**UNIVERSITY OF INDONESIA**

# SUPPLIER SELECTION STRATEGY INDIRECT MATERIAL – PROCUREMENT DEPARTMENT (CASE STUDY: PT MERCK TBK)

## THESIS

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**MM-MBA**
**JAKARTA**
**JULY 2012**

**UNIVERSITY OF INDONESIA**

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## THESIS

**Submitted to fulfill one of the requirements to obtain degree of Magister Management**

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**STATEMENT OF ORIGINALITY**

This final paper represents my own effort,

any idea or excerpt from other writers in this final paper, either in form of publication or in other form of publication, if any, have been acknowledged in this paper in accordance to academic standard or reference procedures.

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## LETTER OF APPROVAL

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Has successfully presented the thesis in front of Board of Examiner and is already approved as one of the requirements to achieve the title Magister Management (MM) and Master of Business International (MBI) in Magister Management Study Program Faculty of Economy, University of Indonesia.

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**Date** **:** June 22, 2012

## PREFACE

Praise to God Almighty because of His grace, who has given an extraordinary opportunity in studying Master Degree at University of Indonesia and also for the continuations and tremendous faith to survive until the completion of this period of study.

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Muchammad, Rangga, Aan, Yodi and wonderful couple Ario & Seno. Hope this friendship lasts forever.

g. All of you that can't be mentioned one by one.

I realize, this writing is far from perfect, but very grateful if it still can be useful to read.

Jakarta, June 22, 2012

Elly Wintania

**LETTER OF AGREEMENT TO PUBLISH THE THESIS FOR ACADEMIC PURPOSE ONLY**
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On behalf of science development, I have fully agreed to give the **Non-exclusive Royalty-Free** of the thesis to the University of Indonesia which titled:

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(Elly Wintania)

# ABSTRACT


Name : Elly Wintania
Study Program : Magister of Management – Master of Business International
Title :Supplier Selection Strategy Indirect Material– Procurement Department (Case Study: PT Merck Tbk)



Supplier Selection is one key activity in Procurement. Supplier which found by appropriate selection will deliver their product and services as requirement. It is time consuming for do the selection but it is worth to have the result. Moreover it is help to have a good reason when choose a supplier for Indirect Procurement which has complexity and various requests.

Many methods can be used for Supplier Selection, as recommendation from many study, this thesis use Analytic Hierarchy Process Method. AHP is a method which help decision maker to choose the best option with considering multi-attribute criteria. Due to AHP is a subjective method, this thesis also use Weighted Points Method for comparison and minimize the subjectivity.



Key Words:
Supplier Selection, Procurement, Indirect Procurement, Supply Chain, AHP

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# CHAPTER 1

# INTRODUCTION

## 1.1 Background

Indonesia pharmaceutical market will increase in 2012 by 14%-15% or IDR 43,3 trillions – IDR 43,7 trillions compare to 2011 base on Gabungan Perusahaan Farmasi Indonesia. The increase was driven by growth in drugs consumption and people's purchasing power. Indonesia is country with a big size population, have a lot of potential customer in the future. Pharmaceutical Market said it will be the sixth largest pharmaceutical market in the Asia Pacific region by 2016. In Figure 1-1 illustrate growth of Indonesian Pharmaceuticals Industry in 5 years.

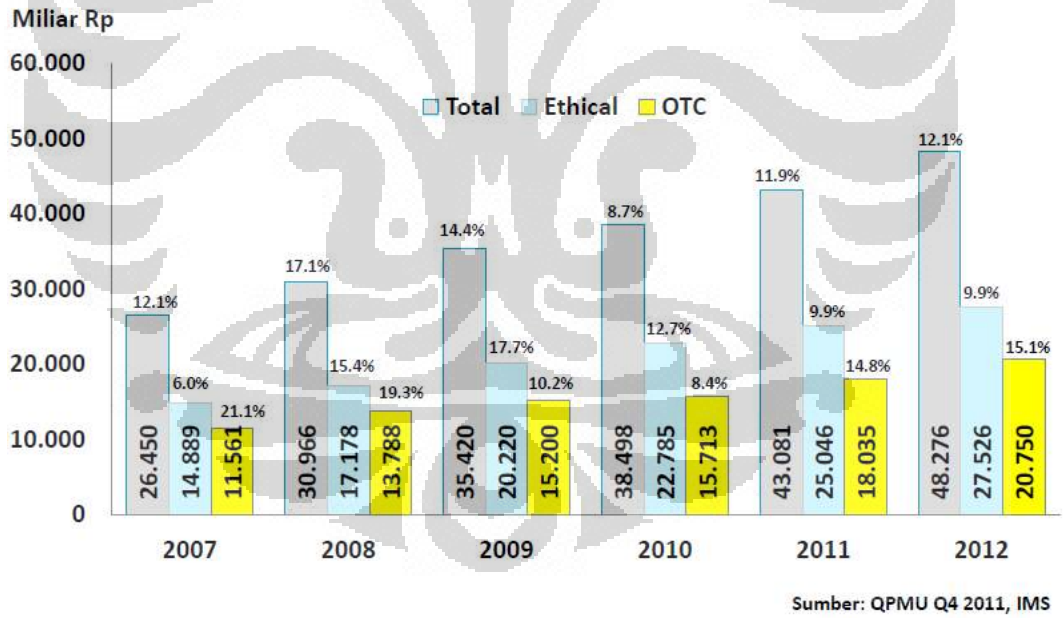


**Figure 1-1 Indonesian Pharmaceuticals Industry**

**Source: Darya-Varia Laboratoria Tbk, Public Expose, 2012, www.idx.co.id**

In 2011, Merck Serono's (Merck's pharmaceutical ethical drugs business) total revenue from sales amounted to IDR 419 billion. This represents an increase of 28 % over the figure of IDR 327 billion recorded in 2010. At 28%, the rate of increase in revenues recorded by Merck Serono in 2011 has significantly outpaced

the growth in the size of the market for ethical products over the same year, with this growth rate reaching only around 10%.

Beside Merck Serono, in area pharmaceutical PT Merck Tbk also produces and markets Over The Counter (OTC) products through Consumer Health Care Division. And in chemicals industries, PT Merck Tbk is a major operator which produces and markets specialty chemicals such as reagents and instruments for laboratory usage and pigments for use in the production of plastics, coatings, and cosmetics, amongst other purposes.

Achievement in 2011 has been done successfully and should be improved in 2012 with hard work and good strategy. From Merck's Executive Board letter on February 24, 2012, in the first two years, Merck plans to set up a new leadership organization, implement efficiency measures and develop a long-term growth strategy. In the second phase, the focus will be on exploiting new growth opportunities ahead.

To compete in the market, Merck needs to address unprecedented market shifts, increasing competition in key product areas and existing inefficiencies in its own organization to ensure the long-term success of its business model. In order to deliver recurring cost reductions and free up resources for investment in promising growth areas, Merck should implement their planned efficiency program. That is a direction for Karl-Ludwig Kley, Chairman of the Merck Executive Board.

Board's policies must be supported by all department, also Procurement, especially for cost reductions. Corporate Procurement mandate has not been changed but sharpened to ensure governance can be performed as needed and result can be achieved jointly with the business. We do this with the aim to improve the competitive advantage of the Merck Group within its respective industries. Two important aspect in this mandate are :

- Procurement has the final say with regard to the supplier selection
- Burden of proof with regard to specifications, volume and compliance is reversed.

Indirect Procurement has many variation of request and they are not demonstrated a huge spends number in every item, but it will be meaningful when

it cumulated. Cost reduction strategy should be defined and one of them which is quite important is supplier selection.

Supplier Selection is one of significant procurement activity to make sure we choose a qualified supplier to fulfil all request. Company usually use price for the basic consideration in supplier selection, but lowest prices is not always give best result. Price is become the main reason because of cost consideration or budget limitation. Company should have a selection method to find a best result. The criteria not only about price but include non price consideration. At the end, with the good method, company will find suppliers which deliver satisfying goods or services with a reduction in cost. This is a responsibility for Procurement.

## 1.2 Problem Identification

Procurement PT Merck Tbk especially Indirect doesn't have a consistent guideline to select a supplier. The supplier is selected with some consideration but not a single method is used to support the decision. There are some methods for supplier selection. An appropriate method should be chosen for begin the strategy.

Strategy is created by explore the procurement business process in Indirect Procurement itself and explore the alternatives methods that might be applied. From this exploration, strength and weakness of the process will be founded and will give some areas for improvement.

## 1.3 Objective of the Study

The Objectives:

- Identify current process of Supplier Selection in Indirect Procurement.
- Identify method for Supplier Selection
- Provide recommendation for PT Merck Tbk, especially Indirect Procurement

## 1.4 Scope and Limitations

Specifically, the scope of this paper is supplier selection. This paper will focus on Indirect Procurement in PT Merck Tbk.

## 1.5 Research Methodology

The methodology:

- Collecting data from the company, as the main sources.
- Discussion with Procurement Manager, discussion with related colleagues, and base on own experience as Procurement staff.
- Collecting data from various sources: textbook, articles, journal, internet, etc.

## 1.6 Writing Systematic

Chapter 1: Introduction

This chapter will explain why the topic is chosen. It contains background, problem identification, objective, and outline.

Chapter 2: Theoretical Background

Chapter 2 contains Literature Review about Supply Chain, Procurement and Supplier Selection. The theory will be use as a reference.

Chapter 3: Company Background & Organization

This chapter will describe about PT Merck Tbk. History, Vision and Mission, Business Strategy and Organization Chart. Continue with description about Procurement, include Procurement Categories.

Chapter 4: Analysis and Discussion

This chapter will discuss about Supplier Selection Strategy base on theory compare with the implementation in daily operation. Try to find a new strategy to implement in PT Merck Tbk.

Chapter 5: Conclusion and Recommendation

In this chapter, the writer will make a conclusion and recommendation, what action should be taken or strategy to be implemented. The writer hopes will find improvements in Procurement compare to current activity which have good impact to PT Merck Tbk as a company.

# CHAPTER 2

# THEORETICAL FRAMEWORK

## 2.1 Supply Chain

Supply Chain is a series of activity that transform raw material to finish good, starting from the supplier until end customer. It is not talking about production process, but the system that organize activities of people, technologies, resources and information.

Sunil Chopra in his book write a supply chain definition is a sequence of processes and flow that take place within and between different stages and combine to fill a customer need for a product. Maximize the overall value generated is the objective of supply chain. The values are defined from the difference between the revenue g enerated from the customer and the overall cost across the supply chain.

Example flow of Supply Chain:

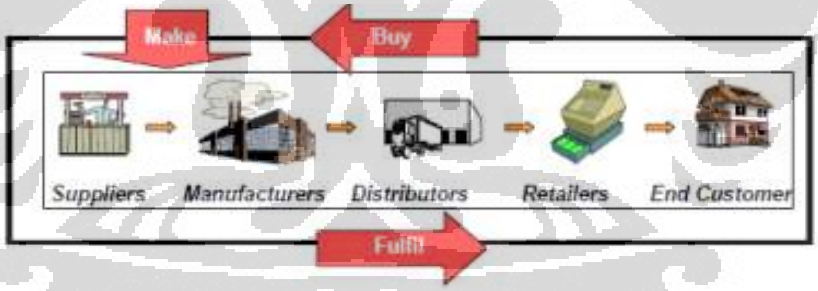


**Figure 2-1 Supply Chain**

**Source:Accenture, Supply Chain Management encompasses a number of key activities., 2005**

### 2.1.1 Uncertainty in Supply Chain

One big challenge in Supply Chain is uncertainty. There are 4 forms of uncertainty base on Geary S., Childerhouse P., Towill D. in their review, i.e. process, supply, demand and control.

Process uncertainty is result from internal ability to meet a production delivery target. The amount of process uncertainty can be established by understanding each work process's yield ratios and lead time estimates for

operations. Supplier uncertainty connects to supplier performance, how they fulfill the company's requirements. It can be specification, lead times, quality or others.

Demand uncertainty is the difference between the actual end-marketplace demand and the orders placed with an organization by its customers. Demand uncertainty can also be quantified by measuring how well companies meet customer demand. And the last is control uncertainty, which is associated with information flow and the way an organization transforms customer orders into production targets and supplier raw material requests.

Every uncertainty has impact to performance, but instead of looking for who should responsible to the uncertainty, company must manage the uncertainty by understand the relationship between supply chain performance and uncertainty. It discussed about reacting to uncertainty to managing the consequences of the unknown.

Prof. Hau Lee, Director of the Stanford Global Supply Chain Management Forum, also discussed about this uncertainty.

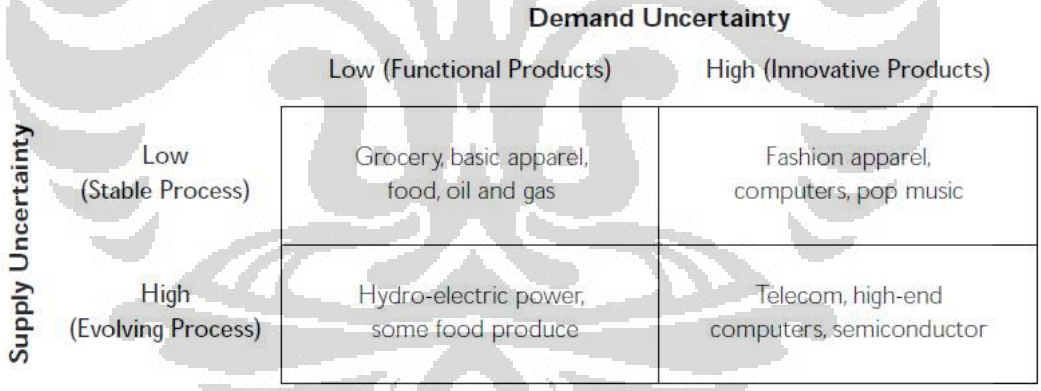


**Figure 2-2 Uncertainty Framework: Example**

**Source: Lee H.L.,2002**

Goal of all the strategies is how to reduce the uncertainty. Supply chain is not just fast and cost effective according, but also should:

- **Agile**: Respond quickly to sudden changes in supply or demand. It refers how to minimizing disruption from unforeseen events, for example natural disasters, terrorism, etc. Lee recommends using techniques such as late-stage

postponement, buffer inventories and sharing of demand signals to enable higher levels of agility.

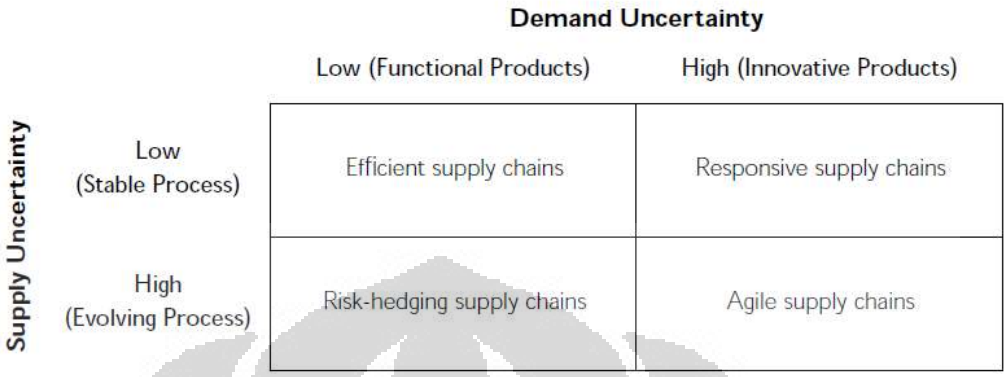


**Figure 2-3 Matched Strategies**

**Source: Lee H.L.,2002**

- **Adaptable**: Evolve over time as economic progress, political shifts, demographic trends, and the technological advances reshape market. It refers to the ability to identify and plan for major structural changes in markets. Political, regulatory, economic, social and technological forces can dramatically transform markets in relatively short time periods. Lee recommends on-going country-level economic analysis; flexible product design models and needs analysis for ultimate consumers (rather than just immediate customers).
- **Aligned**: Align the interest of all participating firms in the supply chain and Original Equipment Manufacturer (OEMs) to distributors and retailers. Lee recommends that all parties have equal access to demand planning data and that economic incentives align to maximize overall supply chain performance. Instead of company-to-company competition we have now entered an era of supply-chain to supply-chain competition.

Later Lee add one additional A for the Triple A with

- **Architecting the right supply chain:** Different supply chain for different requirements, but built on a common "platform" so that the cost and complexity is not too high.

Only supply chains with that all 'A' will provide companies with sustainable competitive advantage. Fast in sensing what is happening to the supply chains, and fast in creating and executing the right response is the key of company success. Both integration with suppliers and the long-term view of how to build a supply chain that can maintain continuous improvement and consistency.

## 2.2 Procurement

The key activities in Supply Chain are Purchasing, Producing, Distributing, Storing and Selling. For successful flow in supply chain it will need coordination role like sales forecasting, production planning, supplier management, and logistics management. It involves internal and external parties.

Sales forecasting create a planning for inventory of finished goods. Quality planning is a must to create a demand. Detail of the planning will be a scheduling for procurement. It is more complex in manufacturing step due to the target maximization in capacity of materials, machine, people and equipment. After that logistics will take part in delivery to end customer as requested and in optimum ways.

As mention above, procurement have a role in supplier management, activity that make sure supplier will fulfill our request properly. Major Elements of Purchasing describe in Figure 2-4.

Procurement has 2 major categories: Direct & Indirect. If Direct purchase raw material and packaging which are related directly to production of finished goods, Indirect Procurement purchase products or services that does not direct related. For example: office supplies, promotion materials, laboratory equipment, etc.

Indirect items tend to be low value items that need in day to day work activity and in a big range of variety products and services. It can be found easily from many suppliers in any volume. Easily describe and no need special expertise to get it.

But indirect items can also very special or unique products or services, for example a creative display for products. Sometime also critical because this item very important in production activity, for example spare part of production

machinery. And can be complex like a project to build a new office or can be very high expenditure like buy a machine for production.

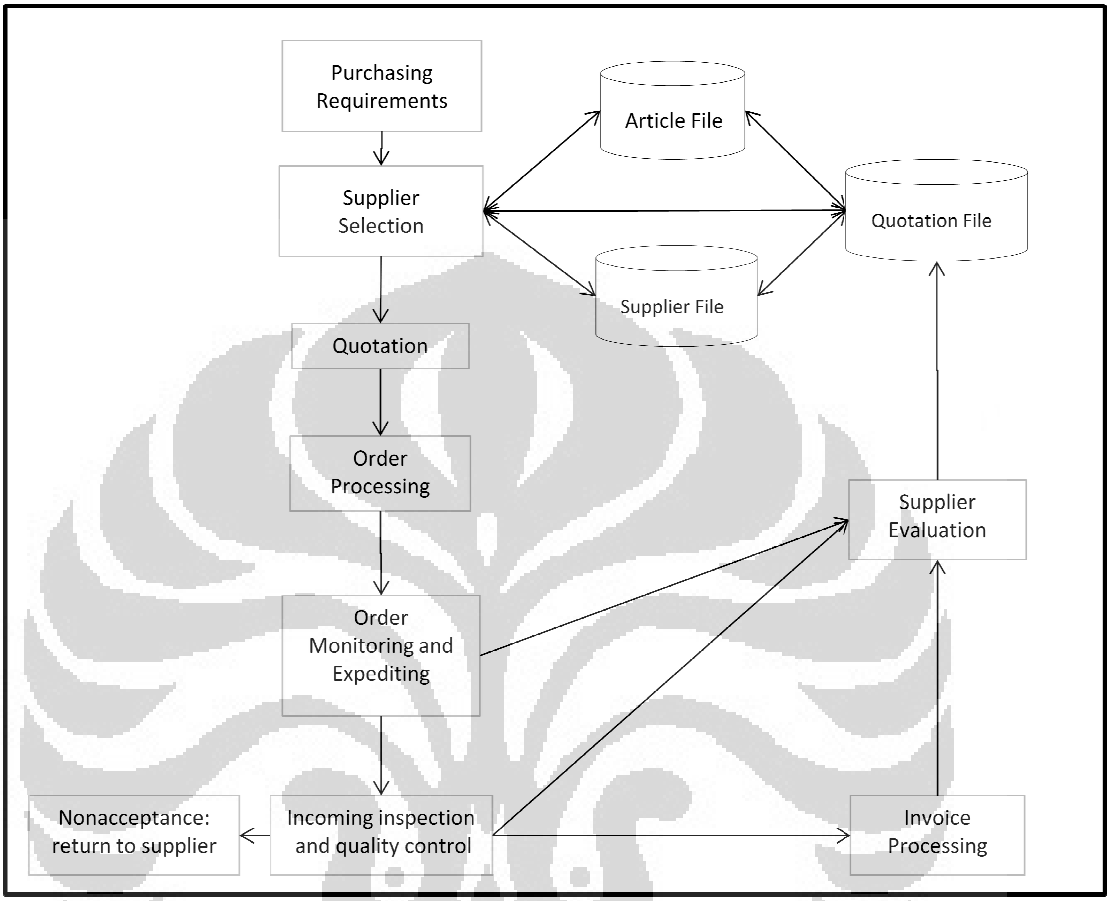


**Figure 2-4 Major Elements of Purchasing**

**Source: Arjan J. van Weele., 2010**

Anne Millen Porter in her article wrote, critical activities in practice of controlling indirect buys are:

- Establish objectives for indirect buying initiatives, how much the corporate spending and the target expectation.
- Populating and training teams, ready to implement and comply to purchasing policy procedure.
- Establishing initiative management processes, all in well written plan.
- Creating a budget reduction process
- Development of processes for new supplier introduction and development
- Measuring result and tracking compliance

Due to the complexity procurement should have a good relationship with the supplier or should have a relationship with good suppliers. We need to do supplier selection.

