ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

Using Fuzzy hierarchical decision making methodology for selecting the choice of departmental strategies

Mehdi Hampaeyan Miandoab
Industrial Engineering Department of AmirkabirUniversity, Tehran, Iran

Manuscript Info

Manuscript History:

Received: 10 November 2013
Final Accepted: 15 December 2013
Published Online: January 2014

Key words:
Fuzzy hierarchical analysis, develop strategic plan, strategic planning.

Abstract

Strategic planning process, considers a department according to its environment and provides the appropriate strategies, the result of applying these strategies is achieving the objectives in accordance with the organization's vision. By using the appropriate methodologies to develop organization's strategic planning has a large effect for acquisition of the best outputs to strategic documenting.
This paper presents different models of strategic planning and selecting the most appropriate model. Since the decision procedures can be helpful in this regard and also there is an uncertaintyin opinions of the decision makers to determine the selected strategy in a fuzzy hierarchical analysis. Also, the selectedfuzzy hierarchical analysis methodology to develop the strategic documenting for an organization will be used as a case of study.

Introduction

Short term program planning and lack of attention for strategic program planning helps to maintain the current status of the company and can't picturethe principle situation to pass this occasion and acquiring the best situation, while today the main principle to be in a competence field is using an appropriate strategic planning. Because, it was not possible even to maintain the current situation without having a strategic plan, and if there is a lack of attention to this note that the competitors will overtake simply. Therefore, organizations will be forced to move in direction of the strategic plan. [1]
After decision making to have a strategic plan in an organization, it is time to compile this program. But the question is that, at this stage to developa strategic plan for an organization, what approach should be chosen? What are the criteria and the procedures of decision making on how to develop a strategic document? Since there are different ways for an organization to develop a strategic document, right way to editing document according to local characteristics of the method is used to an organization?
To use the techniques of decision making to determine the choice for developing the strategic planning of an organization, several measures have been taken. One of these measures, we can note the article of Everett et al. [2].
In this paper, they address the problems of matrix analysis of internal and external environment and finally, they explain the use of matrix methods in the best way.
Fardani [3] has studied the strategic planning process of the municipality as well. Based on the results of studies, this research is done based on content analysis and data collection methods. None of the models available in the literature have not investigated the necessary components to develop strategic planning in the municipalities.The aim of this paper is to explain the steps of the strategic program planning, and how to select the appropriate model and its implementation of the model in the municipality of Esfahan that use the model of David as a final model.
In order to overcome the problem of the high rate of technological change and the complexity of the governing organizations, Khatami [4], has presented a paper in which various models have been tried in strategic planning and evaluation of the advantages and disadvantages of each model and compare them, and strategic planning for the organization is identified. In this research, the definition of strategic planning has been addressed from viewpoint of various schools and scholars of strategic management, and the models of strategic planning continue to be reviewed

and finally, an integrated and comprehensive model for strategic planning, by a comparative study of these models, is presented.

Aghazadeh [5] after referring to concept of strategic planning, defining small and large organizations, and introducing some important strategic planning program models in small and large organizations, in his article, comparatively they were compared, and the result of this comparison, introduce a conceptual model of strategic planning for small organizations and provides them in order to achieve to the objectives and benefits of this type of program.

Given the importance of a proper and scientific approach to strategic planning, in this paper we have tried to compare the different models of strategic planning using a technique of hierarchical analysis for model selection to be performed according to the canvas, and the characteristics of an organization. It is an attempt by scientists to study the different models of this technology, using a multi-criteria decision-making method and investigating different standards of review in determining the formulation of a strategic planning document, a model is selected thathas the maximum compatibility with canvas and also the characteristics of an organization. For this reason, in next section, there is more information about the different approaches to strategic planning that will be explained. Then how to use the hierarchical analysis method to develop a strategic planning process will be explained.The research method adopted in this study is based on descriptive data collection, because it describes the strategic planning process in an organization. Also, the required information sources and methods of gathering information through library and internet resources, and through the questionnaires and interviews have been collected.Finally, the created model for an organization will be examined.

An overview of the methods of strategic planning

In fact, strategy and objectives, stabilized order of an organization, analyzing the relationships between the organization and environment to realize the objectives and re-adjust the activities and distributing resources in long term effectively is essential.

