APPLICATION OF VALUE STREAM MAPPING FOR RESPONDING CUSTOMER ORDER TIME REDUCTION IN A PRECAST CONCRETE PRODUCTION BUSINESS

[1]PHITPHISUT THITART, [2]SAKGASEM RAMINGWONG

[1,2]Department of Industrial Engineering, Faculty of Engineering, Chiang Mai University
E-mail: mod-dangfire@hotmail.com

Abstract—Constantly changing technology and fierce competition force companies to ensure those customers' demands can be satisfied at the right time at the lowest cost. With an increasing focus on Industry 4.0, it is becoming more important to streamline communication using Internet of Services to allow greater interaction between vendors and their customers. This study uses a concrete factory in Northern Thailand as a case study. The company had long order cycle time, leading to the proposition of applying the Value Stream Mapping (VSM) in logistics operation to the company. The investigation found that the main sources of non-value activity are in the following activities: receiving orders, checking stock, and managing transport schedules. ECRS analysis showed that using a web-based application to make real-time information flow would reduce order cycle time and increase customer satisfaction. The study will be extended further to design a web-based application for reducing order cycle time in the company.

Index Terms—Efficiency Improvement, Value Stream Mapping, Order Cycle Time, Concrete Factory.

I. INTRODUCTION

Precast concrete has been used on virtually every type of building, including schools, office buildings, apartment buildings, townhouses, condominiums, hotels, motels, dormitories, and single-family homes. Precast concrete is a smart way to build any type of building; it is easy to control quality, comfortable, versatile, safe, and decreases labor and construction time. Moreover, an increase in real estate businesses and construction businesses benefits the precast concrete industry, and increases competition. So, it is important to make processes more efficient and effective to satisfy customers' needs in order to get more profit.

II. LEAN MANUFACTURING

Lean manufacturing is a way to improve production processes by focusing on efficiency, for example, reducing costs, reducing lead time, responding to market needs, improving service or product quality, et cetera, in order to affect the continuous flow of production processes throughout the system, thereby reducing waste. To accomplish the said goal, wastes must be identified, this also includes redundant processes that do not contribute to value creation. Although Lean was created based on a good production process, it can be adapted and applied to service industries and management as well. There have been various tools used to identify and eliminate wastes, aiming to attain customer's satisfaction using minimal capital and time, and attaining maximal efficiency. There are 5 main components that constitute the Lean principle:

1) Specify Value. Define value from the perspective of the final customer. Express value in terms of a specific product, which meets the customer's needs at a specific price and at a specific time.

2) Map. Identify the value stream, the set of all specific actions required to bring a specific product through the three critical management tasks of any business. Create a map of the Current State and the Future State of the value stream. Identify and categorize waste in the Current State, and eliminate it.

3) Flow. Make the remaining steps in the value stream flow. Eliminate functional barriers and develop a product-focused organization that dramatically improves lead-time.

4) Pull. Let the customer pull products as needed, eliminating the need for a sales forecast.

5) Perfection. There is no end to the process of reducing effort, time, space, cost, and mistakes. Return to the first step and begin the next lean transformation, offering a product which is ever more nearly what the customer wants.

Waste is any activity or process that does not add value; a physical waste of time, resources and ultimately money. They are:

1. Transport: the movement of product between operations, and locations.

2. Inventory: the work in progress (WIP) and stocks of finished goods and raw materials that a company holds.

3. Motion: the physical movement of a person or machine whilst conducting an operation.

4. Waiting: the act of waiting for a machine to finish, for product to arrive, or any other cause.

5. Overproduction: Over producing products beyond what the customer has ordered.

6. Over-processing: conducting operations beyond

those that the customer requires.
7. Defects: product rejects and reworks within your processes.

Value stream mapping is a lean tool that employs a flow diagram documenting in high detail every step of a process. Many lean practitioners see value stream mapping as the fundamental tool to identify waste, reduce process cycle times, and implement process improvement.

Identifying the process of Value Stream Mapping consists of showing waste in activities in the current process thus reducing lead time and cost.

They are split into 3 activities;
1) Value Added (VA) activities refers to activities that are valuable in production processes or product conversion processes. This also includes raw materials and means of production.
2) Non-Value Added (NVA) activities are wastes and should be eliminated. Examples of activities that fall into this category are lead time, bottlenecks in production lines, and repeated activities.
3) Necessary but Non-Value Added (NVA) activities are necessary wastes. These include, but are not limited to, transportation of raw materials and transportation of machines and equipment. Eliminating these activities requires large reorganizations that might not be immediately feasible, for instance, relocating production lines.

