

## **CHAPTER III**

### **RESEARCH METHODOLOGY**

In this chapter there are several stages that will be done that consist of research object, research flow, types of data, data collection method and data processing. The research methodology will be explain below.

#### **3.1 Research Object**

This research will be conducted in PT.Madubaru PG.Madukismo that can be categorized as one of the sugar manufacturing located in Bantul, Yogyakarta. This research will focused on the selecting 1 best supplier from 3 pump supplier in the company.

#### **3.2 Research Flow**

There are several stages to conduct this research, the first step is the problem identification done by researcher after that researcher determine the research question and research objectives. The literature review consist of inductive study which explained about the previous research that has been done in the past and deductive study which explained about the basic theory of supplier selection. The next step is data collection and will be process in data processing. The data that has been collected will be processed using Fuzzy AHP method.

### 3.3 Conceptual Model

The research framework is constructed as the flowchart which shown in Figure 3.1.

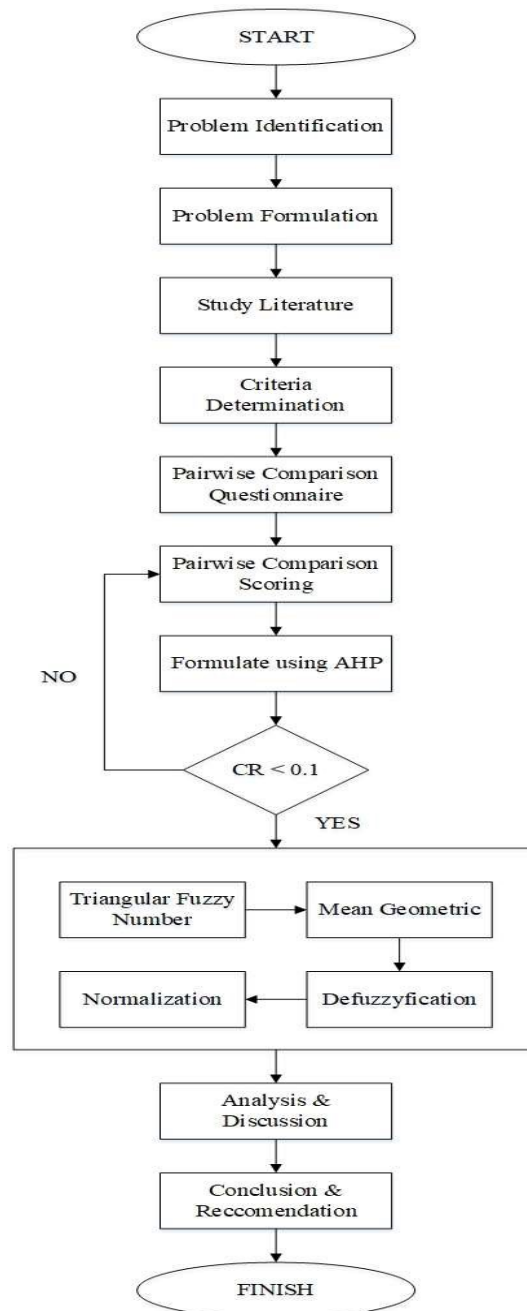


Figure 3.1 Flowchart of Research

### **3.4 Types of Data**

The source of data used in this study consisted of primary data and secondary data.

a. Primary Data

Primary data are data obtained directly from the object of research which is PT. Madubaru PG. Madukismo. The primary data of this study were obtained from the pairwise comparison questionnaires filled out by expert in PG. Madukismo

b. Secondary Data

Secondary data are data obtained indirectly or through other parties. Secondary data of this study were obtained from literature studies, papers, literature that relates to supplier selection and information obtained through online systems.

### **3.5 Data Collection Method**

The data collection method of this research are:

1. Observation

In this step, direct observation is done by the researcher in PG. Madukismo in order to collect information about the suppliers corporate with the company.

2. Interview

In this step, the researcher conducts the interview with the experts from PG. Madukismo especially from installation department and purchasing department in order to obtain information that can't be obtained through observation.

3. Literature review

In this step, the researcher seeks for further information about variable that used by the other researcher to solve the supplier selection problem and also help the researcher to conduct the calculation process.

### 3.6 Data Processing

In this stage the data that already collected will be processed using Microsoft Excel as an instrument of this research. The result will show the value of the most suitable criteria and alternatives (supplier) based on the company's expert opinion.

1. Constructing hierarchical system of pump supplier selection

The first step is to construct a hierarchy of pump supplier selection that consist of 3 parts which are the upper part, middle part, and bottom part. The upper part usually contain the information about the goal of a hierarchy, in this case the goal of the hierarchy is pump supplier selection. The middle part contain about the criteria and sub-criteria that are used as a benchmark to selecting a supplier. The bottom part of the hierarchy contain information about the supplier or alternatives, in this case there are 3 supplier which are PT. X, PT. Y, and PT. Z.

2. Making pair-wise comparisons for the criteria and for the decision alternatives

After constructing the hierarchical system, the second step is to construct the pairwise comparison matrix for the criteria and alternatives. The pairwise comparison matrix is used to compare the importance between criteria and sub-criteria based on PG. Madukismo expert's opinion and the result of the pairwise comparison matrix will be used to determine the best alternatives.

3. Calculating the weights and testing the consistency

The principle eigenvector of the matrix comparison is used to find the comparative weights among the criteria of the hierarchy system. In general if the value of CI is less than 0.1 is a satisfactory or the data is already consistent.

4. Determining the pairwise comparison matrix with fuzzy TFN

After all the pairwise comparison result are consistent, the next step is to transform the pairwise comparison from the PG. Madukismo's expert to triangular fuzzy number.

5. Geometric mean

The next step is to find the lower, medium, and upper value for each criteria, sub-criteria, and alternatives by using the fuzzy geometric mean method.

6. Defuzzyfication

After calculating the value of geometric mean, the next step is defuzzyfication for each geometric mean result from each criterion using the center of area method (COA).

7. Normalization

The last step of Fuzzy AHP is to normalize all the value of each criteria, sub-criteria, and alternatives.

### **3.7 Result Analysis**

The result analysis of this research is to determine the weight of criteria and sub-criteria from the expert's opinion, to determine the ranking of the supplier based on the criteria and sub-criteria, and also to determine the best alternatives (supplier) for the company.

### **3.8 Conclusion and Recommendation**

This chapter will discuss about the answer of the research question, and from the answer the researcher will provide a recommendation to the company about the best suitable alternatives (supplier) based on the result of the calculation of fuzzy AHP.