## 2.3 Supplier Selection

Supplier Selection by Damian Beil is the process, by which the buyer identifies, evaluates and contracts with suppliers.

### 2.3.1 Identifying Potential Supplier

Two things related to potential supplier are find a new supplier and develop existing ones. Identifying and qualifying potential suppliers are times consuming and costly. With new supplier, will push competition among suppliers, find others opportunity, reduce risk because company will have alternative for supply.

Aspect that involves in supplier screening:

- **Reference**: check with previous customer
- **Financial status**: prevent deal with supplier with significant debt
- **Surge capacity availability**: supplier's capacity to increase delivery quantities within short lead time
- **Indication of supplier quality**: look deeply into supplier organization to ensure supplier is capable and competent to meet the buyer's specifications.
- **Ability to meet specification**: check supplier capabilities by audit, visit the supplier's production facility or request sample
- **Buy in from internal customer**: ensure that internal customer has confidence with suppliers

### 2.3.2 Information Request to Supplier

Three type information from supplier:

- Request for Information (RFI): basic information about supplier like what products and services that supplier could provide.

- Request for Proposal (RFP): when buyer find that supplier can fulfill their request, they will ask for more information with detail specification, condition, drawing, etc.
- Request for Quotation (RFQ): as follow up of the RFP, when supplier can match the qualification needed, suppliers complete the statement with detail negotiation for example lowest price that supplier can offer to buyer.

### 2.3.3 Supplier Selection Method

A number of methodologies that have been used in supplier selection describe in Figure 2-5. Supplier selection process represents a complex problem and thus a multi-attribute decision making (MADM) problem. MADM such as the analytic hierarchy process (AHP) model is an important technique that has been used successfully in supplier selection and evaluation.

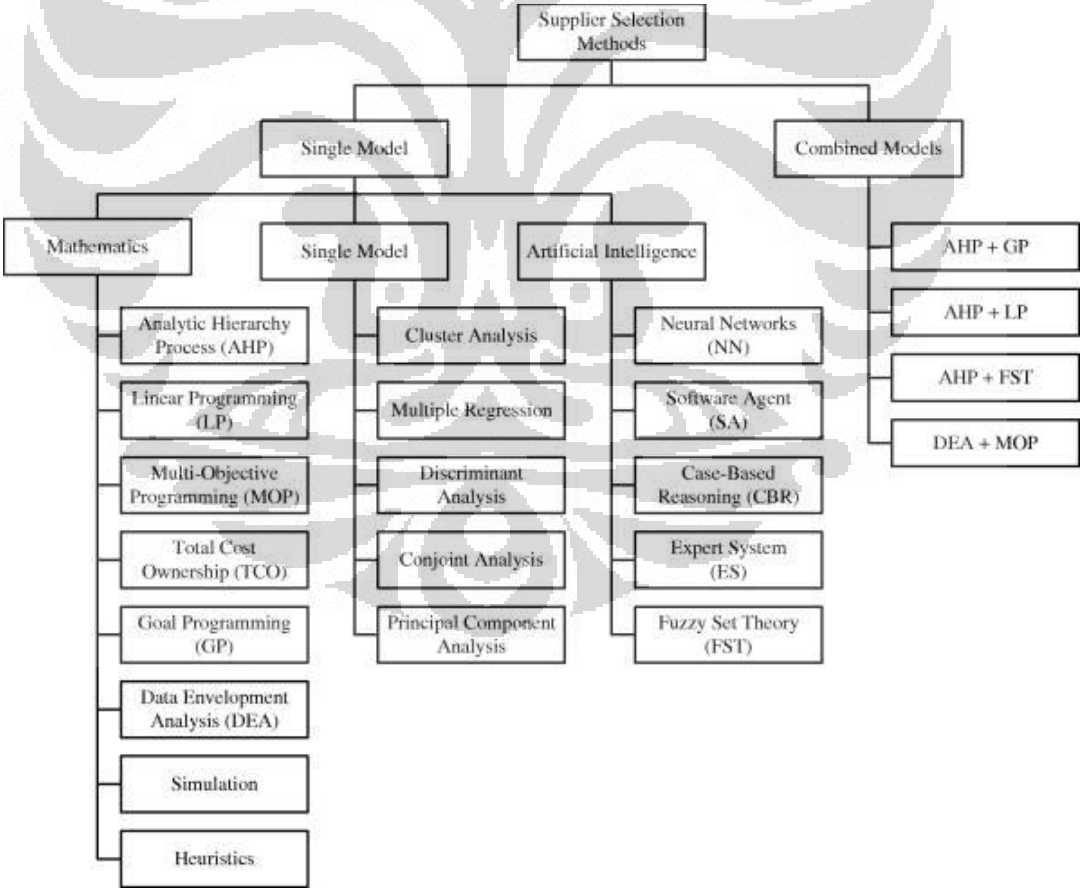


**Figure 2-5 Supplier Selection Methods**

**Source: De Boer et al., 2001**

Following are some method in supplier selection evaluation base on some literature:

#### 2.3.3.1 *Data Envelopment Analysis (DEA)*

From the literature, Data Envelopment Analysis (DEA) is used to evaluate the efficiency of a number of producers. A typical statistical approach is characterized as a central tendency approach and it evaluates producers relative to an average producer In contrast, DEA compares each producer with only the one producers. A producer is usually referred to as a decision making unit or DMU.

In DEA, there are a number of producers. The production process for each producer is to take a set of inputs and produce a set of outputs. Each producer has a varying level of inputs and gives a varying level of outputs. For instance, consider a set of banks. Each bank has a certain number of tellers, a certain square footage of space, and a certain number of managers (the inputs). There are a number of measures of the output of a bank, including number of checks cashed, number of loan applications processed, and so on (the outputs). DEA attempts to determine which of the banks are most efficient and to point out specific in efficiencies of the other banks.

A fundamental assumption behind this method is that if a given producer, A, is capable of producing Y(A) units of output with X(A) inputs, then other producers should also be able to do the same if they were to operate efficiently. Similarly, if producer B is capable of producing Y(B) units of output with X(B) inputs, then other producers should also be capable of the same production schedule. Producers A, B, and others can then be combined to form a composite producer with composite inputs and composite outputs. Since this composite producer does not necessarily exist, it is typically called a virtual producer.

The heart of the analysis lies in finding the best virtual producer for each real producer. If the virtual producer is better than the original producer by either making more output with the same input or making the same output with less input then the original producer is inefficient. The subtleties of DEA are

introduced in the various ways that producers A and B can be scaled up or down and combined.

DEA can be a powerful tool when used wisely. A few of the characteristics that make it powerful are:

- DEA can handle multiple input and multiple output models.
- It doesn't require an assumption of a functional form relating inputs to outputs.
- DMUs are directly compared against a peer or combination of peers.
- Inputs and outputs can have very different units.

The same characteristics that make DEA a powerful tool can also create problems. An analyst should keep these limitations in mind when choosing whether or not to use DEA:

- Since DEA is an extreme point technique, noise (even symmetrical noise with zero mean) such as measurement error can cause significant problems.
- DEA is good at estimating relative efficiency of a DMU but it converges very slowly to absolute efficiency. In other words, it can tell you how well you are doing compared to your peers but not compared to a theoretical maximum.
- Since DEA is a nonparametric technique, statistical hypothesis tests are difficult and are the focus of ongoing research.
- Since a standard formulation of DEA creates a separate linear program for each DMU, large problems can be computationally intensive.

#### 2.3.3.2 *Total Cost Model*

Another method is total cost approach. This type of model includes the cost ratio method and the total cost of ownership (TCO) method. The cost ratio method (Tahiri et al. 2007) is based on cost analysis that considers cost ratios for product quality, delivery, customer service, and price. This method measures the

cost of each criterion as a percentage of total purchase for the supplier. The higher rating applied to the supplier comes from the lower ratio of costs to value. The numbers of costs in the evaluation depend on the products engaged.

Advantage of the cost ratio method, it reveals the actual total cost of doing business and utilizes quantitative evaluation criteria. The most significant advantage of quality cost is to translate quality problems into the language of top management, who are normally concerned with financial performance. Because of the flexibility of this approach, any company in any market can adopt it. This approach's advantages are saving the costs and allowing various purchasing policies to be compared with one another. It improves the purchaser's understanding of supplier performance issue and cost structure and provides excellent data for negotiation and improvement (Garfamy 2006).

The disadvantage of the cost ratio method is its complexity and requirement for a developed cost accounting system of the firm. This approach is expensive to implement due to its complexity and requires more time (Tahiri et al. 2007). Total cost of ownership (Tahiri et al. 2007) is a methodology and philosophy, which looks beyond the price of a purchase to include many other purchase-related costs. Furthermore, it is very difficult to estimate hidden costs thus this method is hard to use with first time supplier evaluation and selection. Finally, cost based supplier evaluation methods do not provide useful information for continuous improvement to suppliers.

#### 2.3.3.3 *Cluster Analysis*

Statistic method which uses a classification algorithm to group a number of items which are described by a set of numerical attributes scores into a number of clusters such that the differences between items within a cluster are minimal and the differences between items from different cluster are maximal.

Cluster analysis is a statistical procedure for grouping observations with shared characteristics. The goal of cluster analysis is to derive core profiles that (a) have minimum within-cluster variation and (b) are highly dissimilar and

demonstrate minimal overlap. A combination approach using a hierarchical clustering method followed by a nonhierarchical method is often advisable (McDermott 1998).

There is no single objective procedure to determine the "correct" number of clusters. Rather alternative cluster solutions were evaluated on the following considerations to select the ideal solution: First, statistical fit criteria, based on the rate of change in a total similarity measures as the number of clusters increases or decreases, are used to indicate the number of clusters. Second, all clusters should be significantly different across the set of clustering variables. This typically involves the use of the analysis of variance (ANOVA). Cluster solutions failing to show substantial variation indicate other cluster solutions should be examined.

Third, single-member or extremely small clusters are generally not acceptable and should be eliminated. Fourth, the cluster centroid should be assessed for correspondence with the researchers' and/or practitioners' prior expectations based on theory or practical experiences. Ultimately, cluster solutions should have theoretical validity assessed through external validation. This validation can be achieved by examining differences on variables not included in the cluster analysis but for which there is a theoretical and relevant reason to expect variation across the clusters.

#### 2.3.3.4 *Weighted Point Method*

The weighted point which consider attributes that are weighted by the buyer. The weight for each attribute is then multiplied by the performance score that is assigned. Finally, these products are totaled to determine final rating for each supplier. Typically this system is designed to utilize quantitative measurements.

The weight-point method is by far the most commonly used technique. It is popular due to its simplicity, flexible, effectiveness, and easy to implement. The mathematics underlying weighted-point method is simple but it is efficient in optimal decision making.

The advantages of the weighted point method include the ability for the organization to include numerous evaluation factors and assign them weights according to the organization's needs. The subjective factors on the evaluation are minimized. The major limitation of this approach is that it is difficult to effectively take qualitative evaluation criteria into consideration.

Base on Wilis and Huston (1990) explained this method in steps. First is to determine and list the criteria for supplier evaluation (which is like categorical method) and second is to assign weight or importance to each criterion. When evaluating suppliers, surveyors score subjectively on each criterion, and a supplier's final score is the sum of each criterion's score multiplying its given weight. The higher final score the supplier gets, the better the supplier is considered.

## 2.4 Analytic Hierarchy Process (AHP)

Analytic Hierarchy Process approach is a subjective methodology (Cheng and Li, 2001); information and the priority weights of elements may be obtained from a decision-maker of the company using direct questioning or a questionnaire method. It is generally agreed in the literature that the following makes the supplier selection decision making process difficult and/or complicated (de Boer, 1998, Murlidharan et.al. 2001).Supplier selection process represents a complex problem and thus a multi-attribute decision making (MADM) problem. MADM such as the analytic hierarchy process (AHP) model is an important technique that has been used successfully in supplier selection and evaluation.

AHP is a multi-attribute decision making process which enables decision makers set priorities and deliver the best decision when both quantitative and qualitative aspects of a decision must be considered. AHP encompasses three basic functions, including structuring complexity, measuring on a ration scale, and synthesizing. (Calantone et.al.,1998). AHP is a methodology that use in many fields, include Procurement.

Supplier selection process encompasses four parts, including problem definition; formulation of attributes; qualification of potential suppliers; and the

ultimate selection of best suppliers (De Boer et al. 2001). In supplier selection, we consider some criteria to choose the best one. AHP is use to solve multi attribute problems, both qualitative and quantitative. .

### 2.4.1 Principles of Analytic Thinking

Three principles by Saaty (2001) in solving problem by explicit logical analysis:

- **Structuring Hierarchies**: How to breaking down reality into homogeneous cluster and subdividing the cluster into smaller ones. It can integrate large amounts of information into the structure of problem and form a more complete picture of whole system.
- **Setting Priorities**: By compare pairs of similar things against certain criteria and synthesize the judgments through imagination to gain a better understanding of the whole system.
- **Logical Consistency**: Establish relationship among objects or ideas in such a way that they are coherent. Consistency means two things. The first is that similar ideas or objects are grouped according to homogeneity and relevance. The second is that the intensities of relationship among ideas or objects based on a particular criterion justify each other in some logical way.

### 2.4.2 AHP: A Flexible Model for Decision Making

The AHP incorporates judgments and personal values in a logical way. It depends on imagination, experience, and knowledge to structure the hierarchy of a problem and on logic, intuition, and experience to provide judgments. Once accepted and followed, the AHP show us how to connect elements one part of the problem with those of another to obtain the combine outcome. It is process for identifying, understanding, and assessing the interactions of a system as a whole.

To define a complex problem and to develop sound judgment and develop sound judgments, the AHP must be progressively repeated or iterated, overtime, one can hardly expect instant solutions to complicated problems with which one has wrestled for a long time. The AHP is flexible enough to allow revision – decision makers can both expand the elements of a problem hierarchy and change

their judgments. It also permits them to investigate the sensitivity of the outcome to whatever kinds of change may be anticipated.

### 2.4.3 Advantage using AHP

One advantage of AHP is that illustrates how possible changes in priority at upper levels have an effect on the priority of criteria at lower levels. Moreover, it provides the buyer with an overview of criteria, their function at the lower levels and goals as the higher levels. A further advantage of AHP is its stability and flexibility regarding changes within and addition to the hierarchy. In addition, the method is able to rank criteria according to the needs of the buyer which also leads to more precise decisions concerning supplier selection. The main advantage of AHP is that the buyer is able to get a good picture of the supplier's performance by using the hierarchy of the criteria and evaluating the suppliers. (Omkarprasad and Kumar,2006)

Kasperczyk N. and Knickel K. define strengths and weaknesses of the AHP. Strengths:

- Flexibility, define by the decision maker intuitively.
- Hierarchies of criteria, to clear the importance of each element.
- Subjective and objective evaluation measures.
- Group decision making through consensus
- AHP is uniquely positioned to help model situations of uncertainty and risk since it is capable of deriving scales where measures ordinarily do not exist (Millet & Wedley 2002).

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Weaknesses:

- Ranking irregularities can occur when the AHP or some of its variants are used.
- The AHP−method can be considered as a complete aggregation method of the additive type. Detailed, and often important, information can be lost by such aggregation.
- The number of pairwise comparisons to be made, may become very large (n(n−1)/2), and thus become a lengthy task (Macharis et al. 2004).

- Artificial limitation of the use of the 9–point scale. It is difficult to distinguish among them.

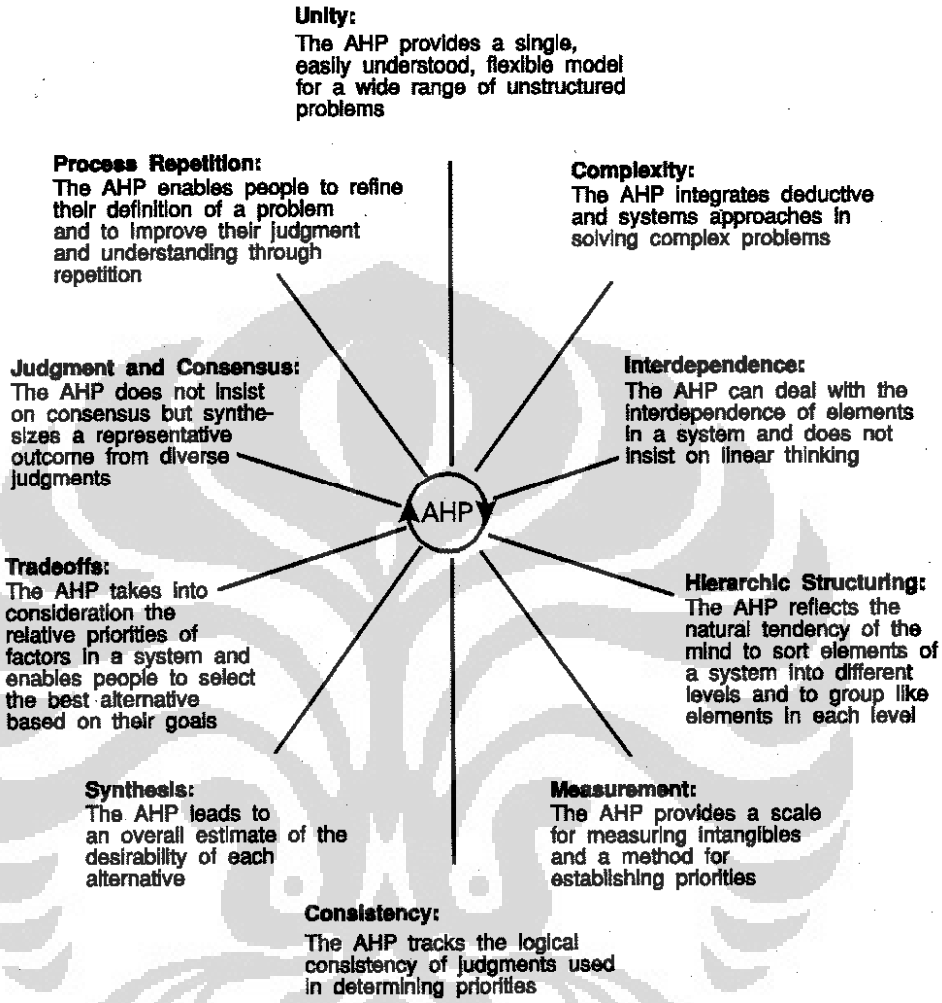



**Figure 2-6 Adavantages of The Analytic Hierarchy Process**

**Source: Saaty T., 2001.**

### 2.4.4 Criteria in AHP

Criteria definition by The Free Dictionary is a standard, rule, or test on which a judgment or decision can be based. A common criteria for supplier is quality, price, delivery and service. Narasimhan in his Journal said that the basic criteria typically utilized for this purpose are pricing structure, delivery (timelines and cost), product quality and service (personnel, facilities, research and development, capability, etc).

See example of criteria for Vendor Selection Process in Figure 2-7.

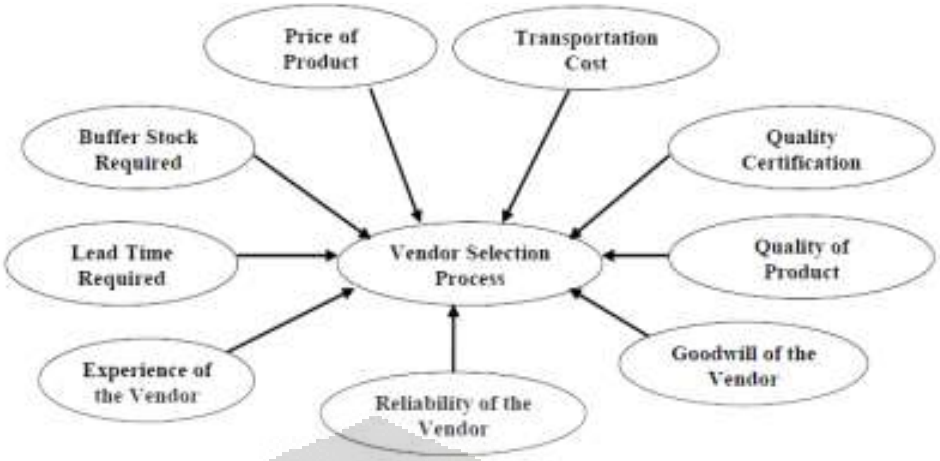



**Figure 2-7 Criteria for Vendor Selection Process**

**Source: Weber et al,1991 ;Bajaj et al, 2005**

And there is Dickson's supplier or vendor selection criteria. See Figure 2-8 Criteria for Vendor Selection Process.

| Rank | Criteria | Main rating | Evaluation |
|---|---|---|---|
| 1 | Quality | 3.508 | Extreme importance |
| 2 | Delivery | 3.147 | |
| 3 | Performance history | 2.998 | |
| 4 | Warranties and claim policies | 2.849 | |
| 5 | Production facilities and capacity | 2.775 | Considerable importance |
| 6 | Price | 2.758 | |
| 7 | Technical capability | 2.545 | |
| 8 | Financial position | 2.514 | |
| 9 | Procedural compliance | 2.488 | |
| 10 | Communication system | 2.426 | |
| 11 | Reputation and position in industry | 2.412 | |
| 12 | Desire of business | 2.256 | |
| 13 | Management and organization | 2.216 | |
| 14 | Operating controls | 2.211 | |
| 15 | Repair service | 2.187 | Average importance |
| 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 |

**Figure 2-8 Criteria for Vendor Selection Process**

**Source: Dickson A.,1966**

Base on Anagnostopoulos K.P. & Vavatsikos A.P. ,(2006) AHP allows group decision making. Each member of the group provides separately his own judgments according to his experience, values, and knowledge. If the group has

achieved consensus on some judgment, only that judgment is registered. If during the process it is impossible to arrive at a consensus on a judgment, the group may use some voting technique, or may choose to take the average of the judgments, that is geometric mean of the judgments. The group may decide to give all group members equal weight, or the group members could give them different weights that reflect their position in project.

