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# Raw Material Supplier Performance Evaluation with Analytical Hierarchy Process

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**Abstract.** Performance evaluation is a process for the company's operations in the form of the actions and activities of an organization at a particular period in accordance intended purpose. CV. Diva Graphic engaged in printing, in which the purchasing activity has a significant value for the company to purchase raw materials and supplies component. The method used is analytical hierarchy process is a functional hierarchy to the main input of human perception. With a hierarchy, a complex and unstructured problems broken into factions. The results obtained is the consistency in which CR <0.1, each factor is unacceptable. The value of each supplier, after evaluation of supplier performance ratings by the three suppliers, namely Indah Sari, Multi Paper and Abad. The final value CV. Indah Sari obtained a total score of 1.32 with the highest value, Multi Paper obtained a total score of 0.65 and Century with a total score of 0.18.

Keywords: Performance Evaluation, Supplier, Analytical Hierarchy Process.

# **1** Introduction

In the current era of globalization, competitive world of business has developed very rapidly. Companies competing in applying new technology and strategy in the production process as well as in management, for that all steps should be calculated carefully business so that a decision taken not wrong in running their discretion. This is done so that the company can maintain its viability and overcome the competition is very sharp, so that the management company is able to overcome the problems of both internal and external problems.

Optimal problem-solving, the management is required to take out a policy with regard to the problems faced by an evaluation, one of the evaluation of production, the company needed raw material procurement. Purchase of raw materials by companies is usually left to the purchasing department. Taking into account the cost, quality, quantity, and others, the purchasing department is expected to get the raw materials vang accordance with company requirements. For that part of the purchase is expected to enter into business relationship with the suppliers of the raw materials used in the supply of raw materials. As was also made by CV. Diva Graphic where

the supplier can provide service, low prices, always have raw materials, and the speed of delivery of raw materials if necessary. Raw materials is the main ingredient of a product. It can be interpreted as the primary material used analysis and hearts.[1], [2].

The operations are carried CV. Diva Graphic prior to the production process to prepare a raw material in the production process that have been stocked by CV. Diva Graphic. Stocks of raw materials consisting of glue, ink, paper and ribbon. In the supply of raw materials is often a shortage of raw materials, which cause a delay of the production process, so the CV. Graphic diva must make reservations in advance kepemasok the raw material suppliers. The process of delivery of raw materials from several suppliers are experiencing delays sometimes come up, which causes the length of the production process customer orders already made. CV of this issue. Diva Graphic require performance information that can provide a solution for the company on a good supplier.

Selection of suppliers is one thing that is important in purchasing activity for CV. Diva Graphic, where the purchasing activity is an activity that has a significant value for the company for the purchase of components, raw materials, and supplies represent a large enough portion in the finished product. In taking the decision to choose suppliers, decision makers (decision maker) requires an analysis tool that allows them to solve complex problems that are making higher quality decisions. In designing the supply chain system, some points to consider in choosing a supplier, including the quality of the goods offered, the price of goods, and timeliness of delivery [3]

Supplier selection should be done carefully because the selection of suppliers which one will cause disruption of the production process and the company's operations. Selection of suppliers is a multi-criteria problems that include factors quantitative and qualitative consisting of several suppliers including Indah Sari, Multipaper and Abad. Some of the criteria that influence the selection of suppliers there is quantitative and qualitative. Therefore we need a method that can include both in the measurement. One method that can be used for the selection of suppliers is Analytical Hierarchy Process (AHP). This method includes the measures of qualitative and quantitative. AHP is a decision-making method developed for prioritizing some alternatives when several criteria must be considered, as well as allow decision-makers to draw up a complex problem into a form of hierarchy or series of integrated level.

# 2 Analytical Hierarchy Process

The decision-making process is basically choosing an alternative [4]. The main equipment analytical hierarchy process is a functional hierarchy to the main input of human perception. With a hierarchy, a complex and unstructured problems broken into factions.

AHP excess compared to the other is: (1) Its hierarchical structure, as a consequence of the selected criteria, to the deepest subhierarchy.; (2) Taking into account the tolerance limit of validity up to the inconsistency of various criteria and

alternatives selected by the decision makers; (3) Taking into account the durability or resistance output sensitivity analysis, decision-making.

- Based on Thomas L. Saaty, steps in AHP method [5]:
- (1). Develop these criteria in a matrix form pairs.

$$a_{ij=\frac{W_i}{W_j}} \tag{1}$$

(2). Where n states that compared to the number of criteria, Wi weights for criteria i, and a<sub>ij</sub> is the ratio of the weight of the criteria of i and j. 3. Normalize each column by dividing each value in the i-th column and j-th row with the largest value in column i.

$$a_{ij=\frac{a_{ij}}{\max a_j}} \tag{2}$$

- (3). Summing up the values in each column to-i are:
- (4). Determining the priority weighting of each criterion i, by dividing each value of a with a number of criteria compared to (n), namely:
- (5). Calculating the value of lambda max (Eigen value) using the formula:

$$\lambda_{max} = \frac{\sum a}{n} \tag{3}$$

(6). Calculating the consistency index (CI) Calculation of consistency is to calculate deviation from the value of consistency, of deviation is called Index Consistency with the equation:

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{4}$$

Where:  $\lambda_{max} = maximum$  eigen value, n = size of the matrix

# **3** Research Method

#### 3.1 Method of collecting data

Data used in this study are primary data is data obtained from CV. Diva Graphic a place of research. Data obtained in the form of secondary data in the form of supplier data, raw materials and written information that is information regarding the type of supplier selection criteria [6].

