



**UNDERGRADUATE THESIS – TB141328**

**SUPPLIER SELECTION AND SUPPLIER  
PERFORMANCE EVALUATION AT PT.INDOLAKTO**

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**RATIFICATION LETTER**  
**SUPPLIER SELECTION AND SUPPLIER PERFORMANCE**  
**EVALUATION AT PT. INDOLAKTO**

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**ABSTRACT**

Dairy supply chain is one of food supply chain that has its own uncertainty both in upstream and downstream process due to the durability of product. Dairy market has good demand trend, because the supply is still below the consumption level. Indonesia use imported dairy product rather than use the domestic ones, because the supply of domestic dairy still below the demand. So, there are opportunities for dairy company to compete in this industry and reach competitive advantage by solving the upstream problems. Selecting supplier is one of upstream supply chain area which affected the quality of dairy product and mitigate supply chain risk management from the beginning. This research aim to develop a framework for supplier selection and improve a supplier performance evaluation form. According to AHP method this research will be determine main criteria by interview, pair wise comparison on developing the AHP, determine sub criteria based on main criteria, and rank the supplier. After selecting the supplier, this research conduct interview for determining main and sub criteria, developing the AHP method with pair wise comparison and forming supplier performance evaluation. The result is forming a framework of supplier selection and forming supplier performance evaluation form based on company requirements. Also, the main criteria for supplier selection are quality, quantity, delivery, warranty, and pricing with sub main criteria which already deployed. For supplier performance evaluation, there are four main criteria which are quality, quantity, delivery and warranty. Maltodextrin A will be choose rather than Maltodextrin B. The sensivity analysis also shown that all of criteria were robust.

***Keywords*** : *AHP, Dairy Supply Chain, Supplier Selection, Supply Chain Risk Management, Supplier Performance Evaluation.*

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# CHAPTER I

## INTRODUCTION

This chapter consists of research background, problem formulation, research objectives, benefits, scope of work, also the report structure.

### 1.1 Background

Dairy supply chain is a kind of food supply chain. Food supply chain has its own volatility of products because of the natural attributes which has impact on customer's health. The food industry has its own uncertainty both in upstream and downstream process (Aung and Chan, 2014; Amorim et al, 2016). In upstream, there are some uncertainty of supply due to some reasons. Chen et al. (2013), the uncertainty of supply is caused by the difference of product quality on each supplier and different pricing due to currency. Based on Pujawan (2010), the uncertainty of supply due to some reason, such as the seasonal of raw material, the capacity of supplier, delivery lead time by supplier and the quantity of available material. In downstream, there are several problems which affect the uncertainty of food supply chain. Dani (2015) argued that food industry deals with uncertainty due to the durability of food product. The life time of food product is limited by period of time. The uncertainty of customer demand and the capacity of warehouse also becoming one of this problem (Pujawan, 2010). Currently, product safety and health becoming consumer awareness (R. R. Pant et al., 2015). For this industry, if a company can survive and dealing with these situations, it will give them competitive advantage.

Dairy market have a good trend, because the supply is still below the consumption level. According to Global Business Guide Indonesia (2015), domestic stock only fulfill fifth of national demand per year. A research have done by Ministry of Industry, the demand of dairy products in Indonesia almost 3.3 million tonnes per year, but Indonesia importer more than 70% in 2009. There are some raw material such as skim milk powder that have to be imported. These imported material come from Australia, New Zealand, United States, and Europe.

As domestic market fails to fulfill the demand, local industries choose to use imported milk.

In supply chain, selecting supplier needs time and resources, especially for the main supplier that supplying for the main product (Pujawan, 2010). Chen and Guo (2013), conducted a research the analysis of supplier selection benefits are mitigate supply chain risk, increasing competitive advantage, and forming strategies for company. Supplier selection also helping decision makers to make decisions. Not all of information is used. Only choose the important one and related to the problems (Saaty, 2008). The method that already found by Saaty in 1970 is called Analytic Hierarchy Process (AHP). AHP could integrate between the existing condition of the company and criteria which company really needs to be developed (Saaty, 2008). If the company already choose the supplier, then they need to evaluate the supplier performance. Companies who are doing the supplier performance evaluation, increasing 20% of supplier performance in several criteria such as on time delivery, quality and reducing cost (Gordon, 2006). Based on research which held by Aberdeen Group in 2002, companies who implements supplier performance evaluation, could affect supplier performance around 26,6%. Supplier performance evaluation can be used for internal needs, developing supplier performance, evaluating supplier for the next term, evaluating report for internal supplier, and predicting supplier performance for the next term (Aberdeen Group, 2002).

According research done by R.R. Pant et al (2015), there are five important criterias in dairy supply chain, such as quality, safety, information flow, traceability, and transparency. These criteria focus on choosing the right supplier. Hence, choose the right supplier affects the quality and food safety of dairy products. Currently, producing healthy food is highly demanded. Regarding to give high quality product, the manufacturer should consider customer awareness through right process a long the supply chain. Giving the high quality, considering the customer's awareness of dairy product can be given with the right process in the beginning of dairy supply chain. Selecting suppliers which suit the company criteria and how to monitor the supplier are the solution.



Aberdeen (2005) categorize four problems which occur in supplier performance evaluation. First, the total amount of supplier who relate into a business process. There are key supplier and supporting supplier. The main supplier have different performance evaluation with others. Second, the difference of information within supplier. Third, metric that will be used for supplier performance benchmarking process. Fourth, there are several analysis system for supplier performance evaluation which can be choosed depending on company needs.

The existing condition at PT. Indolakto – Purowsari based on PPIC manager and Purchasing supervisor is using another form of supplier selection and supplier performance evaluation. Also, this company using level of approval as standard of supplier selection. This standard is used based on main company of Indolakto. There are only two scale which are the supplier doing performance or not. This scale is still too general for supplier selection and supplier performance evaluation. Besides, there are only main criteria on their form. So, for detail information on supplier selection and developing their supplier performance become easier, this report identify each sub criteria of their main criteria. This research will forming supplier selection form using AHP method and supplier performance evaluation using supplier scorecard at PT. Indolakto - Purwosari. Those performance evaluation and supplier selection will be adapted as company needs.

## **1.2 Research Objective**

The objective that will be achieved by this research is to develop a framework for supplier selection using AHP and supplier performance evaluation.

## **1.3 Benefits**

The benefit that can be gained through this final report are :

- 1) PT. Indolakto having standardize supplier performance evaluation form which aligned with company strategies.
- 2) Evaluating supplier in this company will be structured.

## **1.4 Scope of works**

### **1.4.1 Limitations**

The limitations of this research are as follows:

- 1) Products that will be on this research are UHT milk, sterilized milk, and sweet condensed milk.
- 2) Data collection of supplier in Indomilk is restricted data which only several data that can be used.
- 3) Supplier data only using the critical supplier data.

### **1.4.2 Assumptions**

The assumptions on this final report are as follows:

- 1) Operational policies on dairy supply chain at PT. Indolakto are remain the same.
- 2) Respondent are experts at PT. Indolakto.
- 3) The process that happen at PT. Indolakto while this research proceed will be considered as normal process running.

## **1.5 Outline of the Report**

The structure of this report are as follows:

### **CHAPTER I: INTRODUCTION**

This chapter will explain the background of this research, problem formulation, the objectives that will be achieved, benefits, limitations and assumptions, also the writing structure which explain the general overview of this final report.

### **CHAPTER II: LITERATURE REVIEW**

This chapter will discuss the basic theories and literatures which refer to this research. Several theories about dairy supply chain, supply chain risk management, supplier selection using analytic hierarchy process theory and supplier evaluation using supplier scorecard.

### **CHAPTER III: RESEARCH METHODOLOGY**

Chapter III basically consists phases of this research method, including the research flowchart and the steps that will be taken step by step in this research.

### **CHAPTER IV: DATA ANALYSIS**

This chapter explain the method to collect the data and analyze it. Data and information would be collected are coming from interview with experts at PT. Indolakto, questionnaire for understanding the existing condition also the validation of depth-interview, and pair wise comparison using AHP method. Also the result of data collecting and processing. The analysis of literature review and the real condition at PT. Indolakto. Analysis contain the result of AHP method. This research also form the performance evaluation supplier form based on AHP method

#### CHAPTER V: CONCLUSION AND SUGGESTION

This chapter explain about the solution of previous chapter. Those data will be aligned as companies strategies. The suggestion will be advices which related to problem that occurs at PT. Indolakto.

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## **CHAPTER II**

### **LITERATURE REVIEW**

Chapter 2 consists of basic theories of the condition of dairy supply chain, supply chain risk management, supplier selection using AHP theory and supplier performance evaluation.

#### **2.1. Dairy Supply Chain**

Dairy supply chain or food supply chain have different characteristic from other supply chain due to product freshness change overtime, process, and information flow to supply chain actors (Trienekens et al, 2012). According to Aung et al (2014), dairy supply chain is a process with six main activities such as the production of raw milk into dairy product, transportation of the product, processing, packaging the product that match with the characteristic of product, storage and consumption by consumer. As Dani (2015) argued, any activities refer to processes, operations that change the food from raw material to final product is known as food supply chain or agriculture supply chain. Dairy supply chain is one of agri-business subject which has its own complexity. The dairy chain processing raw milk into final dairy product with utilization process (Food Pricing Monitoring Committee, 2013). Based on those statements, it can be concluded that dairy supply chain is a process changing from raw material to final dairy product related to operational process. The operational process of dairy supply chain has its own complexity regarding on the product lifetime.

Consumers refer to products that are trusted quality and safe. They need it as transparency of product. The demand of food product is getting dynamic, so the transparency become more complicated. The key to survive in food industry is understanding the main food supply chain actors (Trienekens et al, 2012). The example of food supply chain actor is supplier for food industry. Trienekens made a framework for transparency analysis for food supply chain. This framework was adapted by R.R Pant et al (2015) shown in Figure 2.1. Framework for analysis of transparency, traceability and information for dairy supply chain.

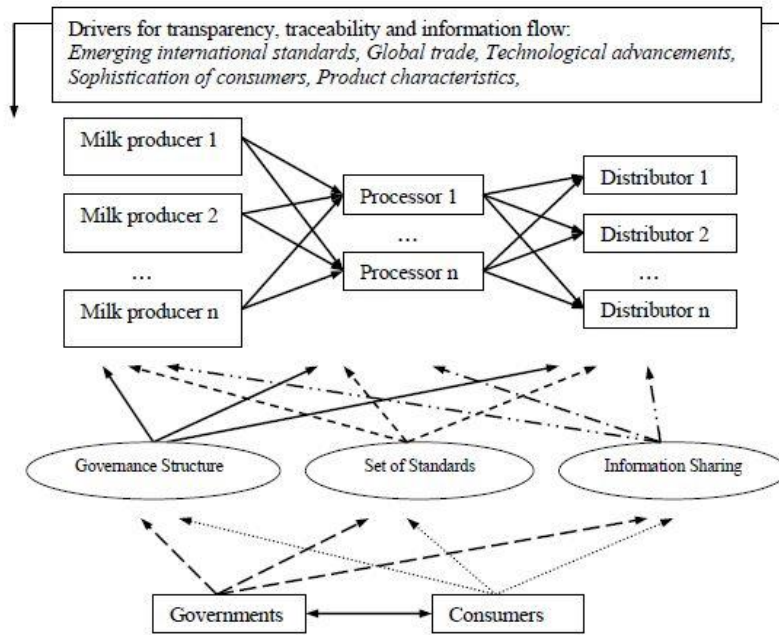


Figure 2. 1 Framework for analysis of transparency, traceability and information flow adapted to dairy supply chain.

(Source : R.R. Pant et al, 2015)

Quality and safety of dairy products depend on the process of dairy supply chain. Consumers will be one of element that affect the standards of dairy supply chain by three factors. Those are quality, price, and safety. Governments have rules for standardizing dairy supply chain such as the safety of dairy products. Consumer preference and government rules will create new information sharing. Information sharing is used for developing dairy supply chain. Determining main actors of dairy supply chain depend on each dairy industry perspectives.

## 2.2. Supplier Selection and Supplier Performance Evaluation

Supplier selection are divided into quantitative and qualitative criteria. The global trends enforce supplier to be suited in environmental criteria (Govindan et al, 2013). According to Beil (2009), supplier selection have three main steps, which are identify, evaluate and contract. Getting information from suppliers that refer to company needs for identifying potential suppliers, setting and negotiating contract, and evaluating their performance. Nowadays, identifying potential suppliers is important. There are four steps to identify supplier:

- 1) Company need to search another supplier, not only the existing one. It is because the new supplier might be have developed qualities than others. The cost might be have competitive and structural cost.
- 2) Selecting supplier is not only for company needs, but also for fulfilling buyer's requirement.
- 3) Screening process for supplier. It is conducted due to mitigate supply chain risk such as delivery postponement. There are several screening process, which are reference checks from previous customer, financial status checks, the capacity of supplier delivering, quality that supplier offered, and the specification which companies need.
- 4) Forming supply base for contracting process.

After implementing those steps, company could request information from supplier regarding to their quality or quantity of goods and services. Contract arrangement can be conducted as the negotiation agreed by each actors.

Based on Weber et al (1991) argued that price, on time delivery, quality of resources, and production ability are four categories for selecting supplier. Dickson (1966) mentioned that there are 23 criteria for supplier selection. Table 2.1. Supplier selection criteria by Dickson.

Table 2. 1 Supplier criteria based on Dickson

<b>Rank</b>	<b>Factor</b>	<b>Mean Rating</b>	<b>Evolution</b>
<b>1</b>	Quality	3.508	Extreme importance
<b>2</b>	Delivery	3.417	
<b>3</b>	Performance history	2.998	
<b>4</b>	Warranties and claim policies	2.849	
<b>5</b>	Productions facilities and capacity	2.775	Considerable importance
<b>6</b>	Price	2.758	
<b>7</b>	Technical capability	2.545	
<b>8</b>	Financial position	2.514	
<b>9</b>	Procedural compliance	2.488	
<b>10</b>	Communication system	2.426	
<b>11</b>	Reputation and position in industry	2.412	
<b>12</b>	Desire for business	2.256	
<b>13</b>	Management and organization	2.216	
<b>14</b>	Operating controls	2.211	Average importance
<b>15</b>	Repair services	2.187	

<b>Rank</b>	<b>Factor</b>	<b>Mean Rating</b>	<b>Evolution</b>
16	Attitude	2.120	
17	Impression	2.054	
18	Packaging ability	2.009	
19	Labor relations record	2.003	
20	Geographical location	1.872	
21	Amount of past business	1.597	
22	Training aids	1.537	
23	Reciprocal arrangements	0.610	Slight importance

( Source : Dickson, 1966)

Dickson did research on 273 purchasing managers in different companies. Quality, delivery, performance history, and warranties are top four categories. Others criteria might be considering for decision making. The study did in 1966, which must be suited in this era, because the situation changing every time. Besides, each companies have their priorities of choosing the criteria.

Rezaei et al (2016) did research on supplier selection in manufacturing industry and divided criteria of supplier selection into best worst method. The research argue that supplier selection is a decision making which influenced competitive advantage of company. The best worst criteria adapted from 23 criteria supplier selection based on research by Dickson in 1966. There are three important categories, which are quality, delivery and price. Each manufacturing should choose one or two of those categories. Rezaei et al add another criteria called as environmental criteria. The benefit of choosing supplier refer to those criteria are reducing unqualified supplier, simplifying decision maker to make decision, and reducing some of possibilities of not choosing the best one.

According to several theories below, it can be concluded that supplier selection is an activities of choosing the right supplier refer to company requirement. The common criteria are price, quality, delivery, and capacity of production. The sub criteria can be made refer to company needs. Some companies already used environment criteria considering environmental awareness, but this criteria can be inputted on sub criteria. The main benefit of using supplier selection is reducing supply chain risk.