Base on International Journal of Business, Marketing & Decision Science by Christ I.E. et al, Selection for supplier in Generic Pharmaceutical Firm use seven criteria, Quality, Cost, Regulatory Compliance, Service, Risk Management, Supplier Profile, and Green Purchasing.

- ***Quality:*** Quality of raw material and component requirements are very vitally important given that the pharmaceutical industry is the most regulated industry. Because FDA demands quality products from drug manufacturers, it behooves the pharmaceutical firms to select suppliers with supplier's certification, proven record of world-class service and quality raw materials.
- **Cost:** Cost has traditionally been considered as one of the most important aspects of supplier selection criteria in the purchasing and supply management literature.
- ***Regulatory Compliance (RC):***The generic pharmaceuticals industry is under increased pressure from the US Government and the FDA to comply with the rules and regulations governing the quality of its active pharmaceutical ingredients. This also means that the generic pharmaceutical manufacturers are interested in selecting suppliers that can be in compliance with the FDA rules and regulations in terms of the quality of their commodities. Indeed, pharmaceutical firms are more than ever mandated to update their knowledge of existing laws and regulations.
- ***Service:*** supplier's services are imperative for any manufacturing firm. Pharmaceutical suppliers are expected to provide high-quality active pharmaceutical ingredients as well as support services. Essentially, services include consist of on-time delivery, value added services, and ease of communication.

- ***Risk Management (RM)*** **:**Suppliers must be able to proactively mitigate and manage supply risks. The ability of suppliers to help buyers reduce risk can positively affect cost containment, quality improvement, operational efficiency, process improvement and consistency, and supply chain visibility.
- ***Supplier Profile (SP):*** This criterion encompasses supplier's reputation, flexibility, capacity, financial health, and production facility.
- ***Green Purchasing (GP):*** This criteria is latest added by the writer, consider that environment increasingly becoming an important criterion when making purchasing decisions. Insert relevant environment criteria in the requirement.

### 2.4.5 Step in AHP

The AHP approach is applied in following seven steps:

a. Describe of the evaluation issues

The research issues are the key points of the research discussion and the objective of final evaluation. Therefore, the research issues should be defined specifically to avoid the deviation as much as possible.

b. Identify all criteria which affect the issues

The related performance criteria should be discussed and selected based on the process of reviewing the relevant literature. These criteria should also be separated in accordance with the level of internal relevance and individual independence.

c. Construct the hierarchy structure

A hierarchy structure, in general, can be established from the top through the intermediate levels to the lowest level which usually contains the list of alternatives. In order to lessen the complexity of the consistency, the criteria for each alternative should contain no more than seven elements, and keep independence individually.

d. Establish the paired matrices for comparison

The criteria within each hierarchy should be evaluated against their corresponding criteria in the level above, and then compared in pairs between themselves. If there are "n" criteria in one hierarchy, decision-makers must conduct paired

comparisons by n(n-1)/2. The establishment of paired matrices A lead to determining the weights of the criteria within each hierarchy.

e. Calculate eigenvectors

The establishment of paired matrixes is used to obtain the maximum eigenvalues which should correspond with eigenvectors.

f. Consistency test

The purpose of consistency tests is to ensure whether the calculation fit the condition of transitivity in priority. Consistency ratio (CR) is used to verify the credibility and reasonability of evaluation, and to check whether there is inconsistent causality or conflicts in subjective judgments. The CR is acceptable if it does not exceed 0.1 (Saaty, 1980).

The consistency ratio is calculated as per the following steps:

- Calculate the eigenvector or the relative weights and λ max for each matrix of order *n*
- Compute the consistency index for each matrix of order *n* by the formulae: CI = (λmax -n)/ (n-1)
- The consistency ratio is then calculated using the formulae CR = CI/RI

g. Normalization

This study normalized the weight of the interval level and connected the local weight to acquire the global weights of the criteria in each hierarchy after calculating the weights of all criteria.

AHP approach is a subjective methodology (Cheng and Li, 2001); information and priority weights of elements may be obtained from a decision maker of company using direct questioning or a questionnaire method. It is generally agreed in the literature that the following makes the supplier selection decision making process difficult and/or complicated. (de Boer, 1998, Murlidharan et al, 2001)

- Multiple criteria both quantitative and qualitative
- Conflicts among criteria – conflicting objectives of the criteria
- Involvement of many alternatives – due to fierce competition
- Internal and external constraints imposed on the buying process.

# CHAPTER 3

# COMPANY BACKGROUND & ORGANIZATION

## 3.1 About PT Merck Tbk

### 3.1.1 History of The Company

Merck is a global pharmaceutical and chemical company with a history that began in 1668. Around the world, the Merck Group has approximately 40,000 employees in 67 countries. The operational business is managed under the umbrella of Merck KGaA, the headquarters of which are based in Darmstadt, Germany. Approximately 30% of the Company's total stock is publicly traded, while the Merck family owns a stake of approximately 70% through general partner E. Merck KG.

Internationally, the Merck Group has established its reputation with the development of innovative products such as Erbitux®, a molecular agent for treating colorectal cancer, head and neck cancer and a group of Biotech products, including Gonal-F® or Rebif®. With the acquisition of the globally prominent biosciences company Millipore in 2010, the Merck Group is well positioned to become a leading global producer of integrated biotech solutions.

In Indonesia, PT Merck Tbk. is a major operator in the pharmaceutical and chemicals industries. In the area of pharmaceuticals, the Company produces and markets over-the-counter (OTC) products through its Consumer Health Care Division and prescription ethical products through its Merck Serono Division. Brands controlled by the Company in Indonesia include products that have won a significant degree of acceptance and trust from Indonesian consumers and medical practitioners, such as Sangobion® and Neurobion®. The Company is also a market leader in the area of therapeutic products for a range of conditions related to fertility, diabetes, and neurological and cardiology conditions. From the Chemicals Division, the Company produces and markets specialty chemicals, such as reagents and instruments for laboratory usage and pigments for use in the production of plastics, coatings, and cosmetics, amongst other purposes.

Merck is the world's oldest global pharmaceutical and chemical company. In 1917 the U.S. subsidiary Merck & Co was expropriated and has been an independent company ever since. It could use the name Merck only in North America, while in other countries it should use the name of MSD.

### 3.1.2 Vision & Mission

Vision: We, at PT Merck Tbk will be admired by all stakeholders for our continued, sustainable and above-market entrepreneurial success in the businesses we operate in.

Mission: We at PT Merck Tbk, aim to provide added value for:

- our customers, by offering them long term business growth, and developing mutual partnerships;
- our consumers, by providing safe and useful products;
- our shareholders, by delivering sustainable and valuable achievements;
- our employees, by creating a safe workplace, and offering equal opportunities to all;
- our environment, by establishing ourselves as a role model in protection measures and community support.

### 3.1.3 Business Strategy

Merck derives its power to grow from the balance between the old and the new, between tradition and innovation. The Merck Way – or the secret as to how a company has managed to remain successful in the marketplace even after more than 40 years – is based on three principles:

**Sustain**: Merck intends to sustain its local entrepreneurship, strict customers focus, as well as the loyalty of its employees, which is exceptionally important to Merck.

**Change**: Changes are inevitable as it expands its businesses globally and respond flexibly to customer requirements, and as it modernizes the required processes and structure its organization now and in the future.

**Grow**: Merck's growth opportunities result from innovations, from strengthening its presence in selected markets, and from acquisitions. Merck's core competencies are its ability to innovate, its traditionally high level of quality awareness, its unique corporate culture, and its mindset of partnership that sharpens its focus on the needs of customers, consumers and patients.

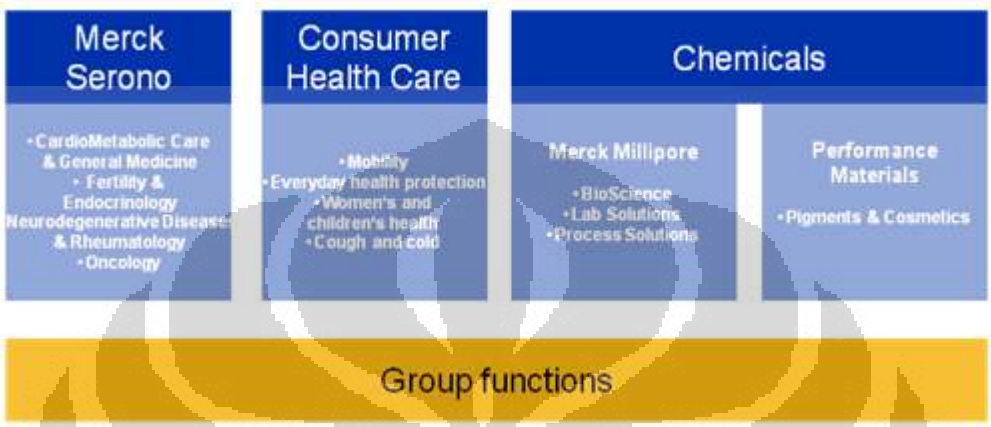



**Figure 3-1 Merck's Business Division**

**Source: Merck,2012**

PT Merck Tbk is a leading, publicly-listed pharmaceuticals and chemicals company in Indonesia. The Company's pharmaceutical Divisions produce and market both over-the-counter (OTC) and prescription ethical products, with the Consumer Health Care Division being responsible for the former and the Merck Serono Division being responsible for the later. The Company's Chemical Divisions markets specialty chemicals, such as reagents and instruments for laboratory usage and pigments for use in the production of plastics, coatings, and cosmetics, and for a range of other purposes. In 2011, the Company recorded a growth in revenue from sales of 15%, from Rp 796 billion in 2010 to Rp 919 billion in 2011. Of this revenue, the Merck Serono Division generated 45%, the Consumer Health Care Division 20%, and the Chemicals Division 35%. The operating profit increased to Rp. 279 billion, resulting in comprehensive income of Rp 231 billion for the Company as a whole.

**Merck Serono - Transforming lives through medical science**

The Merck Serono Division is responsible for the production, marketing and distribution of ethical drugs, which are prescription drugs used only under

medical supervision. In 2011, Merck Serono's total revenues from sales amounted to Rp 419 billion. This represents an increase of 28% over the figure of Rp 327 billion recorded in 2010. Merck Serono's sales revenues account for 45% of the Company's total revenues for the year. Over this year, Merck Serono built on high level of acceptance of a number of products intended for the treatment of Diabetes related conditions, as well as Neurotropic vitamins, Betablocker products, Oncology, complete range of Fertility products and Endocrinology to extend existing products by offering them in a new dosages, presentation and indication. Merck Serono is the market leader for products in a range of therapeutic categories, including diabetes, fertility; neurotropic vitamins; cardiology (betablocker); and thyroid.

**Consumer Health Care - Reach for a better life!**

The Consumer Health Care Division is responsible for the production, marketing and distribution of Over-The-Counter (OTC) drugs, which are drugs that are available to consumers without a prescription. In 2011, revenue derived from the sale of OTC drugs decreased slightly to Rp 180 billion, compared to the figure for 2010 of Rp 199 billion, representing a decrease of 10%. These revenues accounted for 20% of the Company's total sales revenue for the year. The decrease is attributable to fierce competition that has had a disproportionate impact on multinational brand holders as well as consolidation efforts on the sales side to reduce the dependency on large customers.

The Division has implemented a comprehensive program to restructure its sales organization; to implement a new market strategy; and to strengthen leading brands with intensified promotion. It is hoped that by building on the widespread consumer acceptance and trust for our brands, this strategy will lead to renewed growth over the next few years.

**Chemicals – To drive innovations**

The Company markets and distributes a number of chemicals for use in specific industrial and other segments, with the main products being chemical reagents instruments and test kits, pigment and other specialty chemicals. In 2011,

revenue derived from the sale of chemicals increased to Rp 320 billion, compared to the figure for 2010 of Rp 270 billion, representing an increase of 19%. These revenues accounted for 35% of the Company's total revenues for the year. Following the acquisition of Millipore in 2010, the Merck Group marked the official implementation of Merck Millipore Go Live at the beginning of 2011. Millipore is a biosciences enterprise with a strong position in the bioresearch and bio-production segments, offering a comprehensive range of products. The acquisition of Millipore will allow the Company to offer integrated solutions and to cover the entire value chain for its pharma and biopharma customers.

### 3.1.4 Organization Structure

**Organization Structure of Company**

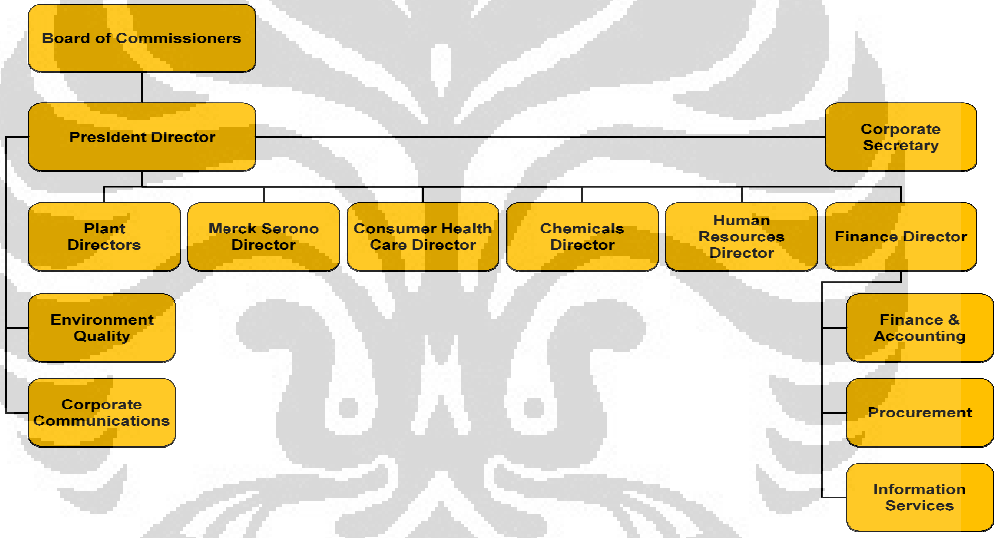



**Figure 3-2 Merck's Organization Chart**

**Source: Merck 2012**

## 3.2 About Procurement PT Merck Tbk

Procurement is a department which responsible to procure goods or services in optimal cost and get others additional value in the process. All purchase goods and services in PT Merck Tbk should be done by Procurement.

Procurement reports to Asia Pacific Head in Shanghai-China for daily operation, but for administration procurement report to Finance Director. Procurement is divided by 2 sub department Direct & Indirect.

Indirect consist of all spend except raw material and salaries. If we discuss about Indirect, it seems like not important part because consist of daily routine items. But from the total spend of 2011, Indirect take 82% of the total spend for 2011. Internal system was developed for Purchase Request and SAP Program for Purchase Order. In 2011, 2215 number of Purchase Order was created by Indirect Procurement.

### 3.2.1 The Organization Chart:

In 2012, procurement team has 1 manager, 2 associate manager, 4 staff and 2 temporary staff. It was displayed in Figure 3-3.

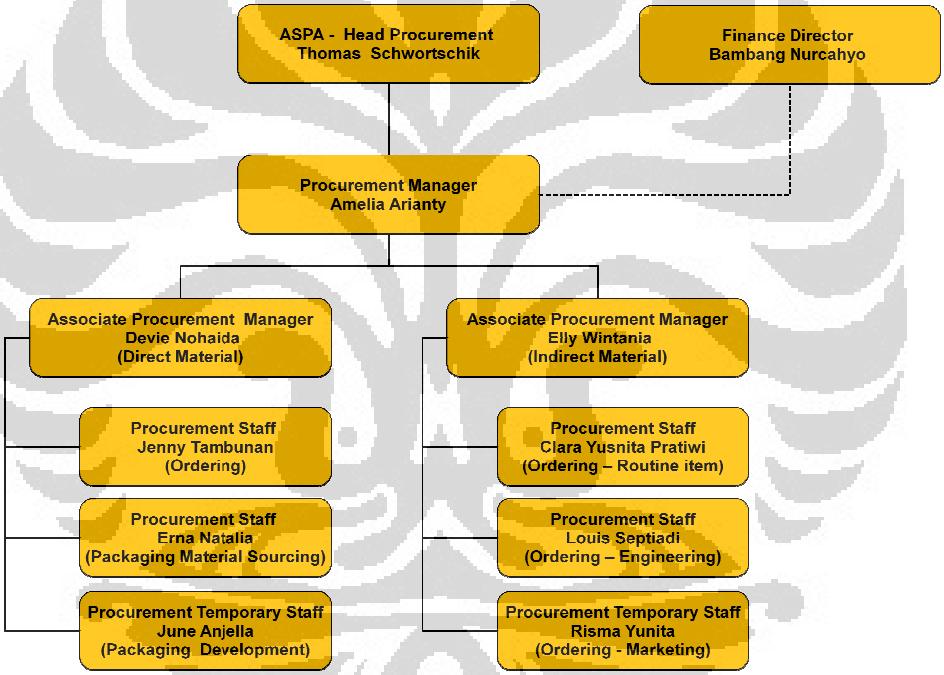



**Figure 3-3 Procurement Organization Chart**

**Source: Merck, 2012**

### 3.2.2 Current Procurement Process:

Procurement Guideline basically has a policy that comparison should be made before procure good or service. The main consideration for supplier selection is price. Purchase and negotiation process should be done with Procurement involvement. Tight lead time, multi level approval and improper supplier selection are the main problem in Indirect Procurement process.

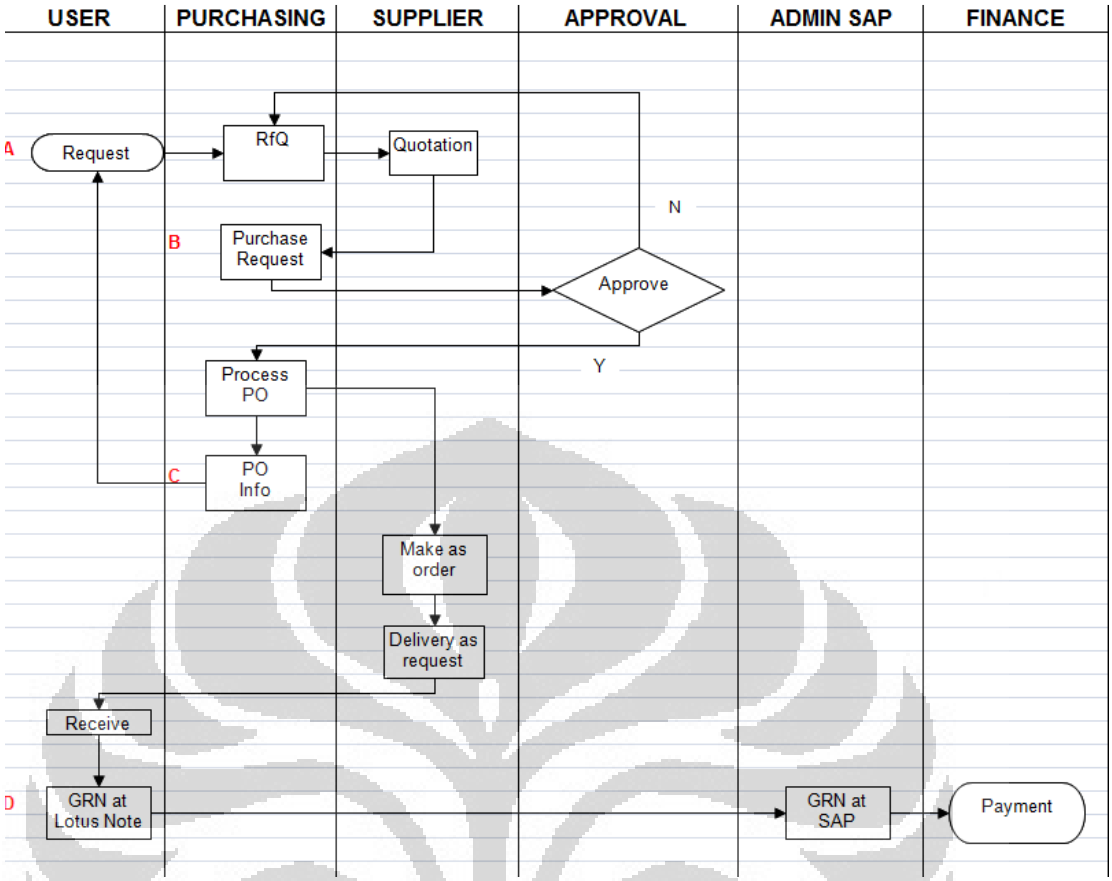



**Figure 3-4 PR to PO Process**

**Source: Merck, 2012**

### 3.2.3 Procurement Categories :

In line with head quarter, we have 17 categories for Procurement Items:


**Figure 3-5 Corporate Sourcing Categories**

**Source: Merck, 2010.**

### 3.2.3.1 PRODUCTION

These categories are all about raw material and packaging for production. There are 4 categories: Chemical Material, Pharma CM & License, Pharma Raw Materials, & Packaging and Devices.

### 3.2.3.2 SERVICES

- Marketing, Media and Events

Marketing is one of the major spend categories within the Merck Group and is part of the expenses at principally all legal entities. This categories contain all marketing activity, such as for agency, media, events, promotion material and market research.

- Clinical Outsourcing

Corporate Category Clinical Outsourcing consults, guides and supports the Merck Group's spend with regard to clinical trials and clinical services.

- Information Technologies

This category contain all activities relating to information technology and telecommunication. The objective is for high product and service quality, secured supply and optimal pricing.

