

## ORGANIZATION STRUCTURE SELECTION BASED ON COMBINATION BETWEEN TIME HORIZON ANALYSIS AND ANALYTIC HIERARCHY PROCESS

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### **Keywords:**

*AHP, organization structure, time horizon, dynamic value, multicriteria, priority*

**Summary:** *The proposed research has objective to evaluate and select organisation structure based on AHP regarding its related time horizon. The research is based on selection process of three main types of organization structure in a manufacturing company. Each alternative is selected based on its relevancy to different periode of implementation. The three tyves are: (a) implementing existing organization structure, (b) implementing strategic business unit and (c) implementing investment holding organization. To evaluate these alternatives, the proposed model has following criteria: increasing efficiency, improving coordination among organizational functions, focusing on supply chain management, minimizing delivery lead time, market orientation, increasing accountability, facilitating control of material and energy. Typical contribution of the proposed model is how to define criteria weight using AHP as dynamic value; whereas the weight depends on its related time horizon. Each time horizon corresponds to different organizational strategic challenges and business requirements. Results of the proposed research is recommendation of priority of organizaiton structures for different time horizons.*

### **1. Introduction**

Organizational diagnosis is a systematic method for gathering, organizing, and interpreting information about organizations for the purpose of helping them anticipate or ameliorate their adaptive problems. It is carried out by individuals, whether as single practitioners or in a team. The individual practitioner is his or her most important instrument or device for gathering data, making inferences, interpreting those data and inferences, and evolving modes of acting on his or her conclusions. (Howard, 1994)

The independent practitioner or human resources specialist within an organization who is undertaking diagnosis may use a wide variety of methods to gather information. Inasmuch as many of the data are subjective (feelings, opinions, perceptions), the diagnostician must

require confirming sources of information to accept data as valid. When there is agreement about the data from various perspectives and different sources, the practitioner is likely to have greater confidence in them. Once sufficient data are gathered, the next task is to give them meaning.

An organization and the people in it are constantly undergoing change. Change inevitably occurs partly as a product of evolution and growth, partly because of technical or cultural change, and partly as a result of vicissitudes of the marketplace or global environment change.

All organizations necessarily anticipate the future and are directed toward coping with it. They invest in building and equipment, in marketing and advertising, in developing their employees. Many engage in long-term projects like building power plants or developing raw material fields. Most acquire capital either by equity (selling stocks and bonds) or debt (borrowing). It is important, therefore, to understand how an organization perceives its future and focuses its anticipatory efforts.

A significant component of that understanding is developing a sense of the organization's trajectory, such as: its history, its evolutionary pattern, what have been the stages in its development, and how has it managed its transitions.

One of the most critical aspects of an organization's evolution is the change in its structure, such as organization restructuring. Political conflicts in an organization may result in power struggles and the compromise choice of a passive leader who will not favor either faction. In family business, often the rule of primogeniture is followed, which means that the eldest son takes over, even though another child may be more competent. On the other hand, size is one of the most important variables affecting an organization's structure. As the organization grows, most organizations follow a similar evolutionary pattern. When an organization starts out as a one-person enterprise, that person performs all the tasks he or she is capable of doing, and contracts out the rest to external providers. For example, if this is a manufacturing business, the owner/proprietor may handle sales, design and manufacture of the product, delivery and billing. He or she may contract out secretarial and bookkeeping services, janitorial and legal services.

As the company grows, the owner will hire some employees, and these people will likely specialize in certain functions. So a division of labor appears. For example, the owner may hire a sales representative, a product designer and a machinist to make the product. The owner may also hire an office administrator to handle secretarial and bookkeeping work and so will reduce the amount of work contracted out.

When the company gets even bigger, we will find departments rather than individuals to handle functions so another level of management is added: a sales manager to handle a group of sales representatives, a design manager to manage a group of designers, and so on.

As the organization gets bigger, middle levels of management appear. Now the sales department may be split up into several sections according to the territory served: each section will have a first-line supervisor managing it, first line supervisors will report to the sales manager, who reports to the president.