Activities and measures in the field of strategic management are summarized as follows:

Very strong understanding of an external environment of the company, to create comprehensive strategies for different combinations of product/market strategies, to become selection policiesand project management in the areas of program, the activity sections, adjusting the organization to an appropriate strategy, distributing the activities of the institute into strategic business units and coordinating them for achieving the goals, creating programming systems, impulse and an appropriate control to implement strategies effectively.[6]

The strategic management process comprises three stages as follows:

Compiling the strategy: involves defining the mission, identify the problems which threaten the organization in the external environment or create opportunities, identify internal strengths and weaknesses, setting long-term goals, consider different strategies and select specific strategies to continue the activities.

Implementing strategies: includes annual goals, policies, motivate employees and allocate resources to enforce the formulated strategies.Implementing strategies requires to cultural development that strengthen strategies, an effective organizational structure will lay the foundation, to conduct marketing efforts, budgeting, and crate and use the information systems, and finally, according to organizational activity compensate the employees services (establishes a reasonable link between performance and compensation of the employees services).

Evaluating the strategy: in the strategic management, evaluation the strategies are considered in final stages. Managers are in great need to know that special and their desired strategies at what time actually will not work; basically, assessing the strategies means that this information should be collected.All strategies are subjected to future changes, because the internal and external factors are constantly changing. Three major activities are performed to evaluate the strategies that include internal and external factors, accounting and performance measurement, corrective actions.

Different strategic planning models

There are many models of strategic planning. The models that have all pre-requisites for each stage of the process and creation of a strategy in context of these models is deliberated and controlled. In fact, the shape of these models also exerts this control easier. For example, some of these models are described as below.

Strategic planning model: J. R. Jannati- which consists of five main steps, each of these steps includes several sub-stages. The main steps of this model are: (1) goal setting, (2) gap analysis, (3) strategy evaluation, (4) formulating strategies, and (5) strategic implementation [7].

In the strategic planning model, Hawks process begins with defining the mission and goals, and the next step is the turn of investigating the internal and external factors. After identifying these factors, formulated strategies and implementing programs are determined. In next stage, funding for these programs is determined. Finally, after

determining how to budget, the plans are implemented. Through all of these stages, there is some reflections to investigate and resolve the potential problems. [7]

Strategic planning model- Brayson consists of eight steps. In the first stage, a preliminary program schedule is provided, and in the second and third major infrastructure programs, including the value of the philosophy and goals of the organization and duties are specified. The fourth and fifth stages of internal and external environment of the organization according to specified parameters in the model are evaluated. In the sixth stage, according to information obtained from the previous steps, the organizational strategies are determined.After this step is turn of the performance planning. After this stage, specified programs are investigated, in the eight stage, in terms of organizational viewpoints and forecasts of future organization, and finally, after this stage, the strategies are implemented. [7]

Strategic planning model- Gloic has four basic steps that includes (1)analysis and diagnosis, (2) choose, (3) implementation, (4) evaluation.

Strategic planning model- Henry Mintzberg consists of two main parts, which provides the infrastructure for preparing strategies. The first part of this section is to formulate strategies, opportunities and identified risks and raw materials, technical issues, financial and managerial resources, organizational and employee's values and the desires of the top managers and social responsibility will be determined at the same time.In the second part that explains the implementation strategywith respect to the components in the first part of the strategy that can be built based on them, strategies to be developed for different parts of the organization. [7]

The concept of strategic management- Igor Ansev planning and executing strategic plans are interviewed and inseparable. In this model, as well as many models of strategic planning, observing the organizational environment is of paramount importance and one of the main inputs is accounted to the model, and in fact, these are challenges and environmental factors that cause the develop strategies to be crucial.[7]

Strategic planning model- Dayson and Bryn designed the formulation and implementation of strategies to cycle and enter a new realm of organized activities, these factors have been evaluated, and to deal with problems or opportunities arising from the entry of new strategies adopted and is being implemented in the organization. [7]

In the strategic planning model- Fred R. David[7] used to determine the starting point of the mission is determining long-term goals and evaluation of the company's current strategy. Then it examines the internal and external factors, in the next stage formulation, evaluation and selection of the strategies is done. After this point, the route begins implementing strategies and allocation of resources over time to determine annual goals and after completing this process and performance evaluation is done.

Fuzzy hierarchical analysis by change analysis **[8]:**

Fuzzy hierarchical analysis process by Thomas L. Sa'ati was expanded in 1970 to include the following four major steps [9].

The first step of modeling, the second step of paired comparison preference judgments based on criteria and standards relative to other options, the third and fourth steps are to calculate the relative weights to merge rankings. The general steps of the fuzzy hierarchical analysis of change algorithm are as follows:

Step 1: create a hierarchy for the problem.

