



Original Research Article

Integration of ERP System for Milk Cooperative: A Comparative Study Using Value Stream Mapping

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ABSTRACT

Mismanagement and errors in communication lead to supply chain inefficiencies manifesting in the form of non-value-added activities. Thai dairy cooperatives, as a result of an increased supply and significant drop in the demand within the domestic market, are facing the challenges of realizing excess inventory of unprocessed milk and reducing the amount of waste due to spoilage. Conversely, Indian dairy cooperatives exhibit greater resilience, given the similar market conditions, due to their appropriate usage and integration of information systems like ERP to optimize the information flow and processes, while Thai dairy cooperatives rely mostly on spreadsheets. The paper discusses current practices used by Thai dairy cooperatives to manage their information flow and later compares the difference in performance metrics such as value-added time (in percentage) before and after integrating ERP systems into their operation. Value stream mapping (VSM) was chosen as a tool to identify all value adding and non-value adding activities within the value chain. Information was gathered in a form of unstructured interviews conducted at a local Thai cooperative before and after the implementation of the ERP system. The results show that there was a 7% increase in value-added activities, 36.1% before ERP implementation and 43.2% after the implementation. Moreover, the study found that not many Thai cooperatives are able to implement and integrate ERP to their production system due to lack of knowledge and education, thus fully relying on Microsoft Excel and other spreadsheets.

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INTRODUCTION

In 2020, Thailand's domestic dairy cows had the capacity to produce raw milk at approximately 3,500 tons per day from about

310,000 cows nationwide. (Faculty of Veterinary Science, 2021). Thai dairy cows are popular among trading partners within ASEAN. As a result, Thailand is able to export 840 dairy cows per year. Dairy cooperatives in Thailand face the problem of

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oversupply of milk in the Thai market. Raw milk production exceeds demand. Thailand's milk consumption has dropped by 17,018 tons, resulting in a large amount of raw milk expiring through inefficient and ineffective management. Compared to Thailand, India produces a larger amount of raw milk but they can manage it much more efficiently due to the main program that Indian milk cooperatives use. Indian milk cooperatives use ERP or enterprise resources planning to manage the flow of information. On the other hand, in Thailand, cooperatives use Microsoft (MS) Excel instead of ERP or other programs. Therefore, our objective to conduct this research was to study the impact of ERP system integration in helping milk cooperatives work more efficiently and effectively rather than relying on spreadsheet technologies. Moreover, research was to study the reasons of Thai milk cooperatives do not use ERP systems but instead prefer spreadsheets like MS Excel in managing their information.

Enterprise Resource Planning

ERP is an enterprise-wide software solution that integrates and automates business functions of an organization. The real-time information integration across the organization's functional areas increases operational efficiencies and helps managers to make better decisions. The organization is more competitive day by day. Today having an ERP system is not a luxury, but a necessity. A robust ERP system along with a fully trained workforce is a must for an organization's survival (Jadawala et al., 2018; Matende & Ogao, 2013).

Just-In-Time

Definition

The just-in-time (JIT) inventory system is a management strategy that aligns raw-material orders from suppliers directly with production schedules. Companies employ this inventory strategy to increase efficiency and decrease waste by receiving goods only as they need them for the production process, which reduces inventory costs. This method requires producers to forecast demand accurately.

Just-in-Time Inventory Work

The just-in-time (JIT) inventory system minimizes inventory and increases efficiency. JIT production systems cut inventory costs because manufacturers receive materials and parts as needed for production and do not have to pay storage costs. Manufacturers are also not left with unwanted inventory if an order is canceled or not fulfilled.

Advantages and Disadvantages of JIT

JIT inventory systems have several advantages over traditional models. Production runs are short, which means that manufacturers can quickly move from one product to another. Also, this method reduces costs by minimizing warehouse needs. Companies also spend less money on raw materials because they buy just enough resources to make the ordered products and no more.

The disadvantages of JIT inventory systems involve potential disruptions in the supply chain. If a raw-materials supplier has a breakdown and cannot deliver the goods promptly, this could conceivably stall the entire production line. A sudden unexpected

order for goods may delay the delivery of finished products to end clients (W.C. Benton Jr, 2011).

Raw Milk

Raw milk is cow milk which has not been pasteurized yet. It is considered a perishable food that has a specific expiration date (Centers for Disease Control and Prevention, 2022). Raw milk which has not been pasteurized has a shorter shelf life than UHT and pasteurized milk. Raw milk or unpasteurized milk can be kept out of the refrigerator for 2 hours and the temperature should not exceed 32.22 Celsius. Otherwise, it can be stored for up to 4 days in refrigerated storage units (Brittany Gibson, 2018; Dairy Food Safety Victoria, 2018; Jadawala & Patel, 2018; Undeniablydairy, 2017).

Cooperatives

Cooperatives are private businesses owned and controlled by users and operated principally to provide benefits to users. Users are most easily viewed as customers of the business. The benefits are provided to users on the basis of use, not ownership.

