Improving Import Processes for Petroleum Industry Parts: A Case Study on Delay Reduction and Cost Savings

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Abstract

We aim to enhance the process of importing materials and equipment from overseas by reducing delays that contribute to cargo storage charges at the port. The primary issues identified were errors in import documentation and inefficient truck management. This study began with an analysis of the current process (As-is Process) using the Fishbone Diagram to identify root causes of inefficiencies. Business Process Reengineering (BPR) was then applied, integrating Google AppSheet to enhance document processing and truck scheduling. Previous studies on import process optimization and Management Information Systems (MIS) integration have guided our approach to improving operational efficiency. As a result, the proposed method reduced shipment delays by 80% and cargo storage charges by 95.22%.

Keywords: import process, As-is and To-be process, Business Process Reengineering, Management Information Systems, Google AppSheet

1. Introduction

The case study company has faced ongoing challenges in importing parts for constructing offshore oil production platforms, wind turbines, and petrochemical plants. Importing goods for business operations requires strict compliance with regulations set by the Customs Department and other relevant authorities. Due to the complexity of import procedures—which involve numerous documents—import agents (shipping agents) are often engaged to handle customs clearance. These agents must possess extensive knowledge and a thorough understanding of import processes and documentation requirements. The case study company has also utilized the services of shipping agents to manage inbound customs clearance.

The materials and equipment imported are typically low-cost items that are either unavailable domestically or cannot be produced locally. Most shipments are transported by sea or are directly from factories, as this approach is more cost-effective than sourcing items from the general market. The stakeholders involved in the importation of materials and equipment include the exporter (supplier), the case study company, and the import agent (shipping company) responsible for customs clearance procedures. The transportation of materials and equipment from abroad is carried out via sea freight, which can be categorized into breakbulk shipping and container shipping.

The materials and equipment are stored at the port for a maximum of three days from the date of vessel unloading. If the materials and equipment are not removed within this period, storage charges will be incurred, for which the case study company assumes responsibility.

We collected data on the quantity of imported materials and equipment from June 2021 to September 2024 (39 months). As shown in Figure 1.

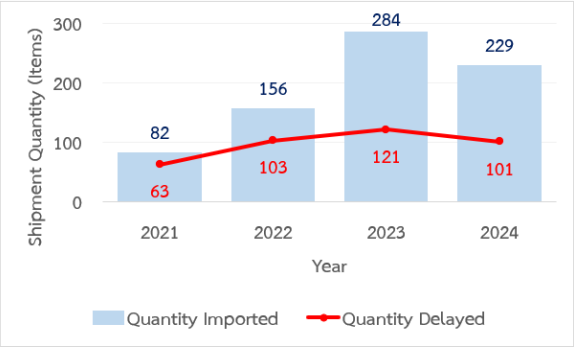

Fig. 1 Historical Number of Shipments and Delays.

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Based on the data on imported materials and equipment, a total of 751 shipments were recorded over a period of 39 months. Of these, 388 shipments experienced delayed. The delays were attributed to issues with import documentation (77%, or 300 shipments) and truck-related issues (23%, or 88 shipments).

Due to delays in the import process, the materials and equipment could not be removed from the port within three days, resulting in storage charges at the port, as shown in Figure 2.

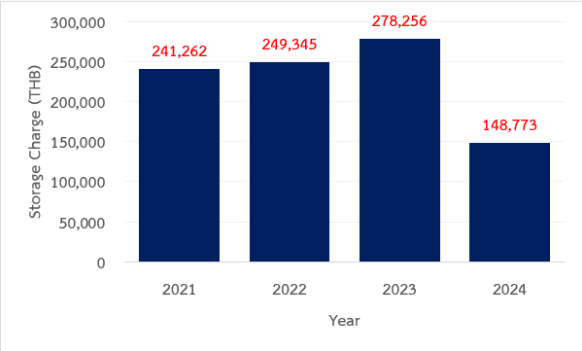

Fig. 2 Annual Storage Charges.

We aim to analyze current operational practices and propose improvements to reduce both the time and costs involved.

2. Literature Review

We provide relevant literature on process improvement, such as 7QC tools, as-is and to-be analysis, business process improvement, 7 wastes under lean manufacturing and job scheduling rules.

2.1 Seven QC Tools

The 7QC tools are simple statistical tools used for problem solving in different sectors. These tools were initially developed in Japan by Deming and Juran. In terms of importance, these are the most useful. Kaoru Ishikawa has specified that these 7 Tools can be used to solve 95 percent of all problems. These tools have been the base of Japan's astonishing industrial renaissance [1].

Currently, there are over a hundred tools available for problem-solving to achieve precise results and save time. However, this research focuses specifically on the 7QC Tools, which are fundamental and widely used in software programs. The 7QC Tools utilized in this study include the following.

2.1.1 Cause and Effect Diagram or Fishbone diagram: It shows the relationship between a problem and its possible causes [2]. A systematic arrangement of all possible causes which give rise to the effect are made. The causes are first divided into major sources (4Ms) i.e., Man, Machine, Method and Material. Then each source is divided into sub-sources and so on. It helps to find out the root cause of the problem.

