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Business Strategy Selection Using SWOT Analysis with ANP and Fuzzy TOPSIS for Improving Competitive Advantage

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ABSTRACT

The purpose of this research is to improve the dimension analysis of SWOT with group decision-making. This study analyses the internal and external environment of companies for formulating alternative strategies during the planning process of strategy formulation. The main focus of this research is to choose the best alternative strategy based on each factor and sub-factor of the SWOT analysis, where the strengths and opportunities are treated as advantages and weaknesses and threats are treated as costs. This research was completed using the Analytic Network Process (ANP) and Fuzzy Technique for Order Performance by Similarity to Ideal Solution (TOPSIS). The incorporation of the ANP and Fuzzy TOPSIS methods is proposed at the end of the study and can be applied with a SWOT analysis to formulate the best alternative strategy.

Keywords: ANP, Fuzzy TOPSIS, group decision-making, multi-criteria determination analysis, SWOT analysis

INTRODUCTION

Global trade in the era of hyper-competition is happening due to the development of technology, information and various emerging business strategies. This opportunity should be utilised to the maximum by businesses because it lowers the entry barriers for opening a new business for domestic products. The globalisation of the economy on the one hand will open up domestic product market opportunities to the international market on a competitive basis, while also opening opportunities for global product entry into the domestic market. A

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real example of this effect of globalisation is the existence of a free market, namely the growth of foreign products that cause Indonesian products to lose competitiveness in the market.

Industrial development in Indonesia has decreased from year to year. With the ACFTA (Asian China Free Trade Agreement), more and more Chinese products enter Indonesia, such as textile products, toys and other products, and these products are outperforming domestic products. In 2000, the industrial sector accounted for 27.7% of Indonesia's total gross domestic product, with 23.8% coming from non-oil and gas industries. In 2001 the contribution of the industrial sector to the national economy increased to 29%, with non-oil and gas industries accounting for 25.2%. However, since 2002, the contribution of the industrial sector has decreased consistently, reaching 23.7% in 2013 and non-oil and gas industry contributing 20.8% (vibizmedia.com, 2015).

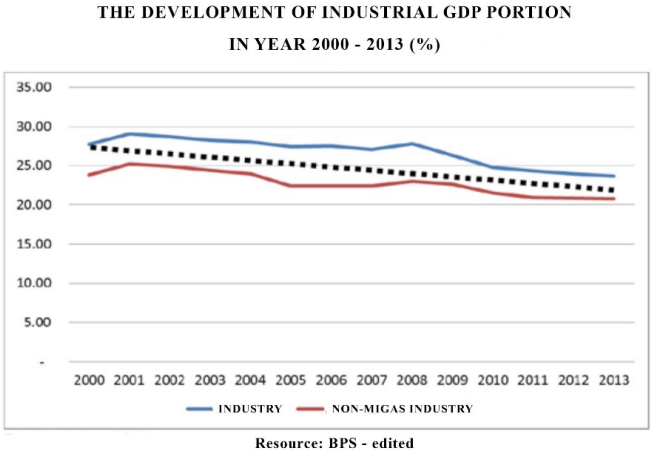

Figure 1. The proportion of industry in PDB. From "Optimism of Indonesia's Economic Growth: Indonesian Industrial Development (2015-2019) - Part 1", by vibizmedia.com, 2015. (http://vibizmedia.com/2015/07/31/pembangunan-industri-indonesia-2015-2019-bagian-1/). In the public domain

Figure 1 shows a decline in the contribution of industrial products to Indonesia's GDP. With global trading mechanisms such as free trade agreements that facilitate cross-border trade and minimise trade barriers, the global market has become a competitive market target. Environmental analyses, especially internal and external, are critical to developing a sustainable competitive advantage, identifying opportunities and threats and providing opportunities to cooperate with other companies. The literature reveals that different approaches and techniques are used for macro-environment.