Benefits users receive include purchasing or selling business transactions users or customers have within the cooperative and the profits earned by the cooperative on those transactions that are returned to the users. The cooperative form of business is used in many economic sectors or industries (Barton, 2000).

Value Stream Mapping

Definition

Jones and Womack (2000) define Value Stream Mapping as "The simple process of directly observing the flows of information and materials as they now occur summarizing them visually and then envisioning a future state with much better performance" (Daniel T & Jones and James P. Womack, 2002).

Adopted to collect information

The tool of Value Stream Mapping (VSM) was adopted to collect information about the food supply chain. This is due to the fact that many firms successfully use this information to plan and discover internal changes (Darren Dolcemascolo, 2006). Furthermore, when used correctly, it benefits the waste disposal process business. Maintaining improved inventory control, improving product quality, and gaining greater overall financial and operational control are all goals (Fawaz A.Abdulmalek & JayantRajgopal, 2007).

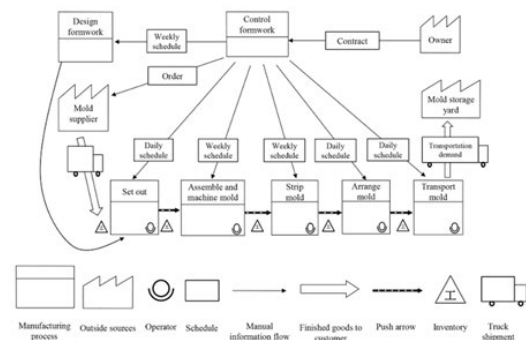


Figure 1. Generic Value Stream Mapping.

MATERIALS AND METHODS

This research is qualitative research to study the ERP system in dairy cooperatives. "Integrating ERP system in milk cooperative" to achieve the set objectives. The researcher has defined 2 research methods as follows:

Part 1 Interview the Thai's milk cooperative and review the literature of the India's milk cooperative.

Part 2 The application of Value Stream Mapping (VSM) and Enterprise Resource Planning (ERP)

Part 1 Interview the cooperative

The authors conducted a semi-structure interview with one Thai's milk cooperative located in the north of Thailand in the following aspects.

1. The work process from receiving milk until the cooperative shipping milk.

1.1 Tracking where the milk has been received.

1.2 What collecting data methods are used?

2. Format of collecting data such as paper/MS Excel or has its own software system.

2.1 The procedure for using paper collecting data.

2.2 The procedure used to collect data using MS Excel program.

Part 2 The application of Value Stream Mapping (VSM) and Enterprise Resource Planning (ERP)

The study applied VSM (Singh et al., 2011) to obtain an overview of the process, the linkage of the flow of information and raw materials. They use ERP to automate and real-time business processes, provide insights and use a central database that collects data. Since contacting the farmer directly, reception, cycle time, packing (Ian McCue, 2022).

RESULTS AND DISCUSSION

Interview the Thai's milk cooperative

The working process of the Thai cooperative starts from receiving milk at around 7.00-8.30 with an average volume of 12 tons and at around 17.30-18.30 with an average volume of 9 tons. In total, the cooperative receives 21 tons of milk per day. After receiving milk, the quality of the incoming milk (QC) is checked by looking at the milk color, smell, CMT for mastitis cells. The next step is to transfer milk into the weighing buckets, and pass the bill to the members. When collecting and updating the respective data cooperative uses MS Excel.

Indian cooperatives, on the other hand, rely on ERP systems and direct communication channel with farmers is by phone. As shown in figure 2, the Indian cooperative receives 32 tons of milk per day. For the milk receiving process, it takes 200 minutes to get milk from the farmer and ferment it for 360 minutes, then testing milk by CMT and alcohol test for 360 minutes; uptime is 100 percent. After that, it takes about 4

hours to wait for the packaging process and for the packaging part it takes 150 minutes. Before distributing it, the milk is stored in refrigerators under 2 Celsius for 4 hours. Then milk is delivered to the customers. Indian milk cooperatives mainly communicate with the customer via email. The manufacturing cycle time equals 1,550 minutes or 25.83 hours and processing time equals 710 minute and value-added time equals 45.80% (Rathana Kumar et al., 2015).

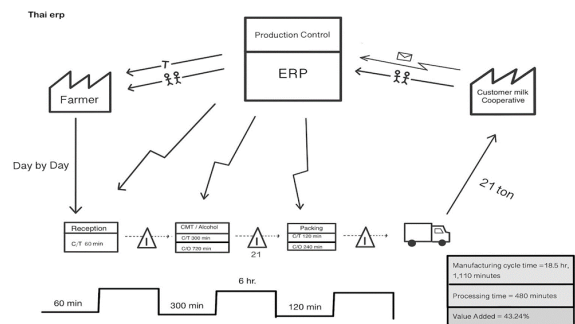


Figure 2. VSM of Gujarat milk cooperative using ERP system.

