Lead Time Loading Dock Reduction in Refined Sugar Company for Continuous Improvement

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Abstract

The industry is growing rapidly by combining digital technology and the internet with traditional industries, and industrial production capacity is also increasing during the digitization process. Demand for sugar in Indonesia is increasing every year in line with the increasing population and the growth of the food and beverage industry, assuming a projected population growth of around 1.25 per cent and the growth of the food and beverage industry by 5-7 per cent per year. The more logistics needed to boost speed without sacrificing precision, the higher the demand. This study discusses the loading dock process and the required lead time. Then it focuses on maximizing the loading process time by processing the loading registration process with a digitalization application at a refined sugar company in Indonesia. Implementing QR codes can speed up the delivery of information and data reports. It can cut down on time wastage by 66 minutes.

Keywords

Sugar, waste, e-kanban, VSM, ECRS and efficiency.

1. Introduction

In Indonesia, sugar distribution involves several partners, including sugar cane producers, sugar factories, distributors, merchants, consumers, and governments. Sugar availability in the market is the distributor's responsibility to serve various regions; thus, a high service level in the distribution process is required. On the other hand, distributors must examine the sugar factory's production rate, demand changes, and volume to deliver a timely response. Distributors must also reduce the cost of sugar storage (Lee, 2006). Demand for sugar in Indonesia is increasing every year in line with the increasing population and the growth of the food and beverage industry, assuming a projected population growth of around 1.25 per cent and the growth of the food and beverage industry by 5-7 per cent per year. The involvement of multiple parties may increase the possibility of inefficiencies in the distribution process. Profits and service response will suffer as a result of this inefficiency. As a result, it is critical to reducing wasting time in physical or administrative procedures, which was addressed in this study using value stream mapping, or VSM.

The improvement of logistics service performance service levels was made possible by VSM. The adoption of VSM helps identify ineffective logistics procedures in a convoluted supply chain. A group of tools and techniques known as lean manufacturing are used to create corrective action plans, decrease waste in manufacturing processes, and enhance working conditions. Businesses can design the finest strategies for surviving the current economic crisis with the help of the advantages of creating and strengthening lean manufacturing via consistent efforts. Several researchers are working to reduce waste by employing the ECRS approach.

The industry is growing rapidly by combining digital technology and the internet with traditional industries, and industrial production capacity is also increasing during the digitization process. Digitization makes information more accessible anywhere, anytime, in any context, and for any user using any device or access. The development of digitalization has resulted in changes in the logistics sector, creating a connected, highly efficient, and transparent digital logistics ecosystem. Adopting the electronic Kanban, a Quick Response (QR) code to each registration and other administrative activities in the loading process.

2. Literature Review

VSM is a tool for visualizing transitioning to lean manufacturing (Lee & Snyder, 2007). This tool is quite useful for explaining how to streamline work procedures. VSM generally reflects the perspectives of a process from external suppliers to external customers. The reason for adopting VSM is that it can aid in observing entire streamlined processes that assess and track the inefficiency that occurred from the start to the completion of the process. Silva (2012) cited the following advantages of utilizing VSM: it provides a single language and understanding so that everyone has the same vision; it integrates material and information flow VSM can greatly assist in decreasing inefficiencies in manufacturing processes, organizations, services, and logistics. McManus and McManus (2002) attempted to accelerate product development using VSM. Vinodh et al. (2010) have combined VSM with lean manufacturing technologies such as 5S, Kanban, Kaizen (Gurumurthy & Kodali, 2011), and total productive maintenance to reduce processing time, which affects production costs and product pricing in India's camshaft sector. Vanany (2005) researched the usage of value stream mapping in each department to decrease wasteful processes, defects, and inventory levels. Endsley et al. (2006) employed VSM in the service process to evaluate the queuing processes in hospital patient care. Lummus et al. (2006) conducted comparative research on clinical medical services of a smaller magnitude. VSM can measure leadership, behaviour, and competencies to improve organizational structure (Emiliani & Stec, 2006).

Serrano and colleagues (2008) Another study undertaken by Lehtinen and Torkko (2005) successfully increased the food service industry's performance toward lean production and supply by integrating suppliers and consumers in terms of inventory, transportation, facilities, and information. Value stream mapping can be used in conjunction with other tools such as simulations, 5S, and Kaizen, as demonstrated by Gurumurthy and Kodali (2011), who used VSM to simulate and analyze inefficiencies in a job-shop production system in a furniture manufacturing company with some product variation where there was one dominant product. When various inefficiencies developed in the sugar company Industri Gula Nusantara's operation in Kendal, Central Java Province, Indonesia, this research sought to optimize the sugar distribution system through value stream mapping (VSM). A VSM analysis of its corporate distribution process yields value by mapping each process stage that leads to added value. As a result, value is an activity or transformation of raw materials or information to suit the wants of consumers (Gasperz, 2007).