The selection of a global business strategy will have a profound impact on corporate growth. These strategies, such as

alliance, acquisition and diversification, can help a company to improve its performance and will have an effect on increasing its competitive advantage. The strategy can be run if it is in line with the vision and mission of the company. The decision of a company to take systematic service improvement action is decisive in following up on consumer complaints so that it can ultimately bind consumer loyalty (Elu, 2005).

LITERATURE REVIEW

According to David (2011), the purpose of an external audit is to develop a limited list of opportunities that can benefit a company and the threats it should avoid. As indicated by limited terms, external audits do not aim to develop a comprehensive list of all factors that affect business, but rather identify the key variables that offer action responses. Companies must be able to respond either offensively or defensively to these factors by formulating strategies that can take advantage of external opportunities or opportunities or that minimise the impact of potential threats. The major external forces are divided into five broad categories: 1) Economic strength; 2) Social, cultural, demographic, and environmental strengths; 3) Political, governmental and legal strengths; 4) The power of technology; and 5) Competitive strength.

Internal Audit

According to David (2011), an organisation has strengths and weaknesses in the functional areas of business. No business is strong or weak in all areas. Internal strengths and weaknesses, coupled with external opportunities and threats and clear mission statements provide the basis for setting goals and strategies. Goals and strategies are set with the aim of utilising strengths and overcoming internal weaknesses.

Internal strengths can be divided into six categories: 1) The power of management; 2) The power of marketing; 3) Financial strength/accounting; 4) Strength of production/operation; 5) Strength of research and development; and 6) Strength of information management systems. SWOT analysis is at the core of any strategy to direct its resources and capabilities to external corporate environmental opportunities (Yuksel, 2011). Therefore, the relationship between a company and its environment in terms of strategic management refers to the external conditions of the environment and the internal environment (resources and abilities).

David (2011) described the SWOT analysis as a systematic way to identify factors of strength (STRENGTH), weakness (WEAKNESS) within a company and factors opportunity (OPPORTUNITY) and threat (THREAT) within the environment facing the company. This analysis is based on the assumption that an effective strategy will maximise strengths and opportunities and minimise weaknesses and threats. SWOT analysis studies the following aspects of an organisation:

1) Strengths: Resources (financial, human, energy, machinery, buildings and so on) skills or distinctive advantages

possessed by other individuals or organisations. Strengths are also called core distinctives or core competencies.

2) Weaknesses: Limitations or lack of resources, skills, capabilities that hinder the progress of the company in performance (competency), profits income, improvement managerial and product.

3) Opportunities: Important situations that benefit the company; it is very important for companies to be able to see various opportunities well from the lens of business to achieve its targets and goals.

4) Threats: Important situations that are unprofitable can be eliminated or be repaired, no matter how the company overcomes them; obstacles have the capability of inhibiting progress and are not profitable.

Framework of Thinking

The framework for this research is illustrated in Figure 2.

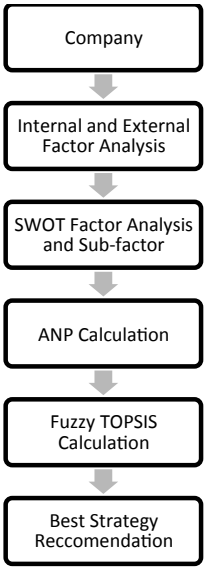

Figure 2. Research framework

MATERIALS AND METHODS

In this study, the authors used the descriptive research method. The analytical method used the concept of strategy formulation framed by David (2011), which covers three stages of implementation and uses the matrix as an analytical model. The three stages of the framework in question are the input stage, matching stage and decision-making stage. Figure 3 shows the operational variables employed in this research.