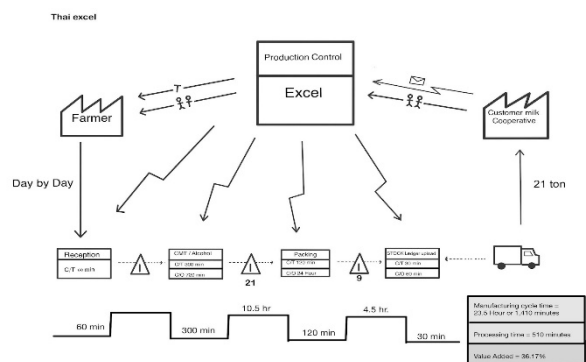


Figure 3. VSM of Thai milk cooperative using MS Excel.

As shown in figure 3, milk cooperative in Thailand uses MS Excel for keeping and updating the relevant data. Thai milk cooperative communicates with farmers by telephone and by word of mouth. The cooperative receives 21 tons of milk per day. Milk receiving process takes about 60 minutes from the farmer then to the CMT testing and alcohol test that lasts around 5 hours; change overtime equal to 720 minutes. After that It takes about 10.5 hours to wait for the packaging process and 120 minutes for packing. Before distributing it, the milk is stored in the refrigerator under 2 Celsius for 4.5 hours. The cooperative will be updating the stock ledger for 30 minutes and distribute milk to the customers. They mainly communicate with the customer by email and word of mouth. Manufacturing cycle time equals to 1,410 minutes or 23.5 hours and processing time equals 510 minute and value-added time equals 36.17%.

After implementing and integrating the ERP system as shown in figure 4, the following analysis is conducted: Milk cooperative Thailand receives 21 tons of milk per day. For the milk reception process, it takes 60 minutes to get milk from the farmer and ferment it, then conduct CMT and alcohol tests for five hours; change overtime equals to 720 minutes. After that It takes about 10.5 hours to wait for the packaging process and for the packing part it takes

120 minutes. Before distributing to customers, milk is stored in the refrigerators under 2 Celsius. Thai milk cooperative mainly communicates with the customer by email and word of mouth. Manufacturing cycle time equals to 1,110 minutes or 18.5 hours and processing time equals to 480 minute and value-added equals to 43.24%.

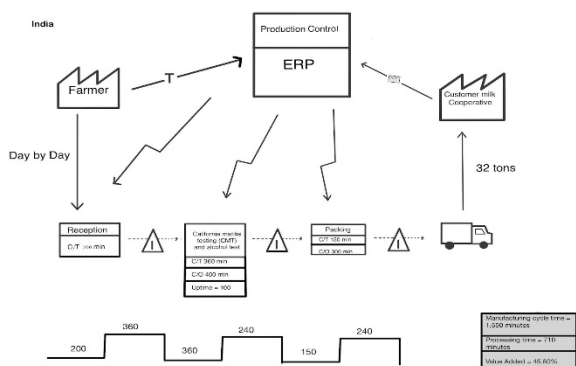


Figure 4. VSM of Thai milk cooperative if using ERP system.

CONCLUSION

To conclude, the percentage of value-added time in Gujarat milk cooperative (India) that uses ERP system equals to 45.8%, whereas in Thai milk cooperative that uses MS Excel system the percentage of value-added time is only 36.17%. The difference of the percentage of the value added of using ERP and without ERP in milk cooperative is 9.63 percent. So, it is better if Thai milk cooperatives use ERP systems instead of spreadsheets.

If Thai milk cooperatives use the ERP system the value added will be higher, achieving 43.24 % of value added (Positive increase of value added by 7.07%) as shown in table 1. Even though it is more efficient to use the ERP system, not many Thai cooperatives are able to implement and integrate it due to lack of knowledge and education, thus fully relying on MS Excel and other spreadsheets. In contrast, Gujarat milk cooperatives can implement ERP systems in their system because of the strong support from the local government in terms of providing training and proper education.

Table 1. Comparing MCT, PT and value added.

Cooperative	Manufacturing cycle time (MCT) (min.)	Processing time (PT) (min.)	Valued added (percentage)
India	1,550	710	45.80%
Thai (MS Excel)	1,410	510	36.17%
Thai (ERP)	1,110	480	43.24%

Current research recognizes limitations in terms of the:

- a) number of cooperatives that participated in the interview.
- b) comparing implemented ERP systems only to spreadsheet technologies used previously within the same cooperative.

Also, future research projects could focus on value added activities gained via integrating ERP systems outside of the single organizational boundaries. For example, ERP system was not linked to suppliers of the milk cooperatives and was not integrated

into the processes of the customers of those cooperatives. Studying the impact of such integration and comparing it to the isolated implementation of the ERP systems could reveal bigger insights into the potential of maximizing value in activities.

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