3. Methodology

The phases of the new VSM proposed by Suhardi et al. were followed in this research technique. The VSM process is used to identify production processes, including material and information data, and then ECRS is used to improve the production process. The first stage is to recognize and map production processes. Cycle times for each process, the number of operators, the number of machines, and the process flow from raw materials to completed goods were all included in the data. This stage divides the industrial process's activity into smaller tasks. The current VSM is created in the second phase. VSM is designed to visualize the movement of material and information in the manufacturing process and can map the entire business process. Lee (2006) examined VSM analysis through system observation, model mapping, determining value added or non-value contributed, identifying waste, and executing restoration activities. The ratio of value-added time to non-value-added time can be used to calculate efficiencies. The output of VSM is utilized to make judgments in inventory control policy to avoid a probable stockout. VSM is used to assist in the identification of waste in a process. The trash is identified as a process in the third phase. Waste can be identified by brainstorming and observing physical and informational flows.

The study framework for enhancing line efficiency through improved work practices may be stated in steps, as follows: 1) Data gathering; 2) Performance rating and line balance calculations; 4) Recapitulation of calculation results previous to improvement; 5) suggested improvement based on the concept of "eliminate, consolidate, reorganize, simplify" (ECRS); and 6) comparison of calculation results before and after improvement. Data gathering is the initial stage of this investigation. Work process flow, cycle time data, an operator working hour data, the number of operators, and corporate objectives are among the data obtained through direct observations and focus group conversations with the group head. The data is then processed; in this case, the data processing includes the performance rating calculation, standard time calculation, and line efficiency calculation. The Westinghouse rating is used to calculate performance ratings. Westinghouse Electric Corporation created this system. The Westinghouse rating comprises four variables defining work regularity and irregularity: skills, effort, condition, and consistency. After calculating the performance rating, the performance rating value will be used to compute cycle time, normal time, and standard time.

The time calculation results will also be determined as takt time, production capacity, production/head/hour, process time, and line efficiency. The next phase is to enhance the work process utilizing the ECRS idea, which entails removing, merging, reordering, and simplifying the work parts in the Bekasi sugar refinery assembly line. The ECRS idea is translated as elimination (removing redundant motions), combination (combining operations that may be done concurrently for greater efficiency), rearrangement (exchanging work parts at other workstations for greater efficiency), and simplicity (simplifying repetitive movements). In this study, using the ECRS idea to enhance work procedures can assist in eliminating inefficiencies or waste of movement during an assembly at each station. Furthermore, depending on the changes made, the standard time of work items that have been enhanced utilizing the ECRS concept is estimated. After collecting the outcomes of advances using the ECRS concept, the following step is to compare the impacts of line efficiency calculations before and after the increase to determine how significant the results gained are. A stopwatch is used to calculate processing time. Each job element's processing time is measured five times at random. After determining the processing time, a uniformity and adequacy test is carried out.

Overproduction, waiting, transportation, inefficient processing, superfluous inventory, unnecessary motion, defect, power and energy, human and potential, pollution, unnecessary overhead, and ineffective design is all waste. The fourth phase is to refine the procedure. Its goal is to eliminate waste in each phase, boosting the production process's efficiency and effectiveness. Workload analysis is used to assess the current circumstances concerning the characteristics of one's job.

Furthermore, workload calculation is employed to assess the workload level of each operator, allowing the best number of operators to be established. After identifying waste and optimal workflows, this stage, ECRS, is used to develop fresh ideas for improvement. The third phase is to develop the future VSM, a concept developed for future lean implementation plans to enhance production flow and attain the ideal conditions by improving the present VSM.

4. Data Collection

The loading dock process begins when the PPIC department has planned the delivery schedule. The logistics department would order as many trucks as needed daily to third-party logistics (3PL). 3PL would issue a confirmation letter to the company, indicating that 3PL already had ready trucks for distribution. In this case, the logistics department would order the trucks one day ahead of the delivery schedule.

