

## **CHAPTER IV**

### **DATA COLLECTING AND PROCESSING**

#### **1.1 Company Profile**

##### **4.1.1 Company History**

The research is conducted in a batik manufacturer that located in Sleman, Yogyakarta. This batik manufacturer known as Sogan Batik. This company was built since 2001. The background of the construction of this company is due to the number of people who lost their jobs due to the monetary crisis in 1997. The founder of this company is willing to help them by creating a job.

In 2001 the company began to learn how to make batik. They began to learn to make batik at Nakula Sadewa Batik company that located in Sleman. Not only learn how to make batik, this company also learn about entrepreneurship from various seminars. About a year later, Sogan Batik started making business plans and proposals that were then submitted to potential investors. At first the company got a lot of rejection from potential investors. But in the end the company got their investors. The company cooperate with nature color batik artist produced batik fabric, scarf, silk sarong with premium price between 2 million until 5 million rupiahs for upper class segment. But due to lack of marketing network, this does not work well.

In 2003, Sogan Batik started making their own products. They began to form a production team, then trained the batik artist, and bought their equipment. Starting from 2004

until 2006, Sogan batik tried to targeting middle class segment which priced 60 thousand until 100 thousand rupiahs and sold on some batik outlet in Yogyakarta and Jakarta, but unfortunately it did not work well because of very thin profit margin. Through *Disperindag* of Yogyakarta in 2007, the company was given facility for exhibition in domestic and international, and got some order for Japan until nowadays.

Finally, 2009 is the year of the rise of Sogan Batik. At this year, Sogan was introduced with online marketing from several friends. Other than that, some disabled people from *Pesantren, Yakkum*, Rehabilitation Centre Solo join to this company in production division. The reason is because their financial condition is not good, but they need job for their daily needs. Their performance is very good, even compared to normal person. And also, the change of Sogan product become a specialized batik for Muslimah / Muslim family. At the end, in 2015, this company has 50 employees.

This batik company produces *batik tulis* and stamped batik. There is several equipment to make a batik which are fabric, wax, dye, canting, and stamp. Almost all of their product theme is Muslim and Muslimah batik. They sell their batik to almost all city in Indonesia. Even more, they also sell their product abroad such as Hong Kong, Taiwan, South Korea. They also plan to sell their product to Australia and Malaysia. Currently, the country with most selling is in Hong Kong and Taiwan.

They also design some new pattern to make their product has its own characteristic. Its product has story behind it, not just a pattern without any meanings. It is to make differentiation with other batik manufacturer.

#### 4.1.2 Working Place

Bellow will show the working place of Sogan Batik.