The data captured is used to support the preparation of this study. In the process of data collection, it is necessary to know the type of data and the methods used. The type of data and the methods used are: (a) interview, in this method the authors collected data directly to the research by asking the parties concerned to provide the required information on the CV. Diva Graphic.; (b) questionnaire, collecting data through forms that contain the questions submitted in writing to a person or group of

people to get answers or feedback and information needed by researchers. This study uses a close questionnaire.; (c) Observation, this method is done by directly observing the situation and activities in the CV. Graphic Diva in order to obtain accurate information.

The scale used in this study is the Likert scale psychometric scale commonly used in questionnaires, and is the most widely used scale in the form of survey research [6]. When responding to questions in a Likert scale, respondents specify their level of agreement to a statement by choosing one of the options available. There are two kinds of questions using a Likert questions to gauge interest in positive and negative questions to measure the shape of the negative interest. Positive questions were scored 5, 4, 3, 2 and 1; whereas the form of negative questions were given a score of 1, 2, 3, 4, and 5. Form a Likert scale response consists of strongly agree, agree, undecided, disagree, and strongly disagree.

### 3.2 Data processing

Data obtained from both primary data and secondary data requires data processing and analysis to compare the problems to be faced with the theories that are used for discussion. In this study, the data processing is done by AHP method to find out: (1) Principles of preparation of the hierarchy; (2) The principle of determining the priority; (3) The principle of logical consistency.

Steps to resolve the problem gradually. Can be seen from the flow diagram of research such as in the figure 1.





Fig. 1. Flowchart of Performance Evaluation Model Raw Material Suppliers.

### 4 **Results and Discussion**

The data are collected by direct interview and questionnaire information by using AHP on Diva Graphic Printing. In calculations using AHP priority values ahp weight to produce the highest value calculation information on the CV. Indah Sari with a total score of 1.32 with the highest value, while Multi Paper a total score of 0.65. Century with a total score of 0.18. It can be concluded CV. Beautiful sari has the highest score in the determination of The final results obtained in the calculation using AHP using weights on ahp priority value is as follows.

CV. Indah SariThe hospitality service of raw materials to the value of 0:20, bonuses in the process of production of raw materials to the value of 0:19, Payment cash to the value of 0:16, existence of the payment period with a value of 0.14 Delivery on time with a value of 0.12, the accuracy of the number of shipments with a value of 0:18, Free suppliers respond to requests for materials raw with a value of 0:16, the raw material is never empty at 0:17 value, in order to obtain a total score of 1.32 with the highest value.

Multi Paper with The hospitality service of raw materials to the value of 0:08, bonuses in the process of production of raw materials to the value of 0:06, Payment cash to the value of 0:05, existence of the payment period with a value of 0:08, Delivery on time with a value of 0:07, accuracy of deliveries with a value of 0:09, Free suppliers respond to requests for materials raw with a value of 0:16, the raw material is never empty at 0:06 value, in order to obtain a total score of 0.65.

The century with Hospitality services with a value of 0:03, bonuses in the process of purchasing with a value of 0:03, Payment cash to the value of 0:03, existence of the payment period with a value of 0:02, Delivery on time with a value of 0:03, accuracy of deliveries with a value of 0:01, Free suppliers to respond to demand for raw materials with a value of 0:01, the raw material is never empty at 0:02 value, in order to obtain a total score of 0.18. the value criteria.

# 4 Conclussions and Recommendations

Based on the results of research and testing of decision support systems supplier performance evaluation has been done by the author, it can take several conclusions, namely: (1) The method used is the method of AHP to the step that is the first step of creating the form to determine the priority criteria, where there are several steps that must be done in determining priority criteria, the second step is creating the form to determine the priority sub-criteria, where there are several steps that must be done in determining the priority sub-criteria Furthermore, the calculation of the eigen value of the matrix above is by way of the number on each line divided by its eigen factor of each column and the results of calculation n.; (2) Perform pairwise comparisons between criteria and sub-criteria to produce a matrix of criteria and summation value of each row to generate consistent information about every factor of subcriteria rated where CR < 0.1, the ratio of the consistency of the results of each criterion.; (3) Supplier performance information that best suits the company's expectations by three suppliers, namely Indah Sari, Multi Paper and Abad results obtained final value Multi Paper obtained a total score of 0.65, Ages with a total score of 0:18 and with the highest scores were obtained by CV. Indah Sari with a score of 1.32.; (4)In evaluating a company's suppliers is based on several criteria, including the criteria of service, price, delivery and availability, with the sub-criteria ie friendliness, bonus, cash, period, accuracy, timely, and demand response is not empty, that consist of suppliers CV. Indah Sari annotated with the letters A, B and Multipaper description Abad letter with a description of the letter C.

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