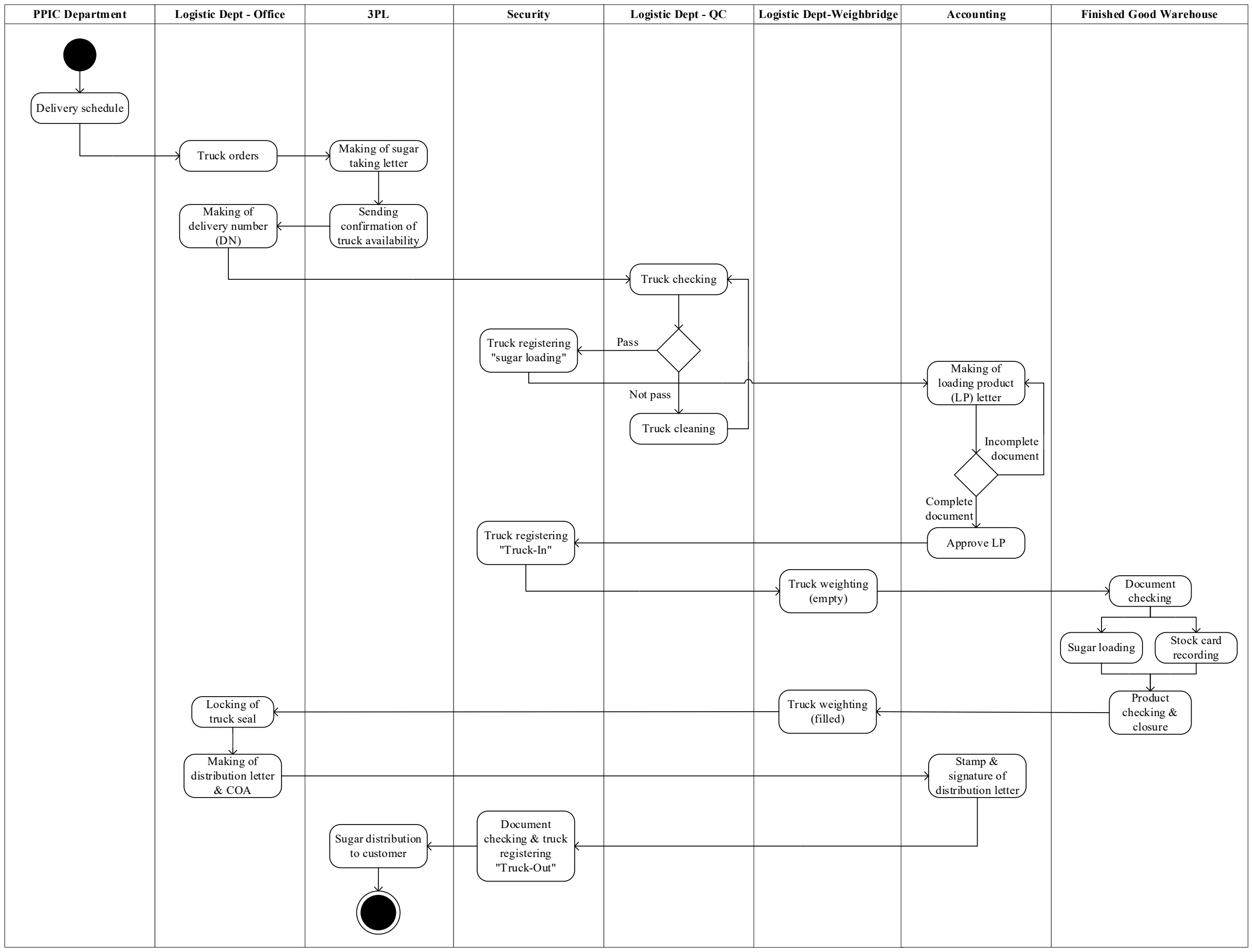

Figure 1. Loading dock process activity diagram current condition

Delivery was made when the delivery number (DN) was assigned. The following day, the truck will be inspected according to the requirements. Only trucks that have been fulfilled can be used for distribution. The complete process is described in Figure 1, and Table 1 shows each process's cycle time and timeline.

Table 1. Cycle time and timeline of each process

No	Activity	Cycle time (min)	Resource name	One day before	The Following day
1	Truck orders	10	Logistic Dept - Office		
2	Making of sugar taking letter	30	3PL		
3	Sending confirmation of truck availability	10	3PL		
4	Making of delivery number (DN)	30	Logistic Dept - Office		
5	Truck checking	5	Logistic Dept - WB		
6	Truck registering "sugar loading"	6	Security		
7	Making of loading product (LP) letter & Approval	12	Accounting		
8	Truck registering "Truck-In"	2	Security		
9	Truck weighting (empty)	2	Logistic Dept - WB		
10	Document checking	1	FG Warehouse		
11	Sugar Loading	45	FG Warehouse		
	Stock card recording	45	FG Warehouse		
12	Product checking & closure	5	FG Warehouse		
13	Truck weighting (filled)	2	Logistic Dept - WB		
14	Locking of truck seal	3	Logistic Dept - Office		
15	Making of distribution letter & COA	8	Logistic Dept - Office		
16	Stamp & signature of distribution letter	1	Logistic Dept - Office		
17	Document checking & truck registering "Truck-Out"	6	Security		
	Total Duration			80	98

There are three categories of activities, according to Gazpers (2007): important and value-added activities, important but non-value-added activities, and waste. While waste and inspection are important but non-value-added tasks, the operation is a value-added activity. There are 17 main activities in the loading dock process involving several resources, including the logistics department for the office division, QC division, and weighbridge division, and 3PL for providing delivery, security, and finished goods warehouse. Loading dock processing activities begin the day before product loading onto the truck to carry out administrative activities for truck orders. Table 1 shows the required cycle time for each activity, the resources responsible for each activity, and the work timeline in the current condition.

5. Result and Discussion

In this study, waste analysis was based on three tools, i.e. activity diagram, flow process chart, and value stream mapping. According to Fowler and Martin (2005), an activity diagram is a technique for describing procedural logic, business processes, and work paths. A flow process chart displays the order of actions taken throughout a process or procedure, including checks, transportation, waiting, and storage (Sutalaksana, 2006). Value stream mapping is a method for identifying activities that add value against those that do not, as well as for mapping the flow of the manufacturing process, the flow of services, and the overall flow of information that results in a particular kind of good or service (Rother & Shook, 2003). Figure 2 shows the value stream mapping of the loading dock services flows current condition.