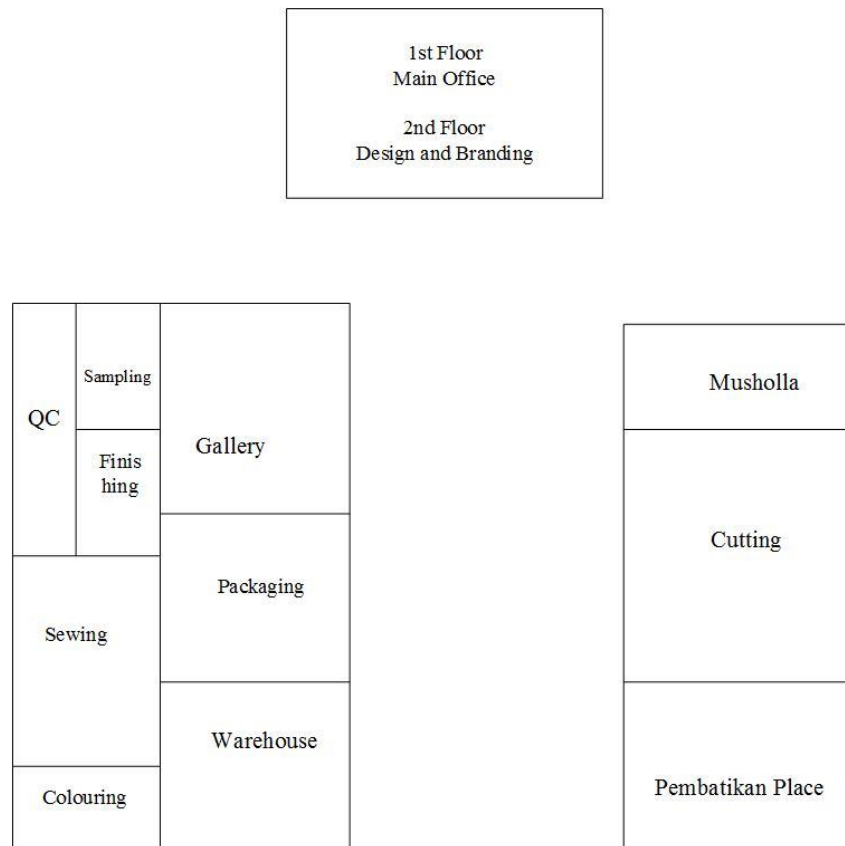


Figure 1.1 Sogan Batik Working Place

Based on figure 4.1 above, Sogan Batik is divided into several working areas that have their respective duties. Here is an explanation of each working area contained in Sogan Batik:

1. Main Office

It is a place for all administrative matters and a place to organize all the activities that conducted in Sogan Batik. Main office is also a place for activities such as cashflow data collection, purchasing order, marketing, and financial.

2. Design and Branding

In this place, making product design and product brand making is done. The process of designing is done by several people. After the designing process is completed, the design will be brought to the warehouse for further process.

3. *Pembatikan* Place

In this place, the depiction of batik began to be done. The motive used is the motive that has been in the previous design. Batik process done by the 7 workers who are experts in the depiction of batik motifs. Tools used in the process of batik is *canting* and stamp tool.

#### 4. Cutting Place

This place is where the cloth will be cut in batik. The size of the cut cloth is determined by the company. The process of cutting the fabric is done by 5 workers with the help of cutting tools such as scissors.

#### 5. Coloring Place

In this place, the coloring process of batik cloth is conducted. Batik that has been drawn will be colored in accordance with the color that has been determined.

#### 6. Sewing Place

This place is where the sewing process is done. Batik cloth will be sewn into clothing and fabric intact. Sewing process is done by about 20 people with the help of sewing machines.

#### 7. Warehouse

This place is a place of raw material storage and finished good. Raw material that has been purchased by the company will be stored in the warehouse for later use on the manufacture of the product. In addition, batik cloth that has been made will be stored in this place before it is sold or shipped out.

#### 8. Packaging Place

This place is where the packaging activity is done. The finished batik fabric will be packed before it is sold or shipped.

#### 9. Gallery

Gallery is a place to show off the results of batik clothes that have been made. The customers can see the various batik sold in Sogan Batik. Customers can also directly buy the batik they want.

#### 10. Finishing Place

In this place done the process of finishing batik cloth that has been made. Finishing process is conducted by giving some accessories on batik cloth.

#### 11. Quality Control

This place is used as a place to check the quality of batik fabric that has been made. Companies should pay attention to whether the quality of batik that they make is in accordance with the standard or not. This is conducted so that the quality of batik cloth is not inferior to the competitors and so as not to disappoint the customers.

## 1.2 Data Processing

### 4.2.1 Risk Event of Production Department in Batik Sogan

Risk event can be occurred in the business process of any company. In this research, the researcher identifies risk events that have probability to occurred in the business process in the production department by interviewing head of production department as an expert and observe the production field in the Batik Sogan. As shown on the Table 4.1 below, there are 10 risk events that can be occur in the business process of production department.

Table 1.1 Risk Event of Batik Sogan's Production Department

No	Code	Risk Event
1	R1	Similar batik motive in the market
2	R2	Delay in supplier delivery of raw materials
3	R3	Lack of raw material inventory
4	R4	Defect on the product
5	R5	Delays in production process
6	R6	Delay in product delivery
7	R7	Worker accidents

8	R8	Defect material from supplier
9	R9	Low durability of machines
10	R10	Raw material damage in inventory

By using the theory of FMEA method, these risk events will be scored based on the severity, occurrence, and detection parameters. Based on the journal from Shirouyehzad (2010), the parameter will be shown as the table below.