- Travel & Fleet

Travel & Fleet covers the following sub-categories:

- Global Travel Policy and Car Policy
- Credit Card program
- Travel Management Company (TMC) - Contracting and management of Travel Agency services
- On-line Booking Tools (OBE) - Online booking of point-to-point travel to reduce travel agency costs and reduce time and process steps
- Airlines - Negotiation and contracting of all relevant airlines according to Merck needs
- Hotel - Local, regional and global negotiations that are incorporated into a centralized booking and reporting system to increase transparency and achieve cost saving

- Rental car - Centrally managed global contract with involvement of relevant CMGs
- Limousine Service - Online reservation service for all destinations worldwide that draws on local preferred suppliers
- Fleet (leased and purchased vehicles) - Local or regional procurement and reporting of car fleet including all service costs

- Logistics Services

This category is focus on Inbound and outbound transport, Warehousing and Customs brokerage.

- Consulting

Consulting consults, guides and supports company to obtain the best value for money by finding and selecting the best suppliers to make a projects success, and providing assistance to you if problems arise. Consulting covers the fields of Auditing, Legal and Tax consulting as well as Financial consulting.

- HR Services

It covers Executive Search, HR Consulting, Temporary Labor, as well as education & training

- Research Outsourcing

During the development of new products, the R&D teams of the Merck Group collaborate intensely with other companies and/or academic scientists. It establishes best-practice sourcing solutions, develops corporate-wide supplier knowledge, and supports global sourcing projects. In close collaboration with the local organizations, sourcing strategies are developed and implemented to maximize value for the Merck Group.

#### 3.2.3.3 TECHNICAL

- Site Services /Utilities / Real Estate

In this category, we cover all external spend for the continuous operations of Merck owned and leased premises. Typical subjects are e.g. security services and cleaning (site services), natural gas and electricity (utilities), and rental costs for buildings (real estate).

- Prod. & Lab Equipm. & Machinery

The Category Production and Lab Equipment is responsible for Merck global sourcing activities related to:

- Pharmaceutical Production Equipment
- Chemical Production Equipment
- Utility Systems
- Process Piping
- Complex Lab Equipment
- Engineering and Validation Services
- OEM Maintenance Parts and Services

The majority of the category spend comes from capital projects, where we focus on technical procurement for CAPEX equipment. In addition, we are also developing a sub-category strategy for lab equipment where we can leverage our global demand and significantly reduce the number of individual tenders. We are excited to lead the equipment sourcing as the Merck business and production processes continue to evolve.

- Construction & Installation

In this category, it is manage the procurement of works and services required for civil, structural and architectural projects and initiatives, including the related technologies and installations. In close collaboration with all the other categories within the technical segment, the procurement functions of the local Merck entities and our internal stakeholders.

- MRO Materials & Technical Production Component

In this category it is cover all external spend with respect to all production/ functional building and equipment-related materials needed for the operation and ongoing maintenance of the facilities. Most of the goods within this category are involving low product value. The quality of the product is clearly defined. That is why for this category we will not need a method to select a supplier. Just ask for two or three quotation and we choose the cheapest one. We can ask supplier to provide us for a long period with fixed price in contract base system.

# CHAPTER 4

# ANALYSIS

## 4.1 Background

Supply chain in Merck as a pharmaceutical company as describe in Figure 4-1. Start from supplier until the customer. Merck also experience uncertainties from demand and supply. But uncertainty of demand is high because it depends on customer level of health. Certain situation can affect high in demand, some of situation like example fasting season is already predicted but some of them unpredicted. Example of unpredicted is like disease attack in area and only limited of medicine can cure the illness. It will be huge demand come to the company.

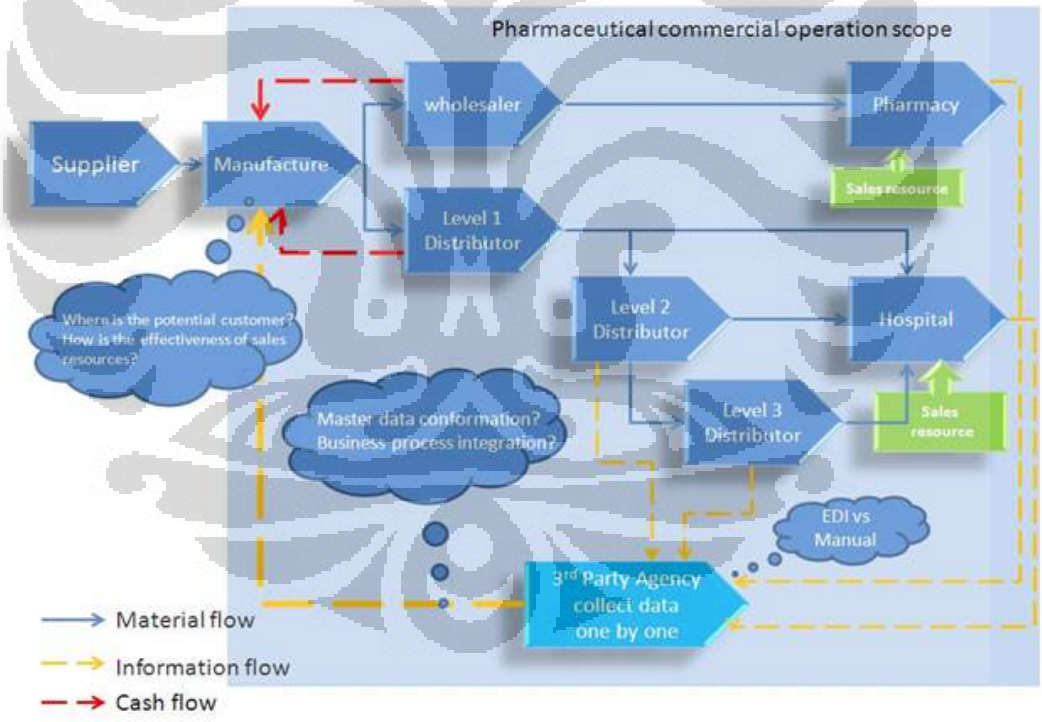



**Figure 4-1 Supply Chain in Pharmaceuticals Industry**

**Source: http://kavinxi.wordpress.com 2011**

New drugs formulation finding by Research and Development, also has impact to uncertainty in demand and supply. Demand cannot be forecast because response from market is not stabilized yet. Also for the supply, besides waiting for the demand, procurement should find a new sourcing for some new items. It makes uncertainties.

From supply side, pharmaceuticals industries has Good Manufacturing Practices (GMP) which a tight control in quality of the products. Sourcing activity in procurement must be passing the Quality Control requirements. This make additional point in uncertainty in supply chain, that procurement must find the supplier. And in the recent situation, procurement also should concern for cost impact because of sourcing activity. Supplier is found but need high cost to get the products. Price concern also makes a big challenge for procurement. Procurement must have reliable partner to done the task.

To manage the uncertainties, company should manage the inventory that can quick adapt to the situation required. As discussed before, company should agile, adapt, and align. Procurement should ensure all activity run in good planning which share with their partner. Procurement should review their capabilities and improve their responding to market changing.

Having qualified suppliers are one of their key success. One way to make it is deal with qualified supplier, which is finding through good supplier selection process.

## 4.2 Current Procurement Process

Every company has a different regulation for procurement process while the goal is the same. Procurement task is to fulfill others department needs in their activity. Not only just fulfill the request but try finding the optimal result like low cost, high quality or other additional values. The process will start with a request submitted by the requester. Special for Indirect Procurement, request consist various items and come from many users.

From statement Alf Noto, Nokia Vice President Indirect Sourcing in five major differences between direct and indirect procurement (European Leaders Network) is that indirect sourcing, increasing your company's use of a preferred supplier is critical to success. From many users and various items, company should go to a group of supplier that selects to deliver products and services as the requirement.

From the requirement, procurement contacts the available supplier to ask for Request for Quotation (RFQ). In current process, user and procurement have a discussion when choose which supplier will provide the products or services. Price is a high priority in supplier selection. When the price fit with the budget, the decision will be created very quickly. However sometime lower prices is related to poor quality.

For some request that have a huge amount of spending and have potential risk, the process of finding the supplier will start with a preliminary meeting between requester and procurement. In this steps discussion about 5W 1H (Who, What, Where, When, Why, How) is the main topic. Requester explains detail of requirement, all needs and expectations. All of materials in this discussion are should be written in User Requirement Specification (URS). It will be difficult if the requester not have a clear requirement. They should determine they want in the detail specifications. URS can be created by looking for the historical data like previous project, interview some expert in the fields, and find new information in internet. More detail the URS will give more complete result.

After URS is developed, procurement has a task to find potential supplier that could delivered as the requirement. Potential supplier could found by looking in list of existing supplier or find a new supplier. New supplier could be found by internet browsing, recommendation from requester, benchmarking with other company, trade shows, advertising in magazine, or by reference from organization, consortium or trade association.

In find supplier, procurement tries to find a main supplier who produces the products or services. If it is possible to get from the manufacturer, no needs to

get it form the distributors. It is depend on number volume of the orders. Sometime if the manufacturers are in other country, a third party is needed in procurement process because of country policy or regulation.

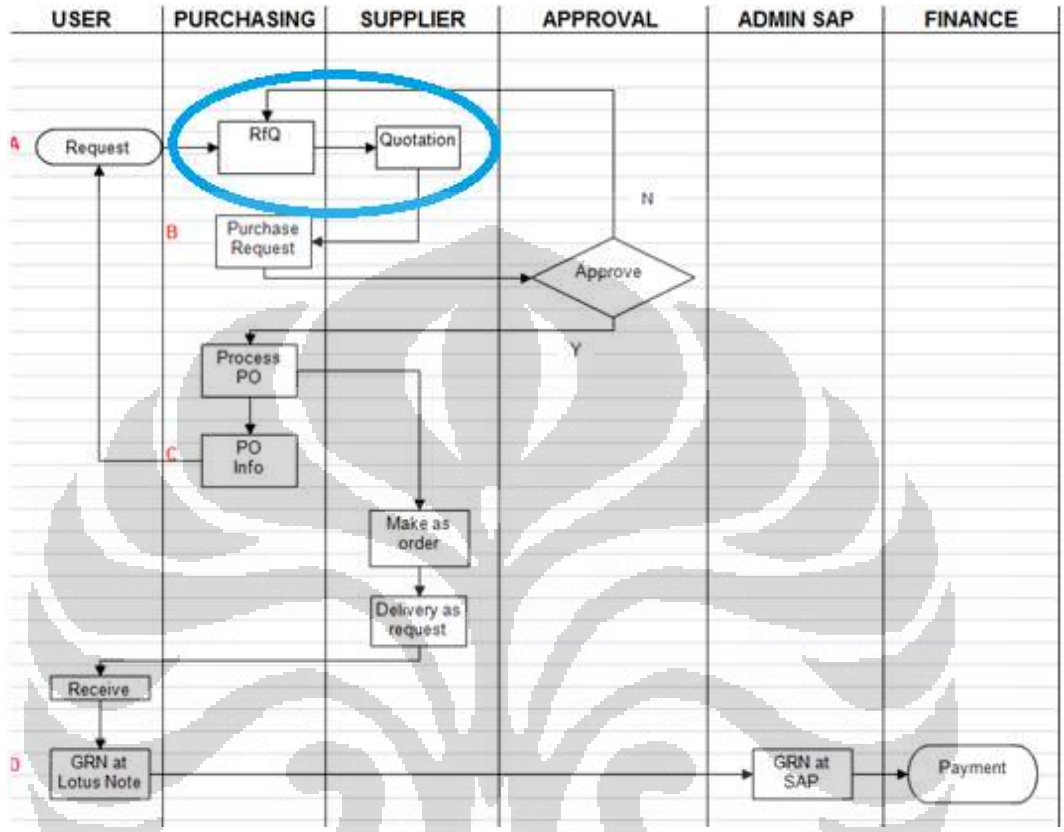



**Figure 4-2 RFQ Process**

**Source: Merck, 2012**

URS Step and process to find supplier are not done properly in current situation. Users usually already have a favorite supplier for their project. They don't think this processes are necessary.

Another concern in procurement process is timeline. Find a supplier will need a process, although if that is a qualified supplier. In some experience, requesters don't have a suitable time for their needed. There always in limited time. It has an impact in decision where quality and other criteria are not the main factor. Decision made by who can fulfill in that short time period.

This situation should be improved with a new guideline in procurement process. A method for supplier selection is needed.

## 4.3 Supplier Selection

Supplier Selection is a key activity in Procurement. How procurement find suitable supplier to fulfill user request. Not only limited to how the supplier can deliver as much as the requirement, but whether they requirement to us also fit with company policy and regulation. For example that is the company having a good profile. Preventive action will save the company from additional cost.

Shortlist of supplier can be created after procurement have a clear detail of specification and identified some potential suppliers. This shortlist of suppliers should be minimizing to 3 candidate of supplier. To find a winner, procurement should have criteria and method.

### 4.3.1 Selection Method

There are a lot of method could be used for supplier selection. Each method has strength and weakness that should be match with the goal or uniqueness of the selection. In this thesis, method is used for select the supplier for Indirect Procurement. Four methods of supplier selection will be compared in the following:

- Data Envelopment Analysis (DEA)
- Total Cost Ownership (TCO)
- Cluster Analysis (CA)
- Analytic Hierarchy Process (AHP)

- **Basic Methodology**

Total Cost Ownership focus in cost analysis, measure the cost of criteria as percentage of total purchase for the supplier. It calculates cost of purchase from a specific vendor, and involves an identification of all major costs associated with a particular purchase. The significant cost items included in TCO, are pre-transaction costs (from requisition to order placement), transaction costs (from order placement to receipt), and post-transaction flows (from receipt to disposal). TCO method helps users to understand the composition of the cost. From the composition, it will be informed which factor that important. TCO will help in negotiation process because detail information is given.

For Raw Material purchase, this method will be match because cost is the main consideration. Quality and specification of the product already ensure by certified document. But for Indirect Procurement, considering only cost is not enough. It should consider other factors like quality, delivery, risk, etc. Indirect Procurement has various items of request, which only 7 from 13 categories of request that will be tested in this thesis. Various in items make also various for selection criteria. That is why methods that use multiple criteria are should be used.

- **Decision Making Tools**

This supplier selection method is used in decision making. Recently request in Indirect Procurement become more important because of huge amount in the total spending. It needs more reasonable background for appointed partner to do such job. There has been a need for a more detailed and documented supplier selection process by considering all qualitative and quantitative criteria.

The four methods are decision making tools for supplier selection. Cluster Analysis use quantitative calculation. Cluster Analysis use statistical procedure with shared characteristics. A combination of approach is advisable. Cluster Analysis use to situation that many supplier and multiple attributes associated to each supplier.

Cluster analysis was used to select one small group of suppliers from a large pool of suppliers. The decision support tool through cluster analysis provides a statistically calculation to filter suppliers that meet requirements. The tool is match while one assessment is important and need to find the best supplier from short list suppliers.

There are huge number suppliers for Indirect Procurement in general, but not the same supplier for every request. It no needs to select a supplier from large number of suppliers, three suppliers are good enough to select. AHP is flexible method in how much criteria, alternative and option. Flexible but means only for

few alternatives, because if use to a large set of alternatives, it will become complex for practical use.

- **Time Consuming**

Supplier Selection method, especially for indirect Procurement, requires the consideration of multiple criteria. Many multi-criteria decision support tools have been developed for structuring and supporting such decisions. DEA is one of multi criteria decision tools. DEA has been used to identify the existence of technical and managerial efficiencies. DEA is a non-parametric, linear programming based technique for measuring the relative efficiency of homogeneous units that consume incommensurable multiple inputs and produces multiple outputs.

The inputs and outputs are assumed to be continuous positive variables and the weights are estimated in favor of each evaluating unit to maximize its efficiency. In general, inputs can include any resources utilized and the outputs can range from actual products to a range of performance and activity measures. DEA methodology develops, enriches and improves both the discretionary ability and effectiveness in managing multi criteria decisions making problems.

However in the implementation DEA has problem that statistical hypothesis test are difficult. It needs effort to explain statistical method to the user and lead reluctance to use it. And if one request need a long process, will create another problem in procurement process. There will be a bottleneck. Need a method which can be done rationally and systematic in short time. AHP with the method no need much time to finish it. Just need an intention to spend time and give a judgment base on the real situation.

- **Flexibility and Simplicity**

Due to Indirect Procurement deal with many users different departments, flexibility and simplicity are need for supplier selection method. AHP give a good

result because have this characteristic. AHP consider intangible factors and allows for subjective judgment and consensus if needed.

For any request that need more deeply research, this AHP method can be combine with others methods. Examples make it combine AHP and DEA, AHP to identify the relative weight of each supplier and DEA to compute the relative efficiency of each supplier.

**Table 4-1 Method Comparison**

**Source data as processed by writer**

| | DEA | TCO | CA | AHP |
|---|---|---|---|---|
| Basic Method | Measuring the relative efficiency | Detail Cost Structure | Select a supplier from Supplier Pool | Select a supplier with hierarchy analysis |
| Decision Making Tools | Multi Input Multi Ouput | Cost is the criteria | One assesment match | Multi Criteria |
| Time Consuming | Need non parametric and linear programing calculation | Need to find all related with the cost. | Need data and statistical calculation | Need judgment & simple calculation |
| Implementation Cost | Statistic software | Software for calculation | Statistic software | Ready software & simple calculation |
| Flexibility & Simplicity | Consider both side, output and input. Not simple calculation | Focus in cost factor | Focus in one assessment | Flexible & Simple |

Base on the consideration above, AHP with all the characteristic and advantage are very suitable for supplier selection method in Indirect Procurement.

### 4.3.2 Selection Criteria

In this paper, 7 criteria are use for select the best supplier. These criteria are selected by research like mention in previous chapter.

#### 4.3.2.1 *Quality*

In quality it should be ensure that supplier can fulfill the entire requirement. Company should define very clear and specific for the requirement. Whether the supplier owns the equipment, has employee to do the job, has experience in the business, etc. With this criteria company ensure supplier will

provide high quality product or service and moreover to suggest improvement in the future.

Supplier with good reputation and experience are usually invited, but also come with expensive price. It is challenge for procurement to looking new supplier with some experience who can give competitive price.

#### 4.3.2.2 *Cost*

The lowest cost not always indicates the best supplier. However cost has an important part because related to budget. Quotation should be observed to find a balance comparison. Sometime supplier gives cheaper price but if the detail is checked it found that the offering is not as the requirement. To minimize this problem, company should give a detail Request for Quotation to supplier, for example Bill of Quantity for construction. Detail size, quantity and brand make it easier to compare and find the cheapest one.

#### 4.3.2.3 *Regulatory Compliance*

Regulatory compliance means confirming the rule. It can be laws, regulation, policy, agreement, etc. As a pharmaceuticals and chemicals company, there are a lot of rules to be comply.

In every activity in work, what regulation said is the guideline. Example for importation, a lot of document should be prepared and submitted to pass the custom clearance process. If a wrong thing happened, it will be impacted to all company process.

Supplier is one part of our compliance process, because supplier also should comply with the regulation. They must have legally approved to do the business, have license to sell the products or services, etc.

#### 4.3.2.4 *Service*

After buyer process the order, they always want to get excellent service from the supplier. On time delivery, compatibility with the requirement, complete information, helping in any problem, and many else are what buyer need from supplier. Not only about the products or services itself but anything related which

can be needed by the buyer. That is make easy communication will give additional point for supplier.

All of them it will receive when the order already placing, but in supplier selection buyer should find out in advance. Reference from others user, sales support availability, information tools like website or manual book, etc are example how buyer can review the service from supplier.

#### 4.3.2.5 *Risk Management*

If there is uncertainty, it means there is a risk. Risk might happen because of anything. It can be failures, accident, financial market situation, disasters, etc. In this criteria, supplier is reviewed by how they strategy to manage risk. It could be not avoiding risk but how to minimize that.

Supplier with preventive action for risk can help the buyer for reducing risk might be happen. Supplier with their experience is good reference for buyer to minimize potential risk.

#### 4.3.2.6 *Supplier Profile*

Supplier Profile helps company to ensure long term supply stability. It appears in financial strength, established company, production capacity, number of employee and the company activity.

A healthy supplier can make sure their standard performance is maintained and their products and services always available. For example leasing company, the agreement should be in long time period.

#### 4.3.2.7 *Green Purchasing*

Merck is certified for ISO 14000 and OHSAS 18000. Therefore this criteria is in line with our requirement. Merck always ask supplier to comply with the standard. Example delivery truck which comes to Merck area should pass the emission test.

Supplier is requested to considering about their environment. They asked to be more responsible if the product or service offered have potential bad impact to environment. Supplier demonstrates their commitment to minimizing environmental consequences in their all activities like in the way of delivery, storing, handling and event in dispose the waste they produced.

Supplier asked to maximize in source use and recycle the waste. Minimum damage, noisy and pollutant that may arise during project also requested. Waste is handled in proper way especially for products with contain B3 (Bahan Beracun dan Berbahaya).

For this type of request, green purchasing might be considered as how far suppliers care about environment.

### 4.3.3 AHP Method

After criteria already define, a hierarchy structure can be prepared from the top through the intermediate levels to the lowest level which usually contains the list of alternatives. Hierarchy describe in Figure 4-3.