Operational Variables

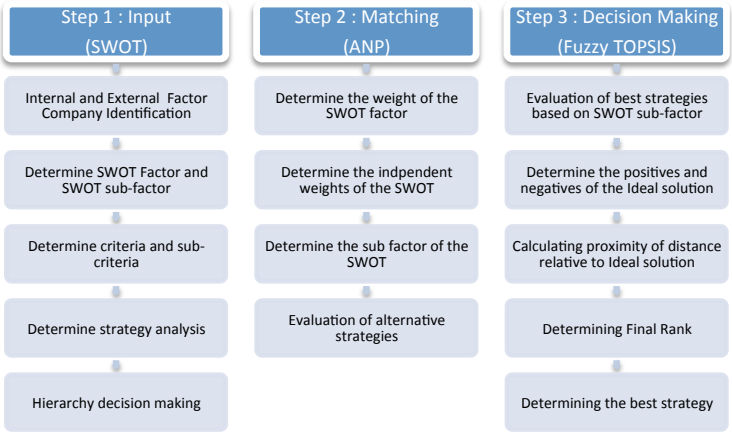

Figure 3. Operational research variables

SWOT Matrix Analysis

A SWOT matrix is an important matching tool that helps managers to develop four types of strategy: SO strategy (strengths-opportunities), WO strategy (weaknesses-opportunities), ST strategy (strengths-threats) and WT strategy (weaknesses-threats). Matching the major external and internal factors is the most difficult part of developing a SWOT matrix and requires good judgement according to David (2011).

SO strategy. An SO strategy uses a company's internal strengths to take advantage of external opportunities. All managers desire their organisation to be in a position where internal strengths can take advantage of external trends and events. Organisations will generally adopt WO, ST or WT strategies to prepare the ground for implementation of an SO strategy. If the company has serious weaknesses, it will struggle to overcome them and turn them into a force. When an organisation is faced with a great threat, the company will first try to circumvent it by concentrating on opportunities available to it.

WO strategy. A WO strategy aims to improve an internal weakness by taking advantage of external opportunities. Sometimes, there are key external opportunities but also internal weaknesses that hinder the company from exploiting them.

ST strategy. An ST strategy uses corporate power to avoid or reduce external influences and threats. This does not mean that a strong organisation must always face threats in its external environment directly.

WT strategy. A WT strategy is a defensive tactic aimed at reducing internal weaknesses and avoiding external threats. An organisation that faces a barrage of

external threats and internal weaknesses is in a perilous position. In reality, such companies may have to struggle to survive, merge, shrink, declare bankruptcy or opt for liquidation.

According to David (2011), there are eight steps in creating a SWOT matrix: 1) Make a list of some of the company's major external opportunities; 2) List some of the company's major external threats; 3) List some of the company's major internal strengths; 4) List some of the company's major internal weaknesses; 5) Match internal strengths with external opportunities and note the results in an SO strategy cell; 6) Match the internal weaknesses with external opportunities and note the results in a WO strategy cell; 7) Match internal strengths with external threats and note the results in a ST strategy cell; and 8) Match the internal weaknesses with external threats and record the results in a WT strategy cell.

The purpose of each matching tool in Stage 2 is to generate a viable alternative strategy, rather than to choose which strategy works best. Not all strategies developed in the SWOT analysis will be selected for implementation. Table 1 below shows the Matrix SWOT:

Table 1
SWOT Matrix

Internal / External	STRENGTH (S) Determine 5-10 Internal Strength Factors	WEAKNESS (W) Determine 5-10 External Weakness Factors
OPPORTUNITY (O)	SO STRATEGY	WO STRATEGY
Determine 5-10 external opportunity factors	Creating strategies that use force to take advantage of opportunities	Creating strategies that minimise weaknesses to take advantage of opportunities
THREAT (T)	ST STRATEGY	WT STRATEGY
Determine 5-10 external threat factors	Creating strategies that use force to overcome threats	Creating strategies that minimise weaknesses and avoid threats

ANP Analytic Network Process (ANP)

Analytic Network Process or ANP is a mathematical theory that allows a decision maker to face factors of interrelated dependence and feedback systematically. ANP is one of the Multiple Criteria Decision-Making (MCDM) methods developed by Thomas L. Saaty. This method is a new approach among qualitative methods, and is a further development of the previous method of Analytic Hierarchy Process (AHP) (Tanjung & Devi, 2013).