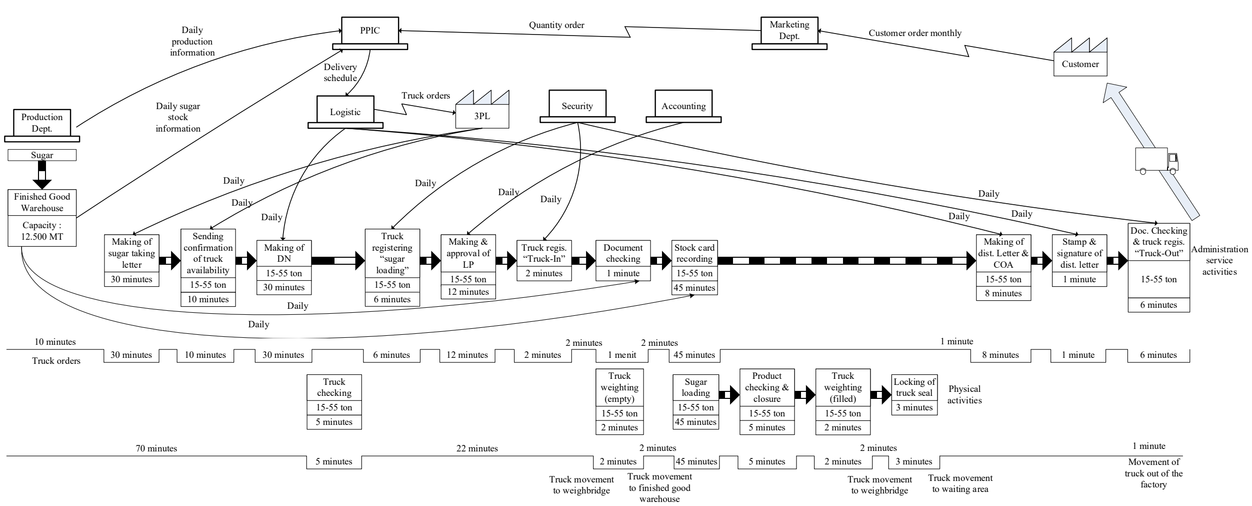

Figure 2. Value stream mapping of services flows current condition

FLOW PROCESS CHART

SUMMARY		
ACTIVITY	NOW	
	QTY	TIME
○ OPERATION	15	165
□ INSPECTION	4	13
⇨ TRANSPORTATION	0	0
D DELAY	4	8
▽ INVENTORY	1	-
TOTAL DISTANCE	481,3	

ASSIGNMENT : ADMINISTRATIVE SERVICE OF LOADING DOCK PROCESS

MAPPING NUMBER : 1

PERSON ☐ MATERIAL ☐ DOCUMENT ☑

NOW ☑ FUTURE ☐

MAPPING BY : RESEARCHER

DATE : NOVEMBER 02, 2022

ACTIVITY	MACHINE	SYMBOL ○	□	⇨	D	▽	DISTANCE M	TOTAL	TIME MIN	NOTE
Truck orders	Email	●					-	1	10	
Making of sugar taking letters	Computer	●					-	1	30	
Sending confirmation of truck availability	Email	●					-	1	10	
Making of delivery number (DN)	Computer	●					-	1	30	
Truck arrives at parking lot						●	-	1	-	
Truck checking	Manual		●				-	1	5	
Truck registering "sugar loading"	Computer & Manual	●					-	1	6	
Making of loading product (LP) letter & approval	Computer & Manual	●					-	1	12	
Truck registering "Truck-In"	Computer & Manual	●					-	1	2	
Waiting for truck movement to weightbridge					●		108,9	1	2	
Truck weighting (empty)	Weighting scale	●					-	1	2	
Waiting for truck movement to finished good warehouse					●		142,7	1	2	
Document checking	Manual		●				-	1	1	
Sugar loading & stockcard record	Forklift & Manual	●					-	1	45	
Product checking & closure	Manual	●	●				-	2	5	
Waiting for truck movement to weightbridge					●		142,7	1	2	
Truck weighting (filled)	Weighting scale	●					-	1	2	
Waiting for truck movement to waiting area					●		40,5	1	1	
Locking of truck seal	Manual	●					-	1	3	
Making of dist. letter & COA	Computer & Manual	●					-	1	8	
Stamp & signature of dist. letter	Manual	●					-	1	1	
Document checking & truck registering "Truck-Out"	Computer & Manual	●	●				-	2	6	
Waiting for movement of truck out of factory					●		46,5	1	1	

Figure 3. Administrative service of loading dock process current condition

FLOW PROCESS CHART

SUMMARY		
ACTIVITY	NOW	
	QTY	TIME
OPERATION	5	55
INSPECTION	2	7
TRANSPORTATION	5	8
DELAY	7	36
INVENTORY	1	-
TOTAL DISTANCE	481,3	