Based on Dey et al (2014), supplier performance evaluation is needed for organisational system for measuring supplier performance effectively. Supplier



performance is one of mitigate system for manufacturing organisation especially in procurement. There is a framework shown in Figure

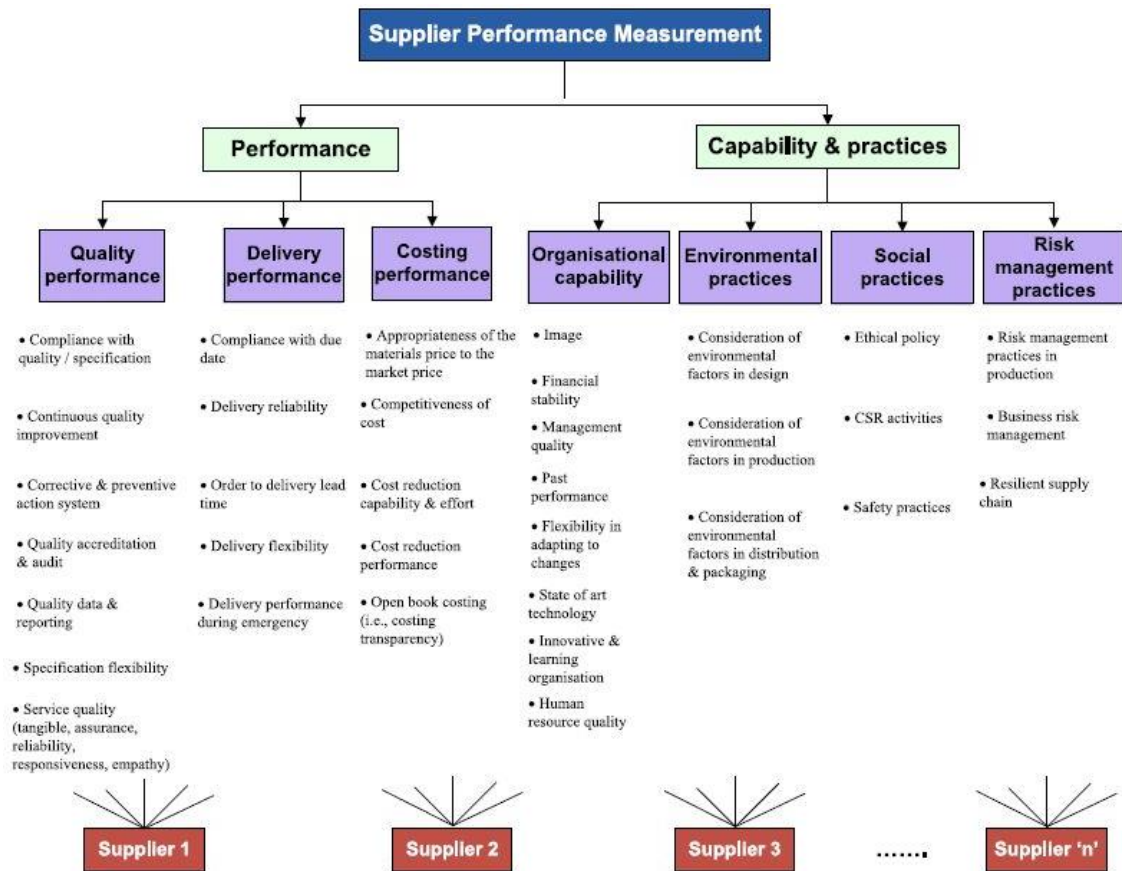


Figure 2. 2 Supplier performance measurement based on Dey et al (2014)

The supplier performance measurement divided into two part which are performance also capability and practices. Main criteria of performance are quality, delivery and costing. While capability and practices can be used conditionally.

### 2.3. Risk Management

COSO (2004), argued that risk is related to impact of negative events and possibility of having unwanted events. There are four categories of risk based on Wu et al (2008). Risk as hazard, possibility, consequence, and potential adversity or threat. Basically, risk is the uncertainty of changes, probabilities, and consequences in the whole time system. Risk associate with time and time build the risk into another level of event. Risk is refer to uncertainty that affected the outcomes. Risk triggered by risk drivers, and it create the outcomes (Monahan,

2008). It can be concluded that risk is uncertainty of negative events or probabilities which can be occurred in the future.

As ISO 31000:2009 standard, risk management is a base theory for managing risk and it help organization to identify opportunities for achieving goals, and mitigate threats. There are other ISO standard for managing risk that focus on risk performance evaluation and risk control. Risk management is managing the unwanted events in organization and divided into three categories, which are financial, market, and operational (Monahan, 2008). Wu et al (2008) stated risk management is used in integrated framework for achieving objectives with rational risk. It is simple to learn, but it is very difficult to implement it. Risk management is how to plan the strategy for executing the implementation.

#### **2.4. Supply Chain Risk Management**

Wu et al (2008), considered supply chain risk management focus on relation between each organizational processes to identify the goals and mitigate the risk of uncertainty events. There are four process of supply chain risk management :

1) Risk identification

There are two methods to identify the risk, qualitative and quantitative. Qualitative method using for disruption risks (disaster risks and economic risks). Quantitative method evaluating on operational daily risk such as the postponement of supply, higher cost on certain event, and uncertainty of demand.

2) Risk assessment

There are uncertainty events and some factors which become the difficulty of qualitative risk assessment. Decision maker tend to pay attention only on possible outcomes rather than the uncertainty events that will be occurs while reaching the outcomes.

3) Risk avoidance

Risk avoidance basically depend on financial risk. It is focus on reducing cost. Supply chain theory for risk avoidance are reducing postponement by just-in-time delivery, concurrent engineering with coordination between division, etc.

4) Risk mitigation

Supply chain risk mitigation connected with unwanted event of supply and demand changing, product processes and information sharing.

### 2.5. Analytical Hierarchy Process (AHP)

AHP theory was found by Saaty (1980). Saaty implied on his research (2008), decision making is fundamental things after getting the right information. Not all of information is used, only the important ones. Making decision is better if all aspects are transparent. It is involves a lot of criteria and sub criteria refer to company requirements. Priority of many options will be discovered as a decision. Besides, the criteria not always tangible ones, but can be refer to the intangible criteria. AHP is used on variety decision making, which are alternative options selection, evaluate priorities, best scenario, benchmarking, and quality management. Here are the following steps for AHP :

- 1) Determine the problem and sources of information
- 2) Making structure of decision hierarchy with the goals on top, the objective, and how to accomplish the goals (which usually have alternatives contents). It is shown on Figure 2.3. Decision hierarchy structure.

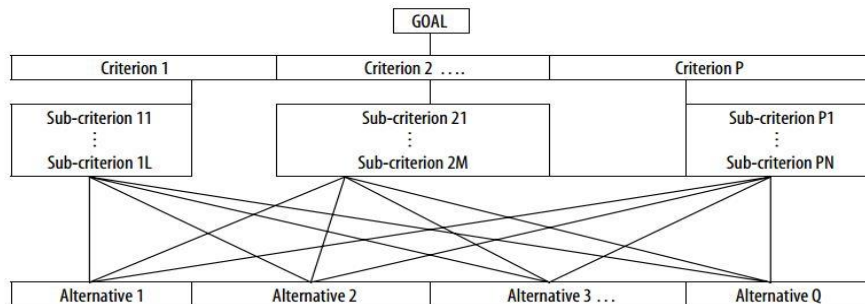


Figure 2. 3 Structure of decision hierarchy

Source : Strategic Decision Making Applying the Analytic Herarchy Process  
(Adopted from Bhushan and Rai, 2004).

- 3) Setting comparison matrices. Each criteria in the upper level will be compare to the immediate level.
- 4) Priorities needs for comparing the priorities using fundamental scale. The fundamental scale is shown on Table 2.2. Fundamental scale of AHP theory.

Table 2. 2 Fundamental Scale (Adopted from : Saaty, 2008)

<b>Intensity of Importance</b>	<b>Definiton</b>	<b>Explanation</b>
1	Equal Importance	Two activities contribute equally to the objective
2	Weak or slight	
3	Moderate importance	Experience and judgement slightly favour one activity over another
4	Moderate plus	
5	Strong importance	Experience and judgement strongly favour one activity over another
6	Strong plus	
7	Very strong or demonstrated importance	An activity is favoured very strongly over another, it is dominance demonstrated in practice
8	Very, very strong	
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order of affirmation
Reciprocals of above	If activity $i$ has one of the above non-zero numbers assigned to it when compared with activity $j$ , then $j$ has the reciprocal value when compared with $i$	
1.1-1.9	If the activities are very close	May be difficult to assign the best value but when compared with other contrasting activities the size of the small numbers would not be too noticeable, yet they can still indicate the relative importance of the activities

Table 2.2. indicate scale of number for comparison which showing how important of one criteria to another. This scale will be given by experts who are trusted in the company for specific area. So, for getting this scale of importance, researcher have to interview several experts. After getting the scale, then use the AHP formula.

Adopted on Dweiri (2016), AHP formula using comparison matrix (A) is  $n_1 \times n_2$  where  $n_1$  considered as the criteria or alternatives which already set up and  $n_2$  considered as goal or criteria. Those  $n_1$  and  $n_2$  will be compared. Matrix which will be used are  $a_{xy}$ . Matrix M considered consistent.

$$a_{xy} = a_{xz} \times a_{yz}$$

$$a_{xy} = 1/a_{yz}$$

x, y and z are elements of matrix A, considered  $a_{xy} = 1$  and  $x = y$

$$A = \begin{Bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{Bmatrix}$$

Then, using B matrix for testing the consistency, where  $b_{xy} = a_{xy}$ .

$$N = \begin{Bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{Bmatrix}$$

$$b_{xy} = \frac{axy}{\sum_x^n axy}$$

$\sum_x^n = axy$  is sum of columns

Dividing the weight for each row with the sum values of each row.

$$\text{Weight of } i = w_i = \sum_{y=1}^n \frac{b_{xy}}{n}$$

Noted that  $\sum_{y=1}^n w_i = 1$

Notice that A is consistent if  $A \times b = n \times b$

This equation is considering as Eigenvalue problem. The largest Eigenvalue is greater than or equal to n ( $\lambda_{max} \geq n$ ), the closer  $\lambda_{max}$  to n, the more consistent is

A. The consistency ratio (CR) is calculated by AHP as :

$$CR = \frac{CI}{RI} = \frac{\text{Consistency Index Random}}{\text{Random Consistency of A}} \dots\dots\dots(2.1)$$

$$CI = \frac{\lambda_{max} - n}{n-1} \dots\dots\dots(2.2)$$

$$RI = \frac{1.98(n-2)}{n} \dots\dots\dots(2.3)$$

If  $CR \leq 0.10$ , the level of inconsistency is considered acceptable. Otherwise, the decision maker needs to revise the judgment on the values of  $a_{xy}$ .

## **2.6. Supplier Performance Scorecard**

Supplier performance scorecard using to evaluate and measure supplier performance in a period time using this scorecard. Beside, it is used to report for all of supplier in a company (CIPS, 2013). Performance measurement have several indicators which are representative, simple to interpret, quick to update, sensitive to changes, collect process in terms of data and sensitive of trends per period time (Franceshini, 2007). There are several step for forming supplier performance scorecard, (1) company must determine the important criteria as company requirement, (2) measuring the supplier action, (3) measuring the initial problem or cause and (4) measurable item must be identified (Shapiro, 2014).

## **2.7. Previous Research**

There are several journals references for conducting this research, here are the description:

- 1) Designing an Integrated AHP based Decision Support System for Supplier Selection in Automotive Industry (Dweiri et al., 2016).

This research conducted at Pakistan as developing country. Automotive industry is one of industry that support Pakistan's economic sector. Automotive become the second largest sector at Pakistan. So, the demand is high. Supplier of automotive at Pakistan needs to fulfill the demand. The role of procurement for buying the right specification of automotive parts by selecting competent supplier is critical. Dweiri using Analytical Hierarchy Process method for supplier selection decision making by four main categories. The result shown that supplier selection has main role for increasing supply chain performance by reducing cost and fulfilling customer needs.

- 2) Strategic Supplier Performance Evaluation: A Case-based Action Research of a UK Manufacturing Organisation (Dey et al., 2014).

Evaluating supplier performance with integrated analytical. It applies QFD and AHP method. Considering stakeholder requirements with supplier performance measurement. There are seven steps from identify the stakeholders, find the requirements, apply QFD and AHP method, until supplier evaluation with criteria and sub criteria that already decided. It reveals

that supplier evaluation affect operational performance positively. Assessing only quality of delivery, cost and quality criteria will not affect a lot. It must be added with organisational capability criteria.

- 3) A Framework for Traceability and Transparency in the Dairy Supply Chain Networks (Pant et al., 2015).

The transparency and traceability dairy supply chain in India need to be developed. Transparency and traceability is considered as consumer awareness of product safety and health. This journal explain dairy supply chain condition and adapted to existing condition of dairy supply chain in India. India still need improvement on transparency and traceability supply chain and be supported by actors of dairy supply chain.

- 4) AHP-based Approaches for Supplier Evaluation: Problems and Perspectives (Bruno et al., 2012).

Competitive advantage can be reached with selecting the right supplier. Most of manufacture companies compete in supplier selection. There are several problems which occur on supplier selection. This research using AHP method to identify those problem. It is proven that AHP can be used in many condition with different criteria.

- 5) Examining sustainability performance in the supply chain: The case of the Greek dairy sector (Bourlakis et al., 2013).

Lacking of coordination between supply chain and marketing division at Greek dairy sector make those division do not perform well. There are several indicators, such as framework, efficiency, flexibility, responsiveness, and product quality indicators. Evaluating each process of supply chain in dairy sector can affect the performance and make those division coordinate better than before.

## **2.8. Research Gap**

This observation refers to those journals. There are several journals that only focus on dairy supply chain. Others focus on supplier selection using AHP method and focusing only on strategic supply chain for supplier performance evaluation.

Researcher will combine those research into designing supplier selection with AHP that fulfilling company requirement. Research gap shown as Figure 2.4.

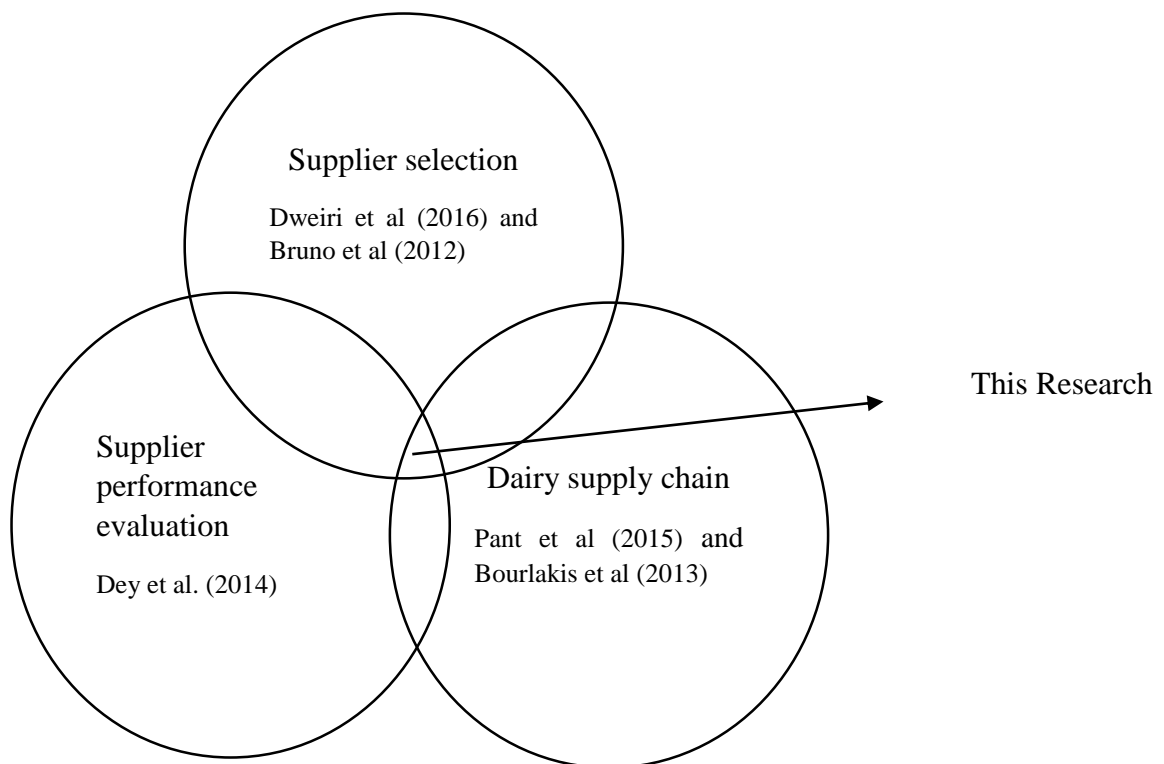


Figure 2. 4 Research Gap

There are three elements which are supplier selection, dairy supply chain, and supplier performance evaluation. Supplier selection is adopted by Dweiri et al (2016) and Bruno et al (2012). While Dairy supply chain deployed form Pant et al (2015) and Bourlakis et al (2013). The last, supplier performance evaluation is coming from Dey et al (2014).