An advantage of ANP over other methods is its ability to assist decision makers in measuring and synthesising a number of factors in the hierarchy or network. Among the many advantages of this new method is the simplicity of the concept offered. The simplicity of this method allows for its easy application

in diverse study areas such as decision-making, forecasting, evaluation, mapping, strategising and resource allocation, among others.

ANP is used to solve problems that depend on alternatives and criteria. In analytical techniques, ANP uses paired comparisons of alternatives and project criteria. In the AHP network there is a level of objectives, criteria, sub-criteria and alternatives, where each level has elements. Meanwhile, the level in AHP is called a cluster on an ANP network that can have criteria and alternatives in it, which is now called a node.

By using feedback networks, elements can be dependent or tied to components such as hierarchical networks but can also depend on the same elements. Furthermore, an element may depend on other elements present in a component. A component is a straight line connecting to another cluster, which is called the outer dependence. However, the elements that will be compared are in the same component, so that the elements form a relationship, a "line of rotation", which is then called an inner dependence.

This axiom states that the elements to be compared are not too different from one another. If the difference between them is too large it will have an impact as a larger assessment error. The scale used in AHP and ANP differs from the scale used in general Likert measurements, which is commonly 1 to 5. The scale used in the ANP has a larger range i.e. 1 to 9 or even wider. Table 2 records the scale used in the weighting of the ANP.

Table 2
ANP scale table

Description	Level of Interest	Explanation
Very much greater influence/ importance level	9	The evidence in favour of one element versus the other has the highest proof of possible affirmation.
Between grades 7 and 9	8	The value of a compromise between two adjacent values
Very big influence/level of importance	7	One element is stronger than the other, and the dominant is shown in practice.
From the value 5 to the value 7	6	The value of a compromise between two adjacent values
Greater influence/degree of importance	5	Powerful experiences and judgements support one element over the other.
Between 3 and 5	4	The value of a compromise between two adjacent values
Slightly greater influence/level of interest	3	Experience and judgement slightly support one element versus the other.
Between 1 and 3	2	The compromise value is between two adjacent values.
Equally influential/level of interest	1	Two comparable elements contribute in the same way towards achieving the goal.

Note: Adapted from "Application of ANP and TOPSIS Fuzzy Methods in Determining Marketing Strategy" by P. Astuti, 2014, Undergraduate Thesis, Universitas Pendidikan Indonesia

ANP Main Function

According to Tanjung and Devi (2013) there are three main functions of ANP, which are considered below.

Structuring complexity. Complex problems, if not well structured, will be difficult to decipher. For complicated and complex problems, ANP helps in structuring the problem.

Measurement in ratio scale. Measurements using a ratio are necessary to reflect the proportion from subject. Any method with a hierarchical structure should use a scale priority ratio for elements above the lowest level of the hierarchy. This is important because the priority (weighting) of elements at any level of the hierarchy is determined by dividing the priority of the parent element. Since the multiplication of two interval level measurements is mathematically meaningless, a ratio scale is required for this multiplication.

Synthesis. Synthesis means uniting all parts into one. Because matters such as critical decision situations, forecasts and allocations of resources all often involve too many dimensions for humans to intuitively synthesise, a method for synthesising these problems from many dimensions is needed. A more important function in the ANP is its ability to assist decision makers in measuring and synthesising a number of factors in the hierarchy or network.

Fuzzy Concept

A fuzzy set is an object class with a continuum membership value. As specified by the membership function (characteristic) assigned to each object the membership class ranges between zero and one. According to Rouhani, Mehdi and Mostafa (2012) there are about five basic definitions of fuzzy, as quoted from Amiri (2010). These are explored below.