III. CASE STUDY

P.D. Concrete Ltd., produces both premixed and precast concrete floor blocks for sale in Lampang and nearby provinces. The production capacity is 2,310 metric tons per month. The response time to customers' inquiries normally took 2 to 3 days, mainly because salesmen could not check the stock immediately while meeting the customers; they must phone the stock monitor or travel to the company themselves to check available stocks. If the stocks would not suffice, the salesmen must contact the production and logistic departments to order and appoint delivery times and dates. The logistic department, however, is sometimes overbooked, making it necessary for the salesmen to reconfirm the shipping times and dates as well as prices with customers once confirmations from the logistic departments have been made.
The unnecessary processes delayed the time taken for the salesmen to gather information and make appointments. The board of the company aimed to correct this by introducing information technology to the quoting process. This would improve the brand's image as well as customers' satisfaction and increase profitability. A web-based application that would allow real-time stock checking, sales information recording, and delivery scheduling was to be used.
This study aimed to analyze and improve the efficiency of the quoting process by using Value Stream Mapping and to design and develop a suitable web-based application that would be used.

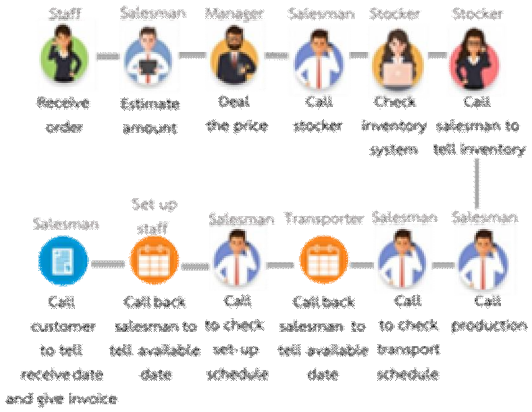


Fig. 1 Current responding customer order process

IV. METHODOLOGY

1. Identification of the Problems and Needs.
To identify and problems and needs, as well as to identify the mission and vision of the company, surveys were conducted and the board of the company was interviewed. The general conditions of the company were also surveyed and recorded. Processes of some employees were observed and recorded to gain insights into the practical aspects.
2. Study and Management of the Value Stream Mapping.
The Value Stream Mapping was used to analyze and categorize activities. The activities were split into 3 groups: 1) VA activities 2) NVA activities and 3) NNVA activities. A Value Stream Map was then drawn in terms of present values and future values after the project was implemented to outline all the processes involved and show potential improvements.
3. Waste reduction with ECRS technical.
The ECRS principles were employed to reduce unnecessary wastes involved in the process shown in the Value Stream Mapping and identified by the 7 Wastes concept. Activities would be eliminated, grouped together or rearranged to simplify the working process, leading to timelier quoting.

RESULT

From the analysis of the quoting process and the involved activities of P.D. Concrete Ltd., the following and figure 2 were created using VSM of the current state.
It was found that a response time to an order enquiry was 776 minutes. This consist of 15 minutes VA

activities, 196 minutes NNVA activities, and 565 minutes NVA activities, and 580 minutes was a waiting time from each process. This is one of the most obvious wastes and it clearly does not add value. Eliminating or reducing this is eliminating waste and improving the value-added activities

We will design a web application to reduce time and make the process more real time. After the analysis and suggested improvements were implemented, the response time reduced to 60 minutes. 92 % reducing. The future state in Figure 3.