2.1.2 Check Sheet: A check sheet is a paper form on which items to be checked have been printed so that data can be collected easily and concisely. Its main purpose is twofold: to make data gathering easy and to arrange data automatically so that they can be used easily later on [3].

A check sheet is a simple data collection tool presented in a tabular format. The table includes specific production steps and designated fields for marking, enabling the recording of the frequency of various events observed during the process [4].

2.2 As-is and To-be Analysis

The working methodology of the As-is and To-be models begins with documenting the current state of operations using an As-is process diagram. This diagram captures an accurate and clear representation of existing workflows, identifying process issues and potential risk points. Subsequently, these process diagrams are modified to depict the proposed To-be processes, simulating the impact of process changes in the future before implementation. This approach not only enables a comprehensive understanding of the potential consequences of proposed changes but also helps mitigate risks and avoid issues within the workflow [5].

2.3 Business Process Reengineering: BPR

BPR is a value-added approach to business operations that involves comprehensive and repaid redesign of processes. It is supported by systems, policies, and organizational structures to enhance productivity and streamline workflows, ensuring optimal efficiency [6]. The process is carried out through the following steps.

2.3.1 Rethink: The study examines the physical conditions or structure of the existing workflow processes to identify the activities and operational steps involved, from initiation to completion.

2.3.2 Redesign: The process involves evaluating and proposing a new logical foundation, hypothesis, or set of rules that are appropriate, modern, and widely accepted. This step precedes the consideration or design of new activities, workflow, or processes, leading to transformative changes that yield significantly different or enhanced outcomes.

2.3.3 Retool: The improvement of tools, equipment, and operational methods is undertaken to align with and support newly designed workflows. This includes not only the tools and equipment but also guidelines, considerations, operational manuals, forms, and related documents. Additionally, it encompasses computers and information systems utilized in the operations.

2.3.4 Retrain: After the processes of Rethink, Redesign, and Retool have been completed, it is essential to conduct training or development programs for the operational staff and all stakeholders. This ensures the

transfer of knowledge, understanding, skills, and appropriate attitudes regarding the new workflows, as well as the benefits to be gained from BPR initiative.

2.4 Seven Wastes under Lean Manufacturing

Lean Manufacturing is a management approach focused on minimizing waste and maximizing value within processes. Its fundamental principles include continuous improvement and value stream mapping, which involved identifying and eliminating unnecessary elements within workflows [7]. This research aims specifically to reduce waste from over processing and delayed caused by waiting.

2.5 Management Information Systems: MIS

It is a system that provides information or an information system related to organization's operation, such as the use of a MIS to support activities of employees, business owners, customers, and other stakeholders involved with the organization [8].

High-quality information should possess the following characteristics [9].

2.5.1 Accuracy: Information must be free from errors and inconsistencies to ensure its reliability in decision-making.

2.5.2 Completeness: High-quality information should include all essential facts, leaving no critical details omitted.

2.5.3 Simplicity: Information should be presented in a clear and concise manner, avoiding unnecessary complexity to enhance understanding.

2.5.4 Timeliness: In addition to being accurate, information must be up-to-date and readily available when required for decision-making.

2.5.5 Reliability: The credibility of information depends on the reliability of the data collection and processing methods.

2.5.6 Cost-Effectiveness: The production and dissemination of information should be cost-efficient, ensuring a balance between quality and affordability.

2.5.7 Verifiability: High-quality information should be subject to verification, allowing users to confirm its accuracy through reliable sources.

2.5.8 Flexibility: Information should be adaptable and applicable across various contexts and decision-making needs.

2.5.9 Relevance: Effective information must align with user objectives and meet their specific decision-making requirements.

2.5.10 Accessibility: Information should be easily retrievable by authorized users according to their access rights and organizational roles.

2.5.11 Information must be safeguarded from unauthorized access, ensuring data integrity and confidentiality.

2.6 Scheduling Rules

The importance of scheduling theory in the truck booking system lies in reducing delays, improving the efficiency of truck utilization, optimizing resource usage by minimizing excess, and addressing various requirements, such as priority delivery [10].

Dispatching Rules are applied to resolve conflicts that arise when there are two or more jobs to be processed. Decisions must be made regarding the order of execution. In certain situations, the application of appropriate job sequencing rules can reduce system congestion or ensure timely delivery as promised to customers [11]. These rules can be categorized into three types as follows.

2.6.1 Fist Come First Served (FCFS) prioritizes service based on the order of bookings. However, a drawback of this approach arises when certain job types require significantly more time to complete.

2.6.2 Earliest Due Date (EDD) prioritizes jobs based on the soonest delivery deadlines, making it suitable for tasks where minimizing delays is crucial.

2.6.3 Shortest Processing Time (SPT) this approach is applied in cases where the objective is to minimize the total processing time.

2.7 Research Instruments

We developed our tools with Google AppSheet and Google Sheet.

2.7.1 Google AppSheet is no-code application development platform that enables users to quickly create mobile and web applications using data from various sources, such as Google Sheets or databased. Users can easily design and customize application to meet their specific needs without requiring programming knowledge. Its key features include creating data in various formats such as tables or maps, setting up notifications, and automating workflows. AppSheet also supports collaboration, allowing users to share applications with team members and provide them with convenient access to data. This platform is ideal for organizations seeking to develop applications to enhance work efficiency or manage data effectively without the need for complex app development investments [12].