Step 2: determine the matrix of paired comparisons and applying the judgments.

Analysis of the developed change procedure can be expressed as follows:

By considering the analytical method of the developed change if X= {x1, x2… xn} as a set of goals G= {u1,u2,…,un} as a set of ideals by considering any objective, develop analysis can be expanded for each of these causes. Thus, m value for develop can be as follows:

$M_{gi}1$, $M_{gi2,\ldots,}M_{gi}m$, i= 1,2,…,n

That, they all tend to be triangular fuzzy numbers (a,b,c) are defined. Steps of the procedure are given below.

Step 1: the value of the expanding the fuzzy cube of cube for each target defined by:

$$s_i = \sum_{j=1}^{m} M_{g_i}^{j} \otimes \left[\sum_{i=1}^{n} \sum_{j=1}^{m} M_{g_i}^{j} \right]^{-1} \qquad (2)$$

If $\otimes$ is the function that multiplied fuzzy between two phases. If $M_{g_i}^{j} = (a_{ij}, b_{ij}, c_{ij})$, then $\sum_{j=1}^{m} M_{g_i}^{j}$ by the operator on the analysis of develop, ideal m is defined as:

$$\sum_{j=1}^{m} M_{g_i}^{j} = (a_{i1}, b_{i1}, c_{i1}) \otimes (a_{i2}, b_{i2}, c_{i2}) \otimes (a_{im}, b_{im}, c_{im})$$

$$= (\sum_{j=1}^{m} a_{ij}, \sum_{j=1}^{m} b_{ij}, \sum_{j=1}^{m} c_{ij}) = (a_i^{'}, b_i^{'}, c_i^{'}) \quad (3)$$

Then, the inverse of this vector is calculated as follows:

$$\sum_{i=1}^{n}\sum_{j=1}^{m} M_{g_i}^{j} = \sum_{i=1}^{n}\left(\sum_{j=1}^{m} a_{ij}, \sum_{j=1}^{m} b_{ij}, \sum_{j=1}^{m} c_{ij}\right) = \left(\sum_{j=1}^{n} a_i^{'}, \sum_{j=1}^{n} b_i^{'}, \sum_{j=1}^{n} c_i^{'}\right)$$

$$= \left(\sum_{i=1}^{n}\sum_{j=1}^{m} M_{g_i}^{j}\right)^{-1} = \left(\frac{1}{\sum_{j=1}^{n} c_i^{'}}, \frac{1}{\sum_{j=1}^{n} b_i^{'}}, \frac{1}{\sum_{j=1}^{n} a_i^{'}}\right) \quad (4)$$

That, finally Si is calculated as follows:

$$s_i = \sum_{j=1}^{m} M_{g_i}^{j} * \left[\sum_{i=1}^{n}\sum_{j=1}^{m} M_{g_i}^{j}\right]^{-1} = (a_i^{'}, b_i^{'}, c_i^{'}) \otimes \left(\frac{1}{\sum_{j=1}^{n} c_i^{'}}, \frac{1}{\sum_{j=1}^{n} b_i^{'}}, \frac{1}{\sum_{j=1}^{n} a_i^{'}}\right)$$

$$= \left(\frac{a_i^{'}}{\sum_{j=1}^{n} c_i^{'}}, \frac{b_i^{'}}{\sum_{j=1}^{n} b_i^{'}}, \frac{c_i^{'}}{\sum_{j=1}^{n} a_i^{'}}\right) = (a_i, b_i, c_i) \quad (5)$$

Step 2: is calculating the degree of preference.

If $s_i = (a_i, b_i, c_i)$ and $s_k = (a_k, b_k, c_k)$, then the degree of preference s_i on s_k that is shown by $V(S_i \succ S_k)$, is defined as follows:

$$V(S_i \succ S_k) = \underset{x \geq y}{SUP}\left(\min\left\{\alpha_{S_i}(x), \alpha_{S_k}(y)\right\}\right) \quad (6)$$

The equation is expressed as follows:

$$V(S_i \succ S_k) = \alpha_{S_i}(d) = \begin{cases} 1 & if\ (b_i \geq b_k) \\ 0 & if\ (a_k \geq c_i) \\ \dfrac{a_k - c_i}{(b_i - c_i) - (b_k - a_k)} & otherwise \end{cases}$$

D is corresponding to largest intersection point between $\alpha_{S_k}(y)$ and $\alpha_{S_i}(x)$. Figure (1), shows $V(S_i \succ S_k)$.