ASSIGNMENT : PHYSICAL SERVICE OF LOADING DOCK PROCESS

MAPPING NUMBER : 2

PERSON ☑ MATERIAL ☐ DOCUMENT ☐

NOW ☑ FUTURE ☐

MAPPING BY : RESEARCHER

DATE : NOVEMBER 02, 2022

ACTIVITY	MACHINE	SYMBOL: ○ (operation)	□ (inspection)	⇨ (transportation)	D (delay)	▽ (inventory)	DISTANCE (M)	TOTAL	TIME (MIN)	NOTE
Truck arrives at parking lot						●	-	1	-	
Truck checking	Manual		●				-	1	5	
Waiting for truck registering “sugar loading”	Computer & Manual				●		-	1	6	
Waiting for making of loading product (LP) letter & approval	Computer & Manual				●		-	1	12	
Waiting for truck registering “Truck-In”	Computer & Manual				●		-	1	2	
Truck movement to weighbridge				●			108,9	1	2	
Truck weighting (empty)	Weighing scale	●					-	1	2	
Truck movement to finished good warehouse				●			142,7	1	2	
Waiting for document checking	Manual				●		-	1	1	
Sugar loading & stockcard record	Forklift & Manual	●					-	1	45	
Product checking & closure	Manual	●	●				-	2	5	
Truck movement to weighbridge				●			142,7	1	2	
Truck weighting (filled)	Weighing scale	●					-	1	2	
Truck movement to waiting area				●			40,5	1	1	
Locking of truck seal	Manual	●					-	1	3	
Waiting for making of dist. letter & COA	Computer & Manual				●		-	1	8	
Waiting for stamp & signature of distribution letter	Manual				●		-	1	1	
Waiting for document checking & truck registering “Truck-Out”	Computer & Manual				●		-	1	6	
Movement of truck out of factory				●			46,5	1	1	

Figure 4. Physical service of loading dock process current condition

A comparison of the value-added time to the process lead time is used to calculate the percentage of value-added time (% VAT), also known as process cycle efficiency (PCE) (lead time, value-added time, and non-value-added time).

Identification of waste based on the seven categories of waste that Shingo (1989) identified, including excess production, unnecessary motion, excessive transportation, inappropriate processing, waiting or delay, defects, and unnecessary inventory, though not all of these categories were fully examined (Vanany, 2005). As specifically demonstrated in Figure 3 and Figure 4, the mapping was used for two types of service operations: administrative and physical service activities.

The total time for the administrative and physical service processes was 186 minutes. Value added time of administrative service current condition was 178 minutes. So, calculate the percentage of value-added time (%VAT) as value-added time (VAT) divided by total time and multiplied by 100%, which was 95,7%. Value added time of physical service current condition was 70 minutes. %VAT of physical service was 37,6%. The average daily shipment with a delivery intensity of 27 to 30 days a month was 912,437 tonnes, with an average daily truckload of 36 trucks. The VSM for the process might be set up to show cycle efficiency while highlighting any inefficient procedures or actions in figure 2. There is an inefficient process that relies on physical activities in managing the registration of "sugar loading", loading product (LP) letters, registering "truck-in", document checking, distribution letters & COA, and registering "truck out", which takes 36 hours minute. When the truck arrives, it has to wait for the registration to be carried out, "sugar loading". A product loading letter is issued after receiving approval from accounting. After the truck has finished loading sugar, it must wait to get a distribution letter & COA so it can make deliveries to the customer. However, these findings have become input for the company to make improvements by redesigning administrative activities carried out the day before and adopting the electronic Kanban, a Quick Response (QR) code to each registration and other administrative activities in the loading process.

QR code is symbolized in both the vertical and horizontal planes since it is two-dimensional machine-readable data (Ashish, 2016). The Kanban system receives crucial data, such as the driver's name, vehicle number, delivery number, delivery weight, catch details, arrival date, and destination, and provides visibility throughout the value chain. Without the requirement for complex infrastructure upgrades, QR codes may be easily used in the dispersed supply chain. They can also hold information for a reasonable price (Reykjavik, 2010). By speeding up data entry tasks and document verification, this QR code helps to reduce human error-related input errors. Figure 5 shows a sample QR code representing details of sugar-loaded for delivery to a customer.

Figure 5. Sample QR code of proposal condition

ECRS analyzes procedures and actions based on the following fundamental ideas: C for Combine operations E for Eliminate superfluous labour R for rearranging the order of operations, and S for Simplify the required operations (Kasemset et al., 2014). Figures 6 to 9 represent the conditions proposed for improvement to minimize non-value-added time and operating efficiency based on the application of the ECRS principle.

Based on the results of the proposed conditions above, a reduction in cycle time was obtained, especially for physical activity. The total time for the administrative and physical service processes is 157 minutes. Value added time of administrative service current condition is 104 minutes. There is a saving of 74 working time, from the previous 178 minutes to the proposal condition is 104 minutes. So, the percentage of value-added time (%VAT) is 66,2%. Value added time of physical service proposal condition is 66 minutes. There is a %VAT for physical service, which is 42%. There was the elimination of the waiting time, and previously there was a delay of 36 minutes. The proposal condition only found a delay of 11 minutes due to scanning the QR code and preparing the distribution letter & COA. The time of current condition took 98 minutes the following day, but the proposal condition, as shown in Table 2, only took 69 minutes.