Table 2. 3 Journal Mapping

No.	Literature		Problems	Purpose	Conclusion and Result
	Title	Author			
1.	Designing an Integrated AHP based Decision Support System for Supplier Selection in Automotive Industry.	Dweiri et al. (2016)	Automotive sector is the second largest of economic sector at Pakistan. Supplier has the key role for supply chain in automotive industry. This industry need to choose the right supplier for achieving competitive advantage.	Structuring decision making process using AHP method for supplier selection at developing country, Pakistan.	Supplier selection creates competitive advantage by increasing supply chain performance.
2.	Strategic Supplier Performance Evaluation: A Case-based Action Research of a UK Manufacturing Organisation	Dey et al. (2014)	Supplier has main role in production planning and procurement. Procurement cost much in manufacture procesess. Evaluating supplier can affect supplier performance by forming integrated supplier performance framework.	Measuring supplier performance using strategic method (connection between QFD-AHP and company requirements).	Organisational capability criteria is needed on supplier assessment, besides quality, delivery and cost.
3.	A Framework for Traceability and Transparency in the Dairy Supply Chain Networks	Pant et al. (2015)	India dairy supply chain (DSC) need transparency and traceability due to consumer awareness on product safety and health.	Forming new framework for transparency, traceability, and information sharing between actors in DSC.	India need to develop the dairy supply chain and be supported with actors related to the framework.
4.	AHP-based Approaches for Supplier Evaluation: Problems and Perspectives	Bruno et al. (2012)	Supplier selection is the main key of manufacture competitiveness. There are several problems occur on supplier selection that need to be identify with AHP.	Identify supplier selection methods for mitigating supplier problems (also using study case for provement)	AHP is a tool that can be used in any condition with many other elements.
5.	Examining sustainability performance in the supply chain: The case of the Greek dairy sector.	Bourlakis et al. (2013)	Urgency of coordination between marketing and the whole system of supply chain (SC) in Greek dairy sector.	Identification each actor of Greek dairy SC and having the same prespective as marketing division with several indicators.	Evaluating each system on Greek dairy SC can improve SC performance and coordination with marketing

No.	Literature		Problems	Purpose	Conclusion and Result
	Title	Author			
6.	Supplier Selection and Supplier Performance Evaluation at PT. Indolakto	Anggani (2017)	PT. Indolakto use another form of supplier selection and supplier performance evaluation. Also, this company using level of approval as standard of supplier selection. This standard is used based on main company of Indolakto.	Forming supplier selection from using AHP method and supplier performance evaluation using supplier scorecard at PT. Indolakto. Those performance evaluation and supplier selection will be adapted as company needs	Choosing the criteria and sub criteria that will be suited with company needs, setting priority on several criteria and sub criteria that affecting company needs and forming the supplier performance evaluation or supplier scorecard.

## CHAPTER III

### RESEARCH METHODOLOGY

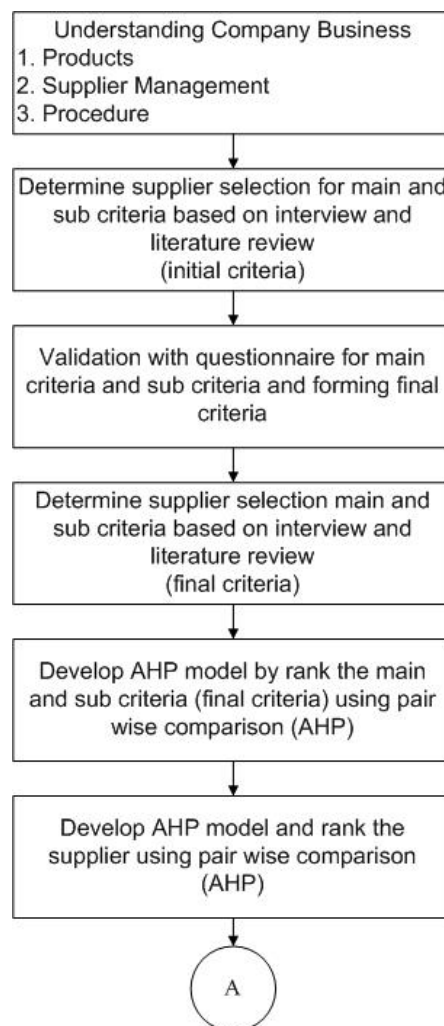
This chapter will explain steps taken to answer research objective.

#### 3.1 General Research Design

This research belong to case study empirical research (Flynn et al, 1990) as it will draw data from the company and will be analyzed to derivat recommendation. Data will be gathered through interviews with key managers as well as small questionnaire. As explained in the previous chapter, this research will largely follow the methodology set out in AHP.

#### 3.2 Data Collection and Analysis

Following AHP, the steps that will be taken in this research are depicted in Figure 3.1.



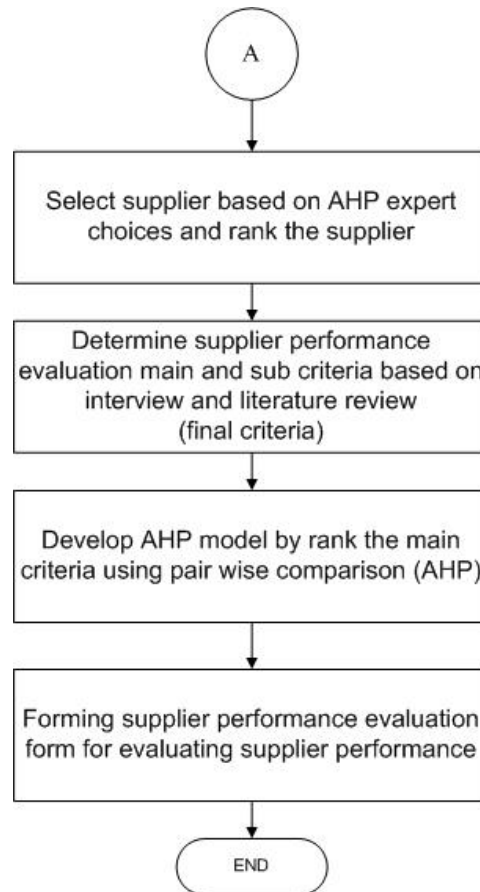


Figure 3. 1 AHP decision support and supplier performance evaluation framework  
(Deployed from : Dweiri et al., 2016 )

### 3.2.1. Understanding Business Process of the Company

Understanding Company business process by identify each product that produce at PT. Indolakto. Product that producing by Indolakto are pasteurized milk, condensed milk, and flavor milk. Then, identifying supplier management due to fulfill the supply needs. The procedure related to supplier management, and business process also consider as useful information for this research.

### 3.2.2. Identify Supplier Selection Criteria

This framework explain about determining main and sub criteria for supplier selection until selecting supplier based on AHP method. Interview is conducted for selecting main criteria refer to company requirements. After selecting main criteria, AHP model is developed and create questionnaire for pair wise comparison based on experts assessment. This steps is repeated for selecting and pair wise comparison sub criteria. Using AHP method, rank the supplier with AHP wise comparison.

### 3.2.3. Validation and Develop AHP Model

Validation in this research is coming from interview with PPIC Manager and Purchasing Supervisor. Interview is conducted fourth times, the first and the second are for determining main criteria and sub criteria in supplier selection. The rest of it for determining main criteria and sub criteria in supplier performance evaluation. Research was conducted for two months (18th October 2016 – 7th December 2016). The result in general of interview will be written in Appendix B.

AHP is used on variety decision making, which are alternative options selection, evaluate priorities, best scenario, benchmarking, and quality management. Here are the following steps for AHP :

- 1) Determine the problem and sources of information
- 2) Making structure of decision hierarchy with the goals on top, the objective, and how to accomplish the goals (which usually have alternatives contents).
- 3) Setting comparison matrices. Each criteria in the upper level will be compare to the immediate level.
- 4) Priorities needs for comparing the priorities using fundamental scale.

### 3.2.4. Determine of Weight of Criteria – Pair Wise Comparison

To do the pair wise comparison, it need a scale of number. The scale show the importance between one criteria on anothers. The fundamental scale is already shown on Table 2.2. The scale is from 1 until 9 scale based on the importance of each criteria. The formula also already shown on index 2.1. until 2.3. formulas. Here are the pair wise comparison based on main criteria:

Table 3. 1 Main Criteria Pair-Wise Comparison

a/b	Qualit y	Quantit y	Deliver y	Warran ty	Capaci ty	Pricin g	Prioritie s
Quality	1						
Quantity		1					
Delivery			1				
Warranty				1			
Capacity					1		
Pricing						1	

After comparing the priorities using fundamental scale as Table 2.2. The priorities is counted by raising the matrix to the biggest amount and summing each row. It will be dividing each criteria by the total sum of rows (Saaty, 2008). The importance of priorities will be shown by the greater amount of each criteria. For example, if Quality has the greater amount of Quantity, then Quality criteria is more important than Quantity. If main criteria already counted for pair wise comparison, the next step is doing the pair wise comparison for each sub criteria. Here is the example of sub criteria pair wise comparison.

Table 3. 2 Example of Sub Criteria Pair Wise Comparison (Delivery-only)

a/b	On time delivery	Delivery delay	Delivery Flexibility	Emergency delivery	Priorities
On time delivery	1				
Delivery delay		1			
Delivery Flexibility			1		
Emergency delivery				1	

The steps is the same as main criteria wise comparison. This sub criteria wise comparison counted in each main criteria.

### 3.2.5. Selecting Supplier

Supplier selection conducted when main criteria and sub main criteria already counted. Selecting each supplier by rank them according to main and sub criteria that already counted for pair wise comparison.

### 3.2.6. Identify Supplier Performance Evaluation Criteria

Supplier performance evaluation criteria based on interview. It is considering the main and sub criteria which needed for assess the supplier performance. The steps is the same for developing AHP model for supplier selection.

### **3.2.7. Determine the Weight of Criteria**

Determining the weight of criteria using the same fundamental scale as Table 2.2. The pair wise comparison steps is the same of pair wise comparison in supplier selection shown as Table 3.1. and Table 3.2. It needs to pair wise for the main criteria, and then do the pair wise for each sub criteria.

### **3.2.8. Assess Supplier Performance**

Supplier performance evaluation form based on the result of the importance each main criteria and sub criteria based on company strategies. This supplier performance evaluation form is for developing the existing supplier performance evaluation form.

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## CHAPTER IV

### DATA ANALYSIS

This chapter explain about company profile and data collection.

#### 4.1. Company Profile

##### 4.1.1. History and Product Innovation

Indofood have several products such as dairy product, drink, beverages, and food nutrition products. One of Indofood company is Indolakto. Official name of Indolakto is registered at 2008 because of merger which contain several companies. Before called as Indolakto, this company known as PT. Australian Indonesian Milk Industries (PT. Indomilk). At the beginning of its business process, Indofood built PT. Indomilk to focus on dairy production at 1967. It developed many kind of products and had halal certificate at 1994. This company also had Food Star Award. This award given to a product that maintaining its quality control consistently. Figure 4.1. shown the history and innovation product of PT. Indolakto.

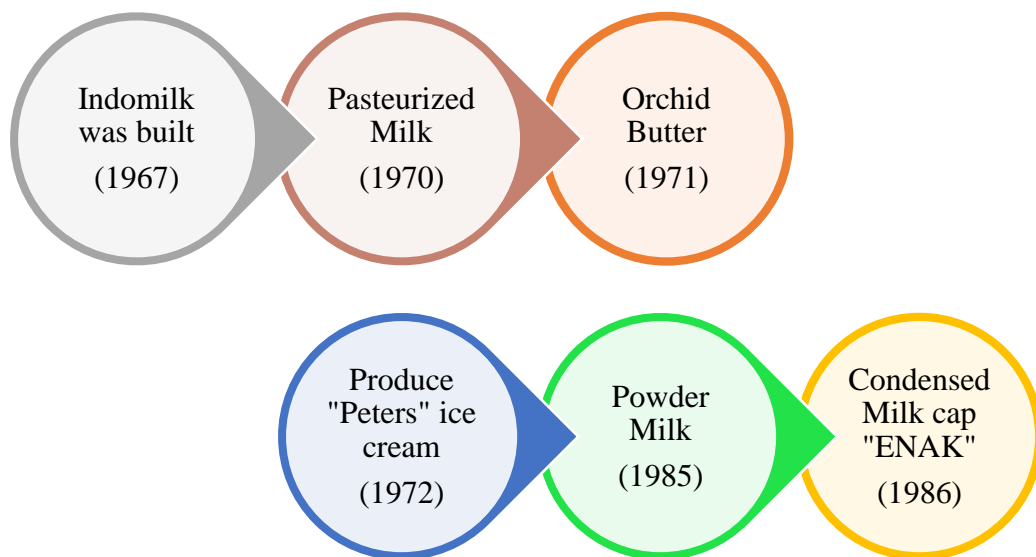


Figure 4. 1 Products Innovation by Indolakto

Source : Indolakto Induction Training

Those product innovation is supported by technology at Indomilk’s dairy supply chain and research development department. Some of those innovation can be found easily in the market, except for “Peters” ice cream.

Indolakto contains several companies which are PT. Indomilk, PT. Indomurni Dairy Industries, PT. Ultrindo, PT. Indolakto, PT. Indoeskrim, and PT. Alam Sumbervita. Each company has its own production process as shown in Table 4.1.

Table 4. 1 Companies production process

Source: Indolakto Induction Training

No.	Company	Production process
1.	PT. Indomilk	<ul style="list-style-type: none"> <li>• Sweetened condensed milk</li> <li>• Milk pasteurization</li> <li>• Butter</li> <li>• Sterile liquid milk</li> </ul>
2.	PT. Indomurni Dairy Industries	<ul style="list-style-type: none"> <li>• Milk pasteurization</li> <li>• Yoghurt</li> <li>• Sterile liquid milk</li> </ul>
3.	PT.Ultrindo	<ul style="list-style-type: none"> <li>• Milk powder</li> </ul>
4.	PT. Indolakto	<ul style="list-style-type: none"> <li>• Sweetened condensed milk</li> <li>• Ultra high temperature milk</li> </ul>
5.	PT. Indoeskrim	<ul style="list-style-type: none"> <li>• Ice cream</li> </ul>
6.	PT. Alam Sumbervita	<ul style="list-style-type: none"> <li>• Distributor for product that needed to be frozen</li> </ul>

Those companies managed into one company as PT. Indolakto in 2008. Nowadays, dairy product at Indofood company becomes the second largest after noodle product (Indomie). There are several location for factory location of Indolakto, which are at Jakarta, Cicurug, Pasuruan and Purwosari. Indolakto export their product to Singapore, Camboja, Brunei Darussalam, Phillipines, Hongkong, Taiwan, Japan, Korea, Fiji, Nauru, Tonga, Solomon, Samoa, Vanuatu, Papua New Guinea, New Zealand, Cameroon, Malawi, Morono, Maladewa and Timor Leste.

#### 4.1.2. Award and Certificate of Standardization

There are several award and certificate of standardization that already received by Indolakto, which are :

- 1) Halal recommendation for all of its product at 1994.
- 2) Hazard analysis of critical control point for raw material, packaging, process, warehouse and distribution.
- 3) SUPERBRAND at 2005 and 2006.
- 4) TOP BRAND for sweet condensed milk.
- 5) ISO 9001:2000 for company performance.
- 6) ISO 9001:2008 for quality management (2009).
- 7) ISO 22000:2005 food safety management system (2010).
- 8) ISO 14001:2004 for environment.
- 9) ISO 18000:2007.