2.7.2 Google Sheets serves as the primary data source for developing data-driven applications using AppSheet as the main platform. This integration allows data to be updated in real time [13], as show in Figure 3.

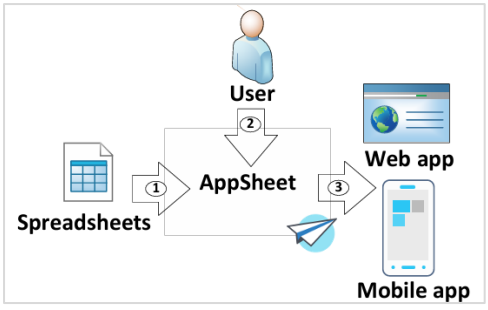

Fig. 3 Overview of Appsheet Workflow.

2.7.3 Work Instruction: WI is a document presented in written or graphic form that provides detailed, step-by-step instructions for performing tasks or processes. It is commonly used to standardize and guide operational procedures [14].

3. Methodology

3.1 As-is Process

The as-is process for managing shipment and customs clearance involves three main parties: the Supplier, the Case Study Company, and the Shipping Agent. The process begins with the supplier sending an Incoming Shipment Notification to the Case Study Company. Following this, the supplier coordinates with the company to arrange transportation by working with the shipping line. Once the arrangements are finalized, the supplier delivers the materials and equipment to Thailand.

Upon receiving the draft shipping documents from the supplier, the Case Study Company reviews them for accuracy. If errors are identified, the documents are returned for correction. If the documents are correct, the company proceeds to grant Authorization to Export. The company then receives the final shipping documents and forwards them to the Shipping Agent. Separately, the Case Study Company also receives the draft import entry prepared by the Shipping Agent. Similar to the shipping documents, if the draft import entry is incorrect, it is returned for revision; if correct, the company authorizes Customs Clearance.

The Shipping Agent then takes over by receiving the final shipping documents and preparing the import entry. Once the materials and equipment arrive at the port, the Shipping Agent performs Customs Clearance. After completing the customs procedures, the agent arranges for a truck to collect the materials and equipment from the port and transport them to the Case Study Company.

The process concludes when the Case Study Company successfully receives the materials and equipment after customs clearance and delivery from the port. This process, as outlined in Figure 4, highlights the sequence of tasks and decision points required to ensure the shipment and customs clearance are completed smoothly.

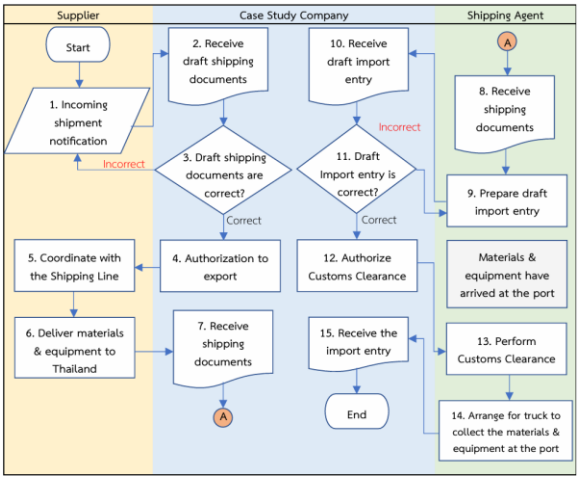

Fig. 4 As-is Process of Importation and Customs Clearance.

The as-is process for the importation of materials and equipment involves two main parties: the Case Study Company and the Shipping Agent. This process, as illustrated in Figure 5, outlines the current workflow, highlighting the key interaction and tasks performed by each party to ensure the successful importation of goods. The workflow begins with the case study company receiving an incoming shipment notification, followed by the shipping agent managing critical tasks such as obtaining shipping documents, preparing a draft import entry, performing customs clearance, and arranging truck booking. The process continues until the materials and equipment are delivered to the warehouse, where they are verified and signed for by the warehouse staff, finalizing the process.

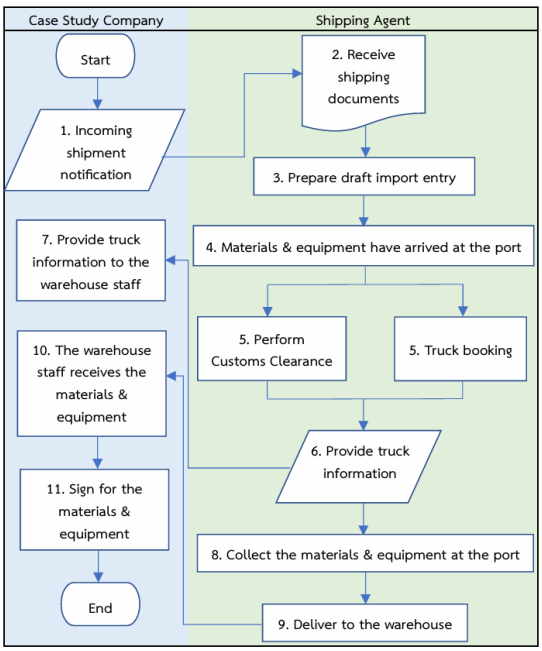

Fig. 5 As-is Process of Importation and Warehouse Delivery.