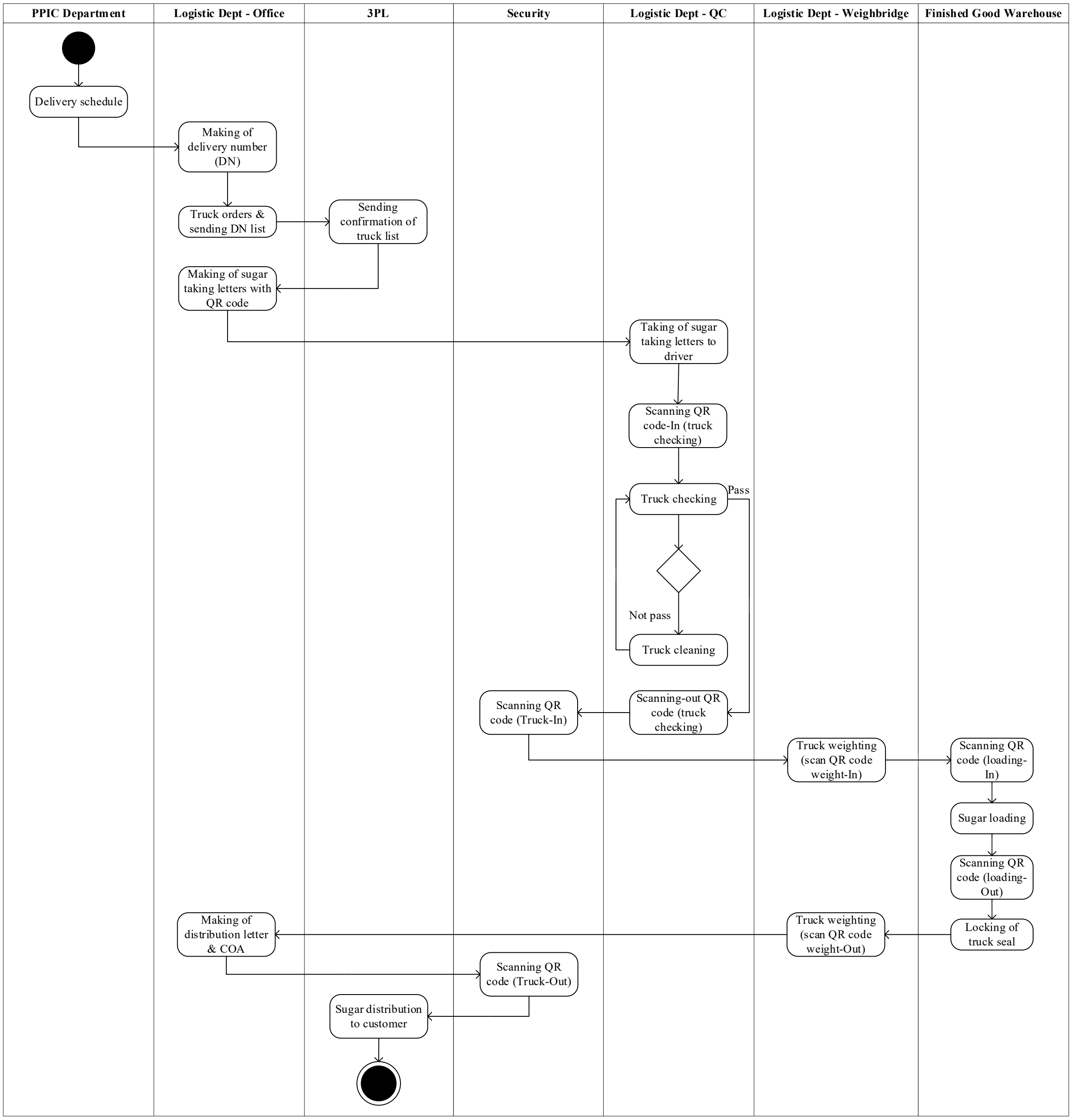

Figure 6. Loading dock process activity diagram proposal condition

FLOW PROCESS CHART

SUMMARY		
ACTIVITY	NOW	
	QTY	TIME
OPERATION	14	99
INSPECTION	1	5
TRANSPORTATION	0	0
DELAY	6	53
INVENTORY	1	-
TOTAL DISTANCE	481,3	

ASSIGNMENT : ADMINISTRATIVE SERVICE OF LOADING DOCK PROCESS

MAPPING NUMBER : 3

PERSON ☐ MATERIAL ☐ DOCUMENT ☑

NOW ☐ FUTURE ☑

MAPPING BY : RESEARCHER

DATE : NOVEMBER 02, 2022

ACTIVITY	MACHINE	SYMBOL: Operation	Inspection	Transportation	Delay	Inventory	DISTANCE (M)	TOTAL	TIME (MIN)	NOTE
Making of delivery number (DN)	Computer	●					-	1	30	
Truck orders & sending DN list	Email	●					-	1	10	
Sending confirmation of truck list	Email	●					-	1	10	
Making of sugar taking letters with QR code	Computer & QR code	●					-	1	30	
Truck arrives at parking lot						●	-	1	-	
Taking of sugar taking letters to driver		●					-	1	1	
Scanning QR code-In (truck checking)	HP & QR code	●					-	1	1	
Truck checking	Manual		●				-	1	5	
Scanning-out QR code (truck checking)	HP & QR code	●					-	1	1	
Scanning QR code (Truck-In)	Computer & Manual	●					-	1	1	
Waiting for truck movement to weighbridge					●		108,9	1	2	
Truck weighting (scan QR code weight-In)	Weighting scale & QR code	●					-	1	2	
Waiting for truck movement to finished good warehouse					●		142,7	1	2	
Scanning QR code (loading-In)	Computer & QR code	●					-	1	1	
Waiting for sugar loading	Forklift & Manual				●		-	1	45	
Scanning QR code (loading-Out)	Computer & QR code	●					-	1	1	
Locking of truck seal	Manual	●					-	1	3	
Waiting for truck movement to weighbridge					●		108,9	1	2	
Truck weighting (scan QR code weight-Out)	Weighting scale & QR code	●					-	1	2	
Waiting for truck movement to waiting area					●		40,5	1	1	
Making of distribution letter & COA	Computer & QR code	●					142,7	1	5	
Scanning QR code (Truck-Out)	Computer & QR code	●					-	1	1	
Waiting for movement of truck out of factory					●		46,5	1	1	