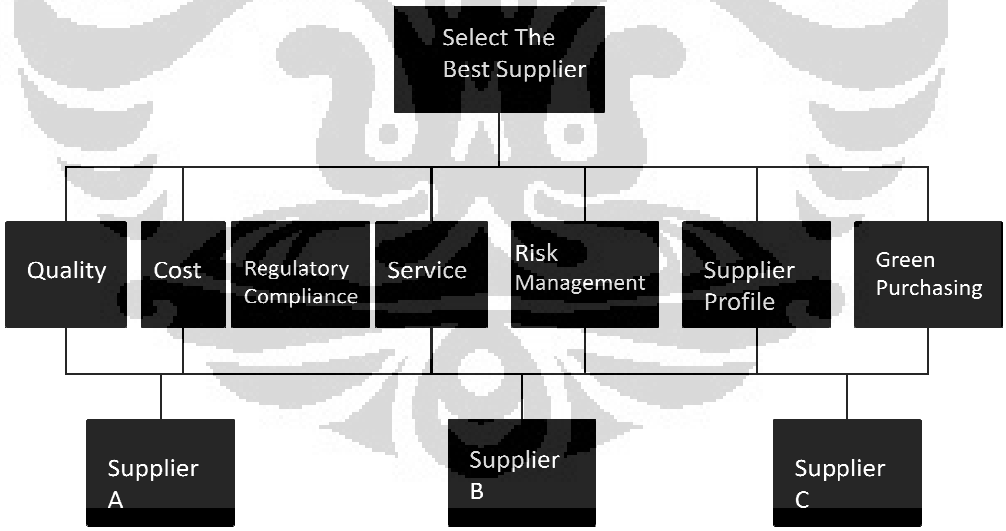



**Figure 4-3 Hierarchy of Select The Best Supplier**

**Source: Chris I. et al (2010)**

A hierarchy structure followed by the set of pairwise comparison matrices. Comparison is made base on judgment to the criteria. The pairwise criteria comparisons are done in terms of which one importance than others. These judgments are expressed as values 1 to 9 as Fundamental Scales in Figure 4-5.

The criteria within each hierarchy should be evaluated against their corresponding criteria in the level above, and then compared in pairs between themselves. If there are "n" criteria in one hierarchy, decision-makers must conduct paired comparisons by n(n-1)/2. In this paper 7 criteria are used, and then 21 paired comparisons should be done by decision maker.

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Quality | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Cost |

**Figure 4-4 Example of Paired Comparison**

**Source data as processed by writer**

Decision maker choose 1 number base on the fundamental scale which is describe condition between 2 criteria. As example in

Figure 4-4, if cost is moderate importance compare to quality, number 3 on the right should be chosen. The same thing also should be done for 20 others comparison.

| Intensity of Importance | Definition | Explanation |
|---|---|---|
| 1 | Equal Importance | Two activities contribute equally to the objective |
| 3 | Moderate importance | Experience and judgment slightly favor one activity over another |
| 5 | Strong importance | Experience and judgment strongly favor one activity over another |
| 7 | Very strong or demonstrated importance | An activity is favored very strongly over another; its dominance demonstrated in practice |
| 9 | Extreme importance | The evidence favoring one activity over another is of the highest possible order of affirmation |
| 2,4,6,8 | For compromise between the above values | Sometimes one needs to interpolate a compromise judgment numerically because there is no good word to describe it. |
| Reciprocals of above | If activity *i* has one of the above nonzero numbers assigned to it when compared with activity *j*, then *j* has the reciprocal value when compared with *i* | A comparison mandated by choosing the smaller element as the unit to estimate the larger one as a multiple of that unit. |
| Rationals | Ratios arising from the scale | If consistency were to be forced by obtaining *n* numerical values to span the matrix |
| 1.1-1.9 | For tied activities | When elements are close and nearly indistinguishable; moderate is 1.3 and extreme is 1.9. |

**Figure 4-5 Fundamental Scale for Pairwise Comparison**

**Source: Saaty T., 2001**

The pair-wise comparisons of the criteria of vendor selection problem generate a matrix of relative rankings for each level of the hierarchy. The matrix is described in Table 4-2.

**Table 4-2 Pairwise Comparison Matrix and Computation**

**Source data as processed by writer**

| | Q | C | RC | S | RM | SP | GP |
|---|---|---|---|---|---|---|---|
| **Q** | 1.00 | 5.00 | 0.33 | 3.00 | 0.33 | 3.00 | 5.00 |
| **C** | 1.00 | 0.20 | 2.00 | 0.33 | 0.33 | 3.00 | 5.00 |
| **RC** | 1.00 | 0.50 | 1.00 | 3.00 | 0.33 | 3.00 | 3.00 |
| **S** | 0.50 | 1.00 | 0.20 | 1.00 | 0.33 | 0.33 | 3.00 |
| **RM** | 1.00 | 1.00 | 1.00 | 0.33 | 1.00 | 3.00 | 5.00 |
| **SP** | 0.33 | 1.00 | 0.20 | 0.50 | 0.20 | 1.00 | 3.00 |
| **GP** | 1.00 | 0.50 | 1.00 | 0.33 | 0.50 | 0.20 | 1.00 |
| **TOTAL** | **5.83** | **9.20** | **5.73** | **8.49** | **3.02** | **13.53** | **25.00** |

Q= Quality C= Cost RC=Regulatory Compliance S=Service
RM=Risk Management SP=Supplier Profile GP=Green Purchasing

After matrices are developed, continue with calculating the consistency ratio CR in order to validate whether the pair-wise comparison matrix provides a completely consistent evaluation. Consistency Ratio is calculating by Expert Choice Program, after input all the judgment by decision maker. The result is described in Figure 4-6.

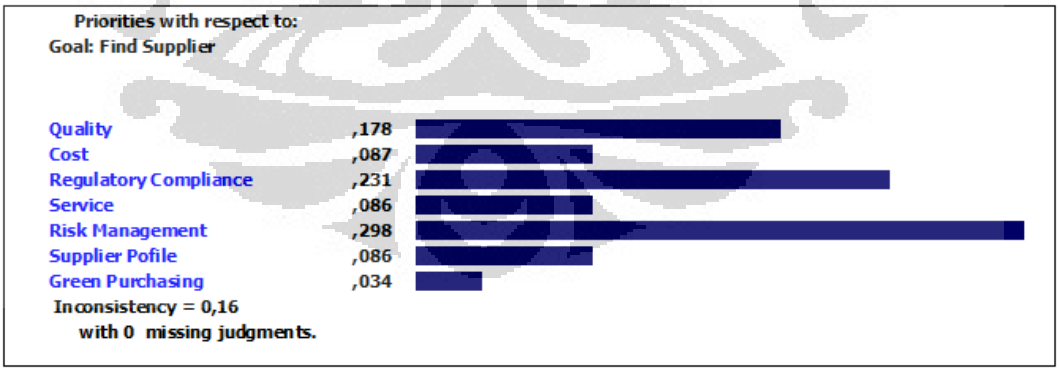



**Figure 4-6 Computation by Expert Choice**

**Source data as processed by writer**

The acceptable CR range varies according to the size of matrix i.e. 0.05 for a 3 by 3 matrix, 0.08 for a 4 by 4 matrix and 0.1 for all larger matrices, n>= 5 (Saaty, 2000, Cheng and Li, 2001). If the value of CR is equal to, or less than that

value, it implies that the evaluation within the matrix is acceptable or indicates a good level of consistency in the comparative judgments represented in that matrix. In contrast, if CR is more than the acceptable value, inconsistency of judgments within that matrix has occurred and the evaluation process should therefore be reviewed, reconsidered and improved. An acceptable consistency ratio helps to ensure decision-maker reliability in determining the priorities of a set of criteria.

After some correction in consistency, we use the new computation in Figure 4-7.


**Figure 4-7 Computation Revise by Expert Choice**

**Source data as processed by writer**

#### 4.3.3.1 *Weighted Point Method*

The weighted point needs attributes that are weighted by the buyer. Criteria for supplier selection above can be use as attributes and computation result from AHP for weighted from buyer.

**Table 4-3 Example Weighted Point Method**

**Source data as processed by writer**

| Criteria | Weight | Score | Point |
|---|---|---|---|
| Quality | 0.214 | 80 | 17.12 |
| Cost | 0.094 | 100 | 9.4 |
| Regulatory Compliance | 0.282 | 80 | 22.56 |
| Service | 0.083 | 60 | 4.98 |
| Risk Management | 0.218 | 80 | 17.44 |
| Supplier Profile | 0.073 | 60 | 4.38 |
| Green Purchasing | 0.037 | 80 | 2.96 |
| TOTAL | 1.001 | | 78.84 |

Every user asked to score the supplier for each attributes. Guideline for scoring is already prepared. Every score is then multiply by the weight. Total score for each supplier is compared, and the highest one is the best supplier to be chosen.

### 4.3.4 7 Categories

There are 17 Merck Procurement Items Categories.

From 17 Merck Procurement Items Categories, 4 categories which are under responsible of Direct Procurement such as Chemical Material, Pharma CM & License, Pharma Raw Materials, & Packaging and Devices, are not discussed in this paper.

And 6 from the rest are: Clinical Outsourcing, Research Outsourcing, Consulting, MRO Materials, Technical Product Component and Production & Lab Equipment. In these categories, supplier already appointed or we use sole agent distributor from the original products or services. That's why we not use supplier selection method for these categories.

Some of MRO Materials and Lab Equipment items are low value purchase items like office stationary, small tools, small part, etc. Supplier selected only by compare the quotation and selects the supplier who offers the lowest price.

Marketing, Information Technology, Logistic Services, HR Services, Travel & Fleet, Site Services/ Utilities/ Real Estate and Construction & Installation are 7 categories left which need supplier selection method because decision maker should considered multi criteria to select the best supplier.

In current situation supplier selected only by compare quotation submitted. For some request with big number spend, visit and audit supplier is a must. However no one method is chosen as a guideline for select a supplier.

From many methods, it is recommended to use Analytic Hierarchy Process (AHP). As already explain in previous chapter, AHP effective when decision should be done by considering multi criteria.

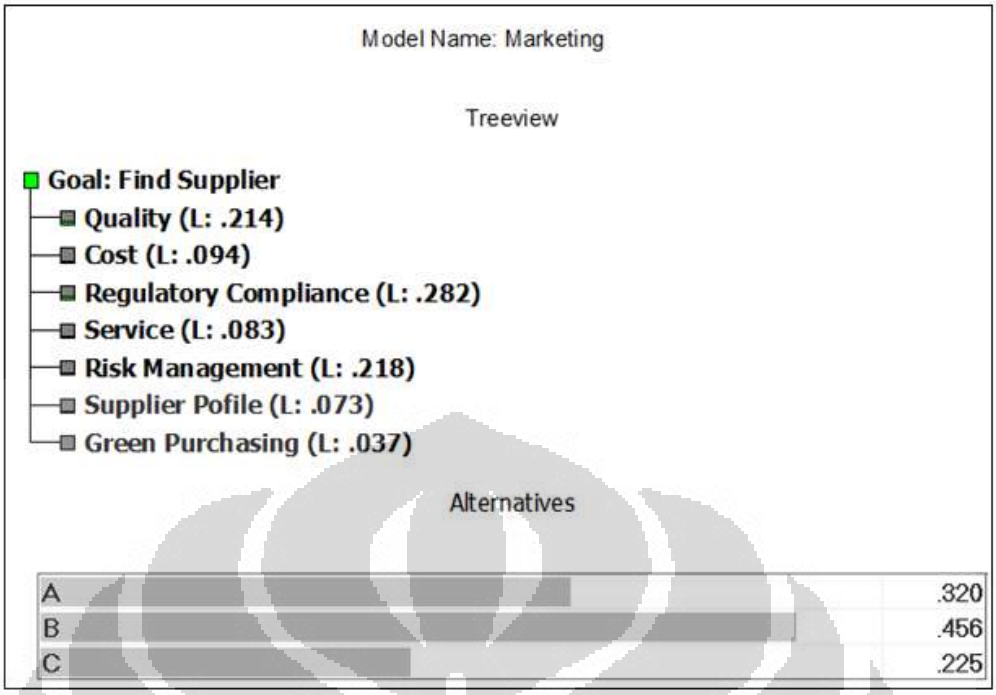
#### 4.3.4.1 *Marketing Category*


**Figure 4-8 Website Fertility Campaign**
**Source: www.maupunyaanak.com**

a. Problem Example: Find an event organizer for Public Awareness Event
b. Background: Merck need an event organizer to arrange and provide all the needs in an event. The needs include the concept, print campaign, website and copywriting.
c. Participant: Supplier FC, Supplier VM & Supplier BN
d. Result:

This project needs a creative supplier which can design a concept for campaign, build an information website, and another tool for campaign. Supplier should have a license to do the business and willing to comply with IT regulatory and confidential agreement.

Result from AHP show that supplier VM has a highest point with 46%, follow by supplier FC 32 % and the lowest is supplier BN with 22%. VM is the best supplier if judge by the capability to create a website. BN only have a small number, because they can create a good design but should find other partner to create the website. They don't have own capabilities to build a website.




**A=FC B=VM C=BM**

**Figure 4-9 Result for Marketing Category by AHP Method**

**Source data as processed by writer with Expert Choice**

VM has experience in website creation, no problem in license or compliance. VM also has a dedicated team in do the project, it makes VM can give better service than others. And from supplier profile side, VM has a completed supplier profile like office, employee, equipment, etc. compare to FC & BN. One weakness of VM is the highest price, it is fine compare to their offer but not fit to company budget.

**Table 4-4 Result for Marketing Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | FC | | VM | | BN | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 80 | 17.12 | 100 | 21.4 | 60 | 12.84 |
| C | 0.094 | 100 | 9.4 | 20 | 1.88 | 60 | 5.64 |
| RC | 0.282 | 80 | 22.56 | 80 | 22.56 | 80 | 22.56 |
| S | 0.083 | 60 | 4.98 | 60 | 4.98 | 60 | 4.98 |
| RM | 0.218 | 80 | 17.44 | 80 | 17.44 | 80 | 17.44 |
| SP | 0.073 | 60 | 4.38 | 80 | 5.84 | 60 | 4.38 |
| GP | 0.037 | 80 | 2.96 | 60 | 2.22 | 60 | 2.22 |
| **TOTAL** | **1.001** | | **78.84** | | **76.32** | | **70.06** |

From Weighted Method, the result give different result, that FC gets the highest point. But the point is only slightly different. VM achieve 76.32% and FC with 78.84% and follow by BN 70.06%. Cost is the significant point that makes the both supplier difference.

For overall, VM actually has the highest point. But in implementation Merck use FC because cost consideration. VM by the point show the best supplier for this project. VM has a good quality but very expensive for the price offered. With this method, company can decide to choose FC because of cost review, with not to worry due to FC also has a strong point.

**Table 4-5 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **FC** | 0.32 | 2 | 78.84 | 1 |
| **VM** | 0.46 | 1 | 76.32 | 2 |
| **BN** | 0.23 | 3 | 70.06 | 3 |

#### 4.3.4.2 *Information Technology Category*

a. Problem Example: Find a supplier to build a cable optic installation between two offices.

b. Background: Merck has two offices in different location with distance about +/-5km. To have a better connection and cheaper than hire services from provider, Merck choose to install fiber cable optic between. It is not an easy project because beside supplier should expert in Information Technology, but also must have experience in do the installation. Need special permit for plant the cable along the way, which is cross the highway, railway and bridge.

c. Participant: Supplier BHP, Supplier DGE, & Supplier KOD


**Figure 4-10 Merck's Two Offices Location**

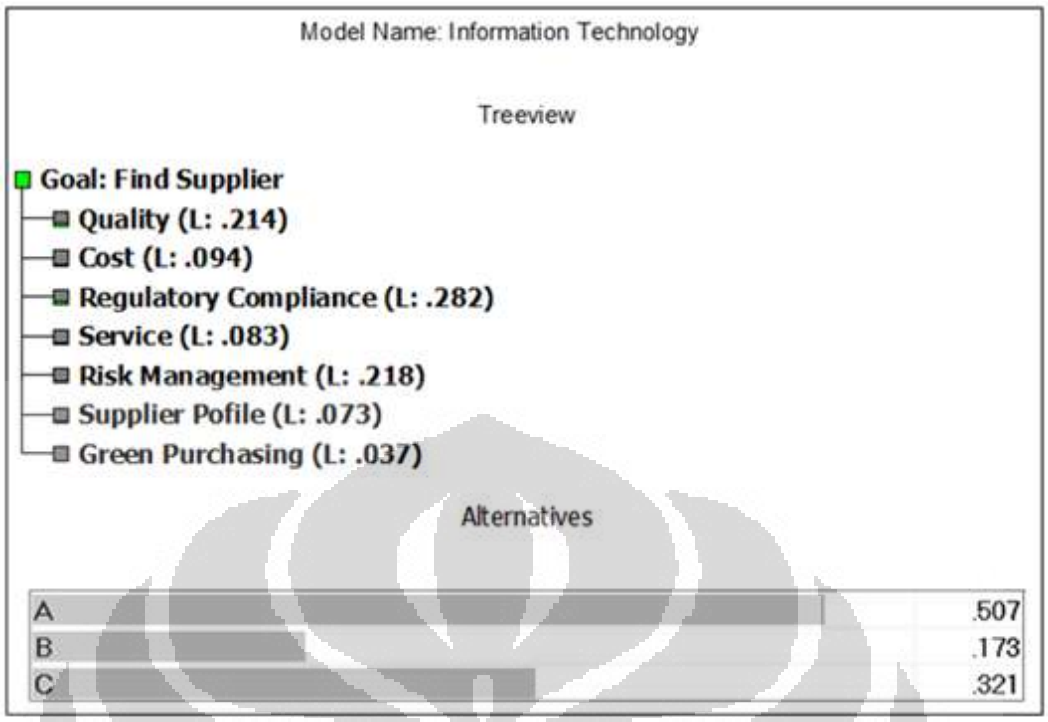
**Source: Google Map**

d. Result:

To do this project, company is looking for supplier who have experience and license in fiber optic installation, they also must have permit from government (Dinas Pekerjaan Umum) before execution. Supplier without experience will have difficulties to get the license from government.

Supplier should be a health company and has a technical ability to do the project. Financial resources, equipment, employee and relationship with third party are needed. Additional point if the supplier has good performance with good reference.

On time process as the timeline agreed is important because the new office also should start the operation immediately. Without the fiber optic, it is not possible to start the operation. Other thing is company who do this project should be easily to be contact, to responsible if something need to be confirmed after the project. If there is any loss to third party because of this project, all risk is under supplier responsibility.




**A=BHP B=DGE C=KOD**

**Figure 4-11 Result for Information Technology Category by AHP Method**

**Source data as processed by writer with Expert Choice**

From result of AHP, the calculation show that supplier BHP achieve highest point with 50% compare to DGE 17% and KOD 32%. BHP is a good choice to do this project.

Actually from quality view, KOD is the best supplier because fiber optic installation is their daily work. BHP and DGE use other partner as subcontractor to do this installation, especially in plant the cable. From supplier profile side, BHP is a well known company that is why they have a higher point than KOD and DGE.

BHP process the permit to government and responsible for any claim. DGE rely to the subcontractor and not responsible for any claim because of this matter. KOD confident do the installation and there is not any claim from others.

BHP agree to give a compensation if any claim from third party related with their installation work and also if any delay from the schedule. And because BHP is Merck's existing supplier, it is also give additional point.

**Table 4-6 Result for Information Technology Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | BHP | | DGE | | KOD | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 80 | 17.12 | 60 | 12.84 | 80 | 17.12 |
| C | 0.094 | 20 | 1.88 | 20 | 1.88 | 20 | 1.88 |
| RC | 0.282 | 80 | 22.56 | 40 | 11.28 | 60 | 16.92 |
| S | 0.083 | 80 | 6.64 | 60 | 4.98 | 60 | 4.98 |
| RM | 0.218 | 60 | 13.08 | 60 | 13.08 | 60 | 13.08 |
| SP | 0.073 | 40 | 2.92 | 20 | 1.46 | 60 | 4.38 |
| GP | 0.037 | 20 | 0.74 | 0 | 0 | 40 | 1.48 |
| **TOTAL** | **1.001** | | **64.94** | | **45.52** | | **59.84** |

Compare to AHP, Weighted method also give the same result. BHP achieves the highest point with 65 points followed by KOD with 60 points and the lowest is DGE with 46 points.

From comparison between AHP method and Weighted Point method, not show any difference. The result appoints BHP as the best supplier for this project.

**Table 4-7 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **BHP** | 0.51 | 1 | 64.94 | 1 |
| **DGE** | 0.17 | 3 | 45.52 | 3 |
| **KOD** | 0.32 | 2 | 59.84 | 2 |

#### 4.3.4.3 *Logistic Services Category*

a. Problem Example : Find a New Provider for Local Transporter
b. Background: Local Transporter is one of logistic services activities. Every business division in Merck has a different need for local transporter and use different provider. There is a potential cost saving if we make coordination

and only use one appointed provider to support all needs. After gathering all requests, we try to find a provider that suitable for all that requests.


