EXPORT PROCESS IMPROVEMENT

Piyathida Chaipunya*, Vilasinee Srisarkun and Piyawan Puttibarncharoensri
Assumption University of Thailand

ABSTRACT

This study applied the DMAIC (Define, measure, analyze, improve, and control) method to improve the export lead time. The export operation is considered in the optimization of lead time in supply chain management which mainly focuses on export daily operation in the internal process in the company. To understand the risk area, process mapping is used to show the existing export process and find out the critical issue to be analyzed. Then, the fishbone diagram is applied to analyze the export process and help the company identify the root cause of the problem. Next, brainstorming is applied to find the alternative solution. The best solution was identifying and selecting to improve the current process. The implementation plan was proposed to related export process members in order to implement the new process of the export procedure and workflow for achieving sustainable procedures to improve the company's operations.

After the implementation of the best alternative solution, the process has shown significant improvement in lead time performance. The company gains advantages from the increased capacity in workload and lead time reduction. These contribute to the standardization work in the export operation of the company.

Keywords: *Export process, DMAIC, process mapping, fishbone diagram, brainstorming*

บทคัดย่อ

งานวิจัยนี้ได้นำแนวคิด DMAIC (Define, measure, analyze, improve, and control) มาใช้ปรับปรุงระยะเวลาการทำงานของการส่งออกสินค้า การดำเนินการปรับปรุงระยะเวลาของขั้นตอนการส่งออกถือเป็นการเพิ่มประสิทธิภาพของการทำงานในการจัดการโซ่อุปทาน โดยมุ่งในการแก้ไขขั้นตอนการทำงานในแต่ละวัน เพื่อให้เข้าใจถึงพื้นที่ปัญหาในการทำงานปัจจุบัน การวาดแผนผังกระบวนการจึงถูกนำมาใช้เพื่อแสดงภาพรวมของกระบวนการส่งออกทั้งหมดและค้นหาปัญหาหลักเพื่อที่จะนำไปทำการวิเคราะห์ จากนั้นจึงนำแผนภาพก้างปลามาวิเคราะห์กระบวนการส่งออกและช่วยให้บริษัทระบุสาเหตุของปัญหาได้ นอกจากนี้การใช้วิธีการระดมความคิดเพื่อหาทางเลือกในการแก้ไขปัญหา ผลจากการระดมความคิดถูกนำมาหาวิธีการทำงานที่ดีที่สุด และนำมาปรับปรุงกระบวนการทำงานในปัจจุบัน อีกทั้งมีการเสนอแผนการดำเนินงานให้กับสมาชิกที่เกี่ยวข้องในกระบวนการส่งออก นำกระบวนการใหม่ของขั้นตอนการส่งออกไปปฏิบัติจริงและเพิ่มประสิทธิภาพการทำงานของหน่วยงานในระยะยาว หลังจากปรับปรุงกระบวนการทำงาน พบว่ากระบวนการทำงานการส่งออกมีระยะเวลาการทำงานที่ลดลงอย่างมีนัยสำคัญ พนักงานสามารถปฏิบัติงานได้ตามขั้นตอนตามมาตรฐานการทำงาน ส่งผลให้บริษัทสามารถบริหารงานได้อย่างมีประสิทธิภาพมากขึ้น

คำสำคัญ: กระบวนการส่งออก, DMAIC, แผนผังกระบวนการ, ผังก้างปลา, การระดมความคิด

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*Ms. Piyathida Chaipunya is a MSc. Supply Chain Management student at the Martin de Tours School of Management and Economics, Assumption University. Email: piyathida.chaipunya@zf.com
**Dr. Vilasiness Srisarkun is a lecturer in Supply Chain Management at the Martin de Tours School of Management and Economics, Assumption University. Email: vicki911@gmail.com

INTRODUCTION

Thailand is a hub for automotive export activity in Asia, especially for vehicles and automotive parts. The company must adjust its strategy to compete with competitors and survive in business in order to gain a competitive advantage. The strategy of the exporter can fulfill customers' needs in the most competitive way and create value-added services. All customers expect to receive the shipment as scheduled agreement.

MMST company has to manage all export activities in Thailand with its limited resource and capacity. The export business was not a smooth operation. A company cannot manage the export activity and provide shipping documents on time to support customs clearance at the destination. DMAIC was a method applied for identifying, analyzing, and improving the existing processes for long-term business. The purpose of this project is to improve process lead time. The objectives of this study are given below.

