CHAPTER III

RESEARCH METHODOLOGY

1.1   Research Object

3.1.1 Research Location

This research will be conducted in one of company or Small and Medium Enterprise (SME) in Yogyakarta. Small and medium enterprise is non-subsidiary, independent firms which employ less than a given number of employees. SME is depends on who's doing the activity usually it can be categorized based on the number of employees, annual sales, assets, or any combination of these. Sogan Batik is the place where this research is conducted. Sogan Batik is a batik manufacturer that located in Sleman, Yogyakarta. This company was built since 2001.

3.1.2 Focus of The Research

This research ill focus on assessing and analyzing the risk that might occur in Batik Sogan Production Department. The method that will use is FMEA (Failure Mode Effect Analysis) supported by TOPSIS.

1.2   Data Collection Method

The research will require several data that are acquired from:

1. Interview

    The interview will directly ask to the expert in the Batik Sogan production department. The information that will be taken from this interview is the risk events that may occur in Batik Sogan's production department and the weights at each criterion of the existing risk events which are (severity, occurrence, detection).

2. Questionaire

    Questionaire will be given to the expert in the company where the research is conducted. This Questionaire will contain the scoring of severity, occurrence, and detection for each risks that have been determined. Then, expert will also be asked to provide judgments ranging from severity, occurrence, and detection at each risk.Expected Result

3. Literature Review

    The data that get by this method is from the reference in book or theory that support the research. The data that need will relate in supporting of determining the parameter research. Literature riview is needed to avoid plagiarism in the study. Literature riview is obtained from deductive and inductive study. Deductive study comes from research journals related to this research, while inductive study is the foundation of existing theories. Inductive study comes from books or literature.

1.3   Tools

There is a tool that implemented on this research:

1. Microsoft Excel

    In this study, Microsoft Excel will be used as a calculation medium for the method used. The calculation will be done by using multiplication, sumation, division, if function and many others contained in Microsoft Excel.

1.4   Data Collection

Data collection is the primary data where this data will be the input of calculations to be performed.The list of data collection are:

1. Batik Sogan production department business process flow
2. Risk event in Batik Sogan production department
3. Risk severity score of risk event
4. Risk occurrence score of risk event
5. Risk detection score of risk event
6. Importance level score between severity, occurrence and detection

1.5   Data Analysis

The data already collected will then be used as input calculations on this research. FMEA stage will focus to find out the risk event that might occur in Batik Sogan Production Department and then scoring on every severity, occurrence and detection. Then, the TOPSIS stage will focus on determining the priority of the risk event considering the importance of the score level of each severity, occurrence, and detection. Below is an explanation of data processing:

1. FMEA Stage
   A. Find The Risk Events

      At this stage, researchers will find out the risks that may occur in production depatment. This will be conducted by using interview method to an expert in the company. The Expert will determine what risks may occur and disrupt the business process.

   B. Determining The Severity Score

      At this stage, the expert will determine the severity score of each risk event. Severity score is conducted to see how big impact of risk event at company if risk event

happened. Scoring process will be done based on parameters that are already available.

C. Determining the The Occurrence Score

At this stage, the expert will determine the occurrence score of each risk event. An occurrence score is performed to see how often the risks will occur. Scoring process will be done based on parameters that are already available.

D. Determining The Detection Score

At this stage, the expert will determine the detection score of each risk event. Detection score is performed to see how difficult the risks are to be detected if they occur. Scoring process will be done based on parameters that are already available.

2. TOPSIS Stage

At this stage, data that has been obtained through the FMEA method will be calculated to obtain the result of risk priority.

A. Construct The Decision Matrix And Determine The Weight Of Criteria

At this stage all data that has been obtained through the FMEA method is changed in the form of a decision matrix. In addition, at this stage will also be determined the weight of each criterion. This weighting is carried out by an expert at the Sogan Batik Production Department.

B. Calculate The Normalized Decision Matrix

Each data in the decision matrix is normalized. The formula used in the data normalization stage is as follows:

$$rij = \frac{xij}{\sqrt{\sum_{i=1}^{m} x^2{}_{ij}}} \ . \hspace{4cm} (2.2)$$

C. Calculate The Weighted Normalized Decision Matrix

Weighted normalization is conducted by multiplying data on normalized decision matrix with weights on each criterion. Or it can be written with the following formula:

$$Vij = Wj \times Nij \hspace{4cm} (2.3)$$

D. Determine The Positive Ideal And Negative Ideal Solutions

Identify the positive ideal alternative (extreme performance on each criterion) and identify the negative ideal alternative (reverse extreme performance on each

criterion). The ideal positive solution is the solution that maximizes the benefit criteria and minimizes the cost criteria whereas the negative ideal solution maximizes the cost criteria and minimizes the benefit criteria.

