Chapter 22
A Conceptual Framework for Analysing Supply Chain Performance of Oil Palm Refinery in Malaysia

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Abstract The purpose of this research is the development of a supply chain framework in order to provide the process reference model based on the relationship between entities. This research chooses multiple cases of oil palm refinery in Malaysian because there is a barrier in implementing supply chain strategy in the form of inadequate measurement performance system. The methodology developed in this research comprised three phases involving business process reengineering, supply chain relationship model and performance indicator. There are 35 refineries in the peninsular Malaysia. However, measurement of supply chain performance will be selected in 6 oil palm refineries. The findings show that the conceptual framework can provide an instrument to analyze supply chain performance and evaluate the existing supply chain strategy.

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1 Introduction

The oil palm industry has several entities of processing industries involving Milling, Crushing Refinery and Oleochemical in order to win the market through strengthening business networks into supply chain strategies [1]. To conduct of the supply chain strategy, most of researchers divide the oil palm business into upstream and downstream [2, 3]. According Arip et al. [4] downstream sector has the biggest added value of products rather than upstream sector. Therefore, it has the potential to enhance the comparative advantage in order to develop industrial products of oil palm feedstock. In addition, there is one of processing industries in the downstream sector that connect with overall entities which it is the oil palm refinery. This industry produces many type derivative products of oil palm nevertheless they are processed through the different technology of processing industry [5].

The business process of the oil palm industry requires to improve the performance in supply chain strategies. Most of the research finds there is a barrier in the application of supply chain strategy in the form of the measurement system is inadequate [6, 7]. Omain et al. [8], conduct the research on the implementation of supply chain strategy in the oil palm industry in Malaysia. The finding shows one of the barriers in implementing supply chain strategy is in term of relationship between members of the supply chain that cause the measurement system inadequate. Therefore, supply chain strategies were used for different constructs for different country [9].

The purpose of this study is to conduct the method of the supply chain strategy in order to develop a conceptual framework for analyzing supply chain performance of the oil palm refinery in Malaysia. The method will be constructed using the Supply Chain Operations Reference (SCOR) model which this method can be used for modeling, benchmarking and performance measurement [10]. In this case, SCOR model is used to conduct relationships between entities in the oil palm downstream industry. Based on the gap of this research, it requires a tool to analyze supply chain strategy in the oil palm refinery that provide the reference process model based on the relationship between entities. To achieve objectives of the study, the oil palm refinery will be conducted based on the activity business process in Malaysia.

2 Measuring Supply Chain Performance

Measurement of supply chain performance aims to determine the extent of supply chain strategy that has been set in running business processes working properly. Akyuz and Erkan [11] conducted a literature review on supply chain performance measurement. They revealed that this concept is useful for controlling and managing the system. Thus, the several stages of improvements that are planned obtain optimal results. Supply chain performance measurement is very necessary to assist in evaluating supply chain strategy [12]. Many supply chain performance measurement

methods that have been studied. However, application of these methods must be adapted to the case studies that are conducted. Kurien and Qureshi [13] suggest that the selection of the method of supply chain performance measurement must be in accordance with a system that will be improved. Indeed, it is necessary to answer the question of how measure supply chain performance of oil palm downstream industry in Malaysia.

Several methods are used by researchers in measuring supply chain performance. Balanced Scorecard (BSC) was developed by Kaplan and Norton in 1992 which it purpose to measure performance based on perspectives, financial, customer, internal business and innovation and learning. It methods focus on performance measurement based on the vision and mission of the organization [14, 15]. Furthermore, Activity-Based Costing (ABC) is a technique to measure performance in supply chain strategy based on data of financial flow involving financial value and variable cost [16] nevertheless it can not used for non-financial measurement. In addition, Ramos et al. [17], measurement of the supply chain performance using Total Quality Management (TQM) to analyze and improve the goal of the business process in form products, services, and processes by creating value for customers. This approach focuses achieving the target and customer satisfaction. Moreover, Supply Chain Operations Reference (SCOR) model is used to evaluate the relationship between supplier, manufacturing and customer in order to measuring the performance more detail into activity of business process [18]. These methods are used to measure supply chain performance and support problem solving of supply chain cases, however the advantages of the methods depend on the scope of the problem.