Figure 7. Administrative service of loading dock process proposal condition

FLOW PROCESS CHART

SUMMARY		
ACTIVITY	NOW	
	QTY	TIME
OPERATION	5	53
INSPECTION	1	5
TRANSPORTATION	4	8
DELAY	7	11
INVENTORY	1	-
TOTAL DISTANCE	481,3	

ASSIGNMENT : PHYSICAL SERVICE OF LOADING DOCK PROCESS

MAPPING NUMBER : 4

PERSON ☑ MATERIAL ☐ DOCUMENT ☐

NOW ☐ FUTURE ☑

MAPPING BY : RESEARCHER

DATE : NOVEMBER 02, 2022

ACTIVITY	MACHINE	SYMBOL: Operation	Inspection	Transportation	Delay	Inventory	DISTANCE (M)	TOTAL	TIME (MIN)	NOTE
Truck arrives at parking lot						●	-	1	-	
Taking of sugar taking letters to driver		●					-	1	1	
Waiting for scanning QR code-In (truck checking)	HP & QR code				●		-	1	1	
Truck checking	Manual		●				-	1	5	
Waiting for scanning-out QR code (truck checking)	HP & QR code				●		-	1	1	
Waiting for scanning QR code (Truck-In)	Computer & QR code				●		-	1	1	
Truck movement to weighbridge				●			108,9	1	2	
Truck weighting (scan QR code weight-In)	Weighting scale & QR code	●					-	1	2	
Truck movement to finished good warehouse				●			142,7	1	2	
Waiting for scanning QR code (loading-In)	Computer & QR code				●		-	1	1	
Sugar loading	Forklift & Manual	●					-	1	45	
Waiting for scanning QR code (loading-Out)	Computer & QR code				●		-	1	1	
Locking of truck seal	Manual	●					-	1	3	
Truck movement to weighbridge				●			108,9	1	2	
Truck weighting (scan QR code weight-Out)	Weighting scale & QR code	●					-	1	2	
Truck movement to waiting area				●			40,5	1	1	
Waiting for making of distribution letter & COA	Computer & QR code				●		142,7	1	5	
Waiting for scanning QR code (Truck-Out)	Computer & QR code				●		-	1	1	
Movement of truck out of factory				●			46,5	1	1	