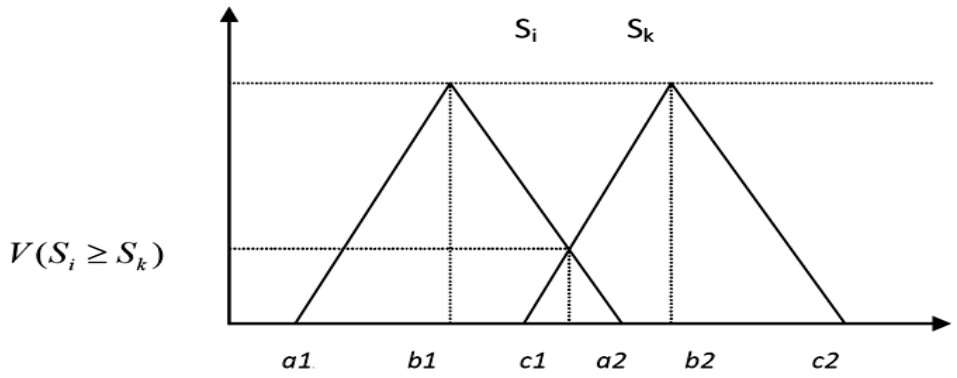

Figure 1: degree preference of two fuzzy number

Step 3: is calculating the degree of preference (degree of feasibility), S is a convex fuzzy number that is greater than K which is fuzzy number, is defined as follows:

$$V(S \succ S_1, S_2, ..., S_n) = V\left[(S \succ S_1), (S \succ S_2), ..., (S \succ S_n)\right]$$

$$= \min\left(V(S \succ S_1), V(S \succ S_2), ..., V(S \succ S_n)\right) =$$

$$\min V(S \succ S_i)$$

$$i = 1, 2, ..., k \quad (7)$$

If it is assumed that

$$d'(A_i) = \min V(S_i \succ S_k) for (k = 1, 2, ..., n), k \neq i \quad (8)$$

Then, the weight vector is obtained as follows:

$$W' = \left(d'(A_1), d'(A_2), ..., d'(A_n)\right) \quad (9)$$

Most notably, the weights are obtained by dephsation.

Step 4: normalized vector W' and gaining normalized weight W .

$$W = \left(d(A_1), d(A_2), ..., d(A_n)\right) \quad (9)$$

Case study

After offering a variety of patterns of developing the strategy for organizations, in order to use the hierarchical structure of the decision-making model and the manner of selecting the main criteria, group meeting is formed with the participation of experts and the decision is made about hierarchical tree. The proposed hierarchical structure is as follows, and consists of the following three main criteria in the second level of 10 items (strategic programming model) to be elected.

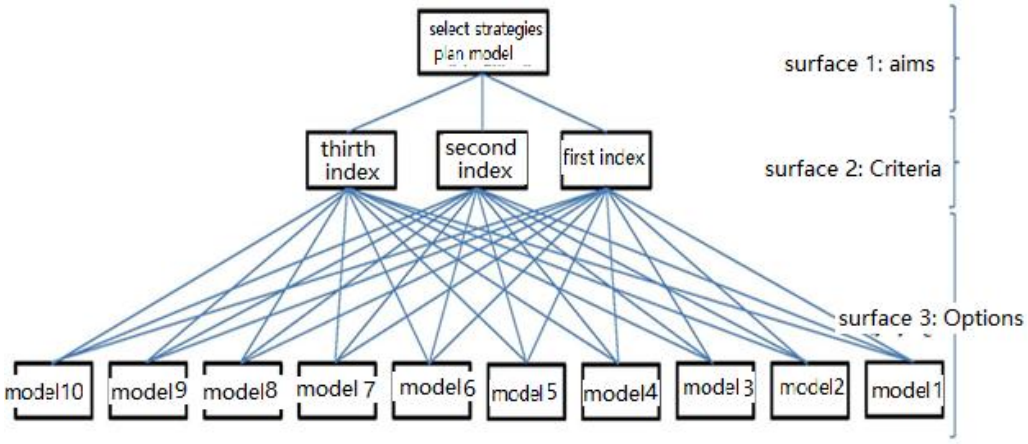

Figure 1: hierarchical structure to select an appropriate model for strategic planning

For determining model selection criteria see the number of articles and relevant professional literature and finally, afteragreeing with experts on eight basic criteria, three of them including "making different chains of measures based on consecutive steps" and "existence of experience of successful implementation models" and "to know about model" were selected. According to the method described and Table 1, discussed possible options within the strategic planning were attributed to be formed and subjected to paired analysis.

