Using Fuzzy Analytic Network Process (FANP) in a SWOT Analysis

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Abstract

The present study aimed at using Using fuzzy Analytic Network Process (FANP) In a SWOT Analysis.On the other hand, In this research we tried to use of strengths, weaknesses, opportunities and threats (SWOT) analysis which is one of the most famous table technique in strategic planning process in identify strategic factors of organization and by discovering and identifying those factors, the organization can be build strategies that in SWOT are referred to as SO, ST, WO and WT strategies.According to internal dependencies existed in most parts of strategic planning, therefore it was necessary to employ a technique which allowed us to measure its dependencies. In many of decision problems was desirable that relations among factors could be imagin as like as reality word.The ANP powerful instrument with fuzzy phase got to allow modeling SWOT analysis to planners organization. This research was done in 2011, in Notash Afra Co. which works in the field of installation of water and energy projects in Tehran.The present research in terms of purpose was an applied research; it was also considered as a descriptive research. In this research for determining importance weight, fuzzy analytic network process was used.

Index terms— strategic planning, SWOT matrix, analytic network process, fuzzy analytic hierarchy process, chang?s extent analysis method, triangular fuzzy number

1 Introduction

ow a day quantity methods are more valuable and managers organization are interests on acquiring and utilizing those techniques and methods in encounter with their difficulties and problems organizations to ease. Chose a suitable strategy according to abilities and environmental Organizations have to chose of strategies which certify survivability them in competitions and it is possible only by strategic planning. In other words, companies must choose goals and strategies that ensure their survival in competition, based on their available resource and the information from the environment. This is possible in the form of strategic planning within strategic planning framework of the organization analyze capability and environmental condition and in accordance with its specific available goals and the method for reaching them. These factors play a key and vital role in the success of the organization. Many approaches and techniques can be used in strategic analysis in the process of strategic management [4]. Such as Boston consulting group, the porter model or GE model that was introduced by general Electric Company. But among these techniques, SWOT matrix analysis, which evaluates opportunities, threats, strength and weaknesses of the organization, is one of the most famous methods. In SWOT analysis two environments must be carefully analyzed and evaluated, one is internal environment, which requires identifying strength and weakness of organization and another one is external environment of the organization [8]. The data from environmental analysis can be shown systematically in a matrix [6]. Various combinations from four factors of matrix if analyzed properly, can be a good basis for the compilation and designing of strategy. But the analysis of SWOT has flaws in evaluation and measurement of steps [12]. Routinely, this method does not

specify quantitatively the amount of influence of each of these factors on the proposed program or the chosen strategy **??**11].

In other words, SWOT analysis is not specifically an analytical tool for determination of relative importance of each of these factors. It does not also have the ability to prioritize the options for our strategy. This method usually gives a general and brief description of the impact of each factor while SWOT matrix should be able to specify quantitatively in the analysis the precise impact of each of these factors [5]. SWOT matrix must also be able to rank these factors in relation to a decision; in this way it provides opportunity for decision makers to analyze the importance of strategic factors in comparison with each other **??**17]. As a result of ignorance to deficiencies SWOT matrix analysis only Due to the reasons SWOT matrix analysis could not fully and comprehensively carry out the process of strategic decision-making that enables organizations to do the right strategic decision. Kuttila and et al developed a combined technique to eliminate defects in SWOT. This technique uses AHP 1 For many years the ANP in the SWOT analysis **??**7.9] 2 as a comprehensive approach, used to solve many problems of decision making. In this research FANP 3 a) Research Question the new and powerful tool of fuzzy analytic network process is used, which links fuzzy concepts with network analysis process. This method can be useful when the decision faced with several options and decision indicators. The theory of fuzzy system through using fuzzy logic theory and fuzzy sizes can enter parameters such as knowledge, experience and human judgment, in to the model. and in addition to creating flexibility in the model, provide a gray picture of the gray world.