This research develops a framework of performance measurement in supply chain strategy using the SCOR model which it was built by the Supply Chain Council (SCC). This method is used to investigate the relationship between entities in business processes [19]. Therefore, distribution of physical products from the supplier to the customer has a pattern that can be standardized into operational procedures within business processes [20]. In addition, the relationship between entities in supply chain strategy require developing the modeling tool which this method can adopt business process reengineering based on the stages that have standardized involving Plan, Make, Source, Deliver and Return [21]. This approach also is used as a set of key performance indicators [22].

3   Oil Palm Refinery in Malaysia

The upstream industry produces raw materials from oil palm business. These industries involve the plantation that produces Fruit Fresh Bunch (FFB) and the milling that extracts the raw material in the form of oils [23]. Thus, these industries commonly are an upstream stage in its production process. Moreover, downstream industry involves processing the materials collected from the upstream industry into finished products which it consists of crushing, refinery and oleochemical [24, 25]. The type of customer will vary depending on market destination such

as international market and local market because the downstream industry has direct contact with customers through the finished products. Furthermore, oil palm downstream industries in Malaysia have the high competition in the global market because industries of oil palm derivative products have been clustered into the specific finished product. These products will be processed by the developed countries to retail businesses such as food products, chemical industry, personal care products, animal feed, cleaning products and several sources of energy [26].

The oil palm refinery has the relationship with the overall downstream industries involving milling, crushing, oleochemical, delivery service providers and customer to process the oil palm derivative products [27]. Therefore, the oil palm refinery requires raw materials from the milling industry in the form of crude palm oil (CPO) and the crushing industry in the form of crude palm kernel oil (CPKO). The finished products are RBD palm oil, RBD palm kernel oil and palm fatty acid distillate. Finished products that consist of various types of products will be distributed in warehouses or direct shipping to await orders from the customer. In addition, the final products will deliver to export through port and local industry in the form of business to business (B2B) or business to customer (B2C). The integrations of oil palm refinery with other entities within the oil palm downstream industry show there is several configurations in the supply chain strategy. Thus, stakeholders can optimize the integration in the oil palm refinery with measuring supply chain performance based on the relationship between entities involving supplier, manufacturer, distributor and customer [28]. Figure 22.1 show supply chain oil palm refinery in Malaysia.

Furthermore, Malaysia has 55 refinery processes including 35 refineries in the Peninsular Malaysia, 6 refineries in Sabah and 14 refineries in Serawak [29]. The cases of oil palm refinery are chosen to be part of the sample with a specific
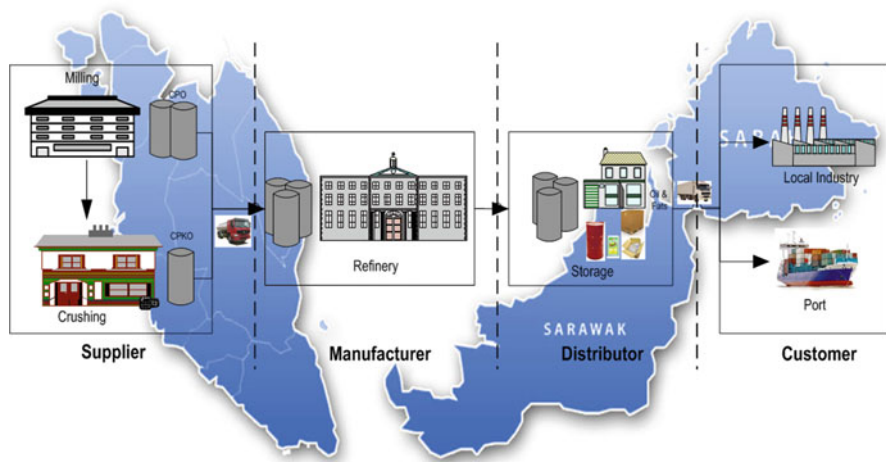

Fig. 22.1 Supply chain oil palm refinery in Malaysia

purpose of the research. In addition, the overall refineries in Malaysia cannot directly distribute their finished products to international market through the port and local industry such as oleochemical industry. Thus, the samplings of the case study will select certain refineries that deliver the finished product both of them which the oleochemical industry is only in Peninsular Malaysia. It technique adopts sampling based on purposive personal judgment [30]. Indeed, this research can choose multiple cases in Malaysian oil palm refinery. There are 35 refineries in the peninsular Malaysia. However, measurement of supply chain performance will be selected in 6 oil palm refineries.