1. To identify and analyze the current export process of MMST Company.
2. To study how to improve the lead time in the export process of MMST Company.
3. To propose a new process, create guidelines, and set a standard of work for the export activity of MMST Company.

The company failed on its KPI on the export operation, which was the reason for the headquarters' complaints about its performance. There were many waste processes of the export activity. Moreover, the staff spent more time handling daily tasks. It led to a high lead time in the export activity. Therefore, this study focused on how to eliminate the waste process and improve the lead time of the export operation. So, the question, **"How can MMST improve the current process?"** was raised.

LITERATURE REVIEW

DMAIC

This research uses a method called "DMAIC" which is a process improvement methodology. Prashar (2014) explains this tool can identify the root causes of the export process and improve the current process to be the standard operating procedure of the Company. DMAIC is a five-step methodology: Define, Measure, Analyze, Improve and Control the processes. Step 1 is the DEFINE phase. This state seeks and solves the current problem, re-processes activity, looks for new opportunities for improvement, drives to the project goals, and determines the process boundaries. The description of the problem should include an essential aspect of the Define phase. Jobstl and Freisinger (2015) gathered Voice of the Customer (VOC) to be a tool to study in this phase. Therefore, it is to classify the current information, the project purposes, and the timeframe for achievement.

Step 2 is the MEASURE phase. The company starts by gathering data in the current process to describe the current situation or process performance. Then, the company will determine and identify the best parameters for analysis, work for the best approach to measure them, accumulate and classify the necessary information, and establish and design a plan to collect them. This includes summarizing and carrying out the measurements by conducting an experiment. The actual process or data should be used to ensure a reliable process evaluation (Watson, 2004).

Step 3 is the ANALYZE phase. The purpose is to define the root causes of the inefficiencies.

The categories of causes could be processes, technology, knowledge, and information systems (Beckford, 2002). Statistical analysis is a crucial element of this step and is used to exhibit these relationships and rank improvement opportunities. So, the Ishikawa Diagram is usually a product of the team's brainstorming about the problem in question (Wong, 2011).

Step 4 is the IMPROVE phase. This step includes discovering a method of countering the root causes. Techniques involve brainstorming to devise potential solutions and identify solutions. Data analysis and charting techniques are applied to verify that the performance has improved to achieve the project's goal. Accordingly, mind map and Ishikawa Diagram are used to represent a huge amount of ideas on a single page and are mostly used to facilitate brainstorming and trigger new ideas. The key element of the Improve phase is to eliminate the root causes and control the process to ensure that defects do not reappear (Naslund, 2008).

Step 5 is the CONTROL phase. This step is exercised to guarantee that the additions are obtained while improvement is maintained. The improved process or product performance is ensured to achieve the target. Once the solution resolves the problem, the improvements must be standardized and sustained. The standard-operating procedures may require revision or update plan records regularly and an ongoing maintenance plan for monitoring to transit the standardized improvements. Therefore, control procedures must be simple, easy to use, and easy to understand (Albeanu et al., 2010).

The following parts review related literature mainly on the identification of the root causes of the problems by using process mapping and a fishbone diagram to see the waste area in the process. Process mapping is a valuable method to understand the overall process. complicated processes can be analyzed for improvement (Colquhoun, Baines & Crossley, 1996). To analyze the current process, all parties need to brainstorm together to help identify the root cause in the company (Bozarth & Handfield, 2013). As a result, the fishbone diagram is a significant tool. It is used for analyzing and evaluating the current process to improve the process for best practice (Southern, 1995). In addition, the Brainstorming strategy is applied for seeking the alternative solution to improve the current process within the organization. It is a technique for problem-solving (Osborn, 1953).

Process Mapping

Process mapping consists of constructing a model that can show the relationships among the activities, people, data, objects, and a specified output in production (Colquhoun et al., 1996). It is one of the necessary quality or process improvement tools. It is a visual symbol of what a business does taking into account responsibilities and standards of the actions, decisions, or tasks performed at every step in the process to achieve the outcome. Workflow maps show the information through the systematic flow. This method delivers practices easily and quickly to visualize standard procedures. All related points are added to picturing work processes. The process mapping shows how inputs and tasks are linked from the starting point to the finishing point. The required steps can be mapped to create a standard workflow or to find the problem and remove waste. Moreover, it can be applied very successfully as a tool during the initial stage of the project (Ballard & Howell, 1994). It consists of a collection of tools and methods which are used to understand an organization and processes. Those tools allow us to review the document, analyze, improve, streamline, and redesign business processes to realize organizational efficiencies (Halseth, 2008).

