

SUPPLIER SELECTION WITH THE INTEGRATION OF DEMATEL (DECISION MAKING TRIAL AND EVALUATION LABORATORY) AND AHP (ANALYTIC HIERARCHY PROCESS) : A LITERATURE REVIEW

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ABSTRACT

The decision of Supplier selection is a crucial process in supply chain management, where the interest of the decision makers in this stage increase and progress significantly. This is due to the opportunity of fit selection of supplier might reduce costs such as inventory carrying cost and able to increase the quality of products. In this paper, the supplier selection is done based on the case study in Indonesian company using the approach of Decision Making Trial Evaluation And Laboratory (DEMATEL) dan Analytic Hierarchy Process (AHP) which are integrated to determine the criteria for supplier selection. In those two methods used in this paper, the quantitative and qualitative approaches are used by doing interviews to stakeholders and also giving the questionnaires to some respondents.

Keywords: Supplier Selection, DEMATEL, AHP

1. INTRODUCTION

Supply Chain Management of a part that is quite important and influential in the performance of the company, because in the absence of Supply Chain Management is both the company's performance will not be good. Due to supplier performance directly affects business performance (Fu & Zhu, 2010). Supplier has always been an integral component of the company's management policy (Bhutta & Huq, 2002).

Supplier is seen as a critical resource for the company. Increasingly fierce competition requires companies to adjust strategies in order to improve services to attract more customers thereby increasing sales volume. When examined in more depth, the essence of the competition lies in how a company can implement the process of creating products and / services are cheaper, better, and faster (cheaper, better, and faster) than business competitors (Harsono et al. 2009). Attempt to create a series of process is not a short-term targets, but are dynamic, in the sense must always be pursued constantly and continuously. The key to the process circuit performance improvement lies in the ability of the company in collaboration with its business partners, which in this case are

those that provide supplies the needs of companies in a variety of forms.

Supplier selection are defined in Sonmez (2006) As the process' of finding suppliers who are able to provide the buyer with the right products and services at the right price, in the right quantities and at the right time. "This process is commonly described in the literature consists of five stages : (1) Identify the need for new suppliers, (2) identification and elaboration of the selection criteria, (3) the initial screening of potential suppliers of a large set; (4) the selection of the supplier, and (5) evaluation and continuous assessment of the selected suppliers . Supplier Selection is a process that is important in the Supply Chain Management of the process, where the interest of the decision makers on supplier selection process has continued to evolve as the best supplier that is reliable and allows a reduction in the cost of inventory and are able to improve the quality of products.

MCDM methods are appropriate for use in decision-making applications in the performance evaluation of supplier is the integration of DEMATEL method. DEMATEL can be used to determine the relationship that occurs between supplier performance evaluation criteria. In addition, the DEMATEL can also be used to find and

analyze the dominant criteria in a system (Tzeng et al., 2007).

According to Chang et al. (2011) DEMATEL method can be used to analyze and can help companies accurately predict where suitable suppliers by focusing on important factors were found. DEMATEL method can also be used to obtain a causal relationship between each - each factor can provide a basis for determining the price and also provides the most important reference data for decision makers (YX Wu & Guo, 2011).

2. THEORETICAL BACKGROUND

a. Supply Chain Management

Supply Chain Management is a set of approaches to streamline the integration of suppliers, manufacturing, warehouse and storage, so that goods are produced and distributed in the right amount, the right location, the right time, to minimize costs and provide service to the customer satisfaction (Simchi-Levi, 2005).

A supply chain refers to a complex network of relationships in which the organization maintains with its business partners to source production in conveying to consumers. Goals to be achieved from every supply chain is to maximize the overall value generated (Chopra & Meindl, 2007). Integrated supply chain will increase the overall value generated by the supply chain.

According to Chopra and Meindl (2004) there are three activities undertaken related to the partner company in the supply chain. The first activity, namely the upstream sourcing. Secondly, the transportation of goods or to downstream downstream. While the third is the downstream product pricing. In the present study focused on the first activity on the upstream sourcing the raw material supplier.

Chopra and Meindl (2004) suggests there are five major processes associated with sourcing activity. These five activities are:

i. Supplier Scoring and Assessment

A process for assessing the performance of suppliers. Supplier performance should be compared based on their impact on the total cost.

ii. Supplier Selection and Contract Negotiation

Before choosing a supplier company must decide whether to use one or more suppliers in the procurement of products. Once the supplier is selected, a contract is made between the buyer (the company) with each supplier.

iii. Design Collaboration

Collaborative design can reduce costs, improve quality, and reduce time to market.

iv. Procurement

Procurement process should be consolidated so as to obtain economic benefits and discounts.

v. Sourcing Planning and Analysis

Procurement has been done must be analyzed either by parts / items purchased and the supplier to obtain economic benefits.

b. Supplier Selection

Research on supplier has been considered important during the past few decades. Some organizations have begun to focus on issues of core competencies and outsource activities that are less profitable for the supply chain partners. (Arnold, 2000). This evolution focuses on strategic buyer supplier relationship in which close cooperation between certain skills and abilities required (Sarkis & Talluri, 2002). Skills and abilities necessary require greater oversight of organizational buyers, which causes tasks more complex strategies for identifying and selecting supply chain partners. because some suppliers have limited capacity or other constraints (Kannan et al., 2013).