4   Development Supply Chain Framework

The following phases of frameworks for analyzing supply chain performance:

- Phase one: Reengineering of business process

    The SCOR model serves to improve activities in the supply chain strategy [31]. The model contains five different processes involving Plan, Source, Make, Deliver and Return. Furthermore, it is breakdown into several levels of SCOR model which the model can be seen in Fig. 22.2. The plan represents the planning activities in achieving corporate targets. Source represents suppliers that supply raw material to the industry. Make represent process transformation of raw materials into finished products. Deliver is a process to distribute and deliver finished products to the customer. Return represents customer complaints about product of rejecting, defect, and repair. The five categories will be selected based on activity in oil palm refinery in order to understanding the business process. Furthermore, the data collection will be developed into business processes using software which it can develop business processes based on SCOR model.

- Phase two: Determining supply chain relationship model

    Most of the manufacturers have similarity the core business; nevertheless, they have the different operational strategy in production [32]. This research will explore some of operational strategies in the oil palm refinery, which become several alternatives of supply chain configurations in the oil palm downstream industry. This strategy considers the relationship between supplier and buyer, which are based on the frame thinking of five force competitive models into by Michael Porter at 1980. It conducts the condition whenever supplier or buyer has power to affect activity in the business process. In addition, many oil palm industries can be categorized into a holding company which it means supplier and buyer allow to cooperate in order to obtain the optimal size of production. The categories of relationship model between supplier and buyer can be seen in Table 22.1.

- Phase three: Selecting performance indicator

    The numbers of alternative relationship models appear into several scenarios in supply chain strategies in order to measure performance indicator. SCOR
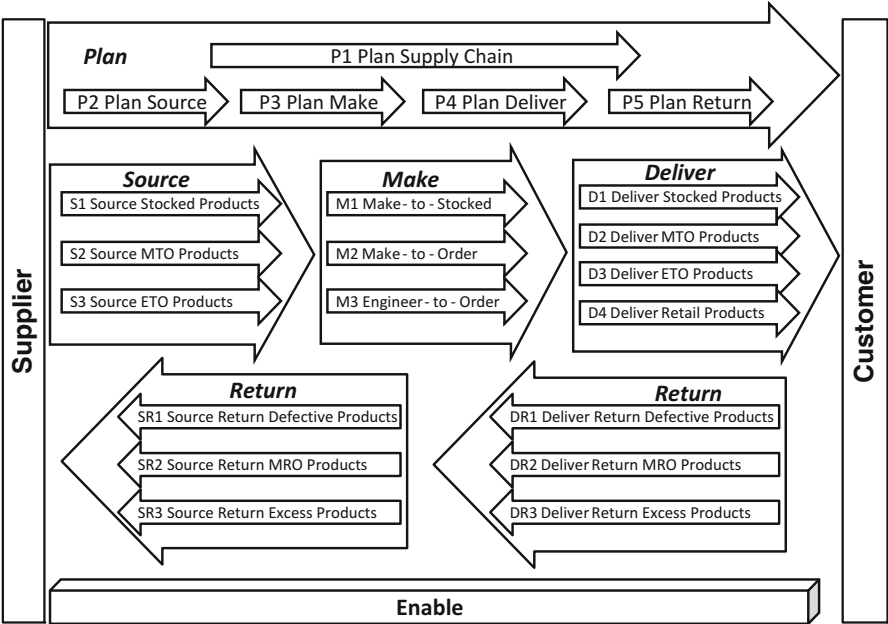
Fig. 22.2 The reference process modeling using SCOR model