Leavitt (1965) demonstrated that a workflow map is an accessible, complex search for mutual

adaptations between tasks, structures, people, and technology. This tool helps to create processes in an organization by making everyone understand information and see areas for improvement. However, it is very important to map what is happening and developing by monitoring the workflow to identify areas for improvement. Table 1 shows the tools and techniques suggested for DMAIC methodology in each step. Some tools were applied in this study.

Table 1: Tools and Techniques for DMAIC Methodology

Phase	DMAIC Phase Steps	Tools Used
Define	- Define the current requirements. - Define the current resource and evaluate the key person support. - Identify the current process, goal, and benefit. - Alternative solution plan to develop the current process.	- Process map
Measure	- Define the current process to find the defect and opportunity. - Collect the information and develop for a collection Plan. - Detailed process mapping, track record to determine resource capability.	- Process map
Analyze	- Define performance objectives. - Identify Value/Non-Value Added Process Steps. - Identify Sources of Variation. - Determine Root Cause(s).	- Fishbone Diagram - 5 Whys - Process Map - Brainstorming
Improve	- Define Performance Objectives. - Identify Value/Non-Value Added Process Steps. - Identify Sources of Variation. - Determine Root Cause(s).	- Fishbone Diagram - 5 Whys - Process map
Control	- Define and Validate the Monitoring and Control System. - Develop Standards and Procedures. - Implement Process Control. - Determine Process Capability. - Verify Benefits or voidance. - Close Project, Finalize Documentation. - Communicate to Related Person.	-Process Map

Source: Adapted from iSixSigma (2000)

Brainstorming

Brainstorming is a technique for problem solving. Brainstorming techniques generate a creative idea. Honig (2001) identified it as a different thinking that includes the breaking up of gray ideas, creating new systems, enlarging the limits of knowledge, and the onset of amazing ideas. All members feel free for the environment to present their ideas, without attracting criticism from anyone. Every possible generated idea is recorded and considered as a solution to a problem. Osborn (1953) introduced to create a group of 12 participants for brainstorming. All participants provide an expectation for the idea to find alternative solutions. Moreover, group brainstorming techniques are creating team idea methods. This method's benefit guarantees a variety of different ideas and leads to better problem-solving as well as developing innovation and creativity (Abdelnor, 2004).

Jarwan (2005) stated that the brainstorming process could serve as an effective way to create a cover list of ideas, and it allows the people to understand the thinking process in-depth detail about the problems. Besides, brainstorming is an effective technique and useful method to create critical thinking skills. Harbi (2002) identified that this tool has a significant positive

relationship between critical thinking and achievement. It helps activate people's thinking to explore new alternatives instead of receiving information from others.

Besides, VanGundy (1983) explained that the brainstorming method requires the participants' idea to recall their previous experience, including practice different knowledge and skills. So, Bwli (2006) summarised the steps for brainstorming to solve the problem. The first is defining problems. Then, the participants need to choose valid information to solve the problem. After that, all members need to employ and apply knowledge in a new setting and evaluate inference. The problem-solving processes for brainstorming have come up with the method for transforming knowledge and experience into behavior and developing long-term memory capacity to reserve more information (Anderson, 1993).

RESEARCH METHODOLOGY

The primary and secondary data on the process were collected. The primary data are information initially collected in the process of investigation. Secondary data are information already collected by the headquarters of the MMST.

DMAIC is a tool consisting of Interviewing, Process flow, Fishbone diagram, and Brainstorming. These tools were used to seek and identify the problems in the export process. They also use to develop areas for improvement. Moreover, they can apply to find solutions to improve the export in the current process.

Define Phase

MMST Company failed in its performance for the export process. Hence, MMST set up an internal team and conducted initial informal interviews with members of the related departments in the company, such as Part Supply and Logistics officers (PS&L), warehouse office (MLSA), 3PL, HQ officer, and export officer about the export process. As an advantage, the researcher was one of the members of the working group to identify the export process.

In this phase, the problem related to the export process was identified. The export process was concerned both the internal (Order Processing Department, Logistics, Department, and export officer) and the external (warehouse officer, 3PL, HQ officer).

Firstly, the complaints about MMST performance related to the internal process were documentation, such as late documentation and erroroneous documentation, and administrative failure such as late feedback/ responding. The complaints can be seen in Table 2.

