Business Process Analysis and Improvement for a Third Party Logistics Provider in Indonesian Cold Chain Logistics

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Abstract. Indonesian consumer awareness to seek for quality fresh food products is increasing. Therefore, a cold chain logistics is required to deliver agricultural and fishery products across islands. The number of logistics providers in Indonesia are continuously growing, especially for cargo services. Our objectives are to identify the business processes and related activities in a cold chain logistics provider, to analyse problems and to provide recommendations for improvement. We conducted an in-depth interview and analysed the business process using Integration Definition for Function Modelling (IDEF0). The results showed that the major problems are lack of proper cold chain logistics and knowledge in supply chain management. Then, we recommended to improve efficiency in the major activities. These could be the direction for further development to enhance Indonesian cold chain logistics especially for other third party logistics providers to improve their competitive advantages.

1. Introduction
Indonesia is archipelago comprising of over 17,000 islands with five big economic islands approximately 1,904,569 km² of land area. There have been difficulties in accessing and delivering fresh products across the islands. Most agricultural products in Indonesia become waste annually for about 40% due to unsuitable storage, shipping, and poor handling of the products [1]. The centre of the economy and food industry is on the Java island, one of which is Surabaya. However, the products must be distributed throughout Indonesia, especially in Eastern Indonesia within a short time. According to Indonesia Cold Chain Association 2016, the number of logistics providers in Indonesia are still growing, especially for cold chain to deliver agricultural and fishery products to the customers [2]. Quality and safety of food products can be maintained from producers to consumers by using proper temperature control system such as reefer containers. Although there are many logistics service providers in Indonesia, Indonesia’s national logistics remains inefficient [3]. Therefore, in this research, we explore a case study of third party logistics provider (3 PL’s) located in Eastern Java, Indonesia and its supply chain. Our objectives are to identify the business processes and related activities in a third party logistics provider, to analyse problems and to provide recommendations for improvement.

2. Methodology
In this research, we conduct an in-depth interview with the marketing and operational managers of a third party logistics provider in Surabaya, Eastern Java, Indonesia using a questionnaire as a tool to
explore the Indonesian cold chain. The questionnaire is used to understand key activities such as planning, sourcing, delivering, and returning in the organizational and the department levels [4]. Then, we analyse a business process using Integration Definition for Function Modelling (IDEF0). The IDEF0 is a method designed to model the decisions, actions, and activities of an organization, process or system [5]. IDEF0 represents flow of activities in the form of square box with a code at the right corner in order to indicate the rank of the activity such as A1, A2, and A3. There are four types of arrows which identify the input, output, control, and mechanism of activities. First, the input is the factor that drive the activities, represented by a left arrow entering into the activity box. Second, the output is the result from doing the activity, represented by a right arrow leaving the activity box. Third, the control is the standard, regulation, or requirement of the activity, represented by an arrow entering the activity box from the top. Fourth, the mechanism implies the resources such as people, equipment, and/or machine that used to perform the activity, represented by an arrow entering into the bottom of the activity box [6]. In addition, a solid line identifies the current activities and a dashed line shows the improvement that we suggested after analysing the business process in order to improve the efficiency of the third party logistics provider in Indonesian cold chain.

3. Results and Discussion

3.1. Background of a third party logistics provider
A company is a third party logistics provider specialized in the transportation of temperature controlled products, both locally, and internationally. Surabaya's location has a Tanjung Perak port which is the second largest port in Indonesia after Tanjung Priok (Jakarta). All shipping activities from inbound or outbound Java must utilize this port. The company has more than 40 branches spread throughout the archipelago in Indonesia. The company specializes in shipping goods with reefer containers for local coverage between islands in Indonesia. The main commodities handled include frozen fish, seafood, meat, frozen chicken, fresh milk, eggs, vegetables, fruit, and other food or beverage products. The product will be shipped from inside or outside the Java island to various parts of the island in Indonesia. There are about 100 trailers, 200 chassis for both 20" and 40", 1,700 reefer containers units consisting of 20" and 40" with 90 generator sets for electricity sources during transportation. In carrying out the shipping work, the company cooperates with a local feeder vessel operator.