Initially, most organizations start by being functionally organized. When they become large, they often split into divisions that are organized by product, customer or geographical area served. These divisions often have functional departments within each.

By the time an organization grows extremely large, it is common to find that it spends more time and resources on maintaining itself than on serving its customers. Today, when being attentive to and responding quickly to changing markets is critical to survival, these top-heavy companies find that their size inhibits their ability to compete successfully. A large organization is very slow to change, even its managers understand the need to do so. It has been compared to an ocean liner that simply cannot stop in its tracks or change course in an instant even if its captain is alert enough to spot danger ahead. Large companies try in different ways to capture the speed and flexibility of smaller companies. Sometimes, they split into comparatively independent divisions-becoming, in effect, a cluster of “little companies” or Strategic Business Unit (SBU). The company split up into small, relatively autonomous divisions that we are able to generate their own resources and make their own business decisions. Some companies restructure into teams that have enough autonomy to enable them to respond to customers’ concerns quickly and effectively.

Restructuring organization depends on many aspects, such as external environment, mission and strategy, leadership, culture, management practices, systems, individual skill/abilities, organizational performance, share holder policies, etc. Degree of importance of each aspect is varied and it depends on time horizon of restructuring decision plan. This research proposed organization structure selection model based on combination between time horizon analysis and Analytic Hierarchy Process

## **2. Objectives**

**The proposed research has objective to:**

- a. Identify criteria related to organization structure selection
- b. Develop organization structure selection model based on combination between time horizon and AHP

## **3. Decision Model**

Model development is based on the fact that there is a large company which needs to be transformed into investment holding structure (investment holding structure consists of holding company and its subsidiary companies which are expected to be profitable business units). According to survey and interview to Shareholders, Board of Commissioners (BOC), and Board of Directors (BOD), it is identified that there are environmental changes forcing executives to consider radical transformations and it increased willingness to try new organizational.

Based on organizational diagnosis, there are three time horizon segments as a milestone for executing transformation processes. These three segments are:

- a. Year 2007, time horizon to prepare organizational transition structure
- b. Year 2008, time horizon to implement transition process toward investment holding readiness
- c. Year 2010, time horizon to implement investment holding structure

Meanwhile, there is critical needs to implement investment holding organization structure directly in the year 2007. On the other hand, to implement this structure there are some prerequisites which are not simple to fulfil. In fact, there are some key factors which influence implementation success, such as readiness of human resources, accountability of business process management, etc. So there is another option which proposes Strategic Business Unit (SBU) structure as preparation stage before implementation investment holding structure (SBU is a company which consists of more autonomous divisions in which these divisions have more authority in operational and financial transaction regarding accountability principle).

### **3.1 Building alternatives:**

Alternatives are built based on the following decision rules:

- a. If in the year 2007, transition organization structure is selected, then there are two possible structures in the year 2008, i.e.: SBU structure or investment holding structure
- b. If in the year 2008, SBU structure is selected, then there is one possible structure in the year 2010, i.e.: investment holding structure
- c. If in the year 2007, SBU structure is selected, then there is one possible structure in the year 2008, i.e.: investment holding structure
- d. If in the year 2007, investment holding is selected, then it is not necessary to consider other two structures in the year 2008 and 2010.

So, there are four following alternatives of organization structure (tabel 1):

**Alternative-1:**

Transition organization structure in year 2007, Strategic Business Unit (SBU) structure in year 2008 and Investment Holding structure in year 2010

**Alternative-2:**

Transition organization structure in year 2007 and Investment Holding structure in year 2008

**Alternative-3:**

Strategic Business Unit (SBU) structure in year 2007 and Investment Holding structure in year 2008

**Alternative-4:**

Investment Holding structure in year 2007

**Tabel 1 - Four alternatives of organization structure**

YEAR	2007	2008	2010
<b>Alt 1</b>	Transition Organization Structure	SBU Structure	Investmet Holding Structure
<b>Alt 2</b>	Transition Organization Structure	Investmet Holding Structure	
<b>Alt 3</b>	SBU Structure	Investment Holding Structure	
<b>Alt 4</b>	Investment Holding Structure		