Table 1.2 Severity Risk Parameter

<b>SEVERITY RISK PARAMETER</b>		
<b>Effect</b>	<b>Criteria</b>	<b>Rank</b>
Very High	Very disturbing the process, experiencing long delay, it took several days to repair Very disturbing business process company	5
High	Disturbing the production process, it took several hours to fix Disrupt the business process of the company	4
Medium	Slightly disrupt the production process, repair time less than 1 hour Slightly disrupt the company's business processes	3
Low	Slightly disrupt production flow, does not require repair (damage does not affect to process) Slightly disrupt the business process of the company	2
Very Low	Does not interfere with the production process Does not interfere with the company's business processes	1

Table 1.3 Occurrence Risk Parameter

<b>OCCURENCE RISK PARAMETER</b>		
<b>Effect</b>	<b>Criteria</b>	<b>Rank</b>

Very High	Occurred > 9 times in 6 months	5
High	Occurred 7-8 times in 6 months	4
Medium	Occurred 4-6 times in 6 months	3
Low	Occurred 2-3 times in 6 months	2
Very Low	Occurred ≤ 1 times in 6 months	1

Table 1.4 Detection Risk Parameter

<b>DETECTION RISK PARAMETER</b>		
<b>Effect</b>	<b>Criteria</b>	<b>Rank</b>
Very High	Very high control to detect failure	1
High	High control to detect failure	2
Medium	Medium control to detect failure	3
Low	Low control to detect failure	4
Very Low	Very low control to detect failure	5

The Table 4.2 below will be showing the score of the 10-risk events severity based on severity parameters level according to the effect (very low = 1, low = 2, medium = 3, high = 4, very high = 5).

Table 1.5 Risk Severity

<b>Code</b>	<b>Risk Event</b>	<b>Severity</b>
R1	Similar batik motive in the market	5
R2	Delay in supplier delivery of raw materials	3
R3	Lack of raw material inventory	4
R4	Defect on the product	5
R5	Delays in production process	4
R6	Delay in product delivery	4
R7	Worker accidents	2
R8	Defect material from supplier	3
R9	Low durability of machines	4
R10	Raw material damage in inventory	3

In table 4.5 above, score 2 indicates that the risk event has a less disruptive impact on business process. Score 3 indicates that the risk event has a considerable impact on business process. Score 4 indicates that the risk event has an impact that disrupts business process. Score 5 indicates that the risk event has a significant impact on the business process. Next, Table 4.6 below will be showing the score of the 10-risk events occurrence based on occurrence parameters level according to the occurring frequency (very low= 1, low= 2, medium = 3, high = 4, very high = 5).

Table 1.6 Risk Occurrence

<b>Code</b>	<b>Risk Event</b>	<b>Occurance</b>
R1	Similar batik motive in the market	1
R2	Delay in supplier delivery of raw materials	3
R3	Lack of raw material inventory	3
R4	Defect on the product	2
R5	Delays in production process	2
R6	Delay in product delivery	2
R7	Worker accidents	4
R8	Defect material from supplier	2
R9	Low durability of machines	1
R10	Raw material damage in inventory	2

In Table 4.6 above, score 1 indicates that the risk event is very rarely occurred in business process. Score 2 indicates that the risk event is rarely occurred in business process. Score 3 indicates that the risk event sometimes occurs in business process. Score 4 indicates that the risk event is often occurred in business process. Score 5 indicates that the risk very often occurred in the business process. Then, Table 4.7 below will be showing the score of the 10-risk events detection based on detection parameters level according to the detection difficulties (very low = 1, low = 2, medium = 3, high = 4, very high = 5).

Table 1.7 Risk Detection

<b>Code</b>	<b>Risk Event</b>	<b>Detection</b>
R1	Similar batik motive in the market	2
R2	Delay in supplier delivery of raw materials	4
R3	Lack of raw material inventory	2
R4	Defect on the product	2
R5	Delays in production process	2
R6	Delay in product delivery	3
R7	Worker accidents	2
R8	Defect material from supplier	2
R9	Low durability of machines	2
R10	Raw material damage in inventory	3

In Table 4.7 above, score 2 indicates that the risk event is easy to detect without having to go through several processes. Score 3 indicates that the risk event is not too difficult but not too easy also for the detection. Score 4 indicates that the risk event is quite difficult to detect. Score



5 indicates that the risk is very difficult to detect. Then the results from scoring in Table 4.5, Table 4.6, and Table 4.7 above will be used in computational data in the next step.