First, a number of fuzzy triangles can be defined by (a_1 ,a_2, a_3). The membership function $\mu\tilde{a}^{[x]}$ is defined as follows:

$$\mu_{\tilde{a}}[x] = \begin{cases} 0; & x \leq a_1 \\ \frac{x - a_1}{a_2 - a_1}; & a_1 < x \leq a_2 \\ \frac{a_2 - a}{a_3 - a_2}; & a_2 < x \leq a_3 \\ 0; & x \geq a_3 \end{cases} \quad (1) \qquad (1)$$

Figure 4 shows the triangular fuzzy number expressed in graphic form.

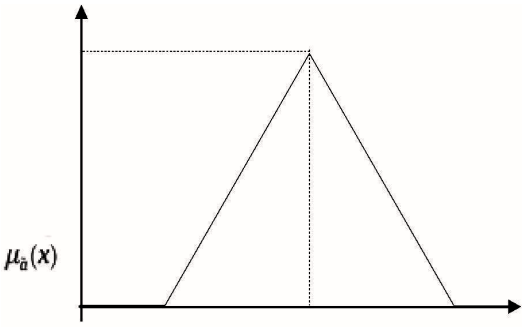

Figure 4. Triangular fuzzy number (TFN). From "An Integrated Approach with Group Decision Making for Strategy Selection in SWOT Analysis" by Yuksel, 2011, *International Journal of Academic Research in Business and Social Sciences, 2*(11), p. 134–161. Copyright 2015 by the American Psychological Association

Second, if the two fuzzy numbers of triangles are indicated by (a_1 ,a_2, a_3) and (b_1 ,b_2, b_3), respectively, then the operational law of the two fuzzy numbers of triangles is as follows:

$$\tilde{a}(+)\tilde{b} = (a_1, a_2, a_3)(+)(b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \quad (2)$$

$$\tilde{a}(-)\tilde{b} = (a_1, a_2, a_3)(-)(b_1, b_2, b_3) = (a_1 - b_1, a_2 - b_2, a_3 - b_3) \quad (3)$$

$$\tilde{a}(x)\tilde{b} = (a_1, a_2, a_3)(x)(b_1, b_2, b_3) = (a_1 x b_1, a_2 x b_2, a_3 x b_3) \quad (4)$$

$$\tilde{a}(/)\tilde{b} = (a_1, a_2, a_3)(/)(b_1, b_2, b_3) = (a_1/b_1, a_2/b_2, a_3/b_3) \quad (5)$$

$$k\tilde{a} = (ka_1, ka_2, ka_3) \quad (6)$$

Third, a linguistic variable that comes with words like very low, low, medium, high and very high is used to describe complex conditions. Fuzzy numbers can also represent linguistic values.

Fourth, if ã and b are the two fuzzy numbers of triangles that have been shown by each triplet (a_1 ,a_2, a_3) and (b_1 ,b_2, b_3), then the vertex method used to determine the distance between a and b is:

$$d(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{3}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]} \quad (7)$$

Fifth, weighted normalisation of the fuzzy decision matrix is made using the formula below:

$$\tilde{v} = [\tilde{v}_{ij}]_{nxj} \quad \text{i=1,2,....n and j=1,2,.....m} \tag{8}$$

$$\tilde{v}_{ij} = \tilde{x}_{ij} x \tilde{W}_i \; \tilde{x} = (\tilde{x_{ij}}, i = 1,2, \ldots, n, j = 1,2, \ldots, m) \tag{9}$$

A set of alternative rating presentations A_j= (j=1, 2,.. m) with criteria C_i = (i=1, 2,..n) and a set of weights of importance to each criterion with W_i i=1,2...n and linguistic variables are used to assess alternative ratings and criteria provided by decision makers in pairwise comparisons. In the preparation of the scale of interest, the Saaty scale can be transformed into triangular fuzzy number. The scale is shown in Table 3.