Table 2: Problems Related to Internal Process

Problem	Description
Documentation	1. Shipping documents - Invoice and packing List: issue invoice late, details on invoice error - Bill of Lading: cross-check (missing) wrong details on the document 2. An error of communication between related parties
System	1. System to issue invoice failure 2. Waiting to issue an invoice for 1 hour
Customer Service	1. Late Feedback to customers and headquarters 2. Miscommunication

Secondly, the problems related to 3PLs (external process) were delays of delivery, document missing in details, billing error, miscommunication, and administrative error (customs clearance problem, cannot pick up and return container on time, late shipment loading, error on loading process). The problems can be seen in Table 3.

Table 3: Problem Related to External Process

Problem	Description
Documentation	1. Shipping documents -Invoice and packing List: issue invoice late, details on invoice error -Bill of Loading: issue wrong details on AWB and SWB 2. An error of communication between related parties 3. Error on export declaration 4. Error on booking details
Process	1. Trucking process is missing schedule. 2. Damage container 3. Container shortage 4. Vessel Delay 5. Shipment is missing the delivery plan
Customer Service	1. Late feedback to customer 2. Miscommunication

Measure Phase

This phase presents the detailed process mapping, evaluation of the existing system, and assessment of the current level of process performance. The export activities are identified, and the lead time of the export process starts when the customers place an order until the shipment is delivered to the customers.

Process Mapping

The process mapping of the export process is related to all internal and external parties. This framework of the process is set up by the headquarter in Japan from the beginning. After the customer places the order at the headquarter, it will be confirmed, and the order is placed at MMST.

Next, when MMST receives the export information, it will contact MLSA to prepare the material for the packing process and 3PL for booking air freight booking (Freight service provider depends on the customer's contract or agreement). According to booking confirmation, 3PL will organize a truck to pick up the containers at the yard and bring the shipment to the MMST warehouse. Then, the shipment will be delivered from MMST to overseas customers. The process is demonstrated in Figure 1.

Long waiting time was the main cause of customers' complaints. The process took 50 minutes per shipment in the export operation as set up by the headquarter. After analyzing the export process, it was found that there was high work load at the Customs Department of MMST.

Tables 4 provides data that was recorded by the researcher. The researcher observed the daily operation and recorded the time in every step in the export process. The total lead time for the export process of the MMST Company was shown. It included both MMST and MLSA activities. These activities were assigned and controlled by the headquarter. After MMST set up the export operation, the total lead time was 195 minutes per shipment.