3.2 Analysis of Problem Causes

3.2.1 Overview of Import Delays.

A Fishbone Diagram was used to analyze the causes of the lengthy process for importing materials and equipment. This tool helps categorize potential causes into structured groups, making it easier to identify root causes and develop solutions.

3.2.2 Step for Using Fishbone Diagram.

- Identify the problem: In this case, the lengthy process for importing materials and equipment.
- Determine major cause categories: The causes were grouped into four main categories: Man, Machine, Method, and Material & Equipment.
- Analyze sub-causes within each category: Each category was examined to determine its contribution to the problem.
- Summarize key finding: The most significant factors leading to delays were identified.

3.2.3 Finding from the Analysis.

The analysis revealed that the primary contributors to import delays were Method and Material & Equipment.

- Method-related delays arise due to suppliers and shipping agents failing to adhere to work standards and a lack of emphasis on document submission timing
- Material & Equipment-related delays occur due to incorrect or incomplete documentation and limit truck availability for unloading materials at the port.

3.2.4 Detailed Explanation of Key Issues.

- Man: Failure to prioritize tasks leads to inefficiencies. Lack of knowledge and understanding of import processes causes document errors. No proper error alert system results in incorrect data submission.
- Machine: Limited access to the customs system delays information processing. Inefficient data management causes errors and delays.
- Method: Suppliers and shipping agents fail to adhere to work standards, leading to incorrect document submissions. Lack of emphasis on document submission timing causes delays, especially due to time zone differences.
- Material & Equipment: Incomplete or incorrect documentation prevents customs clearance. Limited availability of trucks for unloading results in extended storage times at the port. Uncertainty in scheduling pickup dates causes logistical inefficiencies.

The fishbone Diagram analysis, as shown in Figure 6, identified that Incorrect document submissions and last-minute truck booking were the primary contributors to import delays. Addressing these issues by improving supplier compliance, enhancing document submission processes, and increasing truck availability can help mitigate delays in the import process.

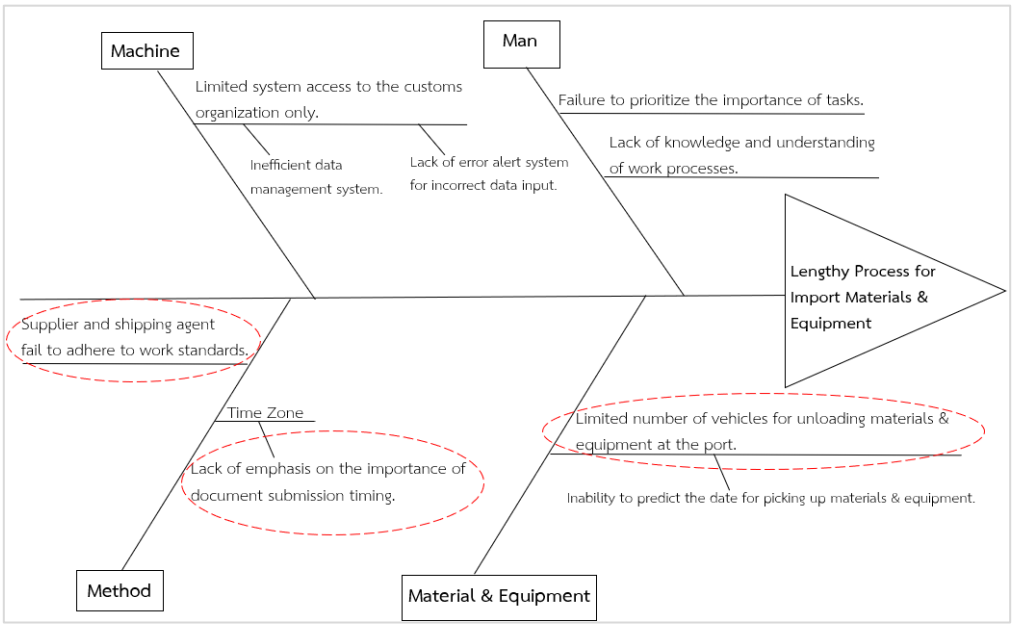

Fig. 6 Fishbone Diagram.

3.3 Proposed Solutions for Improvement

We propose many approaches to reduce the time at the port.

3.3.1 An application was designed to enable suppliers to submit commercial invoice (CI) and packing list (PL) through Google AppSheet, a no-code application development platform. Additionally, another application was

developed for the case study company to coordinate with shipping agent for truck booking purposes.

3.3.2 A document template was designed for verifying the information in the draft import entry before submitting the data into the Customs Department system. This was accomplished using Microsoft Excel.

3.3.3 Work Instructions (WI) were designed to guide suppliers on how to use the application for submitting CIPL documents and the required format for the Bill of Lading (B/L) to ensure accurate shipping document submission to the case study company. Additionally, WI was developed for shipping agent to correctly use the template for verifying information in the draft import entry, as well as for using the application to update truck booing information.

3.3.4 One critical issue identified in the import process was the limited availability of trucks for unloading materials and equipment at the port, which resulted in extended storage times and additional costs. Moreover, the inability to predict exact pickup dates for materials and equipment created inefficiencies in transportation scheduling, leading to last-minute truck booking requests that further exacerbated delays.