**Figure 4-12 Merck's Sample of Chemicals Products**

**Source: Merck**

c. Participant: Supplier D, Supplier R & Supplier N

d. Result:

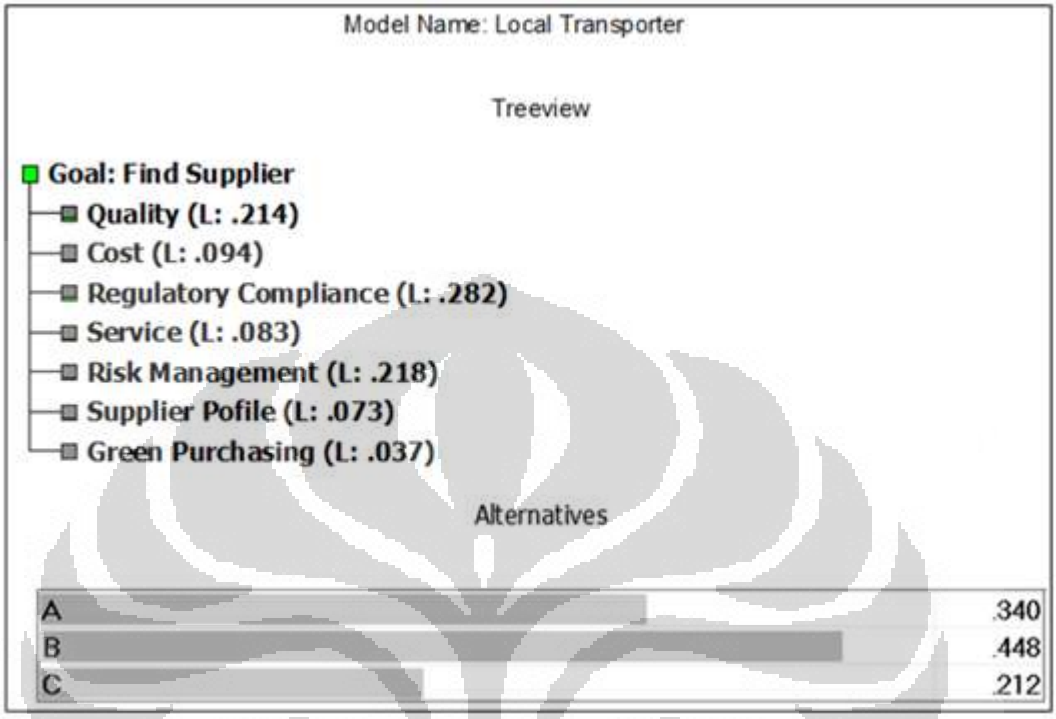
Merck is looking for a health company with appropriate technical ability to manage all delivery products and support items. Supplier should have capable equipments and employees. Additional point if the supplier has good reputation in performance.

Logistic companies who participate in this tender should have a license to do this business, especially in handling special products from pharmaceuticals and chemicals. They also should have additional safety equipment as mention in the regulation guideline.

Cost compare by the quotation submitted. Supplier input their price for every delivery area. Lower cost is better, not only for regular service but also for urgent delivery. On time delivery is the most important because all things deliver are related to selling activity. Trace and tracking facility is additional point, proof of delivery is more important.

The services provided by supplier will support sales activity, everything should be arranged professionally. No potential problem from supplier side that makes process stopped, like financial problems, overload capacity, etc. Supplier already prepared all things to prevent failure and accident.

From AHP result, R achieve the highest point with 45% , followed by D with 34% and N with 21%.




**A=D B=R C=N**

**Figure 4-13 Result for Logistic Service Category by AHP Method**

**Source data as processed by writer with Expert Choice**

From quality, risk management, and supplier profile criteria, R has higher point because R is a well known company with good reputation in logistic business, there is not any hesitancy in doing business with this company. D & N not as known as R, but both are Indonesia companies which their core business is logistic. The three companies are taking on time delivery as their KPI because lead time is critical for logistic company. Their also have the trace and tracking program.

D is the previous supplier for logistic and by experience D has a permit and complies with the regulation. R also has a permit and experience in handling special products. N so far not has experience to handling special products, but they will process the permit if it is a must.

Compare to Weighted Method, R also achieve the highest point with 78 points, slightly different with D 75 points and followed with N 60 points.

**Table 4-8 Result for Logistic Service Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | D | | R | | N | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 80 | 17.12 | 100 | 21.4 | 60 | 12.84 |
| C | 0.094 | 80 | 7.52 | 20 | 1.88 | 80 | 7.52 |
| RC | 0.282 | 80 | 22.56 | 80 | 22.56 | 60 | 16.92 |
| S | 0.083 | 60 | 4.98 | 80 | 6.64 | 40 | 3.32 |
| RM | 0.218 | 80 | 17.44 | 80 | 17.44 | 60 | 13.08 |
| SP | 0.073 | 60 | 4.38 | 80 | 5.84 | 60 | 4.38 |
| GP | 0.037 | 40 | 1.48 | 60 | 2.22 | 60 | 2.22 |
| **TOTAL** | **1.001** | | **75.48** | | **77.98** | | **60.28** |

From comparison between AHP method and Weighted Point method, the ranks are the same for both method, but for weighted it show slight difference points between suppliers. The results appoint R as the best supplier for this project. From this review, it is fine if choose R or D, because there is not a big difference points between R & D.

**Table 4-9 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **D** | 0.34 | 2 | 75.48 | 2 |
| **R** | 0.45 | 1 | 77.98 | 1 |
| **N** | 0.21 | 3 | 60.28 | 3 |

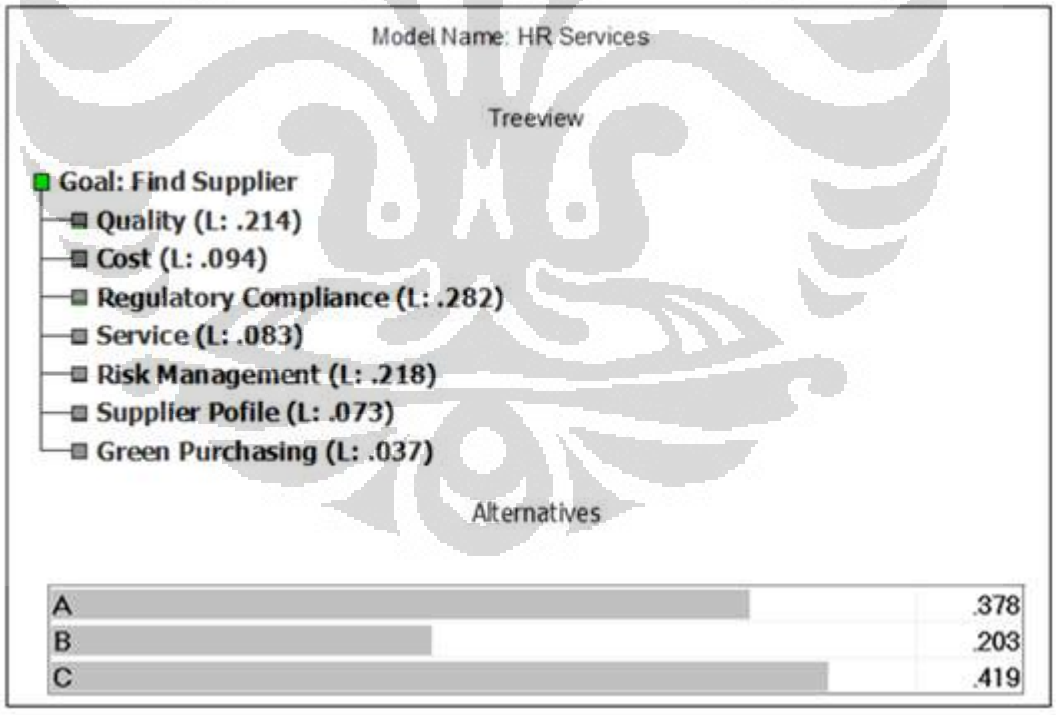
Furthermore for this category, several criteria could be added to select logistic provider like warehouse capacity, schedule flexibility, custom clearance handling, document systems, etc. Good decision in choosing partner in logistics will give a good service requirement. Well manage in transporter systems may increase potential cost saving.

#### 4.3.4.4 *HR Services Category*

a. Problem Example: Find a New Provider for Medical Check Up
b. Background: Medical Check Up is a routine program from company for employee, base on Peraturan Tenaga Kerja. Medical Check Up program held every two years for permanent employee.
c. Participant: PL, IMC & TMC
d. Result:

Medical Check Up program is held by company due to comply with Departemen Tenaga Kerja Indonesia Regulation. Provider for this program should a company which has a license to do the program and has accreditation from government.

Medical Report is one of important thing to be delivered by supplier. This report will be used by company to analyze health condition of the employees and also used by employee itself for their medical record.




**A=PL B=IMC C=TMC**

**Figure 4-14 Result for HR Service Category by AHP Method**

**Source data as processed by writer with Expert Choice**

From result of AHP, the calculation show that supplier TMC achieve highest point with 42% compare to PL 38% and KOD 20%. TMC is a good choice to do this project.

**Table 4-10 Result for HR Service Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | PL | | IMC | | TMC | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 80 | 17.12 | 60 | 12.84 | 100 | 21.4 |
| C | 0.094 | 80 | 7.52 | 100 | 9.4 | 80 | 7.52 |
| RC | 0.282 | 80 | 22.56 | 60 | 16.92 | 80 | 22.56 |
| S | 0.083 | 60 | 4.98 | 60 | 4.98 | 80 | 6.64 |
| RM | 0.218 | 80 | 17.44 | 80 | 17.44 | 80 | 17.44 |
| SP | 0.073 | 100 | 7.3 | 80 | 5.84 | 100 | 7.3 |
| GP | 0.037 | 20 | 0.74 | 20 | 0.74 | 20 | 0.74 |
| **TOTAL** | **1.001** | | **77.66** | | **68.16** | | **83.6** |

Compare to Weighted Method, TMC also achieve the highest point with 84 points, followed with PL 78 points and with IMC 68 points.

From comparison between AHP method and Weighted Point method, the ranks are quite similar for both methods. The results appoint TMC as the best supplier for this project.

**Table 4-11 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **PL** | 0.38 | 2 | 77.66 | 2 |
| **IMC** | 0.20 | 3 | 68.16 | 3 |
| **TMC** | 0.42 | 1 | 83.6 | 1 |

#### 4.3.4.5 *Travel & Fleet Category*

a. Problem Example: Find a Travel Agent for travel arrangement
b. Background: In pharmaceuticals business, one of marketing activity is coordinate a group of doctor to attend a congress overseas. As our

important partner, we should appoint a good travel agent to arrange the airlines, transfer, meals, etc.

c. Participant: Supplier V, Supplier E & Supplier P

d. Result:

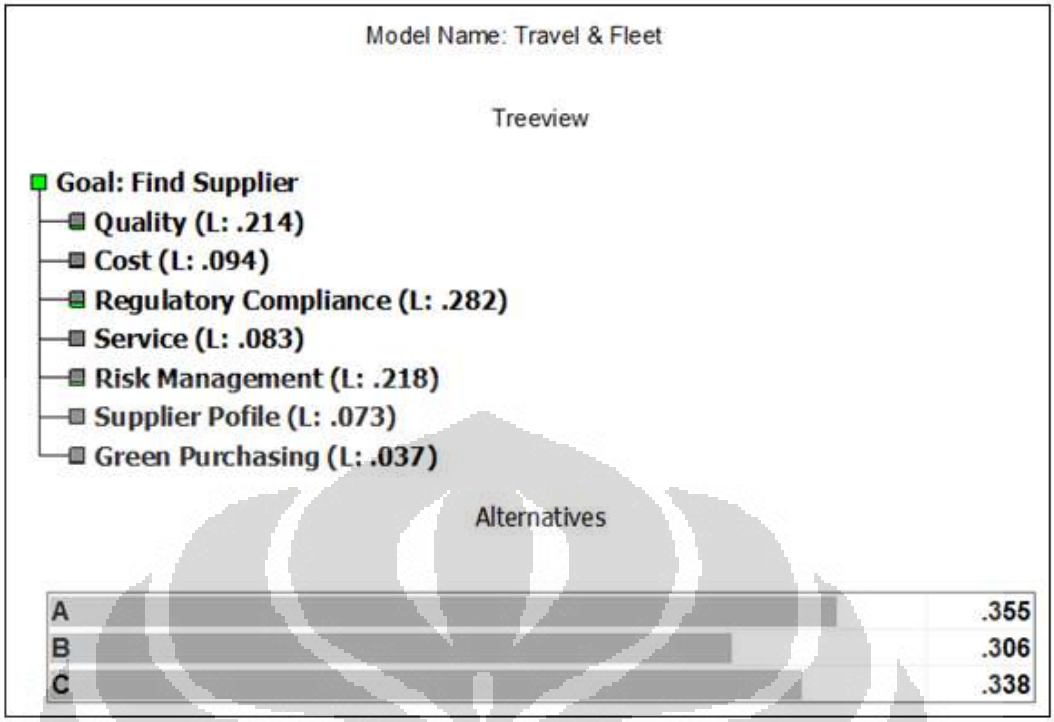
Reputable travel agent should be appointed in this project because we should confidence to offer the program to our partner. If they don't feel comfort with the travel agent, they will not join to the program. In other hand, there are regulations which give some limitation to the arrangement.

A well known travel agent suppose to be has a lot of capability to do the arrangement, because they have enough employee and has a worldwide connection. Supplier has experience in handling the same request and has a good recommendation will have additional points.

On time process as the timeline is important. Airline tickets and visa arrangement should fit to the congress schedule. Easily to be contact, nice in communication and professional in handling are successful key.

If something need to be confirmed. Supplier has a license to do the business. Comply with pharmaceuticals regulations that the service is given only for congress activity. The best price compare to a good service offered.

From result of AHP, the calculation show that the three supplier almost have the same points, V achieve highest point with 35% compare to E 31% and P 34%. Basically this shows that the competition between suppliers is very tight. They almost have the balance points because one supplier might have best point in one criteria but not in others criteria. And others supplier achieve that lowest point as highest point for them, and so on.




**A=V B=E C=P**

**Figure 4-15 Result for Travel & Fleet Category by AHP Method**

**Source data as processed by writer with Expert Choice**

Compare to Weighted Method, this method help to compare more detail and the result P achieve the highest point with 73 points, followed with E with 67 points and with V 53 points.

**Table 4-12 Result for Travel & Fleet Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | V | | E | | P | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 40 | 8.56 | 80 | 17.12 | 80 | 17.12 |
| C | 0.094 | 40 | 3.76 | 80 | 7.52 | 40 | 3.76 |
| RC | 0.282 | 80 | 22.56 | 60 | 16.92 | 80 | 22.56 |
| S | 0.083 | 40 | 3.32 | 80 | 6.64 | 80 | 6.64 |
| RM | 0.218 | 40 | 8.72 | 80 | 17.44 | 80 | 17.44 |
| SP | 0.073 | 80 | 5.84 | 20 | 1.46 | 80 | 5.84 |
| GP | 0.037 | 0 | 0 | 0 | 0 | 0 | 0 |
| **TOTAL** | **1.001** | | **52.76** | | **67.1** | | **73.36** |

From comparison between AHP method and Weighted Point method, the ranks are not the same for both methods. Rank from AHP should not be used because the result almost the same. Result from the weighted method show that P should appointed as supplier.

**Table 4-13 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **V** | 0.36 | 2 | 52.76 | 3 |
| **E** | 0.31 | 3 | 67.1 | 2 |
| **P** | 0.34 | 1 | 73.36 | 1 |

In this case, because suppliers that participate are reputable company with a lot of experience in their fields, it make the result is almost the same. For handle this case, additional criteria should be added which will select the supplier with more deep criteria which at the end will propose one suitable candidate.

#### 4.3.4.6 *Site Services/Utilities/ Real Estate Category*

a. Problem Example: Find a New Office Location for Marketing Division

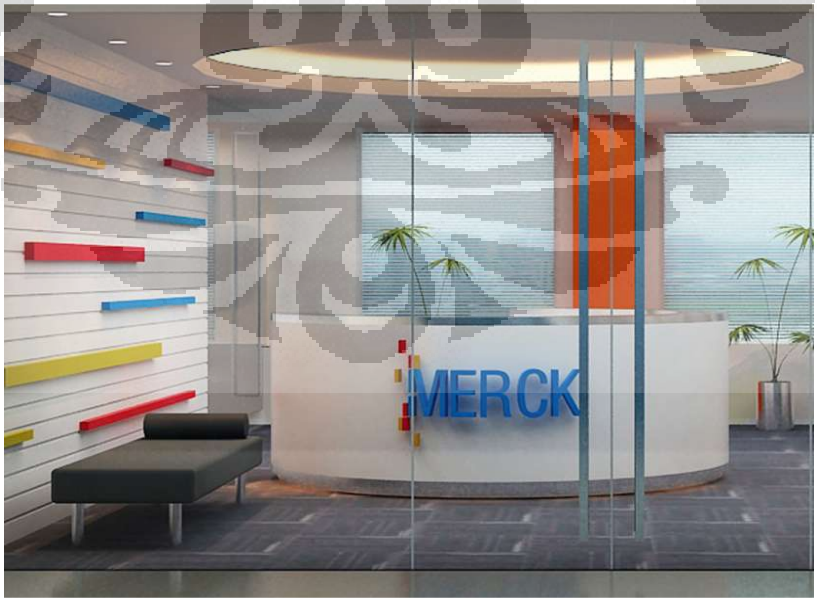



**Figure 4-16 Merck's New Office Reception**

**Source: Merck**

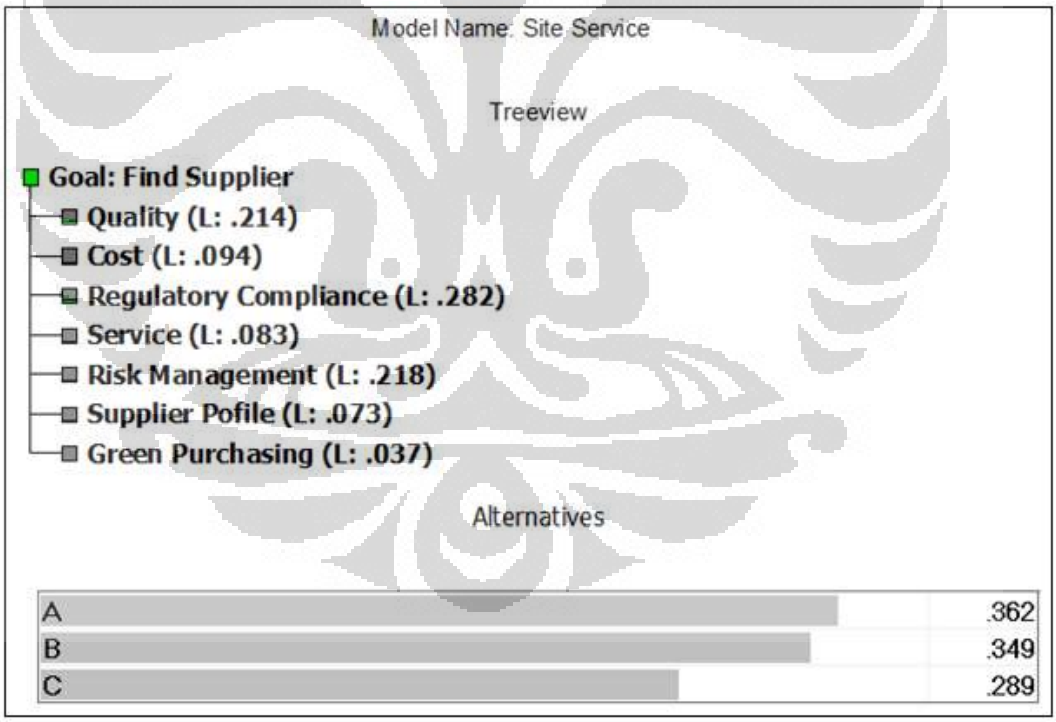
b. Background: When rental period for current office is near expired, management considered to find new location. Not only because the limitation of the work space offered, but also consider about others facilities, ambience, business environment, etc.

c. Participant: Supplier P, Supplier A, & Supplier M

d. Result:

Desire to move to another office area is bigger than stay in current location. However it should consider about the rental fee and cost for decorate and rearrange the workplace layout.

From result of AHP, the calculation show that the current supplier P still achieve the highest point with 36%, slightly different with A 35% and followed by M 29%. The difference points between three of suppliers not really significant.




**A=P B=A C=M**

**Figure 4-17 Result for Site Service/Utilities/Real Estate Category by AHP Method**

**Source data as processed by writer with Expert Choice**

Compare to Weighted Method, this method help to compare more detail and the result difference with AHP method. A achieve the highest point with 73 points, followed with M with 63 points and with V 61 points.

**Table 4-14 Result for Site Service/Utilities/Real Estate Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | P | | A | | M | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 40 | 8.56 | 80 | 17.12 | 60 | 12.84 |
| C | 0.094 | 80 | 7.52 | 20 | 1.88 | 20 | 1.88 |
| RC | 0.282 | 80 | 22.56 | 80 | 22.56 | 80 | 22.56 |
| S | 0.083 | 40 | 3.32 | 80 | 6.64 | 80 | 6.64 |
| RM | 0.218 | 60 | 13.08 | 80 | 17.44 | 60 | 13.08 |
| SP | 0.073 | 60 | 4.38 | 60 | 4.38 | 60 | 4.38 |
| GP | 0.037 | 40 | 1.48 | 80 | 2.96 | 40 | 1.48 |
| **TOTAL** | **1.001** | | **60.9** | | **72.98** | | **62.86** |

From comparison between AHP method and Weighted Point method, the ranks are not the same for both methods. Rank from AHP should not be used because the result almost the same. Result from the weighted method show that A should be appointed as supplier.

**Table 4-15 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **P** | 0.36 | 1 | 60.9 | 3 |
| **A** | 0.35 | 2 | 72.98 | 1 |
| **M** | 0.29 | 3 | 62.86 | 2 |

#### 4.3.4.7 *Construction & Installation Category*

a. Problem Example: Find a supplier for build an emergency stairs

b. Background: Merck Office Building (MOB) was audited by ESHQ from Headquarter. An emergency stairs should be built outside of the building

as an audit result. Management decided to build the emergency stairs includes the emergency door for every floor, which make some change in office layout.