Figure 1: Export Process of MMST

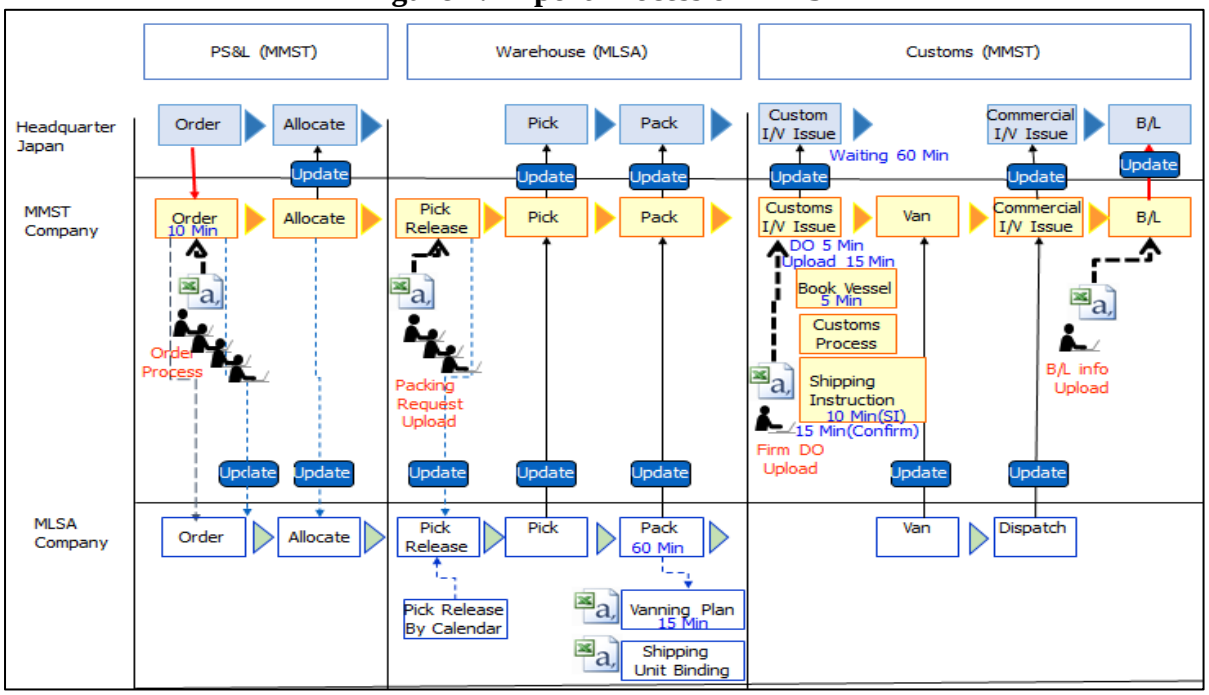


Table 4: Lead Time for Export Process of MMST Company

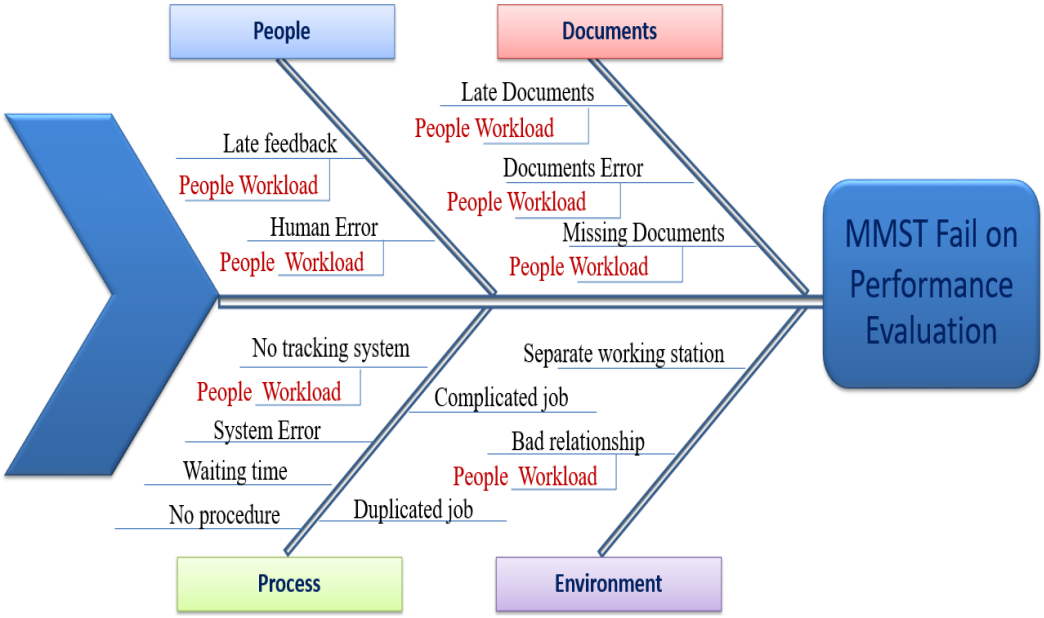
Operator	Process Description	Duration	Minutes-shipment
Headquarter Staff	Place order	Before 10.00 A.M.	
Ordering Team (PS&L)	Confirm order with MLSA and release order from system	Before 10.00 A.M.	10
MLSA Staff	Pack shipment	10.00 A.M. – 02.30 P.M.	60
MLSA Staff	Vanning plan	Before 3.00 P.M.	15
MMST Export	Create firm DO	Before 4.00 P.M.	5
MMST Export	Upload firm DO in system to issue invoice and send back to Order Team and MLSA Company	Before 4.30 P.M.	15
MMST Export	Book vessel and truck with 3PL	After 4.00 P.M.	5
3PLs	Prepare truck to load as scheduled -Air (Next day)	After 4.00 P.M.	
MMST Export	MMST create shipping instruction and send it to 3Pls to create draft air waybill.	After 4.00 P.M.	10
MMST Customs	Check and confirm draft AWB, SWB - If all details are correct, MMST confirms with 3PL to issue Air Waybill - If some information has errors, MMST requests 3PL to correct information on Air Waybill.	After 4.00 P.M.	15
3PLs	Send the completed Air Waybill	After ETD	
3PLs	Send the completed export declaration	After Loading date	
	Waiting time after getting a vanning plan and before issuing invoice		60
	Total Lead Time		**195**

Analyze Phase

Cause and Effect (Fishbone) Diagram

A Cause-and-Effect Analysis (fishbone diagram) was constructed to find the root cause of the problem in export operation which related with export lead time, and it was found that the problem was concerned with the four categories such as environment, process, document, and people as shown in Figure 2.