#### **4.1.3. PT. Indolakto Purwosari**

PT. Indolakto Purwosari was built at 2010. It was because the capacity of Pandaan factory is not great enough to fulfill the demand. On November 19th, 2012, Purwosari factory did the opening by Board on Director Indofood and Commercial Run SCM. Governor of East Java did the official opening at January 9th, 2013. The layout is shown in Figure 4.2.



Figure 4. 2 Indolakto Purwosari Layout  
Source : Indolakto Induction Training

PT. Indolakto Purwosari located at Jalan Raya Purwosari KM 62, Tejawangi, Pasuruan, Jawa Timur. There are three main product that produce in this factory, which are UHT milk, sterilized milk, and sweet condensed milk.

#### 4.1.4. Organization Structure at PT. Indolakto Purwosari

The organization structure at PT. Indolakto Purwosari as shown in Figure 4.3.

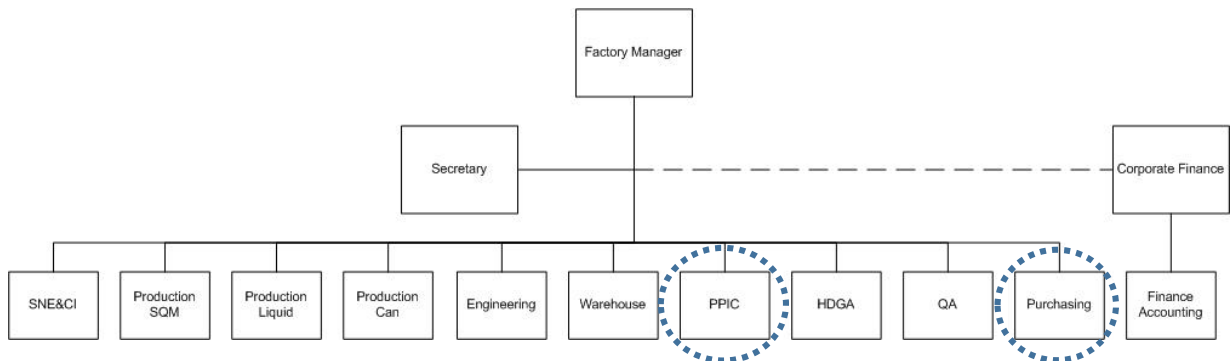


Figure 4. 3 Indolakto organization structure

Source : Indolakto Induction Training

This research conducted at PPIC department and Purchasing department. Procurement itself is part of PPIC department and being called as purchasing. Factory Manager being responsible for all activities which conducted at PT. Indolakto Purwosari to the main office.

#### 4.2. Current Procedure for Supplier Selection and Performance Evaluation

There are two department that have direct relation with supplier, which are Purchasing department and Production Planning and Inventory Control (PPIC) department. Purchasing department has intense relationship with supplier. PPIC also has relationship with suppliers, but not as intense as Purchasing department.

PPIC department conduct production and material planning, consider the demand and supply pattern, make the process order which already approved as the right schedule, and arrange production schedule as shown in Figure 4.4. While PPIC is working, they are also helped by supply planner and supply chain planner. Standard operating procedure running by PPIC mainly concern on how the amount of raw materials that needed for processing procedure.

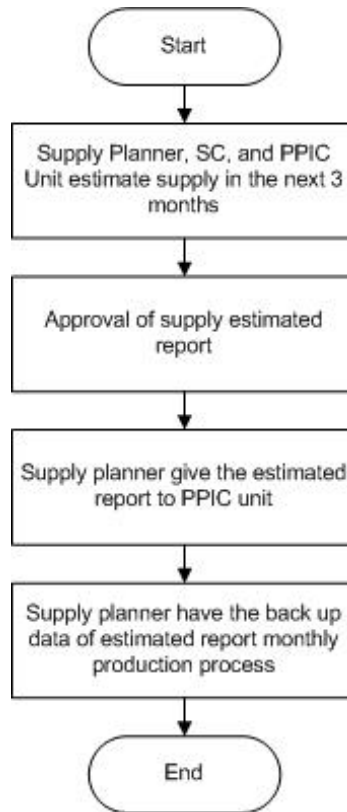


Figure 4. 4 Standard operating procedure by PPIC department

Process procedure is conducted per month with forecasting on company needs. It is also depend on the capacity of their warehouses and demand of products by consumer.

Purchasing department purchase raw material support for milk producing, and packaging. There are some ingredients which are the same as other factories used, these raw materials category will be purchased by main office at Jakarta. Some of main materials such as fresh milk arrange by main office, because not only PT. Indolakto Purwosari use those materials, but also PT. Indolakto at Cicurug, Pandaan and others use it. There are two types of suppliers, which are supplier for imported products and domestic supplier. The challenge happen when the supply for producing milk is under the demand. Besides, Indolakto have to maintain its quality based on R&D standard. So, supplier selection and supplier performance evaluation is needed and continously developing.

Supplier selection at PT. Indolakto – Purwosari follows the standard determined by the main office. Supplier must own their certification such as the

quality that contain on their product have to be aligned as R&D standard. According to interview, there are several criteria at PT. Indolakto for supplier selection as shown in Table 4.2.

Table 4.2. Criteria for supplier selection at PT. Indolakto

No.	Criteria	Details
1.	Price	Price is considerable price
2.	Quantity	Quantity of products match with orders.
3.	Delivery	On time delivery
4.	Quality	Specification and sample of materials aligned to R&D standard. Some of materials will be trial at main company.

Once supplier awarded with contracts, PT. Indolakto evaluate the performance of supplier. PT. Indolakto also has several criteria for evaluating their supplier. Suppliers are evaluated base of the following criterias:

Table 4. 2 Criteria for supplier performance evaluation at PT. Indolakto

No.	Criteria	Details
1.	Quantity	Quantity of products match with orders.
2.	Delivery	On time delivery
3.	Quality	Specification and sample of materials aligned to R&D standard. Some of materials will be trial at main company.

Each supplier is evaluated against those criteria using 0-1 scale. If the supplier perform under 80% then the score will be set to 0, otherwise score will be se to 1. However, there is no weight for each of those factor. Therefore, there is no single measurement to evaluate.

#### 4.2.1. Identifying Main and Sub Criteria for Supplier Selection

Depth interview is conducted for identifying main and sub criteria for supplier selection. There are several main criteria and sub criteria for supplier selection, but as the progress is running, some of them are added or deleted due to experts point of view. Shapiro (2014) state that criteria for supplier selection or supplier performance evaluation is reflect on company condition, not just according to theory. Figure 4.5. shown main and sub criteria which are gather from depth interview.

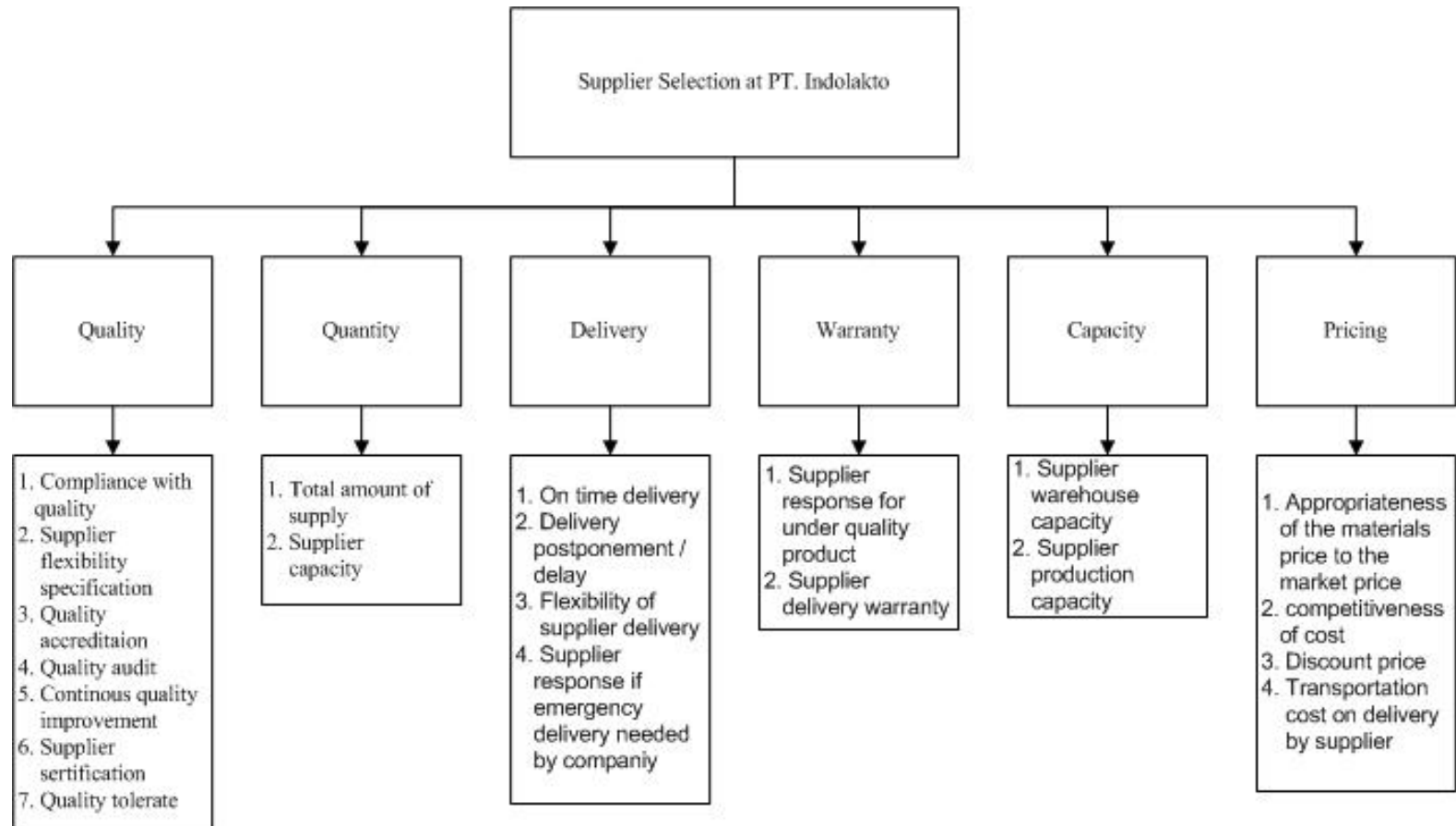


Figure 4. 5 Initial criteria from depth interview as existing condition

PT. Indolakto has four main criteria which are price, quantity, delivery, and quality as shown as Table 4.2. From depth interview, there are six main criteria and several sub criteria on each main criteria that influence experts decision for supplier selection. The added main criteria are warranty and capacity.

Quality is important due to the characteristic of dairy material or product. It is affected by the product freshness and durability of dairy product. The life time of dairy product is limited by period of time (Trienekens et al, 2012; Dani, 2015). During the interview with expert at PT. Indolakto, quality becoming the most important criteria rather than others because the quality will affect the taste and life time of their product. If the quality is under the standard of Indolakto's R&D, then it will reduce the product life time or ruin the product itself. Constantly, the cost will increase due to this problem, the warehouse schedule must be re-schedule due to fail products turnover, and consumer satisfaction will be decrease. If consumer satisfaction decrease, Indolakto's products will be untrusted. Indolakto apply ISO 9001:2008 for quality management, so this company consider quality as important aspect. Delivery become one of supplier selection criteria based on Weber (1991). Dairy industry need material dairy product which are have their expired time. Because of the durability of dairy material, so the delivery must be on time. Beside, warehouse capacity is limited, so if delivery is not on time, then the warehouse schedule must be re-schedule. Quantity of dairy material supply is under the demand. So, it is important for supplier to fulfill the right amount of dairy material as company need. Pricing also one of supplier criteria based on Dickson (1966). Usually supplier already have price which are competitive on each other. Warranty contain some policies and quality standard which already standardize by Indolakto's R&D, such as the amount of protein or fat in each mg of several materials. Capacity also added in the main criteria because supplier capability to fulfill the amount of material that company need will be affect to supplier selection process.

Sub criterias on each main criteria are collected as the existing condition at PT. Indolakto – Purwosari. Only some of sub criteria that are used in Indolakto based on Dey's research. Quality have seven sub criteria. First, the material is compliance with quality. If supplier quality is not pass Indolakto's standard, then



supplier will be unverified supplier. Second, supplier flexibility for fulfilling the request from company. Third, quality accreditation for accomplish Indolakto's R&D requirement. Forth, quality audit in each period for maintaining material quality. Fifth, continous quality improvement as company request. CIPS (2013) argued that continous quality improvement is needed due to develop supplier performance. In contrast, Indolakto already has their own standard for their quality by R&D division. So, if there is no announcement for changing their standard on quality, continous quality improvement for supplier is unnecessary. Sixth, supplier has correlation with ISO 9001:2008 for quality management that company run for years. Supplier must have a certificate that declare of their product standard is qualified. While company will tested their product per period time. Seventh, quality tolerate if the material is not as appropriate as Indolakto want to.

Delivery contain four sub criteria which are on time delivery by supplier, postponement happen while delivery is on process, flexibility on delivery, and if emergency delivery needed, supplier can response as fast as possible. Warranty contain two sub criteria which are the supplier response if product is under quality, and supplier delivery warranty. Supplier response is needed if something wrong happen with the material. For example, if sugar material already clot within several days (which is conditional as each contract with supplier) then supplier response must be as fast as possible. While delivery warranty describe about a condition that the quality deliver to company is in good condition as company standard. Supplier warehouse capacity and supplier production capacity are sub criterias from capacity. Last of main criteria that already known as pricing have four sub criteria. There are the appropriateness of material price to market price, competitiveness cost between other supplier, discount price in several condition, and transportaion cost on delivery. Those main and sub criteria are collected based on depth interview and literature review. As further discussion with expert at PT. Indolakto - Purwosari and questionnaire is conducted for validation on each main criteria and sub criteria, there are some sub criteria that consider to be deleted shown in Figure 4.6.