**Figure 4-18 Merck's MOB Emergency Stairs**

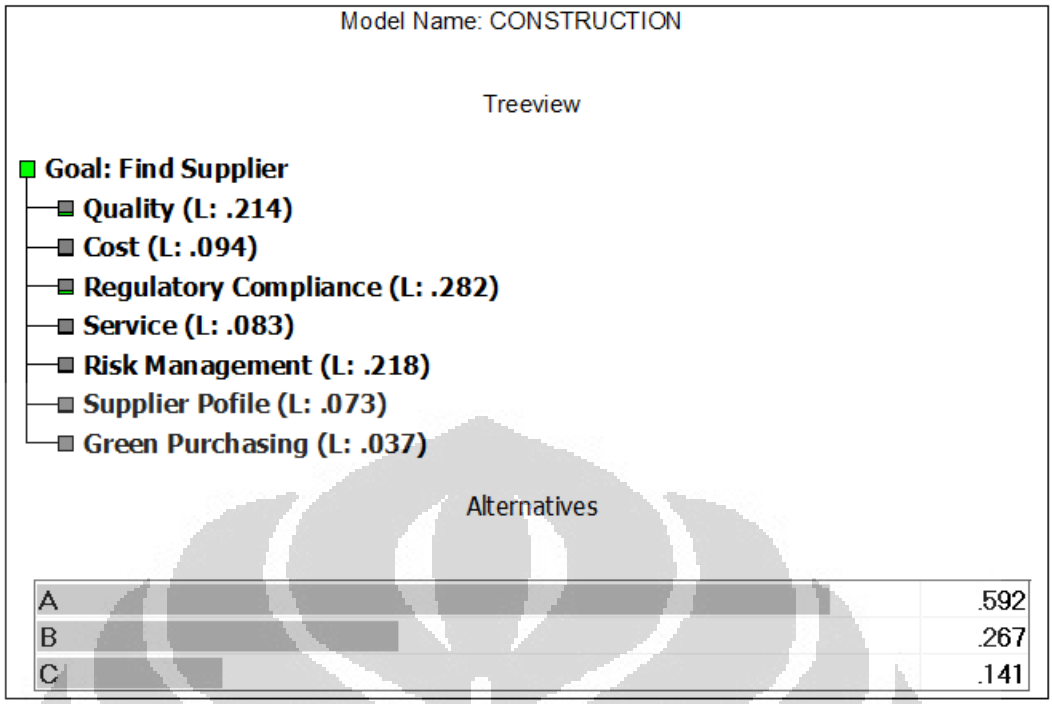
**Source: Merck**

c. Participant: Supplier EPP, Supplier TRI & Supplier MSD

d. Result:

Requirement for this supplier is a reputable contractor which has experience to build an emergency stairs. Permit from government is approved before the project. Supplier has a license to do the project and provides the tools and equipment base on safety procedure. Cost and delivery time are also important to be considered.

From result of AHP, the calculation shows that supplier EPP has the significant points with 59%, compare to TRI with 27% and MSD with 14%. This is shows that the competition between suppliers is not very tight.




**A=EPP B=TRI C=MSD**

**Figure 4-19 Result for Construction Category by AHP Method**

**Source data as processed by writer with Expert Choice**

Compare to Weighted Method, this method also show the same result EPP achieve the highest point with 83 points, followed with TRI with 48 points and with V 34 points.

**Table 4-16 Result for Construction & Installation Category by Weighted Method**

**Source data as processed by writer**

| | Priorities | EPP | | TRI | | MSD | |
|---|---|---|---|---|---|---|---|
| Q | 0.214 | 80 | 17.12 | 60 | 12.84 | 40 | 8.56 |
| C | 0.094 | 60 | 5.64 | 80 | 7.52 | 20 | 1.88 |
| RC | 0.282 | 100 | 28.2 | 20 | 5.64 | 20 | 5.64 |
| S | 0.083 | 80 | 6.64 | 60 | 4.98 | 40 | 3.32 |
| RM | 0.218 | 80 | 17.44 | 60 | 13.08 | 60 | 13.08 |
| SP | 0.073 | 80 | 5.84 | 60 | 4.38 | 20 | 1.46 |
| GP | 0.037 | 60 | 2.22 | 0 | 0 | 0 | 0 |
| **TOTAL** | **1.001** | | **83.1** | | **48.44** | | **33.94** |

From comparison between AHP method and Weighted Point method, the ranks are the same for both methods. Result from both methods show that EPP is the best choice to appoint as supplier.

**Table 4-17 Comparison Final Result**

**Source data as processed by writer**

| | AHP | | Weighted | |
|---|---|---|---|---|
| Supplier | Score | Rank | Score | Rank |
| **EPP** | 0.60 | 1 | 83.1 | 1 |
| **TRI** | 0.27 | 2 | 48.44 | 2 |
| **MSD** | 0.14 | 3 | 33.94 | 3 |

AHP is suggested for evaluate the contractor. With this method various criteria are considered, not only ensure the quality of the construction itself. To avoid possibilities that the contractor cannot finish their job is one of the goals. Due to AHP method can be done by a group, every team member may provide their knowledge and experience to judge which one is the best supplier.

## 4.4 Implication for Management

Implementation supplier selection method in the company activity will give benefits and constrains. Company has to make sure they choose the suppliers as right partners, who will become part of the business process. It is necessary to evaluate the potential suppliers which they will help company to meet the objectives.

### 4.4.1 Business Process

Both methods AHP & Weighted Points are good to use for supplier selection. Due Indirect Procurement have a various request, not every request recommended to use supplier selection process. It should be decided by management, which request need to use the selection method. In this thesis, it is highly recommended to use both methods for the project request only. Project request means the request has a timeline limitation (have start and end date),

specific goal, and multiple parties. Generally a project request associated with a huge amount of cost spend or that something could potentially bring a risk which will give an impact to company.

With guidelines from management, procurement differentiate which request should be taking the supplier selection method step, like in the revision of PR-PO Flow (Figure 4-20). After decide that the request is a project qualification, responsible team member are appointed. The team will create detail user requirement specification. Supplier who pass the preliminary mandatory requirement, are invited for bidding process. This shortlisted supplier will follow supplier selection processes that proceed by the team using both methods to find a suitable supplier.

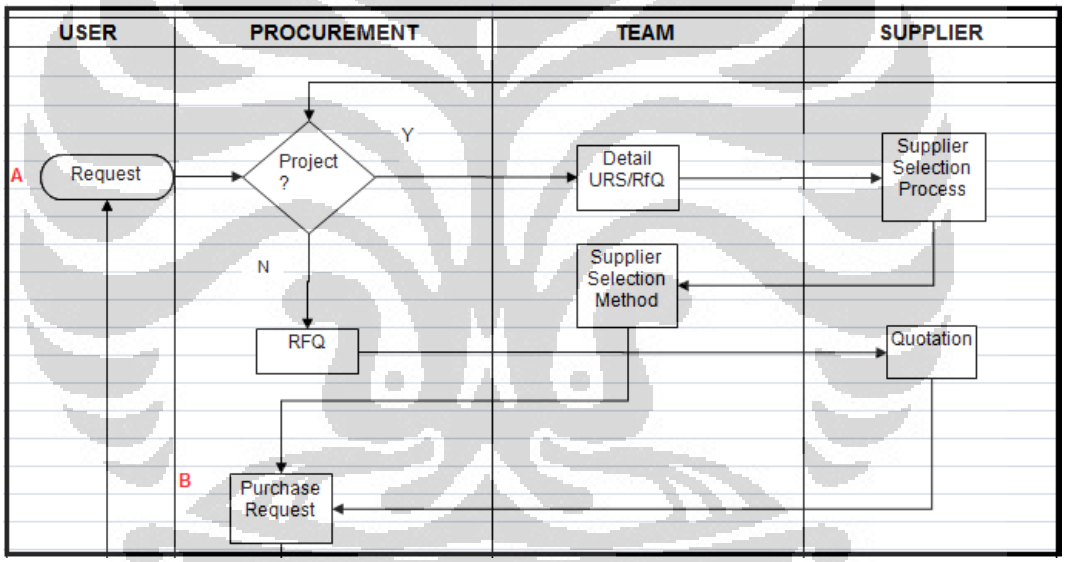



**Figure 4-20 Additional Step in PR-PO Process**

**Source data as processed by writer**

These additional steps are not only simple steps. There are additional effort should be done. However there are benefits and constrain in implementation this supplier selection process.

### 4.4.2 Benefit

- ***Better Quality***

With supplier selection, company will have a qualified supplier which will deliver better quality of product or service. Quality means products and services that delivered are meets the specification or requirement from requester. Because the suppliers are result from supplier selection process, it supposes to be the supplier will give the best of their performance. Better quality result and qualified supplier also add the company competitive advantage.

- ***Reduce Cost***

Selecting suppliers will give opportunity to company for reduce cost. Potential risk that available when deal with any supplier are minimizing due to supplier are already selected. By the method, company not only consider for the price but also other criteria. Low price is not always the best value for money. By reducing cost, company has a cost competitive which will give additional in company revenue.

One way to maximize profits is to minimize costs. Special arrangements with selected suppliers get better prices and guarantee of supplies, it will give potential cost savings.

- ***Time Management***

Besides reducing cost, company also has better in time management, because the selected supplier give reliable scheduling. The supplier manages the time to create and deliver the products and services. They have important factors in company planning. If suppliers always delivery the order at agreed times, company will have opportunity to improve their productivity.

- ***Relationship***

Supplier that appointed by selection process will be more confidence and responsible to deliver their products and services. When finally they are successfully proving their capability, there will be a relationship created between company and supplier. Company will have a steady supplier and they will have interdependence each other in run the business.

With the relationship, they will have a possibility to create some improvement like product development, product quality, and efficiency. They will have arrangement to get improvement in productivity and saving initiative. Suppliers are important source of information to improve performance and productivity. It will bring benefit for both sides. The suppliers will respect the company's business, and they will give effort to provide the best service possible. And company also response by showing the supplier how important they are.

- ***New Improvement***

With implementation the supplier selection method, it was a new improvement for the company's business process. Because it will make give better result for the company, make the business process more complete, effective and efficient. Supplier selection is a preventive action to avoid risk or failure in the future.

Company also has a written document for this process. It is an improvement than only verbal explanation and unclear reason when select the supplier, especially for audit purpose.

### 4.4.3 Constrain

- ***Time Consuming***

Need additional time for do the supplier selection process, to have a preliminary meeting, discussion, calculate, and create the report. Because the process will involve multiple parties, it need the same intention for achieve the goals. Because of the request quantity, there will be a bottleneck in the process. It is need good time management from every team member especially procurement team. If all the people involved are agree what a problem and try to find the solution, everything will be fine.

- ***Lack of knowledge and experience***

In implementation new system to user, there will be lack of knowledge and experience. Need effort to socialize the program and why it should be applied.

From supplier side, they should maximize their effort to submit proposal to fulfill user requirement. And from user side, they should have a complete description about everything they need. Sometime users have unrealistic wants, keep changing what they wants, etc that make the process not effective and efficient.

- ***Technology Support***

To help implementation of the process, technology support is needed like install for the calculation system and changing in workflow. In the future, project management system can be built to improve the process.

- ***Supplier Database***

After the implementation is finished, another challenge for procurement is to have a lot of supplier candidates. Because the selection process will not effective if only use just a limited number of suppliers. Data base of supplier should be built and always updated. Periodically there should a program to add number of new suppliers.

# CHAPTER 5

# CONCLUSION AND RECOMMENDATION

## 5.1 Conclusion

Pharmaceutical market in Indonesia tends to rise in 2012 approximately by 14%-15% or IDR 43,3 trillion – IDR 43,7 trillion compared to 2011. Merck Serono (Merck's pharmaceutical ethical medicament business) has shared 28% from the increment rate of of revenue recorded in 2011. It has significantly outpaced the growth in the size of the total ethical products market over the same year which is around 10%. Thus, achievement in 2011 has met the revenue target requirement planned by company and expected to be higher in 2012 by trying to formulate and apply conducive company strategy.

One of the keys to success for achieving 2012 target is supply chain management system. Uncertainty supply chain management system shall be developed responsively by improving the ability to response, adapt and transform the changes in the market in limited time. In addition, develop source data between suppliers and customers also play an important role in providing fast and accurate source data. In the end, build supply chain management system that compatible with situation required will facilitate company to manage the uncertainty with minimum risk and it will eventually related to the smooth running of production process .

Supplier Selection is one of the key activities in Procurement which supports success in supply chain. Supplier selection can be served as a tool to get trusted and reliable supplier to fulfilling request which is part of business process of company. Many methods can be used for supplier selection process but AHP method is being recommended by many studies. AHP is a multi-attribute decision making process which enables decision makers to set priorities and deliver the best decision when both quantitative and qualitative aspects of a decision must be considered.

AHP method is chosen because this method has flexibility for decision makers in considering multi criteria. Step by step decisions makers will be guided

consistently compare each criteria. The consistency of the evaluation measure is checked to reduce the bias in decision making. AHP method also can be used by group decision making. With simplicity and transparency in this method, it was good start for company to apply this method. It really helps to make better choice from many options. Furthermore the result of this method is easy to understand and implement.

Having tested to sample requests from seven categories of Indirect Procurement, AHP method provides the same result option of 5 categories with final decision. Hence, the results of 2 other categories are not the same with the result which is not using any method since they have slightly different result option. Concisely, the result option of supplier selection process with AHP method is not really different with simple and conventional way. It means the appointed supplier using AHP method also voting to the option supplier selected by the simple and conventional one but it is supported with calculated or detailed description which can be used as a proof for auditing purpose, if needed. AHP method requires to compare every single criteria to every supplier nominated.

Another method which will be also discussed in this thesis is Weighted Point Method. Weighted Point Method shall give added value to AHP method. Weighted points method can minimize the subjectivity in AHP method with quantitative calculation. Subjectivity is being minimized because user should choose point from the table that already prepared in advance.

The result option of Weighted Point Method from 6 categories accompanied with the decision, only one result is different with the decision. Having used the Weighted Point Method, users are required to make a detail comparison of suppliers.

Comparing result between AHP and Weighted Point, 4 results for the best suppliers are the same. The other three are different for the category of Marketing, Travel & Fleet and Site Service. For marketing category, the result is very slightly different with the result using Weighted Method. For travel & fleet and site service category, the result which is using AHP method is relative the same for the

three suppliers and Weighted Method supports the results by providing detailed explanation. AHP and Weighted method is a good combination that can be used as a tool to selecting a supplier.

If the supplier selection process is implemented in PT Merck Tbk, there will be a change in business process workflow. And also there are benefits and constrains as impact of the implementation.

## 5.2 Recommendation

Thus, AHP and Weighted method is a good combination that can be used as a tool to simplify the process of selecting the supplier. It is recommended to PT Merck Tbk to have this method in selecting the supplier. Some additional steps in order to get better result:

1. Both methods are good to use but not every single request in Indirect Procurement need the methods especially for the supplier selection process. It should be decided by management. In this thesis, it is highly recommended to use both methods for the project request only. Project request means the request has a timeline limitation (have start and end date), specific goal, and involving multiple parties. Generally a project request associated with a huge amount of cost spend or that something could potentially bring a risk which will give an impact to company.

   From management guidelines, procurement differentiate which request should be taking the supplier selection method step, like in the revision of flow PR-PO (Figure 5-1). After decide that the request is a project qualification, detail user requirement specification is created. Supplier who pass the preliminary mandatory requirement, are invited for bidding process. This shortlisted supplier will follow supplier selection process that proceed by the team using both method to find a suitable supplier.

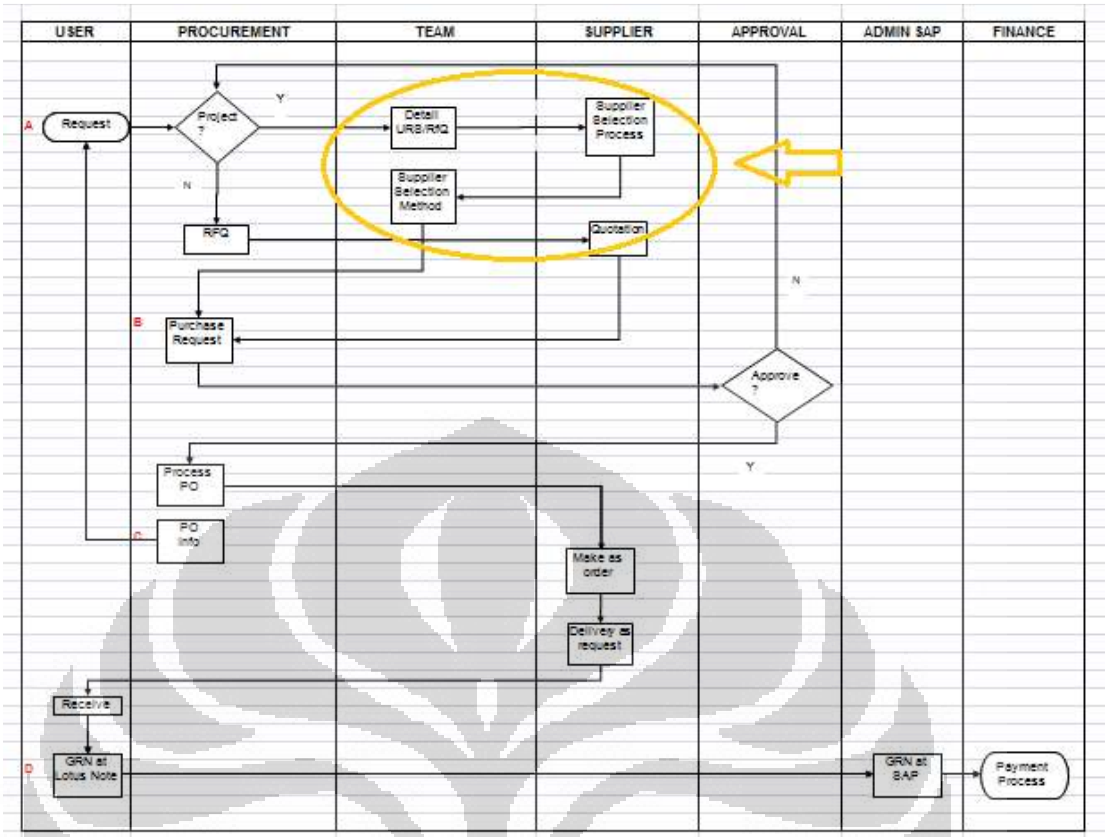



**Figure 5-1 PR-PO Process Revision**

**Source data as processed by writer**

2. For the request which needs supplier selection process, the following recommendations needed to be noted for better result:

   a. Team. Criteria of the required request will be selected and judged by the member of the team. No need a lot of number of team member. As long as this is a solid one, the team will give a good result in return. For some reason, someone from outside the group of requester is needed for neutral judgment and opinion as a member of team.

   b. Criteria. Seven criteria being used in this thesis can be referred as the basic criteria. If it needs to be specific, these criteria can be completed with sub criteria or can be added with other criteria. The more variation and detail

in the criteria will enrich the criteria selection and eventually give better result.

c. Time line. The process will be effective and efficient if the project has sufficient time. Selection process will be discussed and proceed well if all steps in the process are being properly organized and planned.

d. Supplier database. Supplier who will be selected can be obtained from available supplier list data base. There is always any possibility to add new supplier into the supplier list database. Hence, new supplier will give a diversity and chance to encourage the competition. No limitation of number of supplier to be determined in this method.

3. From the method result, it displays supplier's achievement. It can be used as an evaluation media for supplier's performance. By reviewing it, supplier can improve their performance at the specific criteria that they are not good at indicated by its point. If one supplier participates in some tender in the company, the judgment more or less will be the same but it still needs to be reviewed. Furthermore if the supplier is a long term supplier, it should be followed by the periodic audit review in order to maintain the quality of the judgment itself.

4. From constrains of the implementation, it should resolve one by one to make the implementation result more effective and efficient. Socialization and evaluation program to related parties should be arranged. Every party should know the process and understand why it should be implemented. At the end they will support procurement to achieve the goal to find the most suitable supplier. Support also should be come from the management, by creating the policy to ensure this process is implemented and support the need of the program. Finally hard work from procurement team will make the process completely successful.

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## Appendix 1. AHP Calculation

### A. Marketing Category

Priorities with respect to:
Goal: Find Supplier
>Quality


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Cost


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Regulatory Compliance


Inconsistency = 0.05
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Service


Inconsistency = 0.05
with 0 missing judgments.