Figure 2: Cause and Effect Diagram of Failed Performance Evaluation



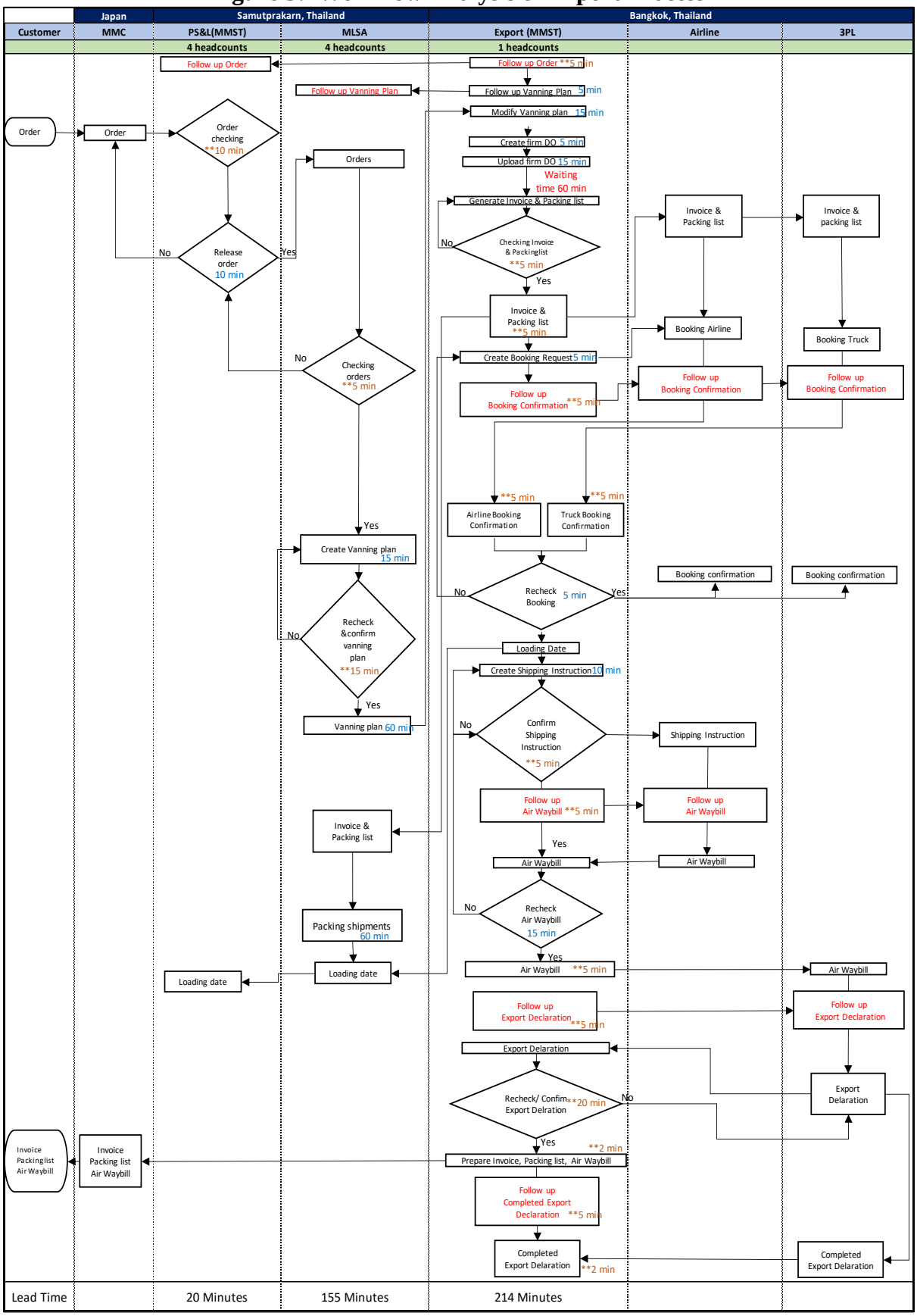
Brainstorming sessions

All participants who worked in the export function referred to their attempts as 'brainstorm sessions'. The brainstorming strategy is one of the most critical approaches in solving problems. In this case, the possible solutions for problems were designed. After the group was set up, every participant needed to have the same understanding of the export operation structure. Then, they gathered to define the current problem clearly. The export process was to reconsider in-depth details to analyze and discuss in every single step. The export process was reviewed in the process flow chart and the total lead time was wrong information from 195 minutes to 234 minutes as shown in Figure 3. According to brainstorming, the critical situation is found in the Export Department. The committee brainstorms to find an alternative solution to improve the lead time at this Department. They proposed four alternative solutions that all members agreed and submitted to the management level for approval as shown in Table 5.