Table 3
Scale fuzzy number

(Fuzzy Number) Adjustment to the Saaty Scale	TFN	Linguistic Scale for Relative Weights of Criteria	Linguistic Scale for the Performance Value of Alternative
9	(7,9,9)	Absolutely more important	Very good
7	(5,7,9)	More important	Good
5	(3,5,7)	More important	Medium
3	(1,3,5)	Less important	Bad
1	(1,1,3)	Equally important	Really bad

Note: Adapted from "Application of ANP and TOPSIS Fuzzy Methods in Determining Marketing Strategy" by P. Astuti, 2014, Undergraduate Thesis, Universitas Pendidikan Indonesia

The membership function curve for scale in Table 3 can be described as shown in Figure 5.

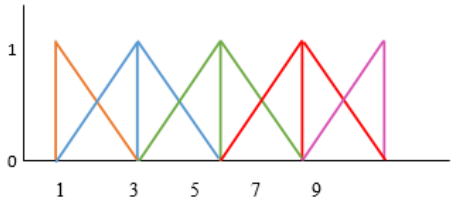

Figure 5. Curve for assessment scale. From "Application of ANP and TOPSIS fuzzy methods in determining marketing strategy" by Astuti, 2014, *Undergraduate Thesis*, Universitas Pendidikan Indonesia

In the initial process, the data are processed in the form of fuzzy numbers and the output is in the form of fuzzy numbers, while the input for the next process uses real numbers. Therefore, the process of mapping fuzzy numbers onto real numbers uses the average method of geometry.

Fuzzy TOPSIS

TOPSIS is a method of identifying solutions from a set of several criteria and limited alternatives (Ashtiani, Haghighirad, Makui, & Montazer, 2008). The basic principle is that the chosen alternative must have the shortest distance from the positive ideal solution and the furthest distance from the ideal negative solution. In TOPSIS, the performance rating and weighting criteria are assigned crisp values.

The main advantage of TOPSIS compared to other methods of complex problem decision-making is that it is easy to use, it can take into account all types of criterion (subjective and objective), it follows rational logic and is easy for practitioners to understand, the calculation process is very easy and the concept allows the best alternative criteria to be depicted. Mohamad and Ibrahim (2017) said that the Fuzzy set with similarity measure approaches is known to be effective in handling imprecise and subjective information in solving decision-making problems. Many methods have been introduced based on these two concepts. However, most methods do not take into account the reliability factor of the imprecise information in the evaluation process. Using simple mathematics, important weights can be easily inserted (Nasab & Milani, 2012). According to Ashtiani et al. (2008), the multi-criteria decision-making of a problem has n number of alternatives A_1 ,A_2, . . ., A_n and m criteria C_1 ,C_2, . . .C_m. Each alternative is evaluated with respect to the criteria. All values/ratings assigned to alternatives with respect to the decision matrix are denoted by $X(X_{ij})_{nxm}$.

The steps of TOPSIS Fuzzy method introduced by Onut and Soner (2007) are as follows:

a. Use linguistic choice for alternatives: Fuzzy linguistic assessment [0,1] and no need for normalisation
b Calculate the normalisation decision matrix

$$\tilde{v}_{ij} = \tilde{x}_{ij} x\, w_i \quad (10)$$

c. Determine the ideal solution and the negative ideal solution of the following equation:

$$\bar{A} = \{\bar{V_1} \ldots . \bar{V_i}\} = \{(min\tilde{V}_{ij} | i \in \Omega b), (max\tilde{V}_{ij} | i \in \Omega c)\} \quad (11)$$

$$A^* = \{V_1^* \ldots . V_i^*\} = \{(max\tilde{V}_{ij} | i \in \Omega b), (min\tilde{V}_{ij} | i \in \Omega c)\} \quad (12)$$

Ωb is a set of profit criteria and Ωc is a set of cost criteria.