Clearly, the results of such models due to providing real condition in the model, would be more accurate and practical [1]. The final output of this process, provides a method for determining importance weights of indictors and priority of options. SWOT analysis is not alone having this ability analyzing strengths, weaknesses, opportunities, threats. (SWOT) is one of the key elements of the strategic planning which is very challenging in the analytical method. Several methods are used to enhance the accuracy of results. Using the FANP in SWOT is one of the new issues which is the innovation of this research.

2 This research has one main question as follows:

? What is the process of using FANP in SWOT?

? And how can its results be analyzed? i. The analysis method of data and information In this study in order to determine the importance weight, FANP is used. The used fuzzy method is Chang's Extent Analysis (EA) method. So in the various steps due to the extensiveness of information on one hand and the high volume of calculations on the other hand according to network analysis process technique of expansion analysis method, two computer programs are used. EXEL software is used for the calculations relating to analytic network process by using expansion analysis method for determination of importance weights, and for final results MATLAB software is used. The reasons for the use of ANP in the SWOT matrix Although the technique of AHP eliminates the major flaws in the assessment and measurement of the SWOT matrix analysis steps, the main drawback of this method is that it couldn't measure the possible dependency between SWOT factors. In the AHP it is assumed that these factors are independent from each other in the hierarchical structure. Although the assumption is not always true in terms of effects on both internal and external environments, an organization can use internal strengths to take advantage of external opportunities, or by exploiting available opportunities in external environment it can improve internal weaknesses, or by using internal strength it can reduce the effects of threats in the environment or eliminate them. As it was said these factors are not independent from each other and in addition, a connection may exist between some of these factors. The technique of analytical hierarchy process of SWOT factors Weights, is calculated with the assumptions that these factors are independent from each other, but it is possible that these factors are related to each other and in this situation these dependencies can affect on SWOT factors weights and this will ultimately change priorities of strategic options. So it is essential that we use a state of SWOT analysis which considers the possible associations between SWOT factors in decision **??**18]. The proposed algorithm in this research uses FANP which makes it possible for us to measure dependency among SWOT factors. In many issues the favorable decision is the one that link real world; we can imagine the interrelationships among criteria. Being a powerful tool of FANP approach available modeling of SWOT factors for the decision -makers is why it became an attractive multi-criteria decision making tool. Dependence among SWOT factors affect both on the weights of SWOT factors branches and the weights of strategy options and may also change the priority of the strategy options. In summery this study shows the process for quantifying SWOT matrix analysis in the situation that there is dependence among SWOT factors.

i. Analytic Network Process (ANP) Saaty in 1996, presented a method for multi criteria, this method is called analytic network process and the aim of its presentation is designing a model through which complex issue of multi decision is analyzed into smaller pieces and by reasonable value ANP is a developed form of AHP which is able to model the correlations and feedbacks among effective elements during a decision-making process. Furthermore, it considers all influences of internal effective components in a decision-making process which are subsequently entered into estimations. Therefore, the technique may be considered as a superior and distinctive model compared to previous ones [2, **??**5]. Thus, hierarchical up-down structure is not suitable for a complicated system. A feedback system can be shown as a network.

Structural difference between a network and a hierarchy is shown in the following figure. Elements in a cluster can affect the elements in other branches. A network can be organized as source cluster, intermediate clusters

and sink clusters. Relationships within the network is shown with arcs and arcs direction shows the dependence [15, 2] interdependence between two cluster, which is called outer dependence and is displayed with a two-way arrow. Internal dependence among the elements of a cluster is shown by looped arcs [2, 16] (Figure1).

ANP consists of four main steps: making model and the issue structure: at first, the issue should be clearly stated and analyzed into a logical system like a network. The structure can be shown in Figure 1.

3 a. Pair wise comparisons matrices and priority vector

In network analysis process like analytical hierarchy process, decision elements in each cluster are compared in pair wisely according to their importance in that criteria and the clusters also, are compared par wisely with each other according to their effects on the goal. Decision-makers are asked in terms of a series of pair wise comparisons. They were asked what effects two elements or two clusters have in comparison with each other on the above criteria.