Table 5: The Alternative Solutions

Alternative solutions	Detail	Duration
1. Eliminate waiting time	Contact IT at Headquarters to improve the waiting time	1 year
2. Eliminate unnecessary process	Remove waste process to improve export lead time	1 month
3. Allocate task		
3.1 Allocate task to 3PL	Allocate the Booking process to 3PL to reduce the workload of the export officer	6 months
3.2 Allocate task internal MMST & MLSA	Allocate issue invoice process and booking process to reduce the workload of export officer	1 year
4. Hiring new staff (optional)	To improve bottleneck at export and customs formally and expand the business as planned	N/A

Figure 3: Workflow Analysis of Export Process



DISCUSSION OF RESULTS

The main propose of the ***Improve phase*** of DMAIC is to improve current processes in export operation. To solve the problems for an export, lead time was identified. After implementing all the alternatives, the researcher summarized the result. The direction was to reduce the bottleneck for the export officer's tasks and improve the lead time for the export operation of MMST. The lead time was focused on PS&L (Part Supply and Logistics Department) and export officer at MMST as shown in Table 6.

Table 6: Summary Result After the Alternative Implementation

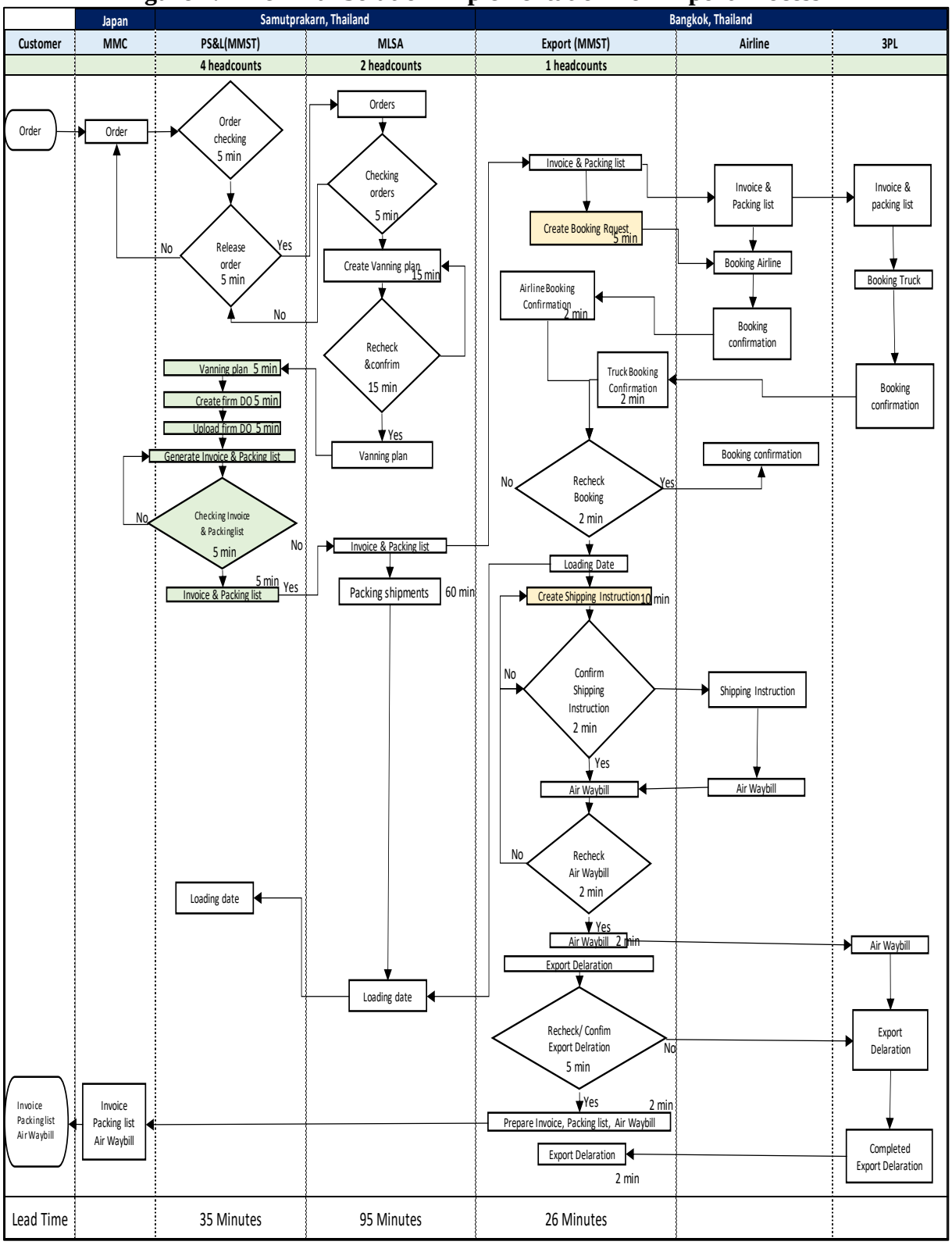
No.	Alternative	Detail	Lead Time PS&L	Lead Time Export officer	Total Lead time
1	Existing Process	Process before implantation of the alternative solution	20 Minutes	214 Minutes	234 Minutes
2	Alternative1	Eliminate the waiting time from the system	20 Minutes	154 Minutes	174 Minutes
3	Alternative 2	Remove non-value-added	20 Minutes	184 Minutes	204 Minutes
4	Alternative 3	Allocate invoicing process to PS&L officers Allocate booking process to 3PL (on-the-job training purpose) The export officer handles the customs process.	125 Minutes	29 Minutes	154 Minutes
5	Alternative 4	PS&L maintain invoice process Export officer handles the booking process and the customs process	125 Minutes	79 Minutes	204 Minutes