Table 22.1 Type of supply chain relationship model

No	Supplier – buyer relationship	Description
1	Supplier dominance	The supplier has power to affect the buyer and uses their forecasting to push products to the buyer
2	Buyer dominance	The activity of business process is controlled by the buyer. Thus, suppliers produce a number of products from information of the buyer
3	Cooperate optimal size	Buyer and supplier conduct the optimal size of demand and supply because they are a holding company that allow deciding the optimal size of production
4	No collaboration	Production based on orders because there is not information sharing. Most of this type considers the high of variant product

model will describe performance indicators into five categories involving Plan, Source, Make, Deliver and Return. Then, it will be grouped from list of indicators to performance indicator which this research adopt qualitative content analysis into inductive category [33, 34]. Finally, the stakeholder will determine the appropriate performance indicator based on the relationship between the supplier and buyer. The performance indicator includes cost, quality, time, asset, reliability, responsiveness, utilization, and political stability.
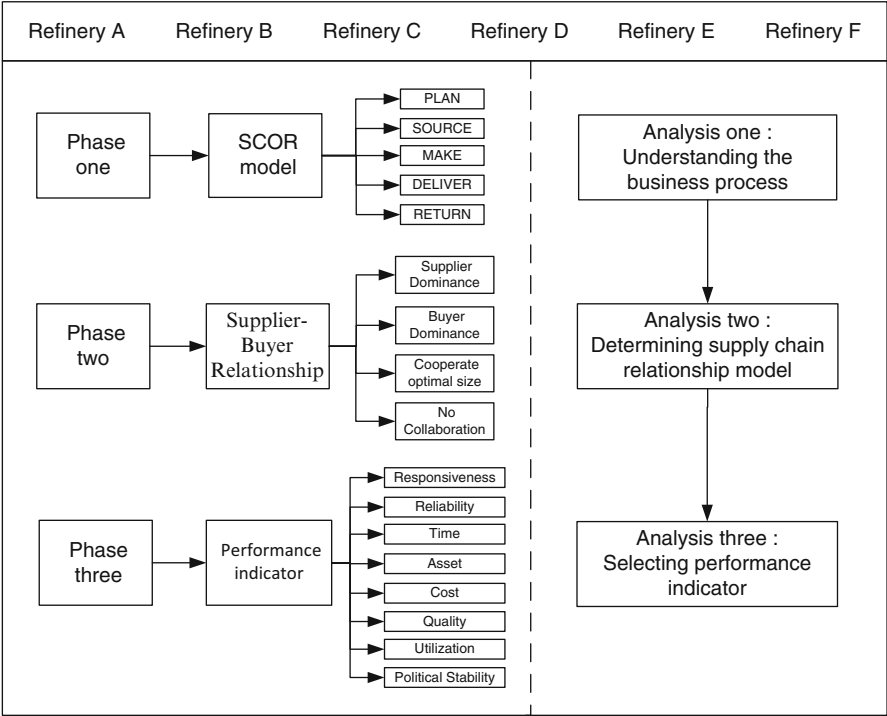
Fig. 22.3 Framework for analyzing supply chain performance in oil palm refinery

The expected results of this research will be achieved into a model to analyze the supply chain performance based on the relationship between entities in the oil palm downstream industry. It is obtained from several cases selection of the oil palm refinery in Malaysia. Number of cases required to collect the data until no significant new findings that are revealed. Thus, the framework is developed more concerned in reaching data saturation. The detail framework of supply chain performance in oil palm refinery can be seen in Fig. 22.3.

5   Conclusion and Future Work

This research has shown the development of a supply chain framework in order to analyze supply chain performance in oil palm refineries. Therefore, oil palm downstream industry involves several processing industries which they are represented by supply chain of business processes. From the framework, it has identified some potential areas for further research. First, developing of the reference process model adopted SCOR model. Second, determining supply chain relationship model based on supplier and buyer profiles. Third, selecting the appropriate performance

indicator of supply chain strategy is done into five categories of SCOR model. Finally, the model provides guidance for improving the business process in the oil palm refinery. Thus, the linkage of business process shows an illustration of the relationship between suppliers, manufacturer, distributor and customers. To support the above model in further research, the data analysis is supported by the Process wizard software in order to develop the reference process model.

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