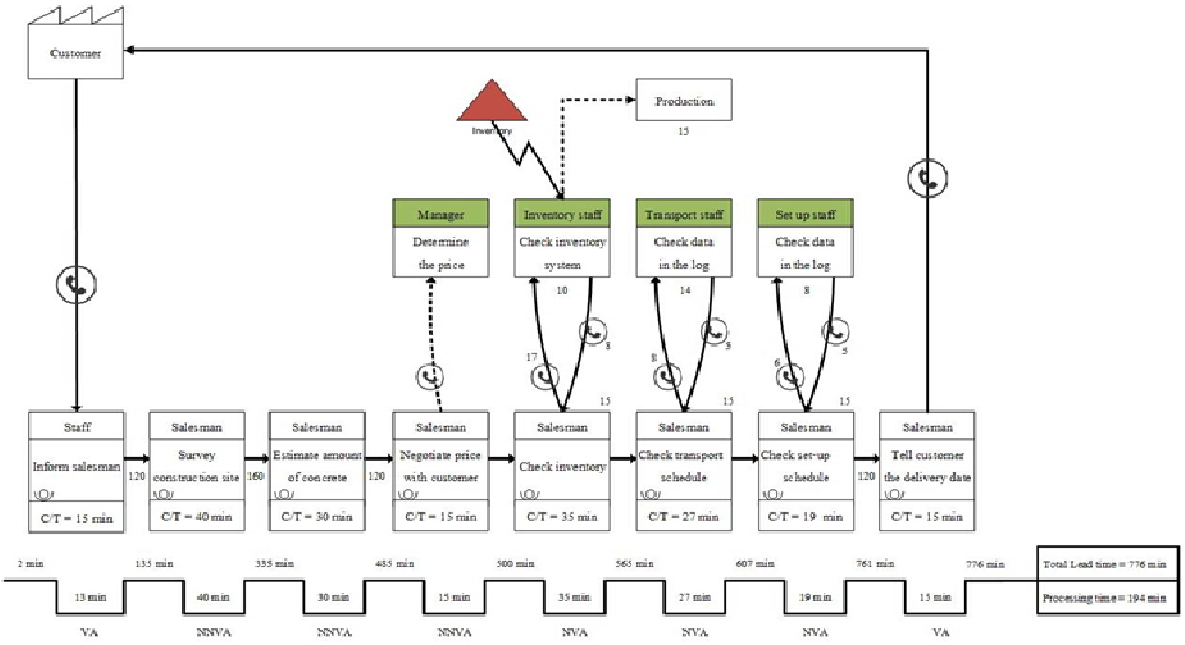


Fig.2 The Current State Value Stream Mapping of Responding Customer Order

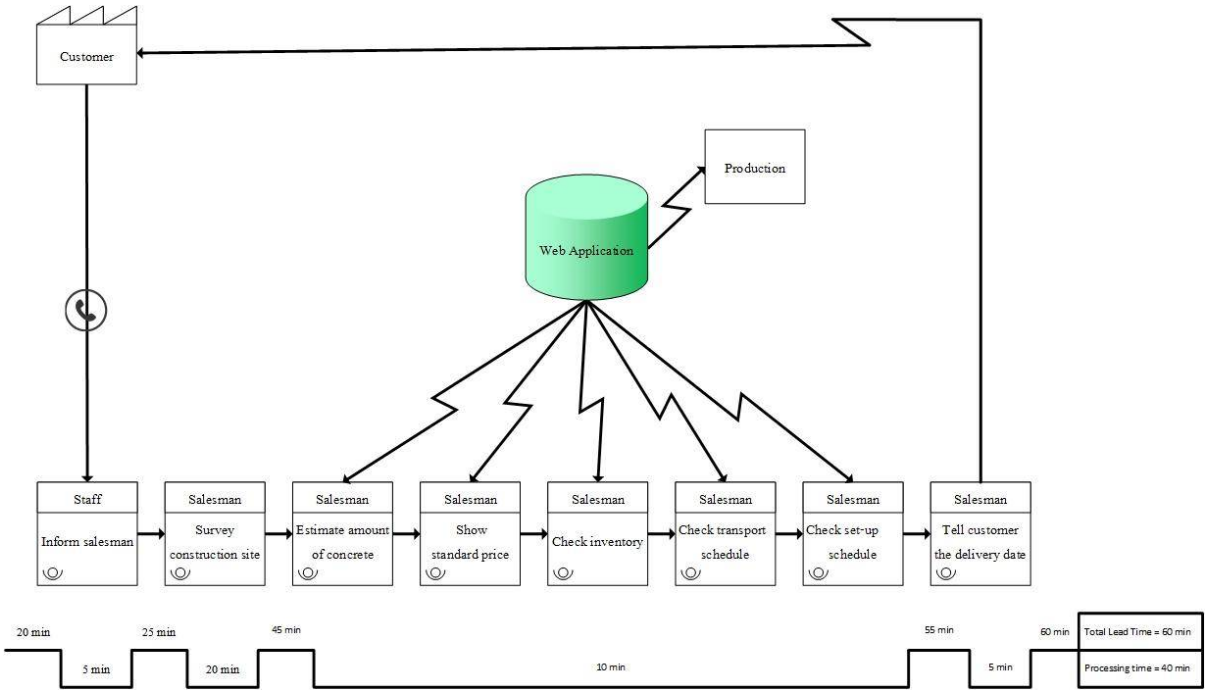


Fig.3 The Future State Value Stream Mapping of Responding Customer Order

CONCLUSION

From the analysis of processes of order-response of P.D. Concrete Co., it was found that the phoning and travelling of the salesmen, in order to check the remaining stocks, place a production request, organize delivery services, and coordinate with customers increased the complexity of the overall process and

cost time and money. By implementing a web-based application, salesmen could work more efficiently and effectively. The time and capital involved, as a consequence, reduced. Approaches similar to this project could be adopted in other similar companies as well.

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