To mitigate these challenges, a scheduling-based approach was considered to optimize truck allocation. By implementing an Earliest Due Date (EDD) scheduling strategy, the case study company aimed to prioritize shipments with tighter deadlines, ensuring that high-priority shipments were assigned transport first. Furthermore, an Optimization Model was explored to balance supply and demand, effectively reducing the likelihood of last-minute truck shortages and improving overall logistics efficiency.

4. Research Results

The To-be process is divided into two parts: the import documentation process and the truck management process.

4.1 The import documentation aspect

Encompasses the process from using the application to create CIPL documents to completing import customs clearance with the Customs Department, as illustrated in Figure 7.

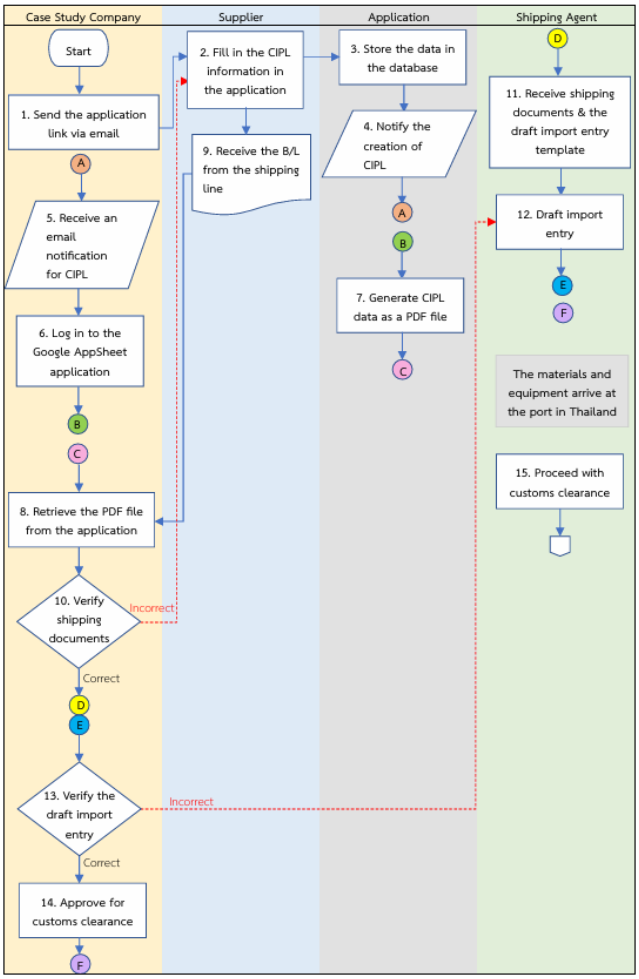

Fig. 7 Import Process After Documentation Improvements.

The main interface of application is divided into three sections as follows.

4.1.1 Invoice Header: This section contains information about the supplier and the case study company. It includes the supplier's company logo, which displays the company name and address, invoice number, invoice date, consignee name, consignee address, attention (ATTN), project name for importing materials and equipment, terms of delivery, country of origin (COO), and the supplier's signature with a company stamp or equivalent, as well as shipping mark.

4.1.2 Invoice Details: This section provides detailed information about the materials and equipment, including the item number, stock code number, description (name/model/specifications of materials and equipment), quantity, unit of measurement (UOM), unit price, and total price. The total price is automatically calculated by the application to prevent errors.

4.1.3 Packing List: This section provides details of the packing items or packaging. All data is automatically retrieved from the Invoice Details based on the selected Invoice Number to facilitate the supplier and prevent discrepancies in the CIPL. Additional information that the supplier must input includes net weight (KG), gross weight

(KG), dimension (L x W x H in cm), number pf packages, and packaging type.

The application for creating CIPL ensures accuracy by fixing key information that suppliers frequently input incorrectly, making these fields non-editable. For example, fields such as Consignee Name, Consignee Address, and ATTN are present to the correct information. A sample view is illustrated in Figure 8.

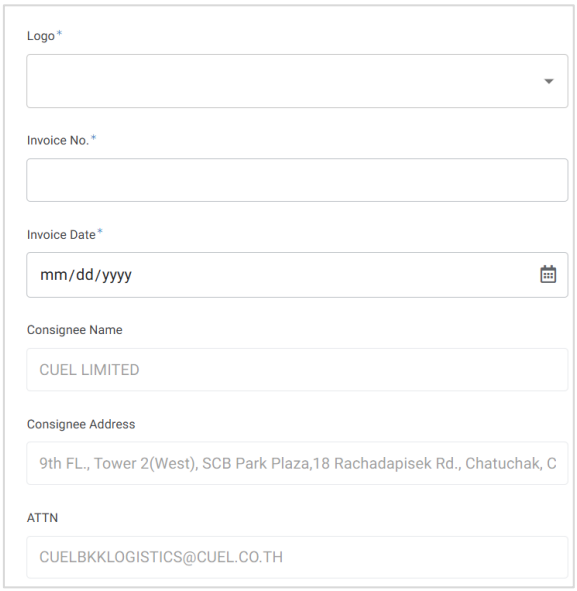

Fig. 8 Partial View of the CIPL Creation Application.