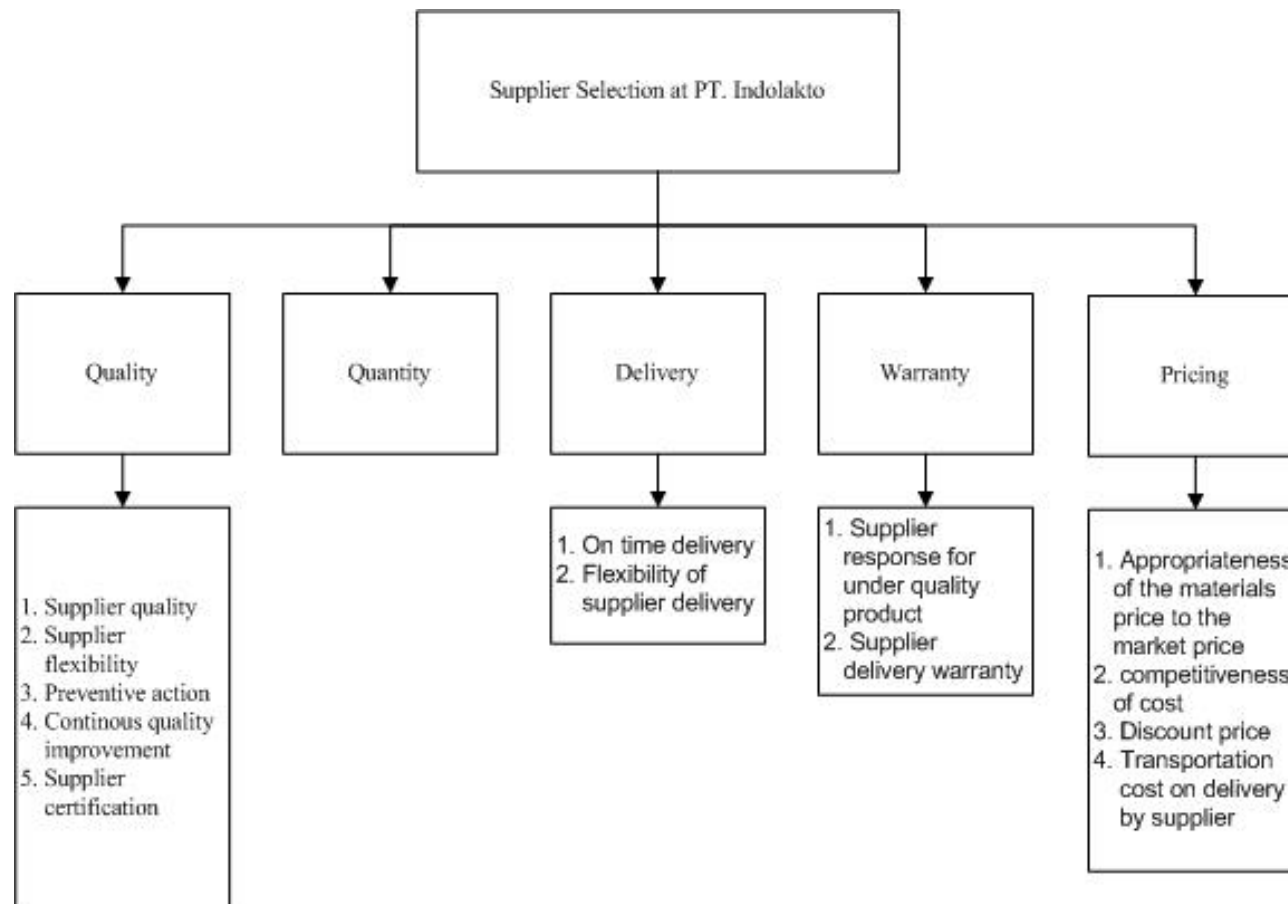


Figure 4. 6 Final criteria form depth interview after validation

Only one main criteria which is eliminated because capacity criteria is not really affected on supplier selection decision. There are six sub criteria that deleted due to incompatible with companies policies. Sub criteria from quality which are quality tolerate and quality audit will be deleted on validation because the material must be passed as Indolakto's R&D requirement. Sub criteria from quantity which are total amount of supply and supplier capacity are not the main concern for companies, so those sub criteria are deleted. Delivery sub criteria eliminates delivery postponement and supplier response if emergency delivery needed. Those postponement usually already had appointment with company, and if there is emergency delivery due to lack of inventory, the problem is coming from companies, not the supplier.

There are some consideration in warranty main criteria. This criteria only using in several terms and condition. According to Dickson (1966), warranty consider as extreme importance criteria. It means, it can be apply in any situation due to its importance. Based on depth interview at PT. Indolakto with purchasing supervisor, warranty criteria can be suited not in every supplier because on some supplier has their own criteria. While PPIC manager argue that warranty is one of important criteria and can be suited in their supplier. Warranty related to quality of product. As mentioned before, quality is the most important criteria at this company because the durability of its product (Trienekens et al, 2012; Dani, 2015).

#### **4.2.2. Determining Weight for Each Criteria**

Weight of each criteria were derived from pairwise comparison following AHP methodology. Pairwise comparison was conducted using questionnaire. The respondents were PPIC Manager and Purchasing supervisor. The result of questionnaire were then inputed onto Expert Choice<sup>TM</sup> software. The final weight of the main criteria is shown in Figure 4.7 below.

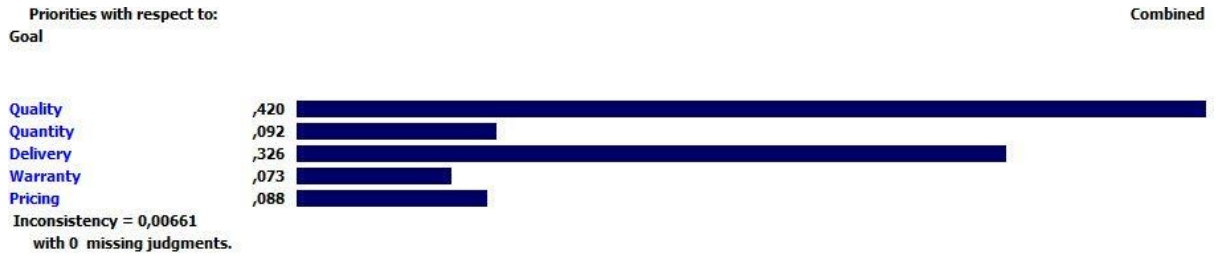


Figure 4. 7 Ranking on main criteria for supplier selection

The inconsistency is 0.00661. It means, the data is valid because the inconsistency is under 0.1. Quality (0.42) is the first main criteria that company considerate for selecting supplier. Followed by delivery (0.326), quantity (0.092), pricing (0.088) and warranty (0.073).

There are four main criteria which has their own sub criteria. Figure 4.8 describe rank of sub criteria based on main criteria quality. The inconsistency for quality sub criteria is 0.08 with 0 missing judgements.

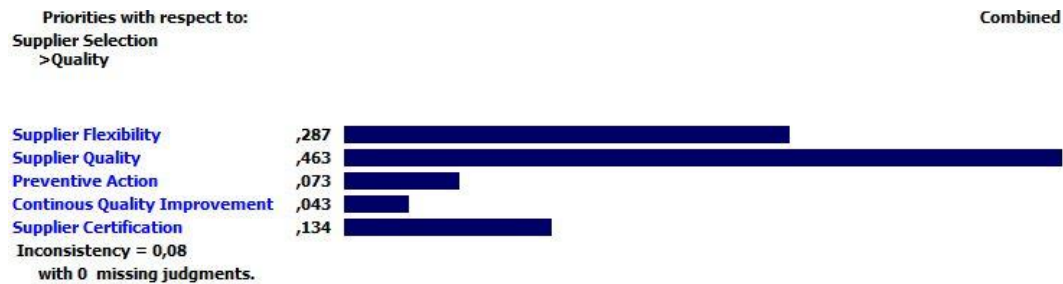


Figure 4. 8 Ranking of sub criteria with respect to main criteria “quality”

Supplier quality (0.463) become the 1st rank. The 2nd rank is supplier flexibility (0.287), followed by supplier certification (0.134), preventive action (0.073) and continous quality improvement (0.043).

Delivery only have to sub criteria which are on time delivery and flexibility of supplier delivery. Priorities for those sub criteria is shown in Figure 4.9.

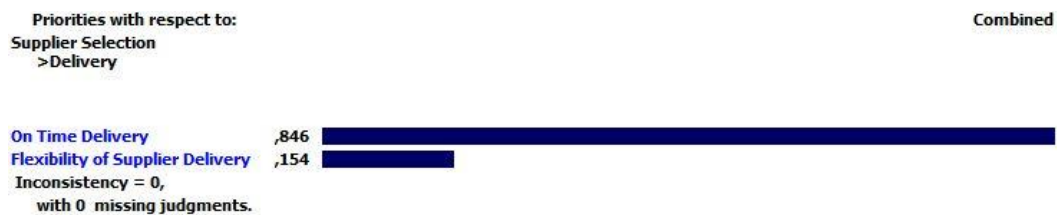


Figure 4. 9 Ranking of sub criteria with respect to main criteria “delivery”

On time delivery is in the 1st place (0.846) and flexibility of supplier delivery is in the 2nd place (0.154).

Priorities with respect to warranty also contain two criteria which are supplier response for under quality product and supplier delivery warranty. It is describe in the Figure 4.10. below.



Figure 4. 10 Ranking of sub criteria with respect to main criteria “warranty” Supplier delivery warranty (0.396) and supplier response for under quality product (0.604). The inconsistency is almost 0 with 0 missing judgements.

Ranking of sub criteria with respect to pricing criteria have four sub criteria in Figure 4.11.



Figure 4. 11 Ranking of sub criteria with respect to main criteria “pricing” They are competitiveness of cost (0.540), appropriateness of the materials price to the market price (0.291), transportation cost on delivery by supplier (0.053), and discount price if Indolakto buy more than quantity as usual (0.117).

The summaray of all sub criteria are listed in Figure 4.12. It is used to know the weight of each sub criteria.

### Combined instance – Synthesis with respect to: Supplier Selection



Figure 4. 12 Priorities on each sub criteria for supplier selection

The overall inconsistency for supplier selection is 0.03. It means the data is valid because the inconsistency under 0.1. The priorities in Figure above describe each weighted sub criteria.

Once, the criteria have been determined, the next step is selecting supplier based on the criteria. Following AHP for each supplier was evaluated against the criteria using pairwise comparison. As the previous step, this pairwise comparison were conducted using questionnaire with the same respondent.

In this process, there are two (2) suppliers who will be evaluated :

Table 4. 3 Supplier information

No.	Supplier Name	Location	Company Sized
Supplier 1	Maltodextrin A	Downstream Industry, Surabaya	Large
Supplier 2	Maltodextrin B	Surabaya	Medium

Maltodextrin supplier which code into Maltodextrin A for 1st supplier and Maltodextrin B for 2nd supplier. It is coded due to confidential reason. Indolacto also got TOP BRAND for sweet condensed milk, it means that the supplier for condensed milk, which one of it is maltodextrin supplier has their verified quality. The mapping for each weighted will be shown in Figure 4.13. While the global measurement is on the Table 4.4.

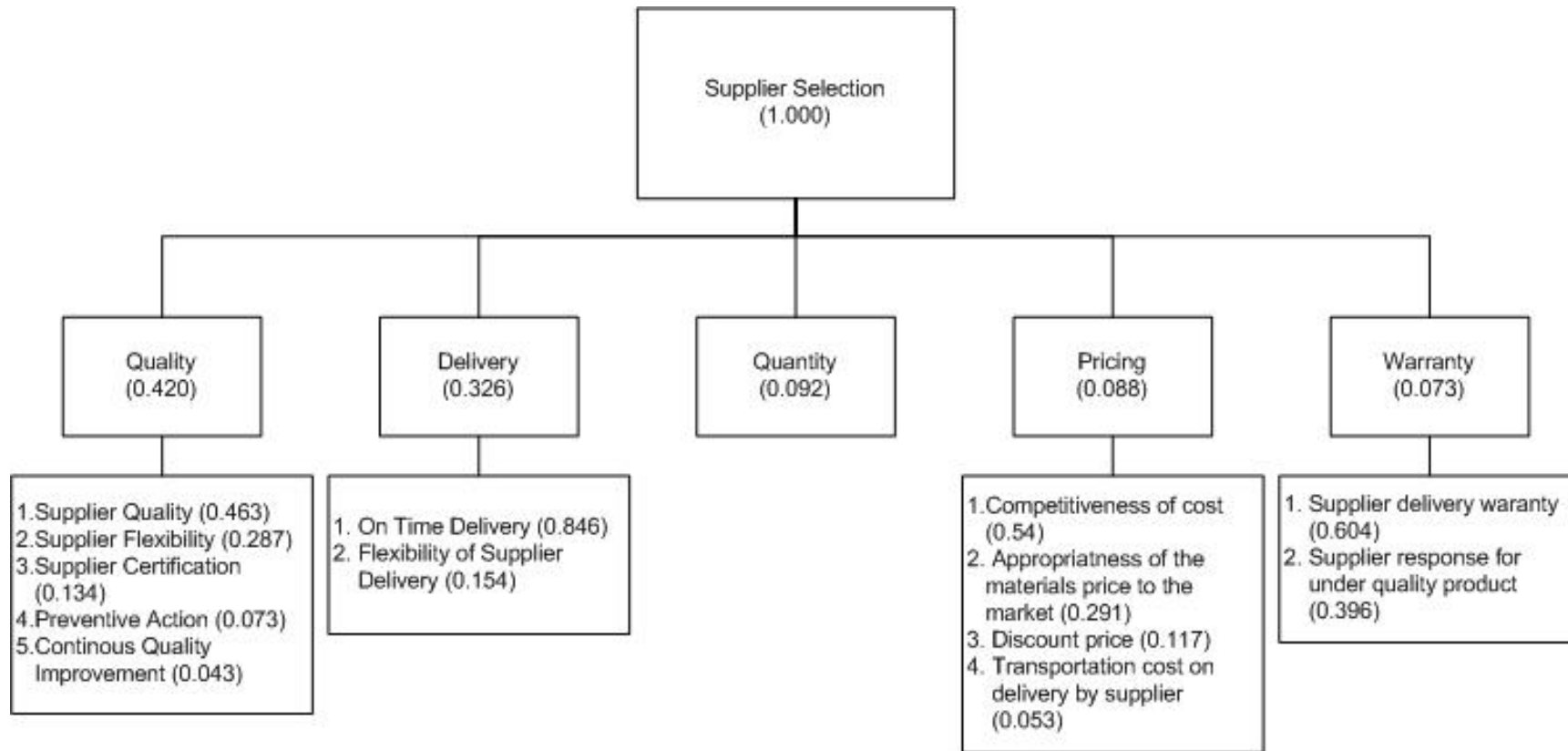


Figure 4. 13 AHP Mapping for supplier (weightened)

Table 4. 4 Global weighted of Supplier Selection

<b>Main criteria/sub criteria</b>	<b>Weightened</b>
<b>Quality</b>	<b>0.420</b>
Supplier quality	0.19446
Supplier flexibility	0.12054
Supplier certification	0.05628
Preventive action	0.03066
Continous quality improvement	0.01806
<b>Delivery</b>	<b>0.32</b>
On time delivery	0.2758
Flexibility of supplier delivery	0.0502
<b>Quantity</b>	<b>0.092</b>
<b>Pricing</b>	<b>0.08</b>
Competitiveness of cost	0.04752
Appropriatness of the materials price to the market	0.02561
Discount price	0.0103
Transportation cost on delivery by supplier	0.00466
<b>Warranty</b>	<b>0.07</b>
Supplier delivery warranty	0.04409
Supplier response for under quality product	0.02891

The comparison score in each criteria with those supplier will be shown in Figure 4.14 until 4.15. Those score is combined score from PPIC manager and Purchasing supervisor point of view. According to Figure 4.14 called as the score with respect to quality, describe that the difference score only happen in supplier flexibility with score 8 (eight). It means the importance is between extreme and very strong scale.

Score with respect to quantity as describe in Table 4.5. do not have any differences with those supplier. According to Table 4.5 that describe about scoring with respect to delivery have difference score in flexibility of supplier delivery. The score is 7, which means that the importance is very strong. The next category is score with respect to warranty. In this category, the score are the same. While in pricing criteria, the competitiveness score is 7 while the appropriate material price to market price is 8 for A Maltodextrin.

From all of scoring aspect, it can be concluded that A Maltodextrin will be choose rather than B Maltodextrin. The priorities A Maltodextrin is 0.556 and B Maltodextrin is 0.444. The inconsistency for this scoring is 0.03 which means under



0.1 and consider data is consistent. Table 4.5 as final scoring of two supplier already in global weighted score. The weighted total score is coming from the total amount of each scoring multiply by each weighted.

Table 4. 5 Final Scoring of two supplier (Ideal Mode)

Main criteria/sub criteria	Weightened	A	B
<b>Quality</b>	<b>0.420</b>		
Supplier quality	0.19446	<b>0.265</b>	<b>0.265</b>
Supplier flexibility	0.12054	<b>0.164</b>	<b>0.021</b>
Supplier certification	0.05628	<b>0.076</b>	<b>0.076</b>
Preventive action	0.03066	<b>0.042</b>	<b>0.042</b>
Continous quality improvement	0.01806	<b>0.025</b>	<b>0.025</b>
<b>Delivery</b>	<b>0.32</b>		
On time delivery	0.2758	<b>0.453</b>	<b>0.453</b>
Flexibility of supplier delivery	0.0502	<b>0.012</b>	<b>0.083</b>
<b>Quantity</b>	<b>0.092</b>	<b>0.5</b>	<b>0.5</b>
<b>Pricing</b>	<b>0.08</b>		
Competitiveness of cost	0.04752	<b>0.420</b>	<b>0.060</b>
Appropriatness of the materials price to the market	0.02561	<b>0.227</b>	<b>0.028</b>
Discount price	0.0103	<b>0.091</b>	<b>0.091</b>
Transportation cost on delivery by supplier	0.00466	<b>0.041</b>	<b>0.041</b>
<b>Warranty</b>	<b>0.07</b>		
Supplier delivery warranty	0.04409	<b>0.302</b>	<b>0.302</b>
Supplier response for under quality product	0.02891	<b>0.198</b>	<b>0.198</b>
<b>WEIGHTED TOTAL</b>		<b>0.556</b>	<b>0.444</b>

The comparison of those supplier is shown in Figure 4.14 as combined instance – Synthesis with respect to Supplier Selection.