In fact in the process of outsourcing and vendor selection resulted in the need to help organizations make decisions more wisely and simple. Simplifying complex managerial decision making is the role of pragmatic theory and also many models (Williamson, 2008).

The model for supplier selection represents just one of more than a dozen areas in supply chain management (Badole et al., 2013). Thus, it is easy to see that the direction of strategic supplier management practice requires the ability to take some of the criteria and the steps to achieve a clear and straightforward priorities for the final selection (Ho et al., 2010).

Extensive nature and complexity of the modeling process used to make the supplier selection problem which depends on several criteria decision model is selected.

Supplier selection process recently (in the last few decades) began to integrate the various dimensions of the environment. Model decision will certainly be more complex because many new dimensions brought about by the efforts of green supply chain, where sacrifice becomes clearer and more (Govindan, Rajendran, et al., 2013). The decision will also include more intangible dimensions such as reputation, supply chain risk, business continuity, and social impact. Criteria and new dimensions necessary for rethinking some of the more established models approach. In addition, decision-makers, or those who influence decisions, continue to grow when environmental factors come into play in it (HervÃ & Roca, 2013).

According Punjawan and Mahendrawathi (2010) selecting or evaluating suppliers is a strategic activity, especially if the supplier will supply critical items or will be used in the long term. The criteria for selection is one of the important things in supplier selection.

The criteria used must surely reflect the Supply Chain strategy as well as the characteristics of the item to be supplied. In general, many business company using criteria - basic criteria such as the quality of the goods offered, price, and delivery time keterpatan. But sometimes the selection and evaluation of supplier performance requires a variety of other criteria deemed important by the company.

c. **Decision Making Trial And Evaluation Laboratory (DEMATEL)**

DEMATEL method (Decision Making Trial And Evaluation Laboratory) was originally developed by the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva between 1972 and 1976 to study the problems and resolve complex and inter-related group (Tzeng et al., 2007).

Procedures DEMATEL method can be summarized as follows according to Tzeng et al. (2007):

Step One: The first step of the calculation method is to find the matrix DEMATEL average - average using the formula:

$$a_{ij} = \frac{1}{H} \sum_{k=1}^H x_{ij}^k.$$

Step two: calculate the value of normalized direct-relation matrix, to calculate the direct-relation matrix D, is

$$S = \frac{1}{\max_{1 \leq i \leq n} \sum_{j=1}^n a_{ij}}.$$

D = A x S with

For each element in the matrix D.

Step three: calculate the total relation matrix. Total relation matrix T is defined by T = D (I - D)⁻¹, where I is the identity matrix.

Step Four: set the threshold value to get digraph. Since the matrix T gives information about how one factor affects another factor, should a decision-maker to make a threshold value to filter out some of the effects are negligible.

3. HYBRID METHOD DEMATEL AND AHP

Research design used in this study using a hybrid DEMATEL method and AHP is composed of 3 main stages, namely the re-identification of supplier criteria, then proceed with the weighting criteria in combination with AHP and DEMATEL method then results in the output. The output of the above process is the supplier recommendations will be used by a decision maker to make decisions appropriate supplier selection. More clearly the stages of research can be seen in the following figure.

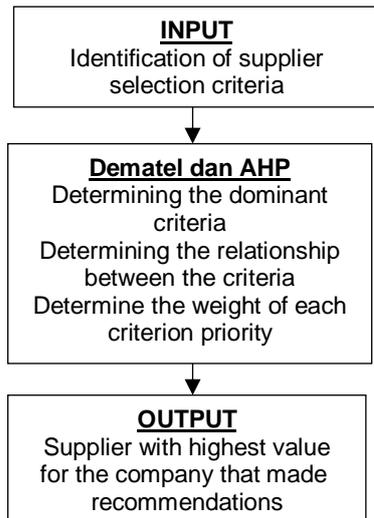


Figure 1. Research design used in this study using a hybrid DEMATEL method and AHP

The first is the input stages, where in this process will be identified and re-inputted criteria - criteria for supplier selection predetermined.

The next stage is to use Dematel and AHP to obtain the weight of each criterion on the priority selected. Through Dematel method will be known that the dominant criterion in the evaluation system of supplier selection, and the most important thing is going to be known as the linkages between the criteria that will be used as input for the AHP method.

The final stage in the research is OUTPUT. That would be obtained by the supplier who has the highest to the lowest value of the output that will be considered by a decision maker in the company.

4. CONCLUSION

This paper provides an overview of the literature on how the application of the method of making decisions on supplier selection. In this paper we take some of the journal in which the article discusses methods for Supplier Selection Decisions Making them is Harsono et al examines how the application of AHP and PROMETHEE method in supplier selection of vegetables. They discuss how the integration of AHP and PROMETHEE method for supplier selection of vegetables.

Literature Review Research is expected to be useful in the study using the

integration of two methods of supplier selection. As a result of this literature review is how the integration of two methods of selecting suppliers for supplier selection can produce better results than using only one method of supplier selection.

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