### 1.3 Data Computational Result

The result of calculation can be gained by conducting these steps which are:

#### 1. Determining the data of criteria

Criteria data containing code, name, attribute, weight. The weight contained in the criteria determines how important these criteria are. Criteria weight is determined by an expert. While the criteria attribute consists of benefits or costs, where the benefit means the greater the value the better, while the smaller the value the better the value.

Table 1.8 Data of Criteria

Code	Name	Attribute	weight
C1	Severity	Benefit	0,4
C2	Occurrence	Benefit	0,3
C3	Detraction	Benefit	0,3

Based on Table 4.8 above, all criteria are classified as benefit attributes. This is because the purpose of this research is to find risk priority. So the greater the value of the alternative to the criteria, the alternative will be a more priority risk. As for the weight of the assessment, the sum of all weights is 1. This weighting parameter is obtained from previous research. Then determine the decision matrix data.

Table 1.9 Decision Matrix Data

Code	Severity	Occurrence	Detection
R1	25	1	4
R2	9	9	16
R3	16	9	4
R4	25	4	4
R5	16	4	4
R6	16	4	9
R7	4	16	4
R8	9	4	4
R9	16	1	4
R10	9	4	9
<b>Sum</b>	145	56	62

<b>SQRT</b>	12,042	7,483	7,874
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Based on Table 4.9 above contains the score of each alternative based on the criterias which are severity, occurrence and detection. Assessment of each alternative is conducted by an expert. The data above is the data that has been obtained during the data collection stage using the theory of the FMEA method that has been explained in the previous stage.

## 2. Conducting data normalization for decision matrix data

Data on the decision matrix will be normalized using the formula:

$$rij = \frac{xij}{\sqrt{\sum_{i=1}^m xij}} \quad (2.2)$$

So that the results are obtained as shown in Table 4.10 below,

Table 1.10 Normalized Decision Matrix Data

Code	Severity	Occurrence	Detection
R1	0,415	0,134	0,254
R2	0,249	0,401	0,508
R3	0,332	0,401	0,254
R4	0,415	0,267	0,254
R5	0,332	0,267	0,254
R6	0,332	0,267	0,381
R7	0,166	0,535	0,254
R8	0,249	0,267	0,254
R9	0,332	0,134	0,254
R10	0,249	0,267	0,381

## 3. Conducting weighted normalization

Weighted normalization is conducted by multiplying each normalized data with weighting on each criterion.

Table 1.11 Weighted Normalization

Code	Severity <b>0,4</b>	Occurrence <b>0,3</b>	Detection <b>0,3</b>
R1	0,166	0,040	0,076
R2	0,100	0,120	0,152
R3	0,133	0,120	0,076

R4	0,166	0,080	0,076
R5	0,133	0,080	0,076
R6	0,133	0,080	0,114
R7	0,066	0,160	0,076
R8	0,100	0,080	0,076
R9	0,133	0,040	0,076
R10	0,100	0,080	0,114

Table 4.11 above describes the normalized data that has been weighted according to the weight of each criterion. The weight of each criterion is determined by an expert at the company where the research is conducted.

4. Determine the positive ideal and negative ideal solution

The positive ideal solution is symbolized by  $A^+$ , while the negative ideal solution is symbolized by  $A^-$ . To determine the value of  $A^+$  and  $A^-$  must be determined in advance whether the attribute of the criteria used is benefit or cost. When the criteria are considered as a benefit, then the highest value of alternative in the criteria is called  $A^+$ , and the lowest value is  $A^-$ . Otherwise, if the criteria are considered as cost, then the lowest value of alternative criteria is called  $A^+$ , and the highest value is  $A^-$ .

Table 1.12 Positive and Negative Ideal Solution

Code	Severity 0,4	Occurrence 0,3	Detection 0,3
R1	0,166	0,040	0,076
R2	0,100	0,120	0,152
R3	0,133	0,120	0,076
R4	0,166	0,080	0,076
R5	0,133	0,080	0,076
R6	0,133	0,080	0,114
R7	0,066	0,160	0,076
R8	0,100	0,080	0,076
R9	0,133	0,040	0,076
R10	0,100	0,080	0,114
<b>A+</b>	0,166	0,160	0,152
<b>A-</b>	0,066	0,040	0,076

Table 4.12 above tells about the value of  $A^+$  and  $A^-$  for each criteria. In this research all of the criteria is benefit attribute. So, the values of  $A^+$  are gained by determine the

highest alternative in each criteria while the  $A^-$  values is gained by determine the lowest alternative in each criteria.