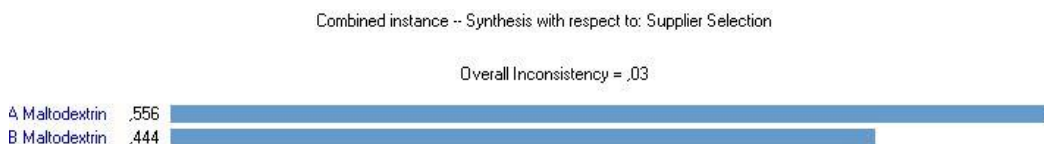


Figure 4. 14 Combined instance – synthesis with respect to supplier selection

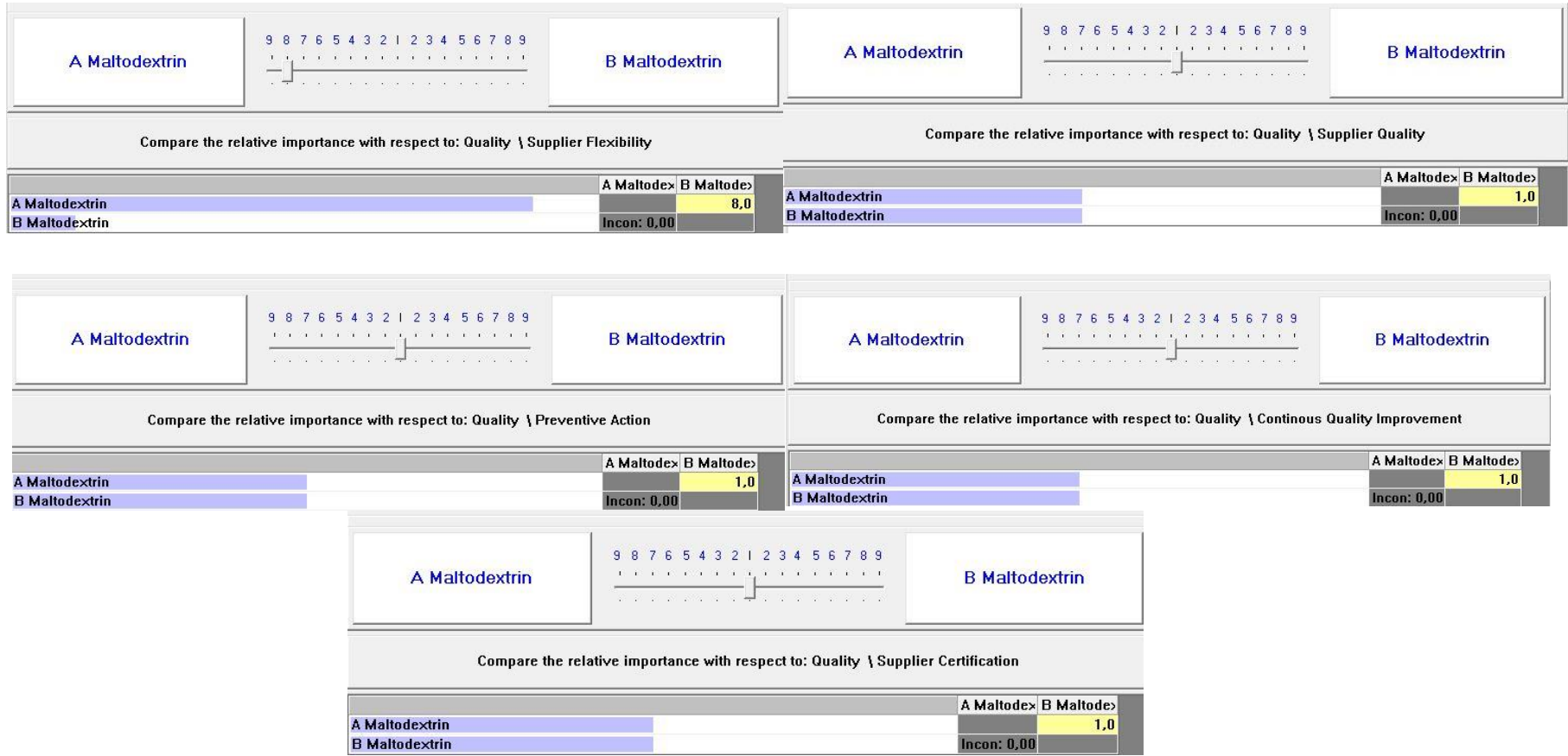


Figure 4. 15 Scoring in Expert Choice™ Software

Supplier selection analyze using sensitivity analysis. Sensitivity analysis is using to describe the effect of changing weights of the main criteria respect to supplier. Overall sensitivity analysis of each criteria for supplier selection will be describe in Figure 4.23. It is shown that the ranking of supplier is A Maltodextrin followed by B Maltodextrin. A Maltodextrin have dominant in quality and pricing criteria. The big gap is shown in pricing criteria. B Maltodextrin have dominant in delivery criteria. While quantity and warranty criteria have the same result for those suppliers.

#### **4.2.3. Sensitivity analysis – Supplier selection**

Sensitivity analysis is performed by changing the weight. The dynamic sensitivity will change  $\pm 10\%$  into upward change or downward change to analyze the ranking of supplier will change or not change (robust). Here is the analysis of sensitivity analysis with respect to each main criteria :

a. Sensitivity analysis with respect to quality

The rank of supplier is the same whether the dynamic sensitivity of quality is changed in upward mode.

b. Sensitivity analysis with respect to delivery

The rank of supplier will not change (robust) regardless of any value.

c. Sensitivity analysis with respect to warranty

The rank of supplier will not change (robust) regardless of any value.

d. Sensitivity analysis with respect to pricing

The rank of supplier is the same whether the dynamic sensitivity of pricing is changed both in upward and downward mode.

Regarding to those result, it can be concluded that all of dynamic sensitivity analysis are remain the same. From all of main criteria, it is accepted that A Maltodextrin is better chosen rather than B Maltodextrin

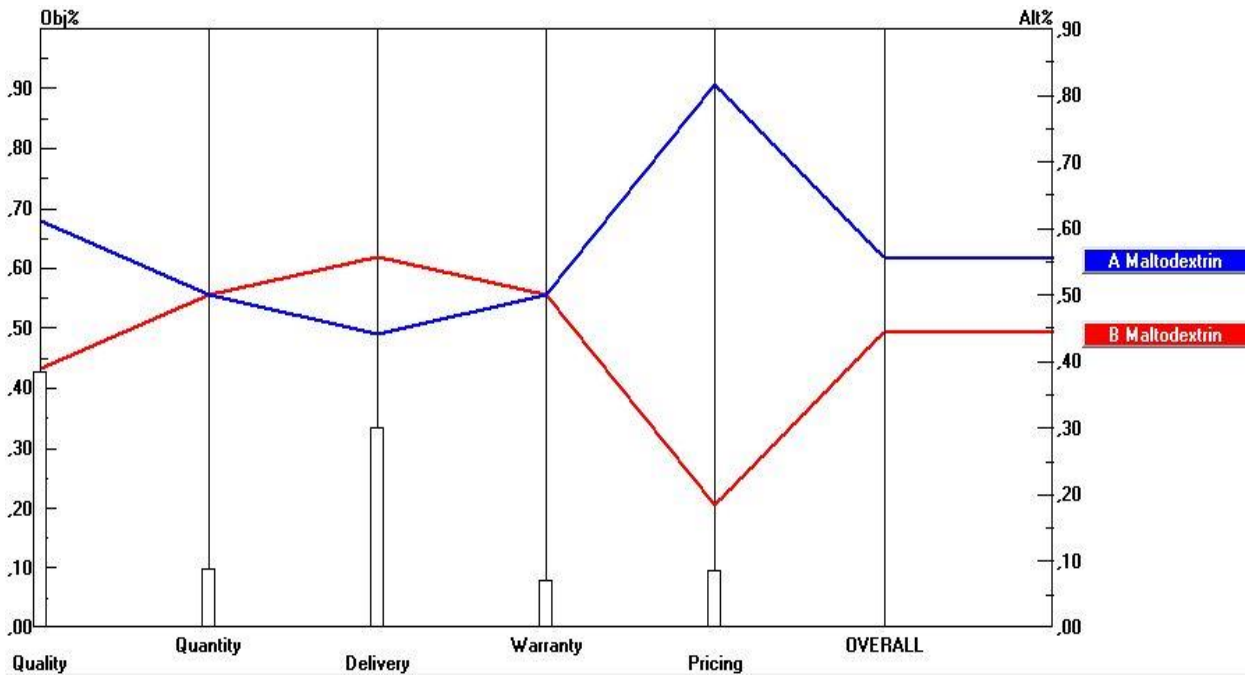


Figure 4. 16 Overall sensitivity analysis

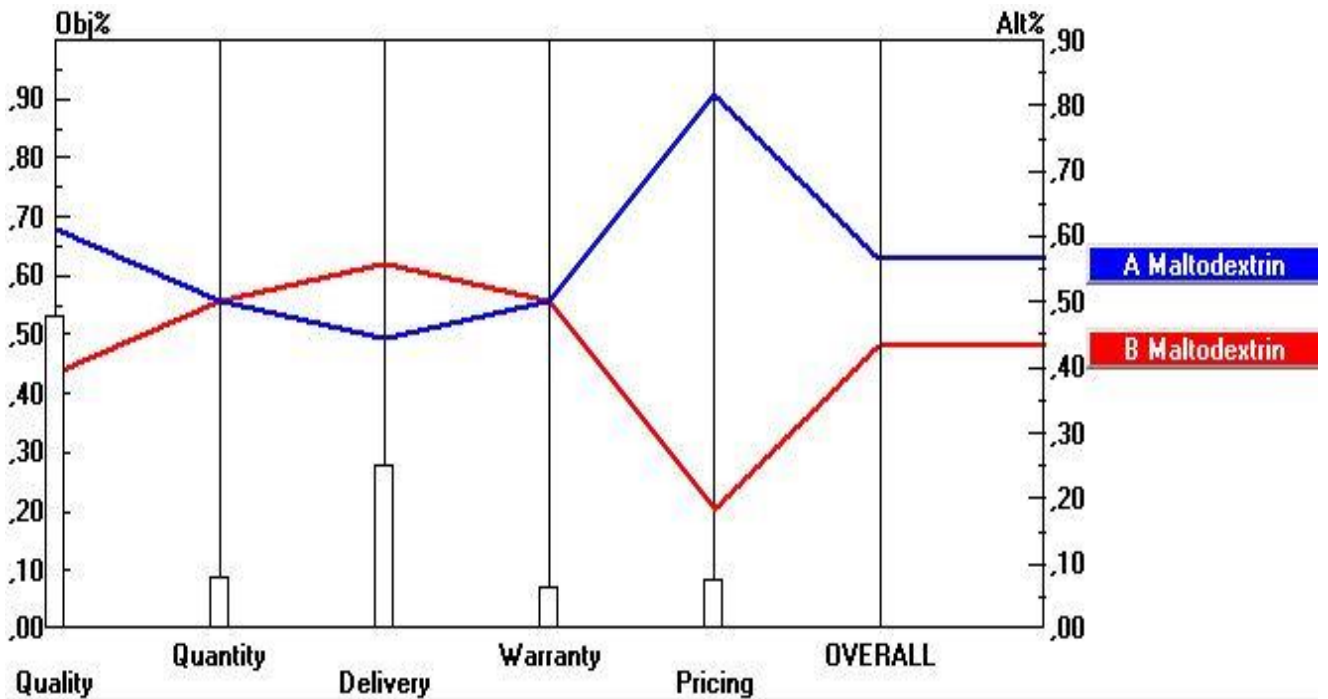


Figure 4. 17 Sensitivity analysis with respect to quality (upward change)



Figure 4. 18 Sensitivity analysis with respect to delivery (upward change)

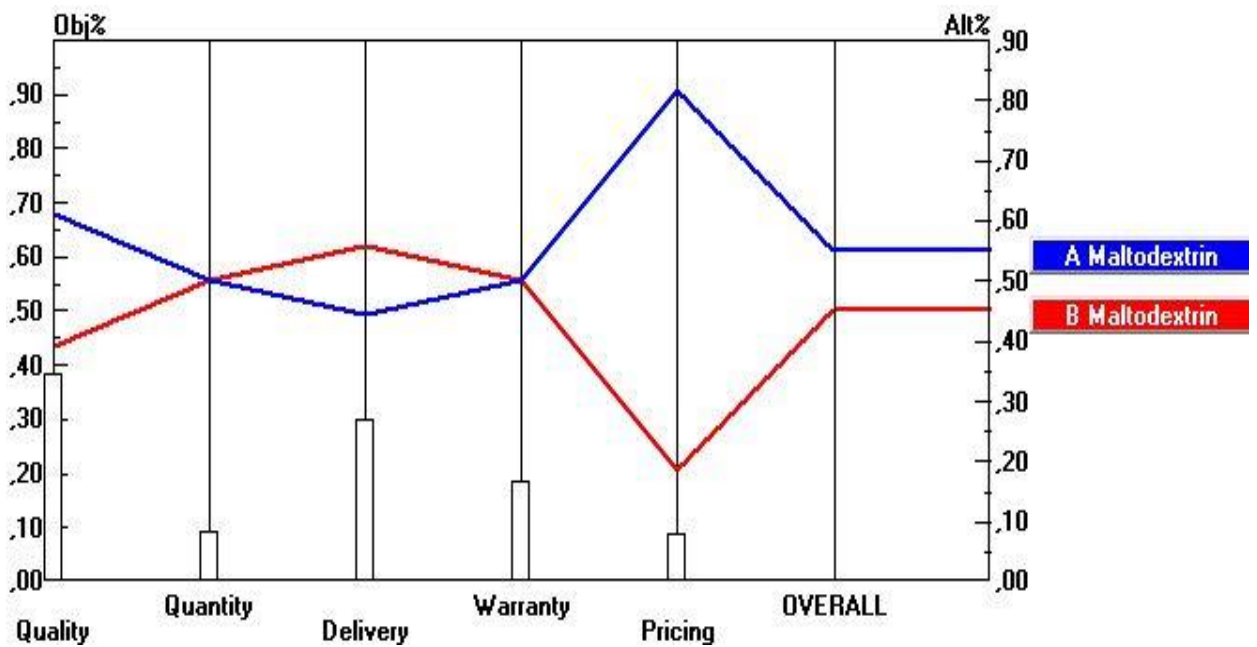


Figure 4. 19 Sensitivity analysis with respect to warranty (upward change)



Figure 4. 20 Sensitivity analysis with respect to pricing (upward change)