E. Calculate The Separation Measures From The Positive Ideal Solution (D$^+$) And The Negative Ideal Solution (D$^-$)

To determine the value of D +, the first step that must be conducted is to find the difference between the alternative value on the weighted normalization with each of the ideal positive solution values (A +) and the results are squared. After that, add all the values in each alternative row. Then the total value of each alternative row is squared squared so that the value of D + can be determined. Whereas to determine the value of D-, the first step that must be conducted is to find the difference between the alternative value on the weighted normalization with each of the ideal negative solution values (A-) and the results are squared. After that, add all the values in each alternative row. Then the total value of each alternative row is squared squared so that the value of D- can be determined. Or it can be written in the formula:

$$D_i^* = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^*)^2} \, , i = 1,2, \dots, m \qquad (2.6)$$

$$D_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij}-v_j^-)^2} \, , i = 1,2, \dots, m \qquad (2.7)$$

F. Calculate The Relative Closeness To The Positive Ideal Solution

To calculate the relative closeness to the positive ideal solution, the formula that can be used is as follows

$$:V = \frac{D^-}{[(D^+)+(D^-)]} \qquad (2.8)$$

G. Determine the Rank of Each Alternative

At this stage, we will determine the rank of risk events based on risk priority. This ranking is obtained from calculations in the previous stage. The results of this ranking will be reference to determine the order of risk priority.
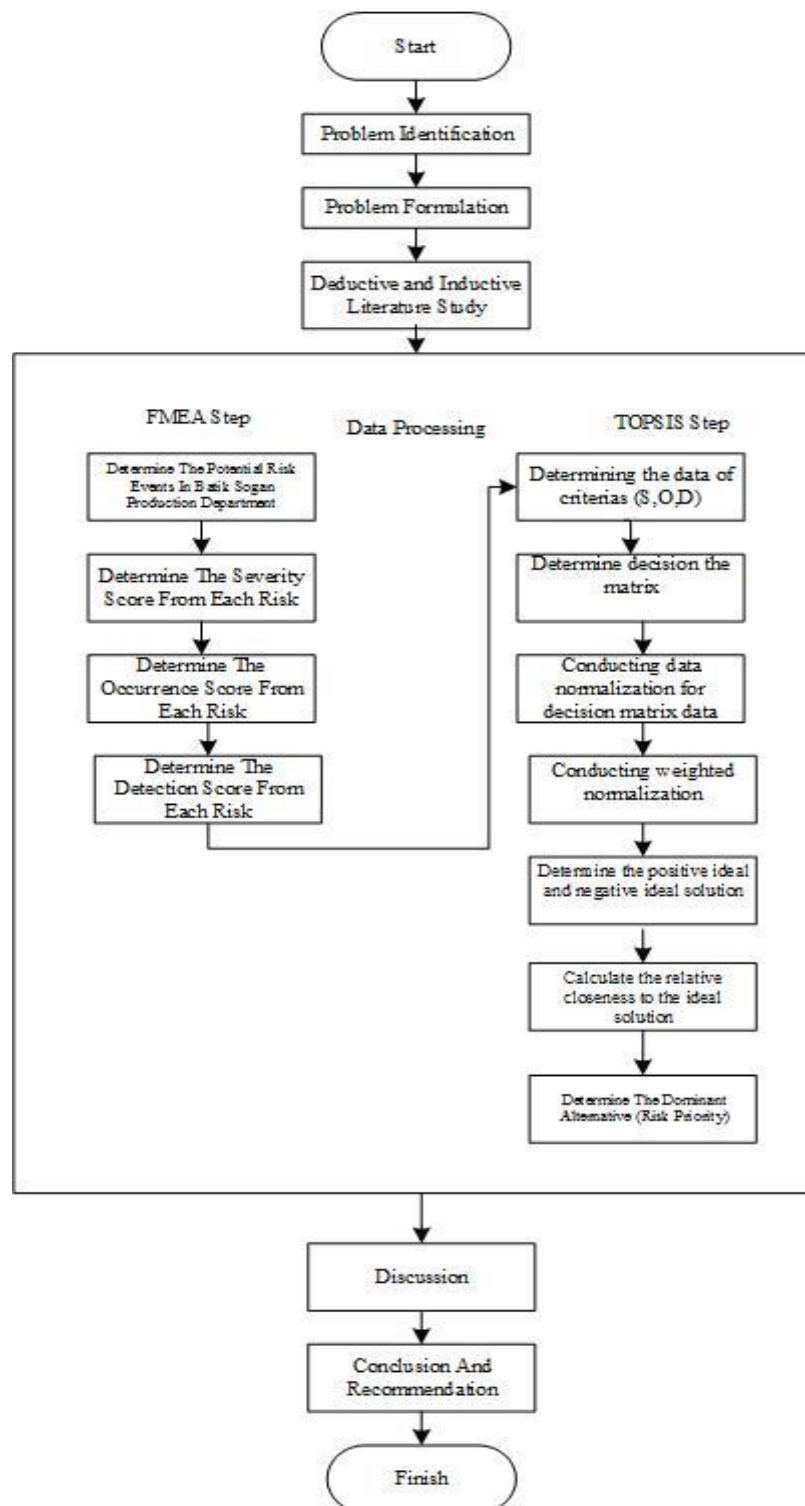
1.6   Research Flowchart

Figure 1.1 Research Flowchart