

CHAPTER I

INTRODUCTION

1.1 Background of the problem

The rapid growth of industry in today's competitive environment has increased the competition among companies. In order to gain business competitiveness, companies are trying to focus on customer expectations of higher quality, lower price, shorter lead time, and less environmental impact (Azadnia et al., 2015). Due to this competition, companies are trying to improve the performance of their entire supply chain. Supplier selection and order allocation are essential decision steps in supply chain design to reduce purchasing costs, supply risks, and environmental impacts as well as to improve corporate price competitiveness (Azadnia et al., 2015; Kannan et al., 2013). The number of companies getting aware considering environmental practices into their strategic proposals and operations is increasing (Sarkis, 2003). Not only, it has led companies to ensure safe practices like pollution control, reuse, recovery, but also led to positive impacts, such as improved business and public image, attraction of environmentally aware customers, and improved quality (Molamohamadi et al., 2013).

The conventional of supplier selection during decision process was focused only on economic criteria, which is the cost. However, within rapidly changing environment which affected by natural resources, environmental disasters, sustainability has been considered as the most decisive criteria for selecting the most suitable supplier (Molamohamadi et al., 2013). It makes economic criteria are not enough to evaluate the suppliers performance. As a result, with increasing consciousness about sustainability in organization, suppliers are

being selected according to sustainability criteria, where environmental and other influencing factors are incorporated in the selection and sourcing processes (Azadnia et al., 2015). Considering sustainability also helps to maintain the continuity of supply chain. Chaharsooghi & Ashrafi (2014) reviewed the literature and summarized the sustainability supplier selection criteria consist of economic, environmental, and also include risk management that could be a consideration for sustainability aspect.

In dealing with the supply chain, companies often face risks that occurred caused by within and outside of the supply chain. In a survey conducted by Deloitte, 71 percent of the respondents consider supply chain risk as a crucial factor in their firm's strategic decision-making (Marchese & Paramasivam, 2013). Supply chain risk categorizes as either operational or disruption risk (Jianlin, 2011). Uncertain customer demand, supply, and cost are the operational risk and disruption risk refers to the major disruptions caused by natural and man-made disasters.

The impact of disruption risk can lead to a loss in productivity, quality, and reputation for the suppliers and the supply chain (Chopra & Sodhi, 2014). This also leads to an increase in the purchasing and logistics cost as the manufacturers are often forced to find and select suppliers quickly from elsewhere and to do the shipping right in time to maintain service levels. The role of risk management is not just in responding to anticipated events but also to implement the culture and organization that can respond to unanticipated risk events (Coleman, 2011). However, most companies still less invest in risk management for mitigating supply risks (Jianlin, 2011).

It is not difficult to see the impact of suppliers on a firm's total cost. In most industries, the cost of raw materials and component parts represents the main cost of a product. For instance, in high technology firms, purchased materials and services represent up to 80% of the total product cost (Weber et al, 1991). Therefore, optimizing the order allocation is crucial in minimizing the total purchasing cost.

The supplier selection process starts with a performance evaluation where the suppliers are evaluated based on predefined criteria to determine the weight of each supplier. Handfield et al., (2002) evaluated the suppliers using AHP based on environmental criteria such as waste management, packaging/ reverse logistic, environmental certificates and environmental friendly product design. This is mostly due to the fact that AHP incorporates both qualitative factors like judgments, feeling, emotions, and quantitative factors, like cost, price in decision making. The extensive application of the analytic hierarchy process (AHP) method is due to its simplicity, ease of use, and flexibility (Borade et al., 2013). Its application area strategic planning, resource allocation, source selection, program selection (Grover et al., 2016). The use of AHP in evaluating the supplier is a suitable and sufficient method for supplier selection.

The order allocation process uses the method of multi-objective linear programming, which is widely used for order allocation problem for multiple objectives. A multi-objective linear programming problem simultaneously optimizes some objectives subject to the given constraints. Azadnia et al. (2015) proposed multi-objective function model to determine the quantity of orders allocated to each supplier, in order to minimize the cost (inventory, purchasing, ordering and transportation cost), maximize the total score of all suppliers in terms of social and environmental issues and maximize the overall score of suppliers in terms of economical qualitative criteria.

One of manufacturing companies in Indonesia is PT. Yoska prima Inti (YPI). YPI is an automotive component manufacturer. YPI provides metal stamping, painting, dies and jig fixtures. YPI has several suppliers to support material supply, but the condition of supplier selection only consider the aspect of economic which is to minimize the cost. However, considering quantitative factors are not enough for supplier evaluation and make the suppliers are not reliable enough for supplying the material. The impact of unreliable supplier is resulted in supply risk, which will affect the effectiveness of production and most importantly will require more costs to overcome that problem. Therefore, qualitative factors should be considered also. By considering qualitative factors, company has higher chance of overcoming disruption in supply chain, reducing supply risk that may occur, make the

suppliers more reliable, and reducing environmental impacts. There are 4 suppliers which supply the plate materials and each supplier has its own costs in providing the raw material.

Therefore, researcher will analyse the supplier selection order allocation by considering sustainable supplier selection and assigning the optimum order allocation among supplier. The sustainable supplier selection criteria consist of the aspect of economic, environmental, and supply risk criteria. The methods used in this research are AHP, multi-objective linear programming, and risk management. AHP is used to determine the weight of supplier for supplier evaluation considering the environmental criteria. For order allocation, multi-objective linear programming model is proposed. Multiple objectives consist of minimizing total purchasing cost and maximizing supplier evaluation, resulted in optimum initial order allocation. Then, supply risk is taken into consideration in determining the revised order allocation by calculating the initial order allocation corresponding to the risk rating. Based on risk rating, the order allocation is transferred from risky supplier to a least risky supplier. Therefore, the result of this research is selected supplier and optimum revised order allocation of each supplier.

1.2 Problem Formulation

Based on the mentioned background above, the problem of this research can be defined as follows:

1. What are the supplier selections considering the aspect of environmental criteria?
2. How many are the initial order allocations among suppliers considering the aspects of, economic and environmental criteria?
3. How many are the revised order allocation considering supply risk ?

1.3 Research Objectives

In accordance with the problem statement above, the objectives of this study are described as follows:

1. Determine the weight of suppliers for supplier selection by considering the aspect of environmental criteria.
2. Provide the initial order quantity allocation among suppliers considering the aspects of economic and environmental criteria.
3. Provide the revised order allocation plan corresponding to risk rating of each supplier.

1.4 Research Scope

There are some limitations that existed in this research, the limitations are as follows:

1. This research only focuses on the supplier selection and order allocation considering the aspects of economic, environmental, and supply risk criteria.
2. The research is conducted at PT. Yoska Prima Inti.
3. The methods used in this research are Analytical Hierarchy Process, Multi-objective Linear Programming, and Risk Management.
4. The research conducted from 16th April until 30th April 2018.

1.5 Research Benefits

The research benefit is expected to increase the knowledge, particularly in optimization with linear programming and risk management. The other benefit of this research is to enhance the application of linear programming and the risk management in industrial practical problems.