**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile


Inconsistency = 0.05
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Risk Management

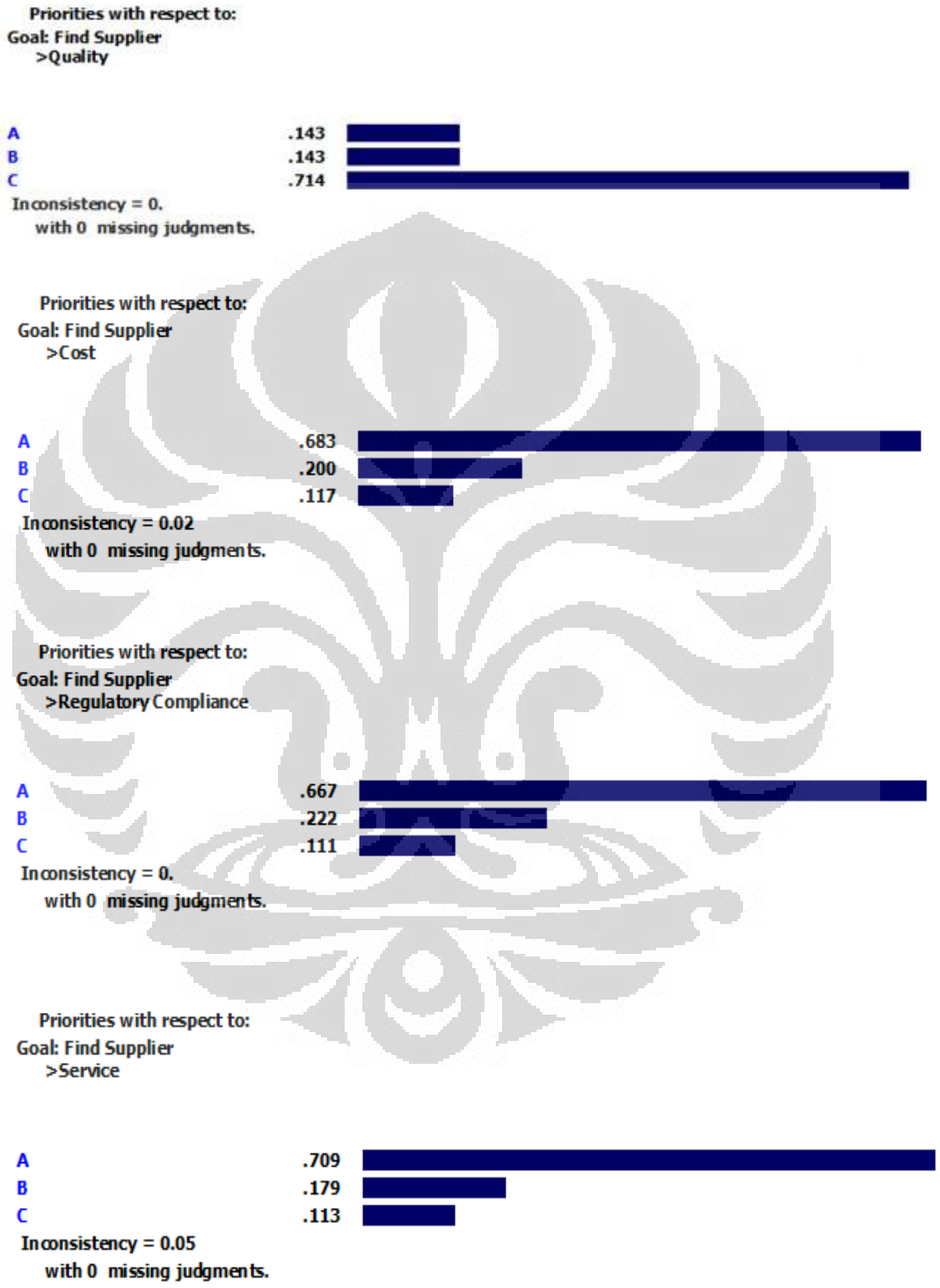

Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.
with 0 missing judgments.

**(Continued)**

## B. Information Technology Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.03
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile

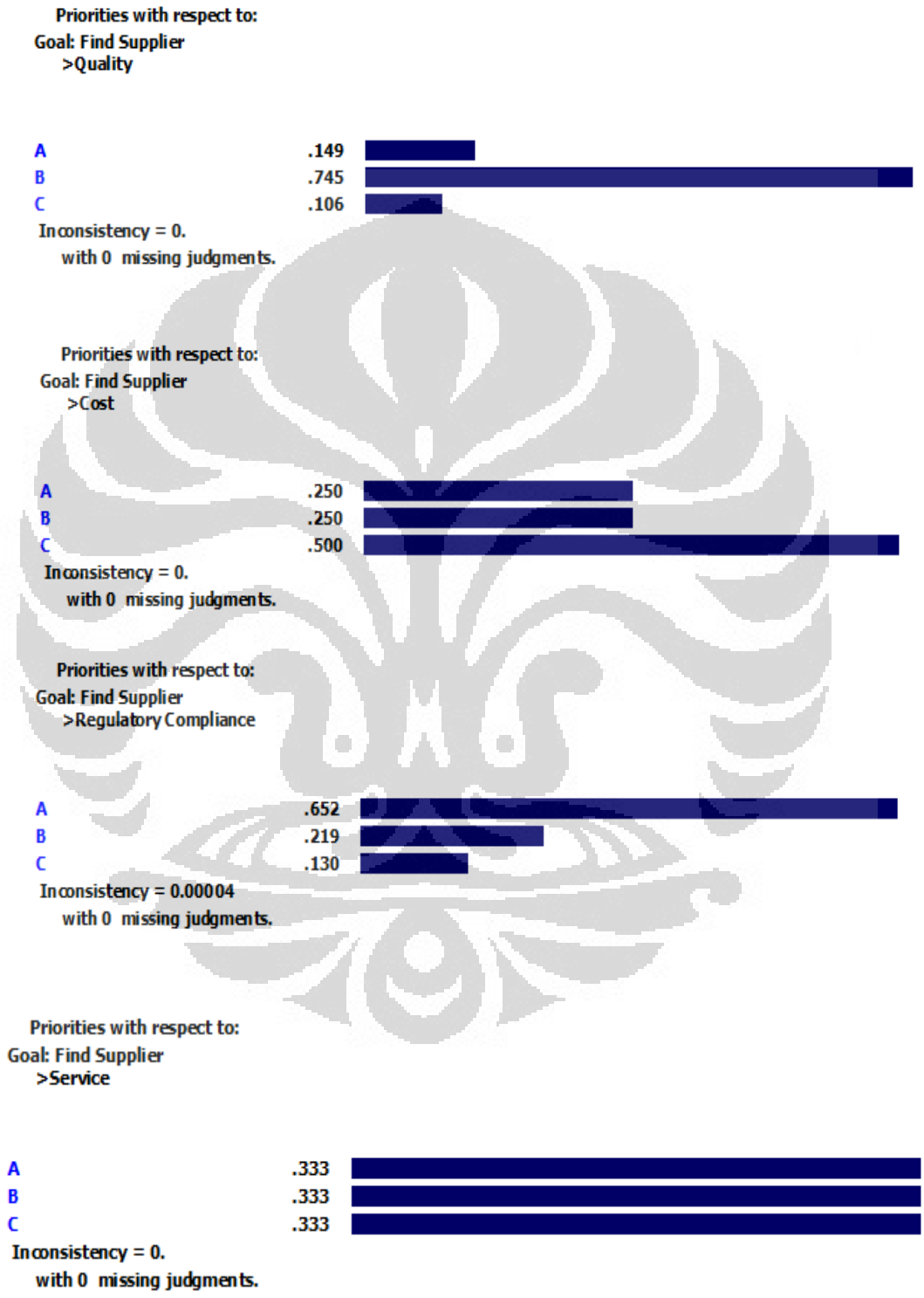

Inconsistency = 0.05
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.
with 0 missing judgments.

**(Continued)**

## C. Logistic Services Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile

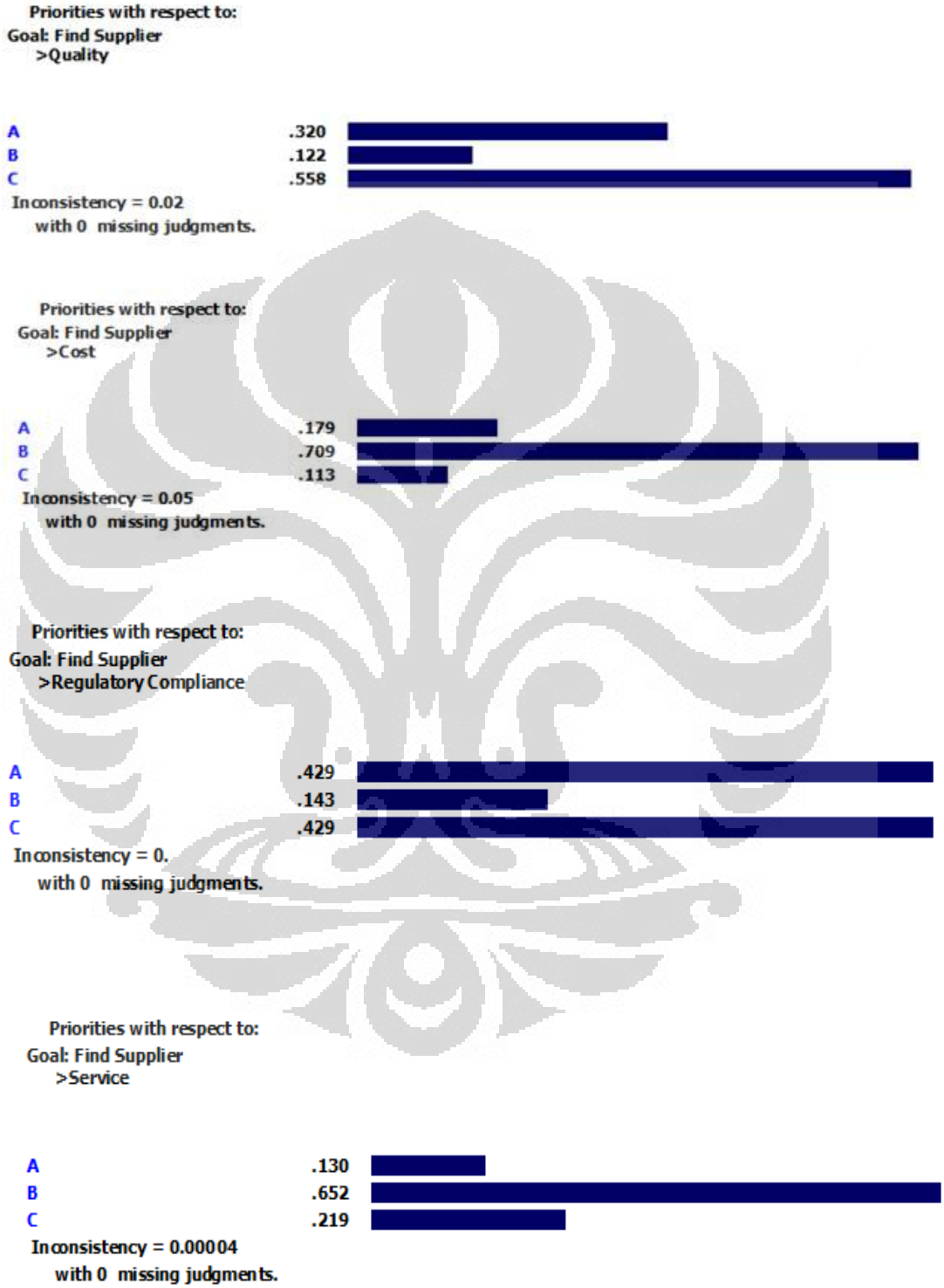

Inconsistency = 0.00004
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.
with 0 missing judgments.

**(Continued)**

## D. HR Services Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.03
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile

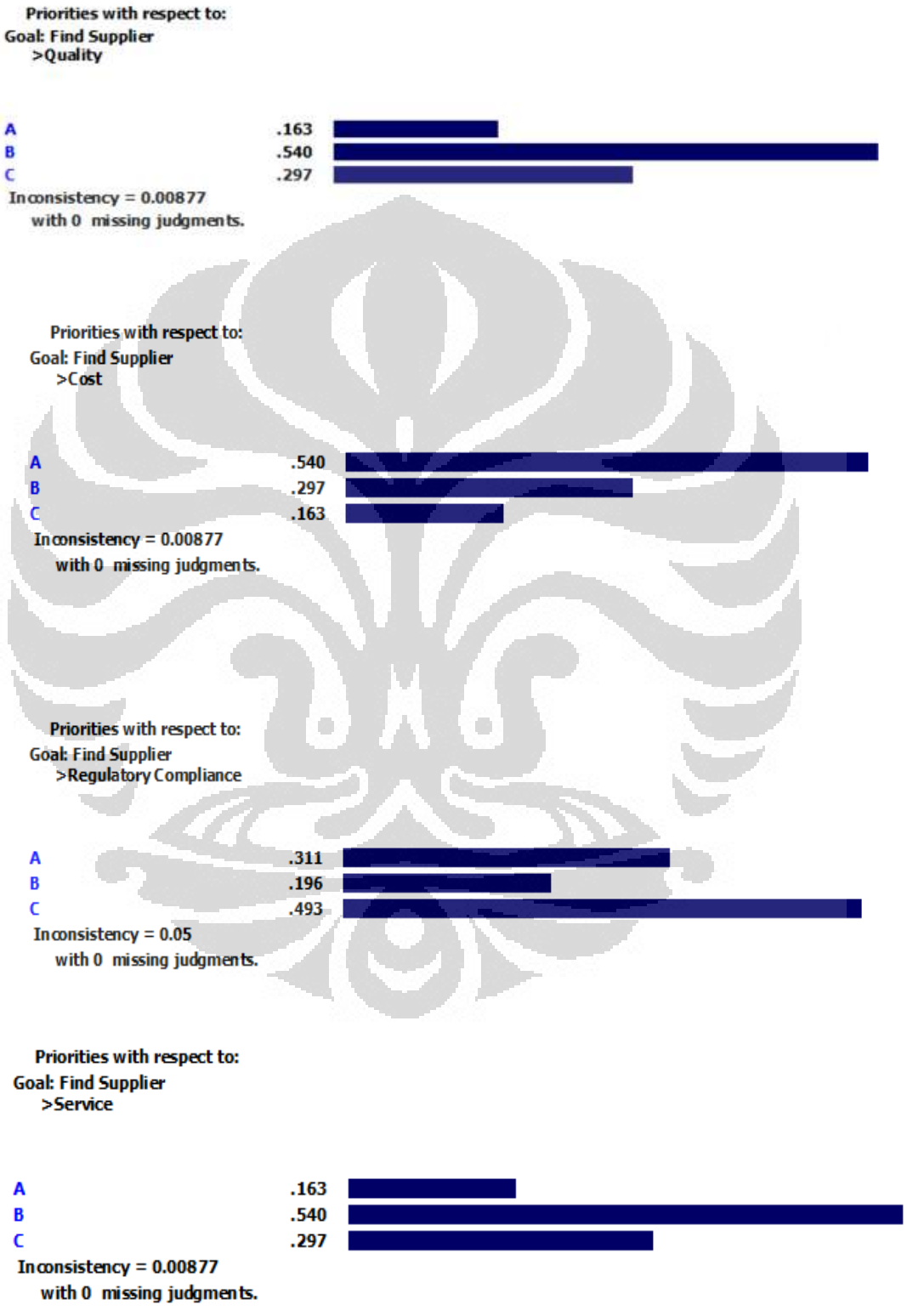

Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.05
with 0 missing judgments.

**(Continued)**

## E. Travel & Fleet Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Profile

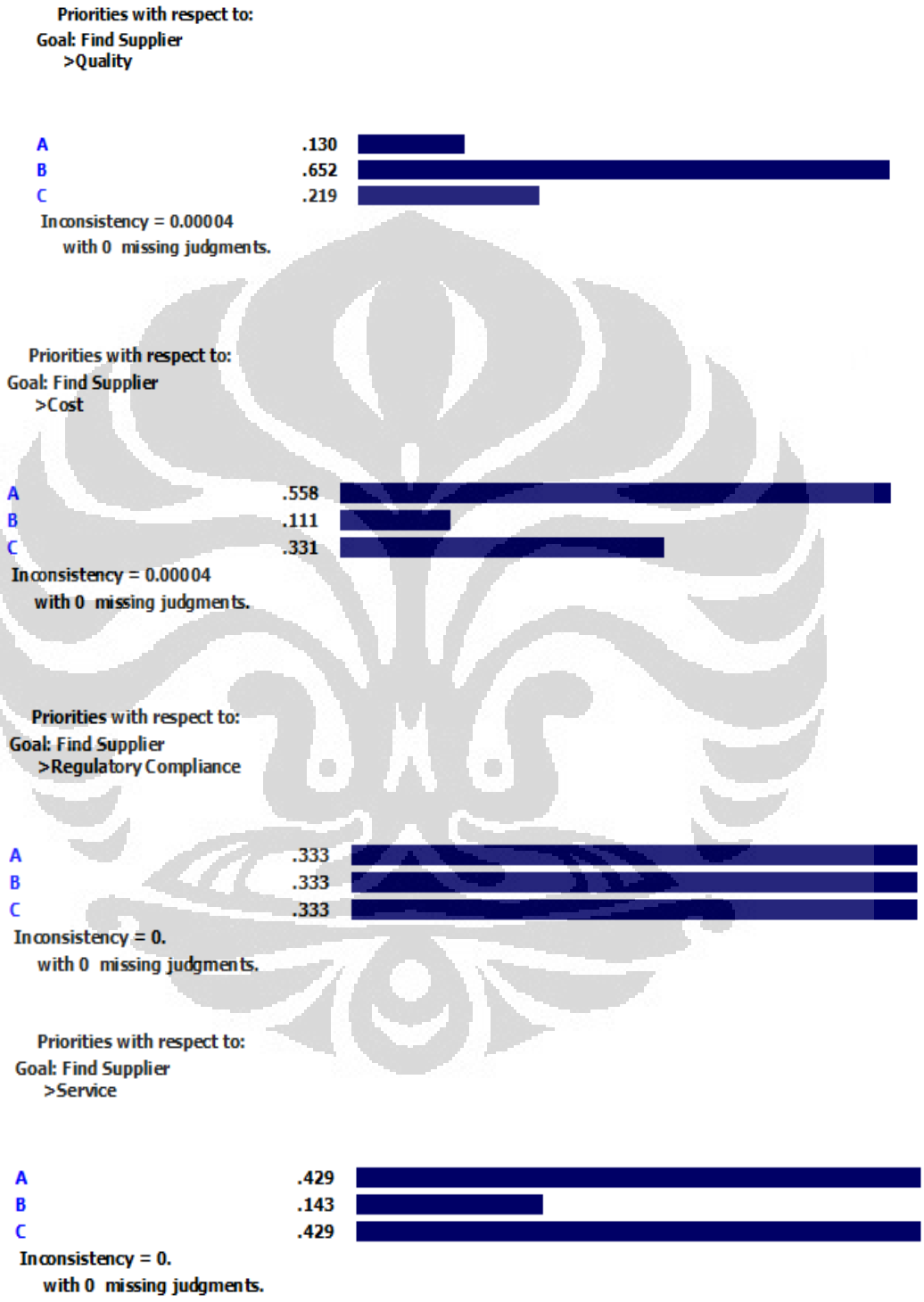

Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.
with 0 missing judgments.

**(Continued)**

## F. Site Services/Utilities/Real Estate Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile

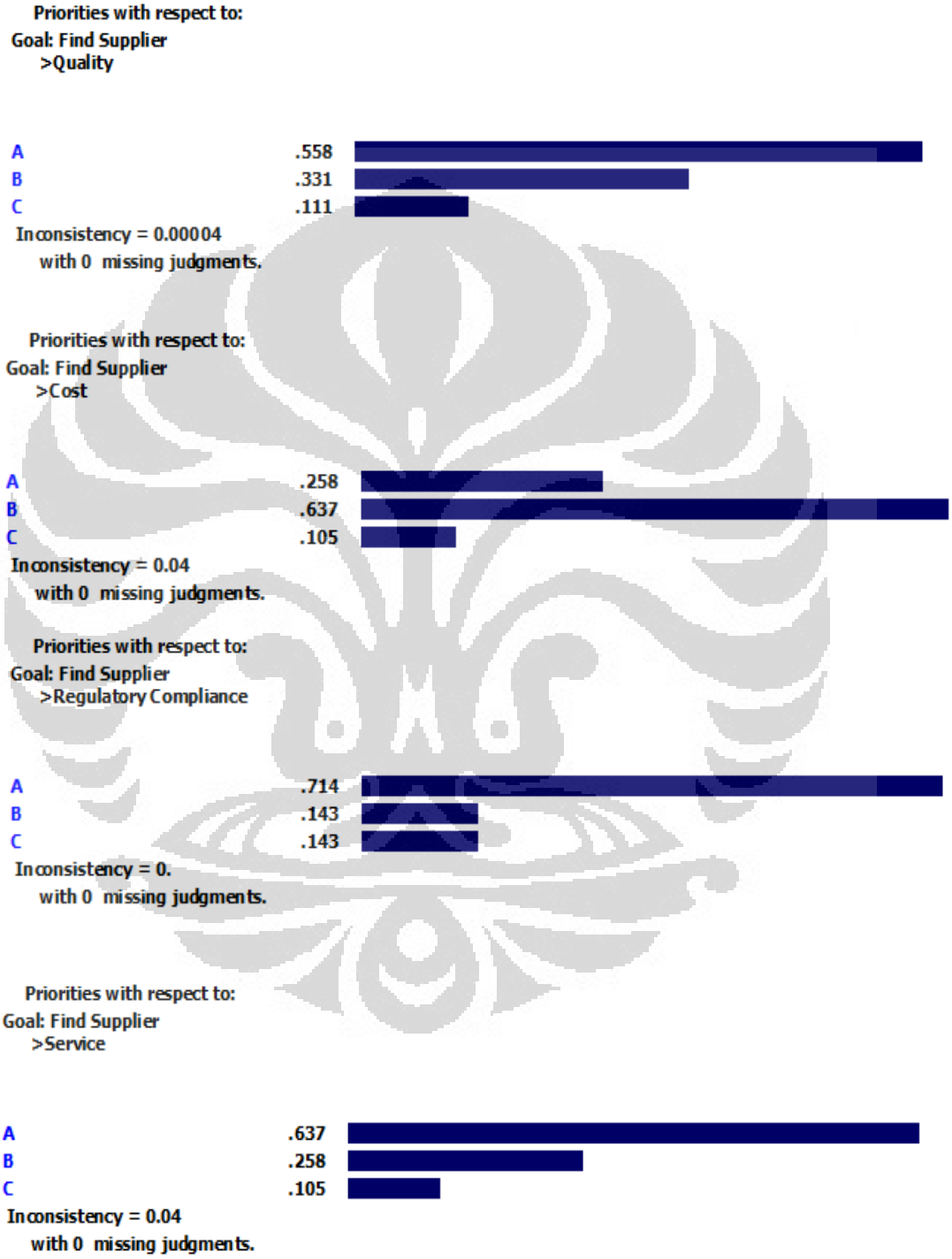

Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.03
with 0 missing judgments.

**(Continued)**

## G. Construction & Installation Category



**(Continued)**

Priorities with respect to:
Goal: Find Supplier
>Risk Management


Inconsistency = 0.
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Supplier Pofile


Inconsistency = 0.04
with 0 missing judgments.

Priorities with respect to:
Goal: Find Supplier
>Green Purchasing


Inconsistency = 0.
with 0 missing judgments.