After the supplier completes filling in the CIPL information in the application, the case study company retrieves the CIPL file in PDF format from the application. The CIPL file generated by the application is in the correct format, suitable for customs clearance procedures, as shown in Figure 9 and Figure 10.

TIANJIN PIPE INTERNATIONAL ECONOMIC AND TRADING CORPORATION.
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Tel: 0086 22 66280988
Fax: 0086 22 66282951
e-mail: sunn@tpcointl.cn

Commercial Invoice

Invoice No.: P-220321E-1-3
Invoice Date: 6/11/2024

Consignee Name: CUEL LIMITED
Consignee Address: 9th FL., Tower 2(West), SCB Park Plaza, 18 Rachadapisek Rd., Chatuchak, Chatuchak
Bangkok, Thailand 10900
ATTN: CUELBKKLOGISTICS@CUEL.CO.TH

Project Name: CVX2263
Terms of Delivery: CIF
Country of Origin: CHINA
Currency: USD

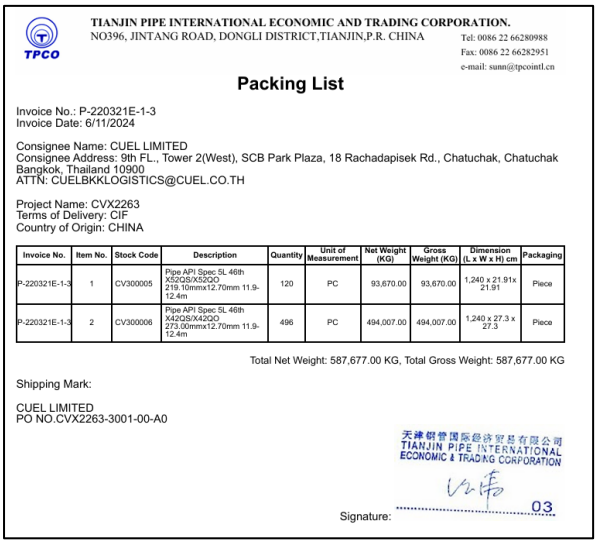
Invoice No.	Item No.	Stock Code	Description	Quantity	Unit of Measurement	Unit Price	Total Price
P-220321E-1-3	1	CV300005	Pipe API Spec 5L 46th X52QS/X52QO 219.10mmx12.70mm 11.9-12.4m	120	PC	1,530.87	183,704.40
P-220321E-1-3	2	CV300006	Pipe API Spec 5L 46th X42QS/X42QO 273.00mmx12.70mm 11.9-12.4m	496	PC	1,732.38	859,260.48

Subtotal 1,042,964.88

天津钢管国际经济贸易有限公司 TIANJIN PIPE INTERNATIONAL ECONOMIC & TRADING CORPORATION
03

Signature:

Fig. 9 Invoice Generated from the Application.



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Tel: 0086 22 66280988
Fax: 0086 22 66282951
e-mail: sunn@tpcointl.cn

Packing List

Invoice No.: P-220321E-1-3
Invoice Date: 6/11/2024

Consignee Name: CUEL LIMITED
Consignee Address: 9th FL., Tower 2(West), SCB Park Plaza, 18 Rachadapisek Rd., Chatuchak, Chatuchak
Bangkok, Thailand 10900
ATTN: CUELBKKLOGISTICS@CUEL.CO.TH

Project Name: CVX2263
Terms of Delivery: CIF
Country of Origin: CHINA

Invoice No.	Item No.	Stock Code	Description	Quantity	Unit of Measurement	Net Weight (KG)	Gross Weight (KG)	Dimension (L x W x H) cm	Packaging
P-220321E-1-3	1	CV300005	Pipe API Spec 5L 46th X52QS/X52QO 219.10mmx12.70mm 11.9-12.4m	120	PC	93,670.00	93,670.00	1,240 x 21.91x 21.91	Piece
P-220321E-1-3	2	CV300006	Pipe API Spec 5L 46th X42QS/X42QO 273.00mmx12.70mm 11.9-12.4m	496	PC	494,007.00	494,007.00	1,240 x 27.3 x 27.3	Piece

Total Net Weight: 587,677.00 KG, Total Gross Weight: 587,677.00 KG

Shipping Mark:

CUEL LIMITED
PO NO.CVX2263-3001-00-A0

天津钢管国际经济贸易有限公司 TIANJIN PIPE INTERNATIONAL ECONOMIC & TRADING CORPORATION
03

Signature:

Fig. 10 Packing List Generated from the Application.

4.1.4 A template for verifying the accuracy of import entry documentation in an Excel format, provided by the case study company to shipping agent. The representative uses the template to input preliminary data for the import entry before submitting it to the Customs system. This process aims to minimize errors. The template includes a status check indicating 'Pass' or 'Fail', facilitating easier review. The template shown in Figure 11 and Figure 12 in Thai, as it aligns with the system requirements of the Thai Customs Department.