d. Calculate the distance of each alternative from the ideal solution using the following equation:

e. $$D_i^* = \sum_{j=1}^{m} d(\tilde{V}_{ij}, A^*) \quad i = 1,2,\ldots.n \tag{13}$$

f. Calculate preference with ideal solution:

$$D_i^- = \sum_{j=1}^{m} d(\tilde{V}_{ij}, A^-) \quad i = 1,2,\ldots.n \quad FC_i = \frac{D_i^-}{D_i^- + D_i^*} \tag{14}$$

The greatest preference value indicates that the alternative becomes more elected. Selected strategy alternatives can be considered for determining the right marketing strategy.

RESULTS AND DISCUSSION

The structure of hierarchical decisions using SWOT factors, sub-factors and alternative strategies is shown in Figure 6.

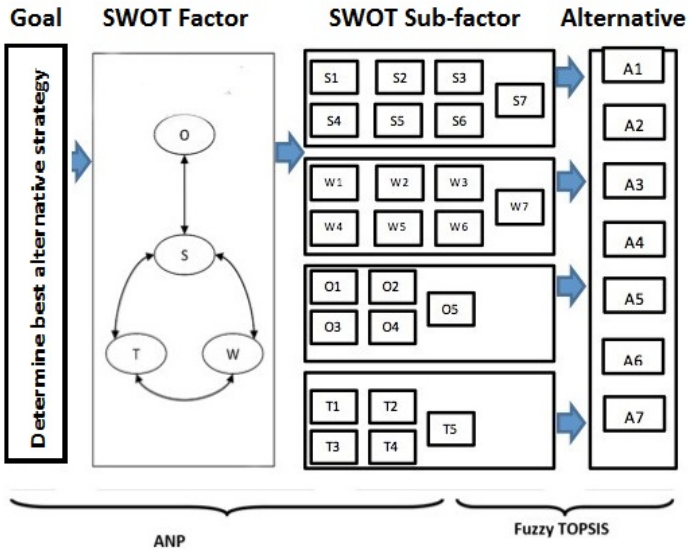

Figure 6. Model for decision-making

This analysis is used to derive the best strategy as the first step. The second stage is used to determine the factors of the SWOT analysis; the SWOT factors are divided into internal and external factors of the company. The SWOT analysis can be more effective and relevant when calculated using ANP techniques. In this third stage all sub-factors of the SWOT are used to perform the appropriate analysis to determine the right alternative strategy for the company. The fourth stage is to formulate the best alternative strategy for the company from the SWOT factors and its sub-factors.

The input stage consists of factors from the SWOT analysis, including the strengths, weaknesses, opportunities and threats. The matching stage consists of SWOT sub-factors, and both stages are tested using the ANP calculation run on the Super Decision software. Furthermore, the final stage is the decision-making stage, in which the results of the SWOT sub-factor calculation using ANP is combined with an alternative strategy determined using the Fuzzy TOPSIS method. In this research the strategy of cooperation with business partners was found to be the best strategy with the biggest score among the alternative strategies. This strategy is widely used to enhance the competitive advantage of a company to establish cooperation covers to provide the best price, creating a win-win solution for fellow business partners, strengthening relationships with customers and business partners and maintaining solidarity by holding regular events.

These results agree with those of a previous study by Yuksel (2011) that the right strategy for the company can be done in three stages: working group, ANP calculation and calculation using Fuzzy TOPSIS. The best alternative strategy, as concluded by this study, is to reduce profit margin i.e. to lower product prices. Although the best alternative strategies are different, the components in the research methodology used are more or less the same. Also, this research recommends that the best strategy is long-term planning of a company that is in accordance with the company's vision and mission.

Second, the results of this study were in line with previous studies conducted by Yuksel (2011) that showed that companies can use PESTEL and ANP analysis to formulate the right strategy for the company's macro-environment in the country. Although the method used was different, the purpose of the research was the same i.e. to determine the best alternative strategy for the company.