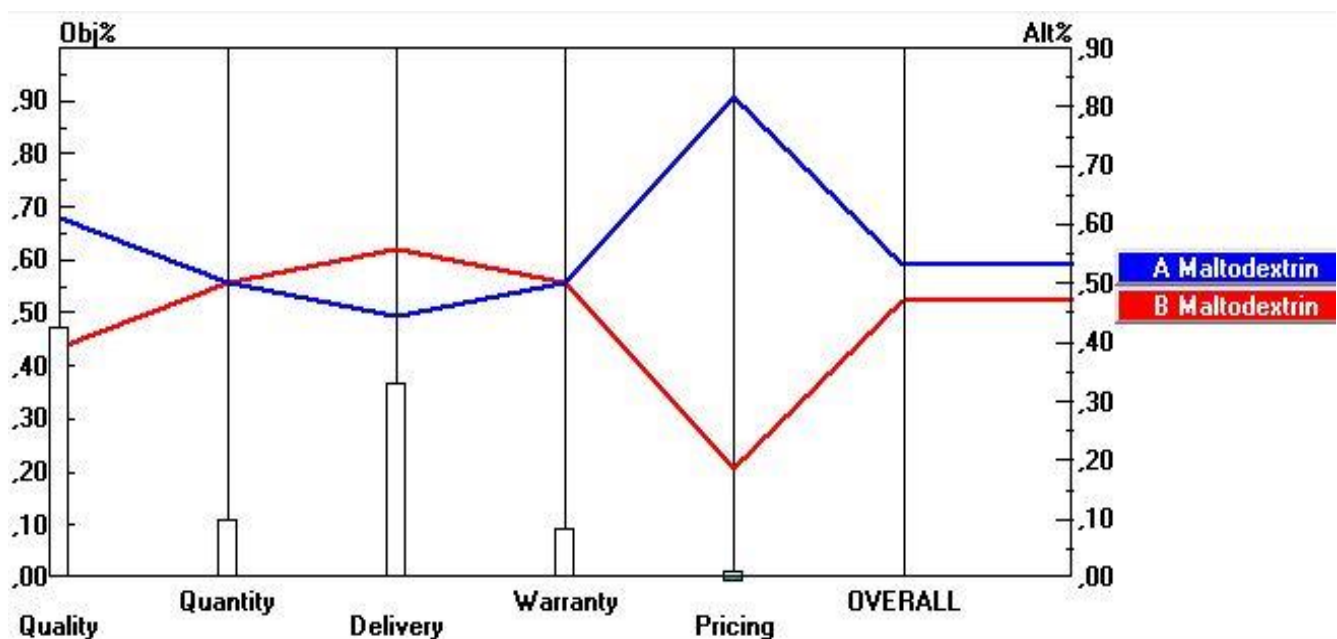


Figure 4. 21 Sensitivity analysis with respect to pricing (downward change)

#### 4.2.4. Identifying Main and Sub Criteria for Supplier Performance Evaluation

Evaluating supplier is as important as selecting supplier. Supplier performance evaluation use to evaluate supplier performance per period time. There are four main criteria. Those are almost the same as supplier selection main criteria but the difference located on the pricing main criteria. Supplier performance evaluation only focusing on how supplier performance during their contract with company, while price already has its contract before the supplier become verified supplier for Indolakto. Sub criterias in each main criteria are remain the same. The detail of supplier performance evaluation is in Figure 4.22.

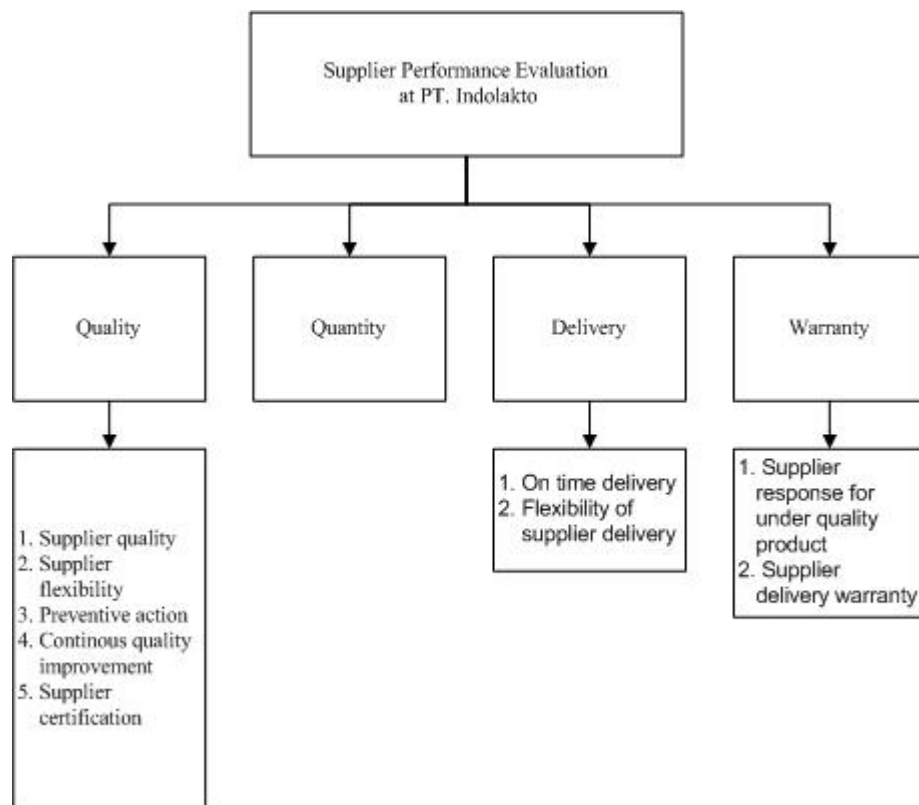


Figure 4. 22 Main and sub criteria for supplier performance at PT. Indolakto

#### 4.2.5. Determining weight of each criteria

Pairwise comparison also conducted for supplier performance evaluation. The experts are the same as pairwise comparison for supplier selection. The difference between pairwise comparison in supplier selection and supplier performance evaluation is on the pricing criteria. As mentioned before, pricing criteria is deleted due to supplier performance evaluation is evaluate supplier performance while they were already became verified supplier. The priorities in each main criteria shown in Figure 4.23 using AHP Expert Choice™ software.

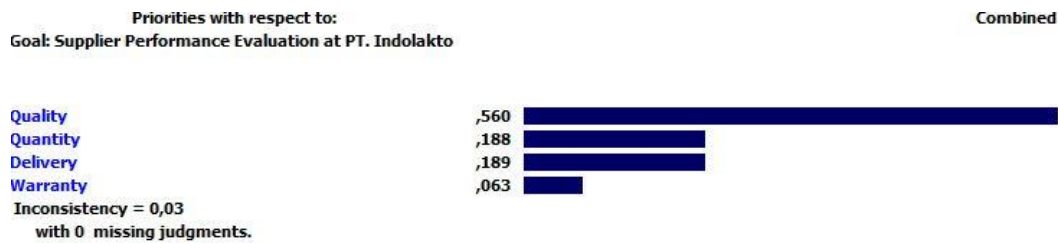


Figure 4. 23 Priorities on main criteria for supplier performance evaluation

The inconsistency is 0.03, which mean the data is valid because it is under 0.1. The priorities is the same as supplier selection on main criteria. The 1st place is quality (0.56), 2nd place is delivery (0.188), 3rd place is quantity (0.189), and 4th place is warranty (0.063).

Pairwise comparison also conduct for sub criteria on each main criteria. It is used to know the weight of each sub criteria. Priorities on each sub criteria for supplier selection is shown in Figure 4.24. The overall consistency is 0.05 which means the data is consistent.



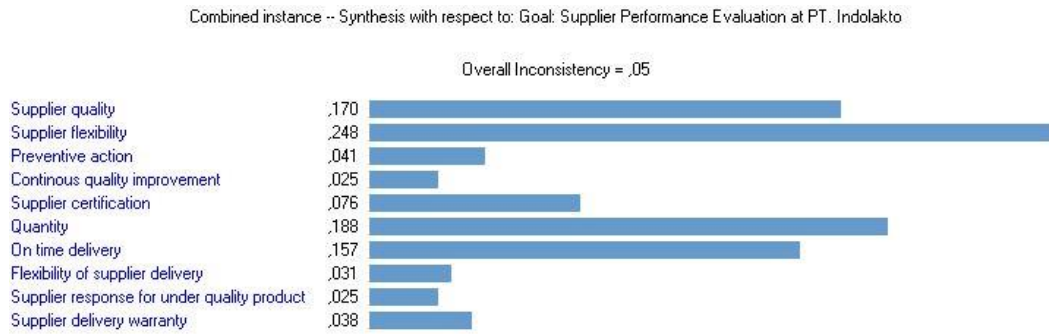


Figure 4. 24 Priorities on each sub criteria for supplier selection

Priorities rank of sub criterias are supplier flexibility (0.248), quantity (0.188), supplier quality (0.170), supplier quality (0.170), on time delivery (0.157), supplier certification (0.076), preventive action (0.041), supplier delivery warranty (0.038), flexibility of supplier delivery (0.031), continous quality improvement and supplier response for under quality product (0.025).

Figure 4.25 below describe priorities rank in quality for supplier performance evaluation. The inconsistency is 0.07.



Figure 4. 25 Ranking of sub criteria with respect to main criteria “quality”

Priorities order are supplier flexibility (0.443). Followed by supplier quality (0.303), supplier certification (0.136), preventive action (0.073), and continous quality improvement (0.045).

Figure 4.26 shown about ranking of sub criteria with respect to main criteria delivery. The inconsistency is really small close to 0, that is the reason inconsistency shown as 0. In the figure below. There are two sub criteria are on time delivery and flexibility of supplier delivery.

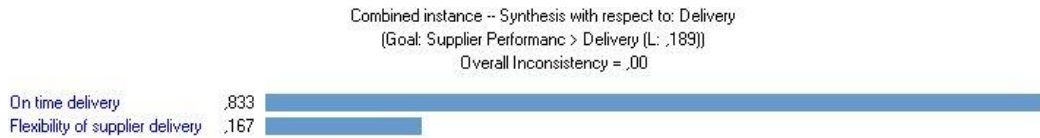


Figure 4. 26 Ranking of sub criteria with respect to main criteria “delivery”

The result is on time delivery (0.833) is more important rather than flexibility of supplier delivery (0.167).

Priorities with respect to main criteria warranty also have two sub criteria which are supplier response for under quality product and supplier delivery warranty. The inconsistency is slightly closed to 0.

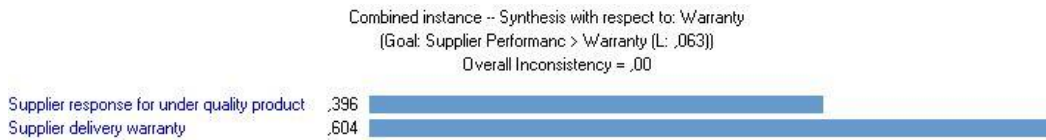


Figure 4. 27 Ranking of sub criteria with respect to main criteria “warranty”

Supplier delivery warranty (0.604) is in the 1st rank followed by supplier response for under quality product (0.396).

#### 4.2.6. Supplier Performance Evaluation System

The hierarchy for performance evaluation is in Figure 4.28. In this figure below, AHP mapping for performance evaluation already weighted (not in global scoring). Supplier scorecard also forming in the Figure 4.29 (weighted score). Supplier scorecard is for evaluate supplier performance in a simple way with weighted score based on AHP. The scale for scoring is 0-10 scale.

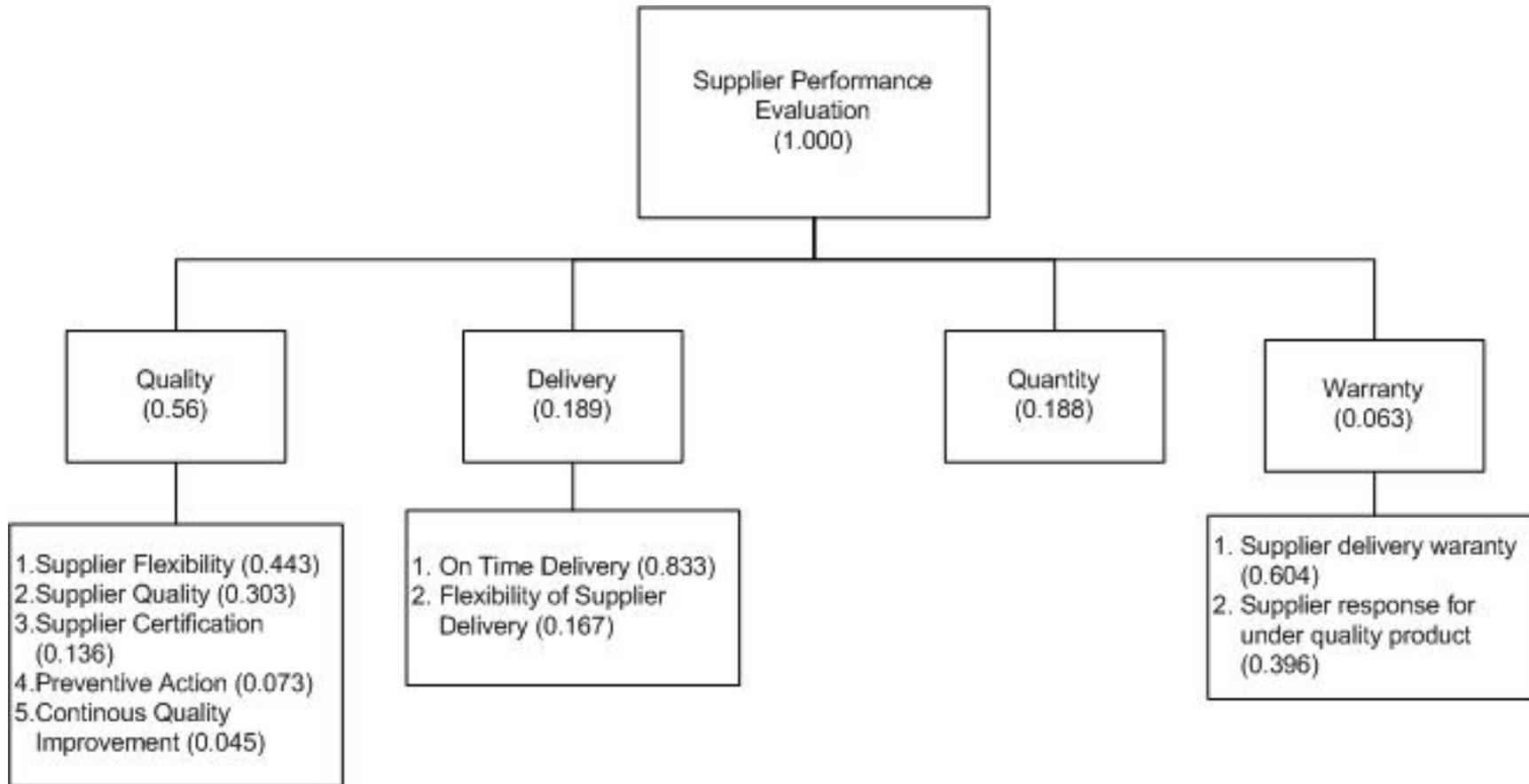


Figure 4. 28 AHP mapping for supplier performance evaluation (weighted-not global score)

Supplier Scorecard of PT. Indolakto

Name of Supplier :

Supplier category :

Main Category	Sub Criteria	Weight	Score	Weighted Score
Quality	Supplier flexibility	0.24808		
	Supplier quality	0.16968		
	Supplier certification	0.07616		
	Preventive action	0.04088		
	Continous quality improvement	0.0252		
Delivery	On time delivery	0.157437		
	Flexibility of supplier delivery	0.031563		
Quantity	Total amount of quantity	0.188		
Warranty	Supplier delivery warranty	0.038052		
	Supplier response for under quality product	0.024948		
			<b>TOTAL</b>	

\*Score within 0-10 scale

\*\*Weighted score based on multiply of weight and score

Figure 4. 29 Supplier Scorcard of PT. Indolakto (global score)

The function of supplier scorecard is evaluating supplier performance in period time based on agreement. So, it will make decision maker easier to decide whether those supplier still cooperate with company or not.

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## **CHAPTER V**

### **CONCLUSION**

#### **5.1. Conclusion**

Regarding to the result of this study, it can be concluded :

1. Selecting the right supplier and evaluating supplier performance is a vital role in the beginning process of supply chain management.
2. The main criterias for supplier selection are quality, delivery, quantity, pricing, and warranty. In addition, the sub criterias are deployed from main criterias based on company requirement.
3. Warranty criteria only used in some conditional situation due to company terms and policies.
4. The result of supplier selection is choosing Maltodextrin A as sweetened raw material supplier. The score for Maltodextrin A is 0.556 and Maltodextrin B is 0.444.
5. The sensitivity analysis is performed to describe the effect of changing weights in main criteria. All of the sensitivity analysis of supplier selection are stay robust.
6. The main criterias for supplier performance evaluation are quality, delivery, quantity, and warranty. In addition, the sub criterias are deployed from main criterias based on company requirement.