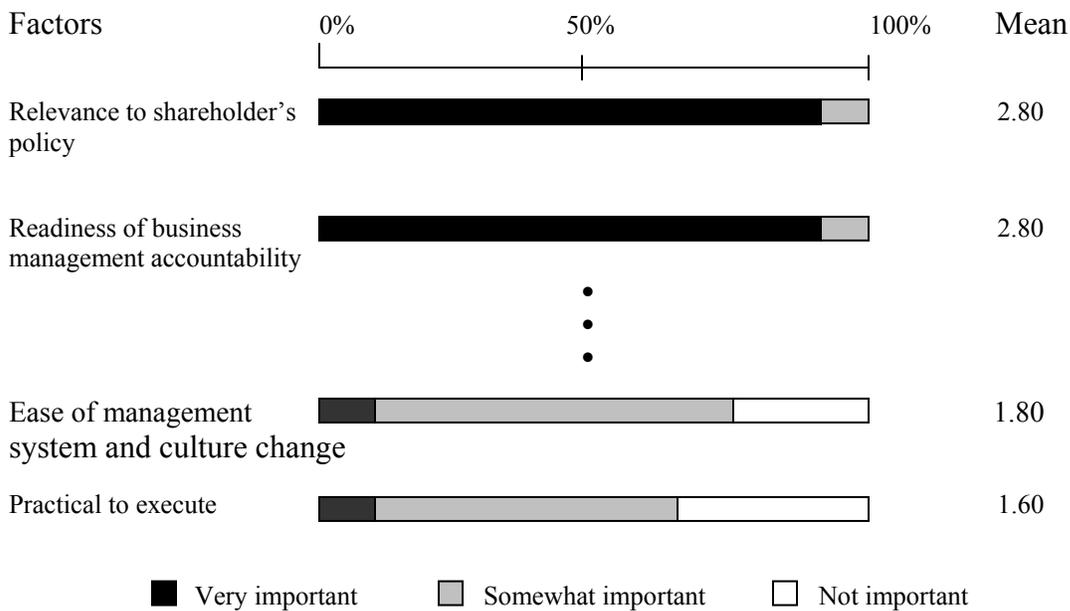
**3.2 Setting Criteria:**

- a. Readiness of human ressource
- b. Readiness of business process management accountability
- c. Supply chain integration
- d. Technology and production capacity
- e. Minimum social impacts
- f. Relevance to shareholder's policy
- g. Ease of management system and culture change
- h. Practical to execute
- i. Funding sources availability
- j. Increase market access
- k. Minimizing delivery lead time
- l. Market orientation
- m. Facilitating control of material and energy

Indeed it may contain criteria that are not really important and can complicate the decision making without adding quality in the decision. So, the following step, is selecting in this list criteria that are relevant for the company, and that could be used in the AHP model.

To match with firm's needs, this selection is based on the inputs of several experts, shareholders, BOC and BOD members. A survey involving 20 respondents selected from shareholders, BOC and BOD members is conducted. A questionnaire, consisting of these criteria, was designed for the survey. Before conducting the survey, this questionnaire was conducted with two professional staff members in the Industrial Engineering Department , Bandung Institute of Technology. Based on the advices of Engineering Department, the questionnaire was modified and some other criteria were added. After that it was distributed to the selected respondents.

The respondents were asked to rate each criteria using the three points scale of “not important”, “somewhat important” and “very important” in selecting organization structure, as proposed by (Tam & al. 01). The mean value of each criterion is determined by multiplying the percentage of respondents with the values of 1,2 and 3 (affected respectively to “not important”, “somewhat important” and “very important”), and by adding the resulting products. For the *Minimum social impacts* factor the answers were 80% of “very important”, 20% of “somewhat important” and 0% of “not important”. So the mean value for this factor is  $(0.8 \times 3) + (0.2 \times 2) = 2.4 + 0.4 = 2.8$ . From figure 1 we can see a way of representing the survey’s results, and the highest (2.8) and lowest (1.6) mean rating values of all the factors included in the survey. The average of these two values is  $(2.8+1.6)/2=2.2$ . This average is used as a cut-off value to identify relevant criteria. So, each factor with a mean value under 2.2 will not be considered anymore.