	A	B	C	D
1	หัวข้อ	รายละเอียด		สถานะการตรวจสอบ
2	ผู้นำเข้า	CUEL LIMITED		ผ่าน
3	นำเข้าโดยทาง	1 = ทางเรือ		ผ่าน
4	ชื่อยานพาหนะ			ไม่ผ่าน
5	ใบตราส่งเลขที่			ไม่ผ่าน
6	ประเทศกำเนิด	CN	CHINA	ผ่าน
7	ประเทศต้นทางบรรทุก	CN	CHINA	ผ่าน
8	จำนวนหีบห่อ	2	Box	ผ่าน
9	Shipping Mark	CUEL LIMITED		ผ่าน
10		PO NO.	3450000	
11	เลขที่บัญชีราคาสินค้า	1234		ผ่าน
12	วันที่	30/11/2024		ผ่าน

Fig. 11 Import Entry Template Header.

	F	G	H	I	J	K	L	M	N	O	P	Q
1	รายละเอียดของใบกำกับราคาสินค้า											
2	ลำดับที่	ประเภทวัสดุอุปกรณ์	รายละเอียดวัสดุอุปกรณ์	พิกัดศุลกากร (ตอน/ประเภท)	พิกัดศุลกากร (ประเภทย่อย)	รหัสสถิติ	ปริมาณ	หน่วย	สกุลเงิน	ราคาต่อหน่วย	ราคารวม	สถานะการตรวจสอบ
3	1	STEEL PIPE	Pipe API Spec 5L 46th X52QS/X52QO 219.10mmx12.70mm 11.9-12.4m	7304	1900	000/KGM	120.00	PC	USD	1,530.87	183,704.40	ผ่าน
4	2	BATTERY	CHARGER, BATTERY, 120 VDC, 1 PH	8507			1.00	EA	USD	8.00	8.00	ไม่ผ่าน

Fig. 12 Invoice Details Template.

4.2 In the trucking aspect

The case study company considers the estimated time of arrival (ETA) of the materials and equipment, along with the verified shipping documents, to pre-book trucks with the import agent via the application. The process is illustrated in Figure 13.

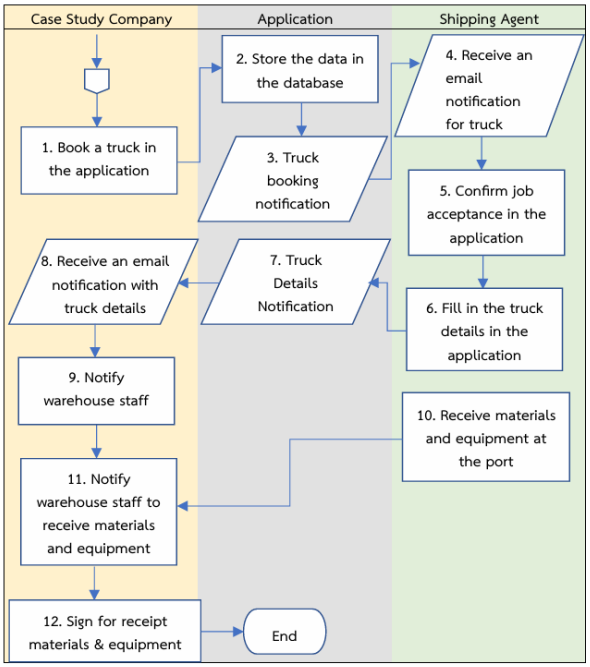

Fig. 13 Import Process After Trucking Improvements.

The main interface of the application is divided into two sections as follows.

4.2.1 Booking Requests: This section is completed by the case study company and includes details such as the invoice number, which reference the job requiring truck transportation for material and equipment pickup. The request date is automatically generated based on the real-time submission in the application. The pickup location is fixed as Laem Chabang Port, while the delivery location is fixed as the material storage yard of the case study company. Additional information includes the truck type, number of trucks, and pickup date as specified by the requester. This section also features a status field, which awaits updates from the shipping agent, and a truck availability status. The application automatically calculates whether the requested trucks are still available based on prior booking data.

4.2.2 Truck Details: This section is designed for the shipping agent to update truck details, including the truck type, number of trucks, truck plate, and driver's name. Once the shipping agent completes the truck information update, the application interface displays the information as shown in Figure 14.

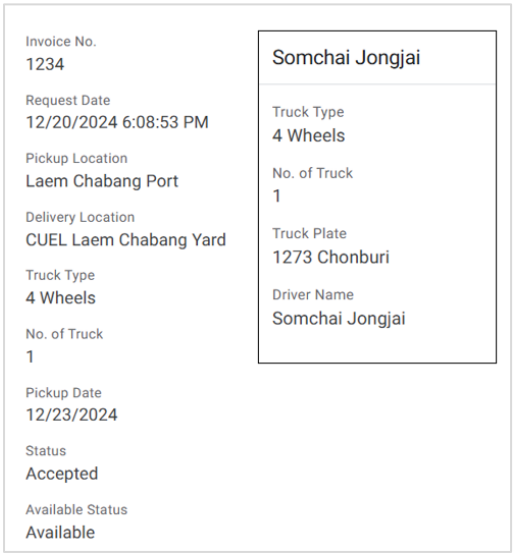

Fig. 14 Truck Details Display Screen.

The adoption of AppSheet in the truck booking system is not merely a tool selection but also involves the design of workflows to align with the system's objectives. These objectives include ensuring the availability of trucks and enabling systematic collaboration between the case study company and the import representatives. Key functionalities, such as truck status notifications and calculations of truck utilization, are integral to achieving these goals. Furthermore, this approach aligns with the principles of Scheduling Theory, facilitating job sequencing for trucks through the application.

