00

Based on the analysis of the problems in the distribution process that causes delays in delivery, it needs to be redesigned to improve the distribution process, through benchmarking against 3PL, or companies that distribute their products.

1. Re-planning order in the Warehouse Management System and RFID Application
   The re-planning order in the Warehouse Management System is used to reset orders when creating a picking list and checker list by the admin so the picking process will be faster where the product can be set up in the closest and most affordable area in the warehouse. Radio Frequency Identifier (RFID) is used to speed up the process of picking, checking and loading goods to trucks.
2. Using multi-vendor shipping
   Using Multi-vendor shipping aims to increase shipping flexibility, by using many shipping vendors (more than 1 vendor). In the current distribution process, 3PL is still using one shipping vendor, so 3PL must follow their ship's schedule, while some problems that occur is over closing, a condition where the container is late in entering the port from a specified time, so containers can be delivered to distributors by following the next ship schedule, which is 3 days after the initial schedule. This problem causes the delivery time target in Lead Time 1 to experience over TAT (more than 4 days), which will result in delays in delivery to distributors where the time spent by 3PL in delivering shipments exceeds 12 days.
3. Information and tracking system to a distributor
   The proposed improvement process is to eliminate the confirmation process to the distributor, where 3PL applies an integrated information system so that distributors are able to identify the position of shipping goods in real time, so that the 3PL and Dairy company do not need to confirm the distributor repeatedly because the distributor already knew the estimated time of the goods to arrive at the port or are ready to be delivered to the distributor. Then the distributor will have time to prepare the warehouse to receive the ordered items.
4. Change in the task of planning truck
   This is intended to eliminate non-value-adding activity where repeated activities occur while these can be done simultaneously. In this strategy, the truck planning task will be carried out by a DFF planner who works in conjunction with planning shipping and is no longer carried out by a warehouse planner, thereby reducing the repetitive time and work.

After the re-design process, these strategies are modeled and simulated to obtain the total time needed to deliver, then combined with each other and resulted in a total of 15 simulation models based on the 4 improvement designs. The simulation results are shown in Table 2.

Table 2. The Result of Proposed Strategy

Model	Strategy used	Transaction Statistics		
		Avg Cycle time	Avg Work	Avg Wait
1	Strategy 1	22,06	13,46	8,6
2	Strategy 2	19,05	12,46	6,59
3	Strategy 3	14,12	7,09	7,02
4	Strategy 4	22,06	13,42	8,64
5	Strategy 1 and 2	19,05	12,59	6,46
6	Strategy 1 and 3	14,12	7,09	7,02
7	Strategy 1 and 4	22,06	13,42	8,64
8	Strategy 2 and 3	11,12	6,09	5,02
9	Strategy 2 and 4	19,05	12,42	6,64
10	Strategy 3 and 4	14,12	7,05	7,07
11	Strategy 1, 2 and 3	11,12	6,22	4,9
12	Strategy 1, 2 and 4	19,05	12,42	6,64
13	Strategy 1, 3 and 4	14,12	7,05	7,07
14	Strategy 2, 3 and 4	11,12	6,05	5,07
15	Strategy 1, 2, 3, and 4	11,12	6,05	5,07

The results show that there are four strategies that have the most efficient time, which is 11.12 days, and Strategy 1,2 and 3 is the strategy that has the lowest waiting time compared to other Strategy. This result shows a reduction in waiting time, where the problem of in-time delivery of a product is caused by a long waiting time. The model of distribution process with strategy 1,2, and 3 is shown in Figure 2.