**Example of calculus of the mean value of the first factor :**  $2.80 = \frac{80}{100} * 3 + \frac{20}{100} * 2$

**Figure 1. Some results of the evaluation of the importance of the factors.**

We can notice that some of the eliminated criteria, could be grouped into other factors with a mean value greater than 2.2. For example “Practical to execute ” could be grouped with “Readiness of business process management accountability” (see figure 1). Anyway, the presence of too many criteria will make the pairwise comparisons difficult and time consuming. Furthermore it could also introduce bias in evaluators works. To solve these problems, it is necessary to use the cut-off value method, or another similar, to reduce the number of criteria (Tam & al. 01).

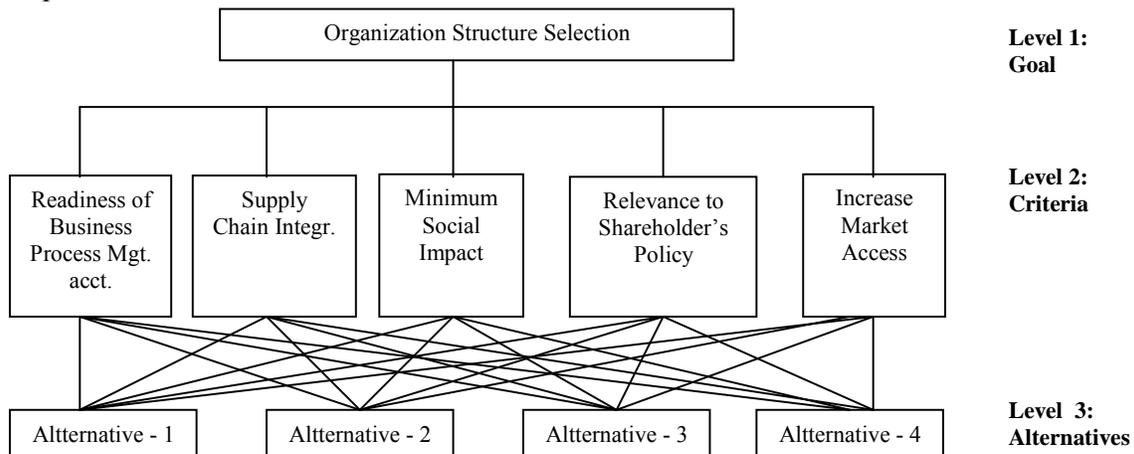
Cut off point method has resulted the following selected criteria:

- a. Readiness of business process management accountability
- b. Supply chain integration
- c. Minimum social impacts
- d. Relevance to shareholder's policy
- e. Increase market access

### 3.3 The AHP Model

The hierarchy of such a problem in the AHP model is basically composed by three levels : the goals, the criteria and the alternatives.

- The goal (1st level) : selection of organization structure
- The criteria (2nd level) : there are five criteria: readiness of business process management accountability, supply chain integration, minimum social impacts, relevance to shareholder's policy, increase market access
- The alternatives (3rd level) : the 3rd level consists of four alternatives as described in Tabel 1



### 3.4 Weighting and Priority Identification

Steps to calculate relative weights among criteria and sub criteria and among solution alternatives are as follow:

- a. Construction of pairwise comparison matrix
- b. Calculate geometric mean in each row:  

$$w_i = (a_{i1} \cdot a_{i2} \cdot a_{i3} \dots a_{in})^{1/n}$$
- c. Summation of all geometric mean from step (b):  

$$w_t = w_1 + w_2 + \dots + w_n$$
- d. Normalization :  $w_{i \text{ relatif}} = w_i / w_t$

Priority identification is formulated based on relative weighting among hierarchy components.