#### **5.2. Recommendation**

Considering the need of supplier selection and supplier performance evaluation, there are several recommendation for practical implication and future studies.

##### **5.2.1. Practical Implication**

Another dairy industry can adapt this main criteria and sub criteria for their supplier selection consideration and supplier performance evaluation. But, in each dairy industry need different main criteria and sub criteria due to each existing condition and policies for company.

### **5.2.2. Future study**

1. This report has limitation only in raw support material supplier. Dairy product also concern for packaging supplier which more complicated rather than raw support material supplier. So, for future study might be identify main and sub criteria for supplier selection and supplier performance evaluation to packaging supplier.
2. It is possible to use another techniques such as fuzzy AHP, fuzzy TOPSIS, ANP to analyze similar problems.



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## Appendix A

### Appendix A – Identify Main and Sub Criteria for Supplier Selection

#### KUESIONER TUGAS AKHIR

Yth. Bapak/Ibu/Sdr/i

Di tempat.

Perkenalkan saya Putri Candra Anggani, mahasiswa semester 7 Jurusan Manajemen Bisnis ITS. Saat ini saya sedang melakukan penelitian dengan judul “*Supplier Selection and Supplier Performance Evaluation at PT Indolacto*”. Penelitian ini bertujuan untuk mengembangkan kerangka pemilihan *supplier* dengan menggunakan metode AHP. Di samping itu, dalam penelitian ini juga dikembangkan form pemilihan dan penilaian kinerja *supplier*. Saya memohon kesediaan Bapak/Ibu/Sdr/i untuk mengisi kuesioner ini dengan menjawab seluruh pertanyaan sesuai dengan kondisi yang dihadapi di perusahaan anda. Identitas dan isian kuesioner ini murni digunakan untuk kepentingan akademik, dan terjaga kerahasiaannya. Atas kesediaan Bapak/Ibu/Sdr/i, saya ucapkan terima kasih.

**Tanggal Pengisian :**

**PROFIL RESPONDEN**

**1. Jabatan :**

**2. Lama Bekerja :**

< 1 tahun

1-5 tahun

6-10 tahun

> 10 tahun

**3. Pendidikan Terakhir :**

SMA / sederajat

S1

S2

Lainnya

**PETUNJUK PENGISIAN :**

Bagian ini terdiri dari 25 pertanyaan, yang akan mengidentifikasi tingkat kepentingan pemilihan *supplier* berdasarkan kriteria *quality*, *quantity*, *on-time delivery*, *warranty*, *capacity* dan *pricing*. Kriteria *quality* digunakan sebagai parameter untuk menilai kualitas suplai susu dari calon *supplier*. Sedangkan *quantity* digunakan untuk menilai kuantitas suplai susu, *on-time delivery* digunakan untuk menilai ketepatan waktu suplai yang dilakukan, dan *warranty* digunakan untuk menilai garansi atas kualitas suplai. Parameter *capacity* digunakan sebagai analisa kemampuan *supplier* mensuplai susu ke pabrik, serta parameter *pricing* sebagai dasar pemilihan berdasarkan harga yang kompetitif.

Pada bagian ini Bapak/Ibu/Sdr/i diminta untuk memberikan penilaian apakah setiap kriteria yang ada merupakan kriteria yang penting dalam memilih dan menganalisa kinerja *supplier*. Penilaian tersebut menggunakan 4 skala, yaitu:

No	Skor / Angka	Interpretasi
1.	0%-25%	Sangat tidak penting (STP)
2.	26%-50%	Tidak penting (TP)
3.	51%-75%	Penting (P)
4.	76%-100%	Sangat penting (SP)

A. Pemilihan Supplier (Supplier Selection)

Kode	Indikator	1	2	3	4
		STP	TP	P	SP
Quality					
Q11	Fleksibilitas <i>supplier</i> memenuhi perubahan baku mutu pesanan dari perusahaan.				
Q12	Kemampuan <i>supplier</i> menjaga kualitas <i>raw material</i> pendukung pembuatan susu yang disuplai ke perusahaan, berdasarkan data historis.				
Q13	Adanya tindakan <i>preventif</i> apabila terjadi permasalahan terkait kualitas antara <i>supplier</i> dengan perusahaan.				
Q14	Adanya peningkatan kualitas <i>raw material</i> pendukung pembuatan susu secara berkala yang dilakukan oleh <i>supplier</i> berdasarkan permintaan perusahaan.				
Q15	<i>Supplier</i> memiliki sertifikasi kualitas proses dan produk dari auditor.				
Quantity					
Qt1	Jumlah <i>raw material</i> pendukung pembuatan susu yang disuplai sesuai dengan permintaan dari perusahaan.				
Delivery					
D1	Ketepatan waktu pengiriman dari <i>supplier</i> sesuai perjanjian dengan perusahaan				
D2	Fleksibilitas waktu pengiriman yang dapat dipenuhi oleh <i>supplier</i> .				

Kode	Indikator	1	2	3	4
		STP	TP	P	SP
Warranty					
W1	<i>Supplier</i> memiliki mekanisme pengembalian apabila suplai kualitas <i>raw material</i> pendukung pembuatan susu tidak sesuai dengan yang dijanjikan.				
W2	<i>Supplier</i> memiliki jaminan kualitas atas suplai <i>raw material</i> pendukung pembuatan susu yang sampai di perusahaan.				
Pricing					
P1	<i>Supplier</i> memberikan harga <i>raw material</i> pendukung pembuatan susu (per satuan volume) yang terjangkau oleh perusahaan.				
P2	<i>Supplier</i> menghitung biaya transportasi pengiriman <i>raw material</i> pendukung pembuatan susu yang proporsional.				
P3	<i>Supplier</i> memberikan potongan harga dengan persyaratan tertentu.				
P4	<i>Supplier</i> memberikan harga <i>raw material</i> pendukung pembuatan susu yang kompetitif dibandingkan <i>supplier</i> lain.				
P5	<i>Supplier</i> memberikan harga <i>raw material</i> pendukung pembuatan susu yang sesuai dengan kemampuan beli pasar.				



A. Penilaian Supplier (Supplier Performance Evaluation)

Kode	Indikator	1	2	3	4
		STP	TP	P	SP
Quality					
Q11	<i>Supplier</i> mampu memenuhi perubahan bahan baku mutu pesanan dari perusahaan.				
Q12	<i>Supplier</i> mampu menjaga kualitas <i>raw material</i> pendukung pembuatan susu yang disuplai ke perusahaan.				
Q13	<i>Supplier</i> tanggap dalam tindakan <i>preventif</i> apabila terjadi permasalahan terkait kualitas antara <i>supplier</i> dengan perusahaan.				
Q14	<i>Supplier</i> mampu memenuhi peningkatan kualitas <i>raw material</i> pendukung pembuatan susu secara berkala jika ada permintaan dari perusahaan.				
Q15	<i>Supplier</i> memenuhi dan menjaga syarat sertifikasi kualitas proses dan produk dari auditor.				
Quantity					
Qt1	<i>Supplier</i> mampu memenuhi jumlah <i>raw material</i> pendukung pembuatan susu yang disuplai sesuai dengan permintaan dari perusahaan.				

Kode	Indikator	1	2	3	4
		STP	TP	P	SP
Delivery					
D1	<i>Supplier</i> mengirim produk <i>raw material</i> pendukung pembuatan susu tepat waktu dan sesuai dengan perjanjian dari perusahaan.				
D2	<i>Supplier</i> memenuhi fleksibilitas waktu pengiriman sesuai permintaan perusahaan.				
Warranty					
W1	<i>Supplier</i> memenuhi perjanjian untuk pengembalian apabila suplai kualitas <i>raw material</i> pendukung pembuatan susu tidak sesuai dengan yang dijanjikan.				
W2	<i>Supplier</i> memenuhi jaminan kualitas atas suplai <i>raw material</i> pendukung pembuatan susu yang sampai di perusahaan.				

## **Appendix B – Pairwise for Supplier Selection**

### **KUESIONER TUGAS AKHIR**

Yth. Bapak/Ibu/Sdr/i

Di tempat.

Perkenalkan saya Putri Candra Anggani, mahasiswa semester 7 Jurusan Manajemen Bisnis ITS. Saat ini saya sedang melakukan penelitian dengan judul “*Supplier Selection and Supplier Performance Evaluation at PT Indolacto*”. Penelitian ini bertujuan untuk mengembangkan kerangka pemilihan *supplier* dengan menggunakan metode AHP. Di samping itu, dalam penelitian ini juga dikembangkan form pemilihan dan penilaian kinerja *supplier*. Saya memohon kesediaan Bapak/Ibu/Sdr/i untuk mengisi kuesioner ini dengan menjawab seluruh pertanyaan sesuai dengan kondisi yang dihadapi di perusahaan anda. Identitas dan isian kuesioner ini murni digunakan untuk kepentingan akademik, dan terjaga kerahasiaannya. Atas kesediaan Bapak/Ibu/Sdr/i, saya ucapkan terima kasih.

**Tanggal Pengisian :**

**PROFIL RESPONDEN**

**B. Jabatan :**

**C. Lama Bekerja :**

< 1 tahun

1-5 tahun

6-10 tahun

> 10 tahun

**D. Pendidikan Terakhir :**

SMA / sederajat

S1

S2

Lainnya

**PETUNJUK PENGISIAN :**

Bagian ini berfungsi untuk mengidentifikasi tingkat kepentingan dari kriteria utama yang sudah ditentukan berdasarkan interview pada tahap sebelumnya. Berdasarkan interview tersebut, terdapat enam **kriteria inti dan kriteria pendukung**, yaitu *quality, quantity, on-time delivery, warranty, dan pricing*. Masing-masing kriteria akan dibandingkan sesuai dengan skala 1 hingga 9. Penilaian kriteria ini untuk *raw material* pendukung pembuatan susu.

Pada bagian ini Bapak/Ibu/Sdr/i diminta untuk memberikan penilaian dengan skala 1 hingga 9 di setiap kriteria untuk kriteria inti pemilihan supplier. Penilaian tersebut adalah sebagai berikut:

Intensitas kepentingan skala	Definisi	Penjelasan
1	Sama pentingnya	Kedua aktifitas menyumbangkan kepentingan yang sama pada tujuan
3	Agak lebih penting yang satu atas lainnya	Pengalaman dan keputusan menunjukkan kesukaan atas satu aktifitas lebih dari yang lain
5	Cukup penting	
7	Sangat penting	
9	Kepentingan yang ekstrim	Bukti menyukai satu aktifitas atas yang lain sangat kuat
2,4,6,8	Nilai tengah diantara dua nilai keputusan yang berdekatan	Bila kompromi dibutuhkan

A. Main Criteria

a/b	Quality	Quantity	Delivery	Warranty	Pricing
Quality	1				
Quantity		1			
Delivery			1		
Warranty				1	
Pricing					1

B. Pair wise comparison untuk kriteria pendukung *Quality*

a/b	Supplier flexibility	Supplier quality	Preventive action	Continous quality improvement	Supplier certification
Supplier flexibility	1				
Supplier quality		1			
Preventive action			1		
Continous quality improvement				1	
Supplier certification					1

C. Pair wise comparison untuk kriteria pendukung *Delivery*

a/b	On time delivery	Flexibility of supplier delivery
On time delivery	1	
Flexibility of supplier delivery		1

D. Pair wise comparison untuk kriteria pendukung *Warranty*

a/b	Supplier response for under quality product	Supplier delivery warranty
Supplier response for under quality product	1	
Supplier delivery warranty		1

E. Pair wise comparison untuk kriteria pendukung *Pricing*

a/b	Appropriatness of the materials price to the market price	Competitiveness of cost	Discount price	Transportation cost on delivery by supplier
Appropriatness of the materials price to the market price	1			
Competitiveness of cost		1		
Discount price			1	
Transportation cost on delivery by supplier				1

## Appendix C - Pairwise for Supplier Performance Evaluation

Tanggal Pengisian :

### PROFIL RESPONDEN

E. Jabatan :

F. Lama Bekerja :

- < 1 tahun
  6-10 tahun  
 1-5 tahun
  > 10 tahun

G. Pendidikan Terakhir :

- SMA / sederajat
  S2  
 S1
  Lainnya

### PETUNJUK PENGISIAN :

Bagian ini berfungsi untuk mengidentifikasi tingkat kepentingan dari kriteria utama yang sudah ditentukan berdasarkan interview pada tahap sebelumnya. Berdasarkan interview tersebut, terdapat enam **kriteria inti dan kriteria pendukung**, yaitu *quality, quantity, on-time delivery*, dan *warranty*. Masing-masing kriteria akan dibandingkan sesuai dengan skala 1 hingga 9. Penilaian kriteria ini untuk *raw material* pendukung pembuatan susu.

Pada bagian ini Bapak/Ibu/Sdr/i diminta untuk memberikan penilaian dengan skala 1 hingga 9 di setiap kriteria untuk kriteria inti pemilihan supplier. Penilaian tersebut adalah sebagai berikut:

Intensitas kepentingan skala	Definisi	Penjelasan
1	Sama pentingnya	Kedua aktifitas menyumbangkan kepentingan yang sama pada tujuan
3	Agak lebih penting yang satu atas lainnya	Pengalaman dan keputusan menunjukkan kesukaan atas satu aktifitas lebih dari yang lain
5	Cukup penting	
7	Sangat penting	
9	Kepentingan yang ekstrim	Bukti menyukai satu aktifitas atas yang lain sangat kuat
2,4,6,8	Nilai tengah diantara dua nilai keputusan yang berdekatan	Bila kompromi dibutuhkan

A. Main Criteria pair wise comparison

a/b	Quality	Quantity	Delivery	Warranty
Quality	1			
Quantity		1		
Delivery			1	
Warranty				1

B. Pair wise comparison untuk kriteria pendukung *Quality*

a/b	Supplier flexibility	Supplier quality	Preventive action	Continous quality improvement	Supplier certification
Supplier flexibility	1				
Supplier quality		1			
Preventive action			1		
Continous quality improvement				1	
Supplier certification					1

C. Pair wise comparison untuk kriteria pendukung *Delivery*

a/b	On time delivery	Flexibility of supplier delivery
On time delivery	1	
Flexibility of supplier delivery		1



D. Pair wise comparison untuk kriteria pendukung *Warranty*

a/b	Supplier response for under quality product	Supplier delivery warranty
Supplier response for under quality product	1	
Supplier delivery warranty		1

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## **Appendix B**

### **1. Interview with PPIC Manager**

For raw material, there five criteria that will be considered. First, quality. Second, delivery. The delivery itself related to buffer stock and can be tolerate. Third is the capacity of supplier, it will be related to urgency of material needed, etc. Forth is service that have connection with added value in after sales services. The last is warranty for standardization. It needs quick analysis and CoA also.

### **2. Interview with Procurement Supervisor**

There are seven criteria that will be needed. First is price. For procurement, price is sensitive area and the most important ones. Second, quantity. Third is delivery which have urgent correlation with PPIC department. Forth is quality because it needs specification of sample. Also there are R&D standard for our quality. Fifth is warehouse. Sixth is performance which included delivery, quantity and quality. Seventh, warranty as durability of its product. Performance evaluation will be in timing area, quality and capacity with 10% tollerance.

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### **Author**



**Putri Candra Anggani**, was born in Malang, 27th June 1995. Author had formal education at TK Sabilillah Malang, SDN Lowokwaru II Malang, SMPN 3 Malang, SMAN 1 Malang and went through to Institut Teknologi Sepuluh Nopember – Business Management.

Knowledge that author got from university were active in AIESEC for one term, joining summer camp in National University of Singapore at 2015 for entrepreneurial and sociopreneur program, and becoming the 3rd winner of business case national competition at PPM Management School Jakarta. While in this department, author taken operational management. Thanks to God for His Blessings that enables the author to finish this final report with title “Supplier Selection and Supplier Performance Evaluation at PT. Indolakto” in time.

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