Third, the results of this study were in line with previous studies conducted by Azimi, Yazdani-Chamzini, Fouladgar, Zavadskas and Basiri (2011) that showed that the best strategy for the mining sector is to increase production and repair in decision-making based on a similar analysis using SWOT, ANP and TOPSIS. Although alternative results of the resulting strategies were different, the objectives of the research were the same i.e. to determine the best strategy for the company.

Fourth, the results of this study were in line with previous studies conducted by Bruno and Ivana (2015) that showed that SWOT analysis, Fuzzy TOPSIS and K-Means could be used to formulate strategic alternatives for the economic development of Croatia.

Finally, the results of this study indicated that in line with previous research conducted by Alptekin (2013) to formulate alternative results, the best strategy was to support innovation as a requirement to increase consumer demand by using SWOT analysis and TOPSIS. Alptekin's research focussed on furniture companies and used only SWOT analysis and TOPSIS test.

CONCLUSION

It can be concluded that the condition of internal and external factors are: 1) Strengths that comes from internal factors of the company; 2) Weaknesses that come from internal factors of the company; 3) Opportunities that come from external factors of the company; and 4) Threats from external factors.

The strengths of Indonesian companies include the fact that competitors in the mechanical electrical industry are still few, support for domestic products is growing, there is high solidarity in work, there is abundant employment, development is very high, the citizens are friendly, making it is easier for businesses to be run. The most highly prized strength of a company is the ability to fulfil time commitments. Their weaknesses include constraints in the import of products, ineffective and inefficient human resources, rampant wild fee charges, labour strikes and disturbances, high entertainment costs in business approaches and differences in standard regulations between countries and unknown brand image.

Opportunities that companies in Indonesia can take advantage of include improved government systems that support local products, increasingly visible business opportunities with time-lapsing, improved Indonesian education that has an effect on employment, improved technology and high development levels. Finally the threats to Indonesian companies include inadequate economic conditions, poor moral influences such as corruption, collusion and nepotism, tighter government policy on imports and the existence of MEA (ASEAN Economic Community), which has led to more competitors flooding the market.

Alternative business strategies can be formulated through data matching using ANP consisting of SWOT factors and SWOT sub-factors. The input stage of SWOT analysis is based on calculation using ANP and SWOT factors. The first rank is the opportunity with the largest total weight of 0.372, the second rank is the threat with a weight of 0.198 and the last is the weakness with a weight of 0.126. Based on this it is evident that the company's opportunities are still great for increasing competitive advantage.

In the data matching stage using ANP, SWOT factors and SWOT sub-factors, the strength of on-time project process (S7) had the largest weight of 0.084 compared

with the other sub-factors. In the weakness category, the company's unknown brand image (W7) had the greatest weight of 0.041, compared with other weakness sub-factors. In the opportunity category, the level of development in Indonesia was found to be very high (O2), with the greatest weight being 0.086 compared with other sub-factors of opportunity. In the threat category, the higher corporate receivables (T3) had the largest weight of 0.078 compared with other sub-factor threats.

In the decision-making phase using Fuzzy TOPSIS, the best alternative strategy for a company was found to be a partnership with business partners (A6). This was ranked first with the greatest weight of other alternative formulation strategies. From the data processing using the Fuzzy TOPSIS method, a partnership with Business Partners (A6) ranked first, with a total score of 0.634701. This score was the highest compared with six other alternative strategies, which were: 1) Improve the work system within the company (A5), with a total score of 0.60371 in second ranking; 2) Increase the company's performance level (A4), with a total score of 0.567873 in third ranking; 3) Expand target market (A3), with a total score of 0.504744 in fourth ranking; 4) Increase sales (A1), with a total score of 0.434995 in fifth ranking; 6) Improve the quality of product design (A7), with a total score of 0.37586 in sixth ranking; and 8) Operational cost efficiency (A2), with a total score of 0.373045 in the last ranking.

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