3.2. A generic Indonesian cold chain
First, we analyse the business process in the organizational level between the stakeholders starting from upstream to downstream by using IDEF0 level 0. Then, we draw the business process analysis of the third party logistics company at level 0, which is similar to other Indonesian cold chain providers as shown in Figure 1. The stakeholders are farmers and fisherman located in the Eastern Java, collection centres and production plants located in the Eastern Java, and retailers located in Surabaya and several major cities in the Eastern Java and others located outside Java such as Sulawesi, Kalimantan, and Irian Jaya island. A solid line implies the products flow. Farmers use their own vehicles or take the vehicle directly from the collection centres, while fish and seafood products usually transport using refrigerated trucks or ordinary trucks with Styrofoam boxes containing ice to maintain temperature. The manufacturers produce food products adding value through several preservation and cooling processes to extend the shelf lives. The logistics service provider picks up the products from the collection centres or production plants and deliver to the customers. Third party logistics providers in this study use reefer containers that are transported with the trailer and connected to the diesel in a truck or plug in a vessel as an electrical power source.
The business process analysis at level 1 as Figure 2 shows that all activities in third party logistics include plan, source, deliver, and return. From IDEF0 level 1, we analyse the activity in the third party logistics provider in more details and identify problems as observed and interviewed. The marketing department passes orders to the customer service department. Next, the customer service officer checks the availability of containers from the operational department and prepare documents used for shipping the goods. The customer service officer provides container numbers to the operational department for loading and shipping process. Currently, container preparation is based on customer specifications such as container size and container temperature settings according to the product being transported. Currently, the availability of containers is manually checked by the operational staff. Then the container will be carried out to cleaning process and physical check inside and outside the containers. Obviously, the container shortage often occurs in Surabaya container yard because not every container shipping outside Java will be resend. Moreover, in fish harvesting seasons, containers are used to transport fresh fish from outside Java (Eastern Indonesia) to the large island of Java. At present, the company keeps containers outside Java before the fish harvesting season, resulting in containers shortage and lost sales. Therefore, we recommend that the company should implement a strategic forecast using both quantitative and qualitative approaches. Next, the company should perform risk analysis, especially, when there is natural disaster.
higher operating cost, but enhance the food safety and the traceability system which add the value to the customers. The guidelines for improvement at the activity level is shown in Table 1.

**Table 1. Summary of current problems and recommendations for improvement**

| Activities | Problems                        | Improvement Guideline                                                                 |
|------------|---------------------------------|----------------------------------------------------------------------------------------|
| Plan       | Lack of strategic forecast      | Implement the strategic forecast for demand of containers based on type of products and location |
|            | No risk management              | Implement risk management                                                               |
| Source     | Local carrier is not efficient  | Evaluate local carriers and build the preferred carrier list                            |
|            | Lack of container database      | Keep record all data in the spreadsheet or use the system regularly                     |
| Deliver    | Real time tracking              | Real time record and container tracking system                                          |
|            | No coordination between quality | Establish the meeting of multi functional team                                          |
|            | control staff and customers     |                                                                                         |
|            | No temperature record           | Use temperature data loggers                                                              |
|            | No temperature control during   | Establish temperature controlled system                                                  |
|            | loading                         | Apply precooling system                                                                  |
|            | High shipping cancelation from  | Improve the vehicle scheduling and check the local carrier schedule regularly            |
|            | local carriers                  |                                                                                         |
|            | High cost of additional plug at | Establish a cold storage at the right location                                           |
|            | a container yard                |                                                                                         |
| Return     | High shipment rejection rate    | Separate the types of goods in containers or using multi temperature controlled containers|

4. **Conclusion**

The current cold supply chain for food products in Indonesia was explored. We analysed the business process of the third party logistics provider based on IDEFO level 0 and level 1. Then, we identified the problems occurred in major activities and give the recommendations for improvement such as implementing the strategic forecast to decrease the container shortage, evaluation the local carrier to reduce the delayed and avoid the additional cost, recoding the data and building the database, monitoring the temperature data to control the temperature, applying the precooling system, and separation of the container for raw materials and finished goods. In this study, we found difficulties in obtaining data, hence, we observed and collected data for a month. In addition, there was limitations in collecting some sensitive information due to company confidential. We hope that our guideline can be implemented at the third party logistics provider to increase the supply chain efficiency. In the future, other third party logistics providers should improve their service management to increase the competitiveness in domestic and prepare to compete with foreign companies.

5. **References**

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