Row	Model name	Row	Model name
1	J. R. Jannati	6	Igor Ansev
2	Brayson	7	Deyson & Brayn
3	Howks	8	Philips
4	Gloic	9	Ports
5	mintzberg	10	David

(Table 1): strategic planning models as the choices for final level

Paired comparisons matrix

To perform comparisons, a square matrix whose rows and columns are model selection criteria, respectively, is established. The square matrix, whose rows and columns are of strategic planning models, was formed. In this step, the experts were asked to utilize the knowledge and experience to each of the factors, with respect to other factors, for fuzzy weighting. Expressions displayed as following fuzzy numbers.

fuzzy number	Expression for determining the preference	Triangular fuzzy number
9	Absolute priority	(7,9,9)
7	Very strong preference	(5,7,9)
5	Strong preference	(3,5,7)
3	Weak preference	(1,3,5,)
1	Same priority	(1,1,3)
1	Exact equal	(1,1,1)

Table 2: correspondingfuzzy numbers with preference in pairwise comparisons

When the experts expressed their preferences with fuzzy method of paired comparisons, in order to integrate the data of these subjects were used for the geometric mean. Based on explaining the fuzzy hierarchical analysis method that was described in the previous section, other measures were carried out in the following table of values for each of the organizational strategic planning methods.

Importance	Absolute weight of options	Model name
1	0,21	David
2	0,16	Philips
3	0,13	Ports
4	0,11	Dayson & Brayn
5	0,11	Igor Ansev
6	0,1	Mintberg
7	0,9	Gloic
8	0,06	Hawks
9	0,05	Brayson
10	0,05	J. R. Jannati

Table 3: weights of each of the methods of developing strategies according the described criteria

By comparing the final weight (final score resulting from the review of the selections), it turns out that "David" model with "0,21" weight has the higher score and rated as very good model based developing strategy in this organization.

Conclusions and suggestions for future

In this paper, we introduce and evaluate different models of strategic planning programs using the techniques of fuzzy hierarchical analysis, as one of the multi-criteria decision-making models relating to paired comparisons and to determine the proportion of models preferences, it was attempted as paired manner. As future measures are proposed in this paper to increase the validity of decision-making model output, we should investigate developing and completing hierarchical analytic model and improving it by changing the decision-making criteria.

To compare the output of the hierarchical analytic model using other models of decision-making, we can use other methods of decision-making like TOPSIS, and compare the outputs. Also, note that the experts use their mental abilities to perform comparisons;however, hierarchical analytic method has no complete reflection of human thinking style. Hence, with a more complete and useful results, we can use other methods of decision-making like Fuzzy TOPSIS.

References

1. Arabi, S. M. (2006). Handbook of strategic planning. Tehran: Office of cultural Research.
2. Everett, Robert F.; Duval, Catherine Rich. (2010). SOME CONSIDERATIONS FOR THE USE OF STRATEGIC PLANNING MODELS. Northeast Decision Sciences Institute Proceedings, p. 525.
3. Saeid Fardani, Mojtaba Heshmatnejad, and Ali Rufigary Haghighat. (2010). Strategic planning process in Esfahan Municipality. The Fifth International Conference on Strategic Management. Tehran.
4. Khatami, B. (2008). A comparative study of models of strategic planning. Third International Conference on Strategic Management. Tehran.
5. Aghazadeh, H. (2004). A comparative Study of models of strategic planning. Tadbir Magazine, Issue 140.
6. AmirKabiri, A. (2002). Strategic Management 9third edition). Tehran: Negah-e- Danesh.
7. Ali-Ahmadi, A, Fath-ollah, M& Tajjedin, I. (2003). A comprehensive approach to strategic management. Tehran: Tolid-e- Danesh.
8. Chang, F.T.S., Chan, H.K., Ip, R.W.L., Lau H.C.W.(2007). A decision support system for supplier selection in the airline industry. Proceedings of the Institution of MechanicalEngineers Part B – Journal of Engineering Manufacture 221 (4), 741–758.
9. Ghodsipour, H. (2001). Hierarchical analytic process AHP. Tehran: edition: Technical University of Amirkabir.