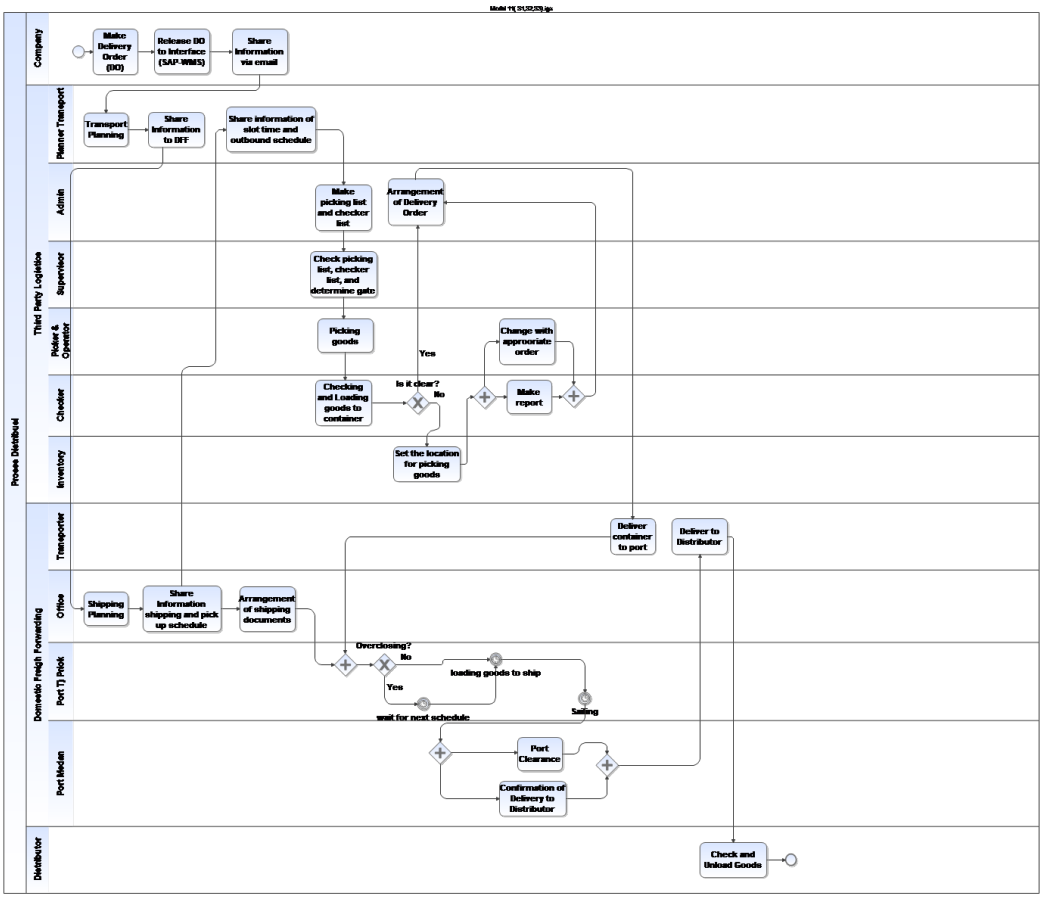

Figure 2. Model of to-be Process with Strategy 1,2 and 3

The model when the demand scenario increases and decreases are simulated to determine the most efficient time if there is an unpredictable scenario that will affect the initial simulation results. This increasing demand scenario affects the process of containers in the port before departing because when demand increases, the number of containers that will be carried out to deliver goods to Medan will also increase. When the number of containers per vessel exceeds the specified capacity for a Dairy Company, more containers will wait for the next ship schedule. Changes when demand decreases occur at the time of loading of goods to the ship, where the number of containers is small and will be faster in loading goods to the ship so that the schedule of departing ships can occur faster than scheduled. The result of this scenario shown in Table 3. From these results, it is shown that with the existence of these two scenarios, the strategy 1.2 and 3 results in the most efficient time with the lowest waiting time.

Table 3. The Result of Scenarios

Model	Strategy used	Transaction Statistics			Transaction Statistics		
		Increasing Demand Scenario			Decreasing Demand Scenario		
		Avg Cycle time	Avg Work	Avg Wait	Avg Cycle time	Avg Work	Avg Wait
1	Strategy 1	26,05	17,54	8,52	21,05	12,46	8,59
2	Strategy 2	21,05	13,79	7,26	19,05	12,46	6,59

Model	Strategy used	Transaction Statistics			Transaction Statistics		
		Increasing Demand Scenario			Decreasing Demand Scenario		
		Avg Cycle time	Avg Work	Avg Wait	Avg Cycle time	Avg Work	Avg Wait
3	Strategy 3	23,12	14,11	9,01	12,12	6,09	6,02
4	Strategy 4	26,05	17,75	8,31	21,05	12,42	8,64
5	Strategy 1 and 2	19,05	13,67	5,39	19,05	12,59	6,46
6	Strategy 1 and 3	16,12	8,18	7,94	12,12	6,09	6,02
7	Strategy 1 and 4	26,05	17,49	8,56	21,05	12,42	8,64
8	Strategy 2 and 3	12,12	7,17	4,95	11,12	6,09	5,02
9	Strategy 2 and 4	21,05	13,75	7,31	19,05	12,42	6,64
10	Strategy 3 and 4	18,12	11,12	7	12,12	6,05	6,07
11	Strategy 1, 2 and 3	11,12	7,22	3,9	11,12	6,22	4,9
12	Strategy 1, 2 and 4	19,05	13,42	5,64	19,05	12,42	6,64
13	Strategy 1, 3 and 4	16,12	8,05	7,07	12,12	6,05	6,07
14	Strategy 2, 3 and 4	12,12	7,05	5,07	11,12	6,05	5,07
15	Strategy 1, 2, 3, and 4	11,12	6,13	4,98	11,12	6,05	5,07

By comparing the results of the current distribution process simulation and redesign distribution process with the strategy 1,2, and 3 which are strategy of replanning order with the WMS and implementing RFID, using multi-vendor shipping, and using information and tracking systems for distributors, the resulting process efficiency of 49.6% with the lowest waiting time among other proposed strategy and is able to cut the time to 10.94 days from the current distribution process.

5. Conclusion

The distribution process carried out by Third Party Logistic is still considered inefficient, this is indicated by the performance of on-time delivery for the Medan Area only reaching 36%. The distribution process is currently modeled and simulated, resulting in 22.06 days of delivery to Medan area distributors. This paper then generates improvement for the distribution process using the Business Process Reengineering approach, which produces four improvement Strategy. The distribution process improvement design produces 15 simulation models, which are then tested using increasing and decreasing demand scenarios. This research resulted in the most optimal distribution process with a rearrangement strategy on WMS, using more than one shipping vendor, and distributor tracking and information systems by producing a total delivery time to distributors of 11.12 days. This result shows the distribution process efficiency of 49.6%.

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Biographies

M. Dachyar is head of Management Information System and Decision Support (MISDS) Laboratory, Industrial Engineering Dept. Universitas Indonesia. His research focused on management information system, decision support system, operation management, and business process reengineering

Gabriella Septiani Miranda is a research asisstant of Management Information System and Decision Support (MISDS) Laboratory, Industrial Engineering Dept. Universitas Indonesia. Her research focus on busines process reengineering.