#### Consistency Ratio

To ensure model consistency, the following equations are utilized::

$$CI = \frac{\lambda_{\max} - n}{n - 1} \quad \text{and} \quad \lambda_{\max} = \frac{1}{w_i} \sum_{j=1}^n a_{ij} \cdot w_j$$

where:

CI = Consistency Index  
 $\lambda_{\max}$  = Maximum Eigenvalue  
n = Matrix orde  
 $a_{ij}$  = Comparison value between  $A_i$  and  $A_j$   
 $w_i$  = Weight of  $A_i$   
 $w_j$  = Weight of  $A_j$

and:

$$CR = \frac{CI}{RI}$$

where :

RI = random index  
I = index consistency  
CR = consistency rasio

Table 2 shows an example of pairwise comparison matrices to calculate criteria weight and Table 3 shows alternatives weight with respect to criteria.

Table 2 Criteria weights with respect to the goal

GOAL	Readiness Bus.Proc.	Supp.Chain Integ.	Min Sos Impact	Relev.Share Policy	Increase Market Acc.	Priorities
Readiness of Business Process	1	1/5	3	1/2	5	0.152
Suuply Chain Integ.	5	1	7	1	7	0.433
Min.Social Impact	1/3	1/7	1	1/4	3	0.072
Relevace Shareholder's Policy	2	1	4	1	7	0.305
Increase Market Access	1/5	1/7	1/3	1/7	1	0.038

Inconsistency 0.05

Table 3 Alternatives' weights with respect to criteria

Increase Market Access	Alt-1	Alt-2	Alt-3	Alt-4	Priorities
Alt-1	1	1/2	1	1/2	0.163
Alt-2	2	1	2.5	1	0.345
Alt-3	1	1/2.5	1	1/2.5	0.146
Alt-4	2	1	2.5	1	0.345

Inconsistency .002

After calculating all alternative weight, it is found that the priority of organization structure is as follows:

<b>Aternatives</b>	<b>Description</b>	<b>Weight</b>	<b>Priority Number</b>
<b>Alternative-1:</b>	Transition organization structure in year 2007, Strategic Business Unit (SBU) structure in year 2008 and Investment Holding structure in year 2010	<b>0.355</b>	<b>1</b>
<b>Alternative-2:</b>	Transition organization structure in year 2007 and Investment Holding structure in year 2008	<b>0.250</b>	<b>2</b>
<b>Alternative-3:</b>	Strategic Business Unit (SBU) structure in year 2007 and Investment Holding structure in year 2008	<b>0.235</b>	<b>3</b>
<b>Alternative-4:</b>	Investment Holding structure in year 2007	<b>0.160</b>	<b>4</b>

#### **4. Discussion and Conclusion**

The poposed research used fundamental step and technique of Analytic Hierarchy Process. And criteria identification is supported by Cut off Point technique, developed by (Tam & all 2001). Meanwhile, the proposed research has contributed a technique in building set of alternatives. In tis case, the alternatives have specific charasteristic, where time horizon is considered as periode to execute the alternatives. In fact, one alternative may become set of other alternatives, such as: alternative – 1 consists of transition organization structure in year 2007, Strategic Business Unit (SBU) structure in year 2008 and Investment Holding structure

in year 2010. On the other hand, Strategic Business Unit (SBU) structure in year 2007 and Investment Holding structure in year 2008 are components of alternative-3. It means, when related time horizon is different, some alternatives may become sub set of other alternatives. In another word, nature of alternatives is influenced by periode of its implementation.

Practically, this phenomenon corresponds to business and organization strategy applied by a company. For example, shareholders want to change organization structure from existing structure into investment holding structure in order to increase market access. But, CEO can not implement the proposed organization structure because there are some constraints, such as the company is not ready to run business process accountability. So there are contradictory criteria which depend on decision makers point of view. Therefore, in the proposed research, criteria are derived based on contradictory point of views.

This research emerges research issue, such as: how to combine AHP with dynamic nature of alternative as function of time horizon. It means, when an alternative is evaluated for different time horizon, it needs to verify if its related criteria have different weights for each time horizon.

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