4.3 Comparison of Delayed Material Items before and After Improvement.

4.3.1 The researcher conducted a test by allowing the supplier to use the application for generating CIPL documents and the shipping agent to use the template for drafting import entry declarations. The application was also used for truck management during the trial period, which lasted for three months, from October to December 2024, as illustrated in Figure 15.

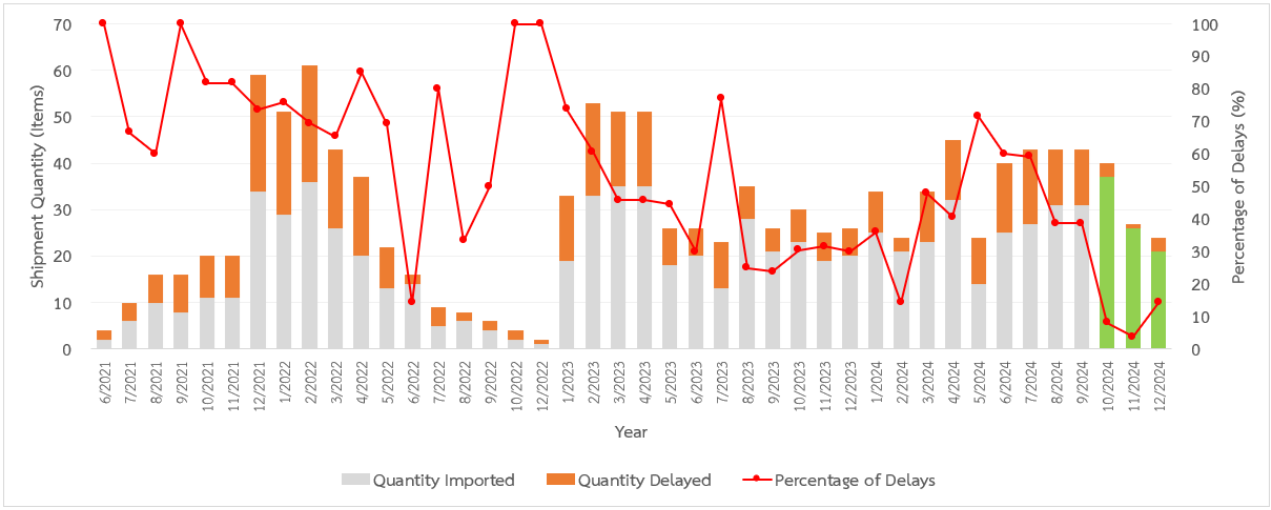

Fig. 15 Comparison of Delayed Quantities Before and After Improvement (10/2024 onwards).

From Figure 15, the post-improvement results during month 10 to 12 of 2024 show that the researcher calculated the average number of delayed items per month before the improvement, finding an average of 10 delayed items per month. After the improvement, the number of delayed items decreased to only 2 items per month, representing an 80% reduction.

To evaluate the impact of the process improvement, a statistical analysis of shipment delays was conducted using trend analysis to predict potential reductions in shipment processing time. The study found that after process improvement, the average shipment delay decreased from 5 days to 1 day, representing 80% improvement.

4.3.2 Comparison of storage charges before and after the improvement: The delays in material and equipment items resulted in storage charges. After the improvement, the average monthly storage charge decreased to only 1,125 THB, compared to the previous average of 23,529.10 THB per month, representing a 95.22% reduction.

To summarize the impact of process improvement, Table 1 presents a comparison of key parameters before and after the implementation of the proposed solutions.

Table 1 Comparison of Shipment Delays and Processing Time Before and After Improvement.

Parameter	Before Improvement	After Improvement	Improve-ment Rate (%)
Average Shipment Delay Time (days)	5	1	80%
No. of Delayed Shipments per Month	10	2	80%

Table 1 (Continued)

Parameter	Before Improvement	After Improvement	Improve-ment Rate (%)
Average Monthly Storage Charge (THB)	23,529	1,125	95.22%

5. Conclusion

We demonstrated that the process improvement significantly reduced delays and associated storage charges in the import process. The study began with an analysis of the current workflow (As-is Process) to understand the overall sequence of operations and identify root causes using Fishbone Diagram. Subsequently, the Business Process Reengineering (BPR) approach was applied to redesign the process and integrate tools with a Management Information System (MIS). A web application was developed using Google AppSheet, along with Excel templates and Work Instructions (WI), to establish the improved workflow (To-be Process).

This resulted in a reduction of delayed items from an average of 10 items per month to 2 items per month, representing an 80% decrease. Similarly, the average monthly storage charge dropped by 95.22%, from 23,529.10 THB to 1,125 THB. These results highlight the effectiveness of the proposed measures in enhancing operational efficiency and reducing costs.

Despite these achievements, the study faced limitations, such as reliance on specific case data and a short observation period. Future research could explore applying similar improvements to other industries or integrating advanced technologies, such as automation, to further streamline processes.

In conclusion, this study provides a practical framework for improving import operations and

demonstrates the potential for significant cost savings and efficiency gains.

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