Figure **8**. Physical service of loading dock process proposal condition

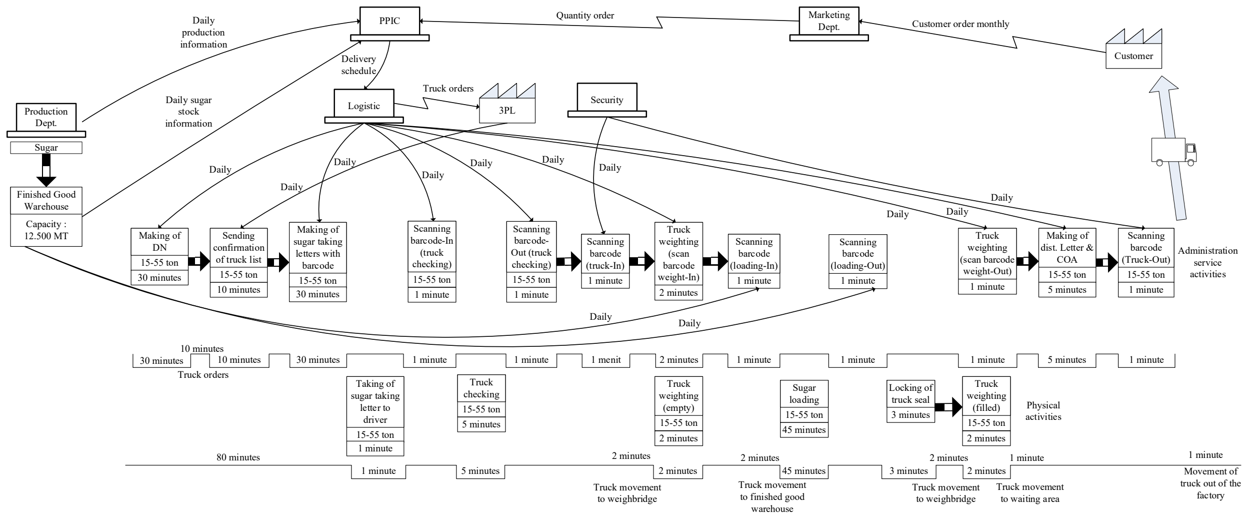

Figure 9. Value stream mapping of services flow proposal condition

Table 2. Cycle time and timeline of each processes proposal condition

No	Activity	Cycle time (min)	Resource name	One day before	The Following day
1	Making of delivery number (DN)	30	Logistic Dept - Office		
2	Truck orders & sending DN list	10	Logistic Dept - Office		
3	Sending confirmation of truck list	10	3PL		
4	Making of sugar taking letters with barcode	30	Logistic Dept - Office		
5	Taking if sugar taking letters to driver	1	Logistic Dept - QC		
6	Scanning barcode-In (truk checking)	1	Logistic Dept - QC		
7	Truck checking	5	Logistic Dept - QC		
8	Scanning barcode-Out (truk checking)	1	Logistic Dept - QC		
9	Scanning barcode (Truck-In)	1	Security		
10	Truck weighting (scan barcode weight-In)	2	Logistic Dept - WB		
11	Scanning barcode (loading-In)	1	FG Warehouse		
12	Sugar Loading	45	FG Warehouse		
13	Scanning barcode (loading-Out)	1	FG Warehouse		
14	Locking of truck seal	3	FG Warehouse		
15	Truck weighting (scan barcode weight-Out)	2	Logistic Dept - WB		
16	Making of distribution letter & COA	5	Logistic Dept - Office		
17	Scanning barcode (Truck-Out)	1	Security		
	Total Duration			80	69

6. Conclusions

Implementing QR codes in administrative services has many benefits, including the ability to reduce data input errors and speed up the sugar loading process, can help to identify a lack or excess quantity of goods, know the type of product, feasibility, and quality of the goods to be shipped, reduce human errors in goods inspection, use less paper, and expedite the issuance of the manifest for shipping. Additionally, QR codes can speed up the delivery of information and data reports. The system will be automatically updated in real-time with information from the Order Processing, Truck Weighing, Outbound Checking, Loading, and Stock Take / Opname to ensure that the data obtained is accurate. Thus, adding QR codes to the logistical management system can improve sugar-loading efficiency. To improve the efficiency of the logistics process, the warehouse must integrate this QR code technology into its logistics management system.

References

Ashish., What is a QR Code, and How Is It Different from a Barcode? [Online]. (accessed: December 14, 2022), 2016.

Emiliani, M.L., and Stec, D.J, Using value stream to improve leadership. The Leadership and Organization Development Journal 25(8): 622-645, 2004.

Endsley, S., Magill, M.K. and Godfrey, M.M. Creating a lean, Family Practice Management. pp.34-48. 2006.

Fowler & Martin. UML Distilled 3rd edition. Panduan Singkat untuk Bahasa Pemodelan Objek Standar. Andi. Yogyakarta. 2005.

Gasperz, V. Lean Six Sigma for Manufacturing and Services Industries-Strategi Dramatik Reduksi Cacat/Kesalahan, Biaya, Inventori, dan Lead Time dalam Waktu kurang dari 6 Bulan. Gramedia Pustaka Utama, Jakarta. 2007.

Gurumurthy, A. and Kodali, R. Design of lean manufacturing system using value stream mapping with simulation. Journal of Manufacturing Technology Management 22(4): 444-473. 2011.

Kasemset, C., P. Pinmanee, P. Umarin.. Proceedings of the Asia Pacific Industrial Engineering & Management Systems Conference, pp.1478. 2014

Lee, Q. The Strategos Guide to Value Stream and Process Mapping. Enna Products Corporation. Bellingham. 2006.

Lee, Q. and Snyder, B. Value Stream and Process Mapping. Enna Products Corporation. Bellingham. 2007.

Lehtinen, U. and Torkko, M. The lean concept in the food industry: a case of contract manufacture. Journal of Food Distribution Research 36(3): 57-67. 2005.

Lummus, R.R., Vokurka, R.J. and Rodeghiero, B. Improving quality through value stream mapping: a case study in physician's clinic. Total Quality Management and Business Excellence 17(8): 1063-1075. 2006.

McManus, H.L. & Millard, R.L. Value stream analysis and mapping for product development. Proceeding of the International Council of Aeronautical Sciences 23rd ICAS Congress. 8–13. 2002. Toronto, Canada.

Reykjavik. M.T.T. Nga, Enhancing quality management of fresh fish supply chains through improved logistics and ensured traceability, Faculty of Food Science and Nutrition, School of Health Sciences, University of Iceland. 2010.

Rother, M., and J. Shook. Learning to See, Value Stream Mapping to Create Value and Eliminate Muda. Cambridge: Lean Enterprise Institute, Inc. 2003.

Serrano, I., Ochoa, C. and De Castro, R.. Evaluation of value stream mapping in manufacturing system redesign. International Journal of Production Research 46(16): 4409-4430. 2008

Shingo, S. A Study of the Toyota Production System from an Industrial Engineering. Productivity Press, Cambridge. 1989.

Silva, S.K.P.N. Applicability of Value Stream Mapping (VSM) in the apparel industry in Sri Langka. International Journal of Lean Thinking 3(1). 2012.

Sutalaksana, Iftikar Z. Teknik Tata Cara Kerja. Work Procedure & Ergonomics Laboratory, Department of Industrial Engineering ITB, Bandung. 2006.

Vanany, I. Aplikasi pemetaan aliran nilai di industri semen. Jurnal Teknik Industri 7(2): 127-137. 2005.

Vinodh, S, Arvind, K.R., and Somanaathan, M. Application of value stream mapping in an Indian camshaft manufacturing organization. Journal of Manufacturing Technology Management 21(7): 888-900. 2010.

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