5. Calculates the euclidean distance of each alternative from positive and negative ideal solution

- a. Euclidean distance of positive ideal solution ( $D^+$ )

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

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

Calculation results from Euclidean Distance of Positive Ideal Solution. ( $D^+$ ) can be seen in Table 4.13 below,

Table 1.13 Euclidean Distance of Positive Ideal Solution

<b>Code</b>	<b>Severity</b>	<b>Occurrence</b>	<b>Detection</b>	<b>Total</b>	<b><math>D^+</math></b>
R1	0	0,0145	0,0058	0,0203	0,1424
R2	0,0044	0,0016	0	0,0060	0,0776
R3	0,0011	0,0016	0,0058	0,0085	0,0923
R4	0	0,0064	0,0058	0,0122	0,1106
R5	0,0011	0,0064	0,0058	0,0133	0,1155
R6	0,0011	0,0064	0,0015	0,0090	0,0948
R7	0,0099	0	0,0058	0,0157	0,1254
R8	0,0044	0,0064	0,0058	0,0166	0,1290
R9	0,0011	0,0145	0,0058	0,0214	0,1462
R10	0,0044	0,0064	0,0015	0,0123	0,1109

- b. Euclidean distance of negative ideal solution

Slightly different from how to determine euclidean distance of positive solution ( $D^+$ ), to determine the value of  $D^-$ , the first step to do is to reduce each alternative value on weighted normalization with each of the ideal negative values of the solution ( $A^-$ ), and

the results are square. After that, add all the values in each alternative row. Then the total value of each alternative line is rooted so that the value of  $D^-$  can be determined. Or it can be written in the formula:

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

Calculation results from Euclidean Distance of Negative Ideal Solution. ( $D^-$ ) can be seen in the following Table 4.14:

Table 1.14 Euclidean Distance of Nrgative Solotion

Code	Severity	Occurrence	Detection	Total	$D^-$
R1	0,0099	0	0,0000	0,0099	0,0997
R2	0,0011	0,0064	0,0058	0,0133	0,1155
R3	0,0044	0,0064	0	0,0108	0,1041
R4	0,0099	0,0016	0	0,0115	0,1074
R5	0,0044	0,0016	0	0,0060	0,0776
R6	0,0044	0,0016	0,0015	0,0075	0,0864
R7	0	0,0145	0	0,0145	0,1203
R8	0,0011	0,0016	0	0,0027	0,0521
R9	0,0044	0	0	0,0044	0,0664
R10	0,0011	0,0016	0,0015	0,0042	0,0645

6. Calculate the relative closeness to the ideal solution

To calculate relative closeness to the ideal solution, we need the value of euclidean distance of positive solution ( $D^+$ ) and euclidean distance of negative solution ( $D^-$ ) in each alternative. The formulas used in this calculation are as follows:

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

So that the results are obtained as shown in Table 4.15 below,

Table 1.15 Relative Closeness to the Ideal Solution

Alternative	$D^+$	$D^-$	V	%	Rank
R1	0,142	0,100	0,412	9,425	6
R2	0,078	0,115	0,598	13,691	1
R3	0,092	0,104	0,530	12,135	2
R4	0,111	0,107	0,493	11,277	3
R5	0,115	0,078	0,402	9,199	7
R6	0,095	0,086	0,477	10,918	5
R7	0,125	0,120	0,489	11,204	4
R8	0,129	0,052	0,287	6,581	10

R9	0,146	0,066	0,312	7,152	9
R10	0,111	0,065	0,368	8,420	8
<b>Total</b>			<b>4,369</b>		

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Table 4.15 above explains the level of each risk after performing various stages in the TOPSIS method. The level of each risk is then used as a risk priority for risk events. From the results that can be seen in Table 4.15 above, the risk that has the highest priority is R2 that is delay in supplier delivery of raw material. For the next rank the sequence is R3, R4, R7, R6, R1, R5, R10, R9, and R8.