The results were submitted to the management to review and make decisions for long-term implementation. Eventhough alternative 3 showed the best result, the company needed to pay for additional service for the booking process. Hence, alternative 4 was selected to be the guideline for the standard process. Moreover, the company developed the alternative 4 to reduce the total lead time for the export operation. In parallel, the company pushed the IT Department to develop the system to eliminate the waiting time from the invoicing process. Consequently, total the lead time was reduced as shown in Figure 4. The company also continued to improve the export process. Finally, the company could reduce the total lead time to 173 minutes as shown in Table 7.

Table 7: Summary Result For Continuous Improvement Selected Alternative

No.	Alternative	Detail	Lead Time PS&L	Lead Time Export officer	Total Lead time
1	Existing Process	Process before implantation of the alternative solution	20 Minutes	214 Minutes	234 Minutes
2	Continuous Improvement of Alternative 4	Eliminate waiting time is done The faster system generates information External documents from the airline and 3PL were reviewed before sending to MMST	35 Minutes	26 Minutes	61 Minutes
Total lead time reduction			15 Minutes	188 Minutes	173 Minutes

Figure 4: The Final Solution Implementation For Export Process



Control Phase

This phase is to control plans for standardization, monitoring, and maintenance. Moreover, it will be processed to make sure that the action item created in the Improve phase is well implemented. A positive result is to confirm the new solution, including reducing the bottleneck

by reducing people's workload and lead time of the export operation, which are the cause of customers' complaints.

As the researcher was concerned about the improvement phase, this study found a solution to eliminate the bottleneck by reducing the export lead time. The researcher set the control sheet for tracking and sharing the status of the shipment. The control sheet was created and be located in the share drive for internal. But, the external control sheet was sent via e-mail and to be acknowledged back, so the researcher had to record and update the status of the shipment every day.

SUMMARY

The export business of the MMST Company is a new process. The company established this process without the guidelines and no standard work. MMST company has to focus on the root causes of the problem. Lead time in the export operation is the main factor affecting the export performance. The researcher reviewed the related literature and determined that DMAIC was a suitable model for identifying the root causes, solving problems, and proposing sustainable solutions to be the work standard. The researcher was aware of the issue, therefore, DMAIC methodology was applied to determine, measure, and analyze the current process. After the internal process was explained, the company needed to improve the internal process by trying to apply the alternative solution. Finally, the best alternative was selected and used as the standard to control and maintain the daily jobs.

For future research, three recommendations are made. The first recommendation is to record the company data and back up data not only on the employee's desktop but also request to keep to the company server.

The second recommendation is to consider the employees. The new process realization requires employees' skills and experience to operate the export process smoothly. Hence, the company needs to maintain the training record to improve employee's skills.

The final recommendation is to analyze related documents for export operation and apply other theories or methods, such as 7 wastes and FMEA to improve the process documentation for further study.

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