Furthermore, if interdependent exists among elements of one part, we should specify the amount of each element effect on the other elements by using a pair wise comparisons matrix and getting special vector of each element.

4 Super matrix formation

Super matrix is like Markov chain process. For obtaining global priorities in the mutual influence system. The relative priority vectors should be entered in the appropriate columns of matrix. As a result, a super matrix is in fact a segmented matrix that each matrix part shows a relationship between tow clusters in a system. Suppose a decision system which has C K parts and K= 1, 2, 3,.., n and each k cluster which has shown through e k1 , e k2 , ? e kmk .

Priority vectors are obtained relatively in the second step; they got sectional and placed in the appropriate position in the super matrix according to the effect direction from one cluster to another. A standard for super matrix is shown in the following [15].

5 c) Select of the best position

If the former super matrix in the third step covers all net work, option weights can be found in the normalized super matrix column. On the other hand, if a super matrix contained the connected parts, more calculations would be needed to achieve the overall priorities of options and finally the option which has the most weight is recognized as the best option. Year alternative (strategy alternatives). Super matrix is a hierarchical SWOT matrix structure which is composed of four levels and is defined as follows:

In which : W21 : is a vector which shows purpose effect on the criteria. W32 : is a matrix which shows criteria effect on each of the sub criteria. In this research for better understanding matrix is used to show calculation details the main steps of the proposed framework can be summarized as follows:

Step one: Identifying the sub branches of SWOT factors (identification of strategic factors) and determination of strategic options with regard to the analysis of these factors.

Step two: Determining the importance degree of SWOT factors with assuming that there is no dependence between SWOT factors.(W 1, i.e. matrix calculation)

Step three: identifying interdependences between SWOT factors and based on these relationship for dependency the matrix of each of the SWOT factors with regard to other factors is formed. (W 2, i.e. matrix calculation)

Step four: Determining priority of SWOT factors, according to the dependency that exists between them. (W SWOT factors = W 1 $\times$W 2)

Step five: Determining relative importance The main inputs required in the technique of network analysis process for calculation of W1, W2, W3, W4 pair wise comparison are existed elements in each cluster which composed of a pair of wise comparison matrix. Pair wise comparisons matrices and output evaluation of them in the fuzzy analytical hierarchy process. In analytical hierarchy process according to the traditional method, pair wise comparisons are done based on the relative scale. Although a discrete scale has advantages in simplicity to understand and is easy to use but due to incompatibility with human mind's map cannot close us to the actual results. In this study a method of fuzzy analytical hierarchy process is used that with regard to the specific model of network structure and existence of internal relationship change to fuzzy analytic network process. As we go on, we study some relationships and the main operators on the triangular fuzzy numbers and we also present a method for extent analysis.

ii. Group decision through change expansion analysis method

As previously noted, to calculate W1, W2, W3, W4 pair wise comparisons with verbal data are required. The mentioned matrices can be calculated by using fuzzy analytical hierarchy process methodology. There are several types of fuzzy analytical hierarchy process method but the calculation and level complexity of some of these methods are based on the least logarithmic squares method. In this research Chang Extent Analysis method is preferred because its stages are easier than other fuzzy analytical hierarchy processes.

7 D) THE (FOURTH STEP) PRIORITY DETERMINATION OF SWOT FACTORS WITH THE CONSIDERATION OF DEPENDENCY AMONG THEM

Concepts and definition of fuzzy analytical hierarchy process based on the Chang Extent Analysis (EA) are as follow:Consider two triangular fuzzy numbers M1 = (L 1 , m 1 , u 1) and M2= (L 2 , m 2 , u 2). (Figure3) M1+M2 = (l 1 +l 2 +m 1 +m 2 ,u 1 +u 2) M1. M2 = (l 1 l 2 , m 1 m 2 , u 1 u 2)

It should be noted that product of two triangular fuzzy numbers or reverse of a triangular fuzzy number, is not a triangular fuzzy number anymore and this relationship tells only an approximation of the true product of two triangular fuzzy numbers and reverse of a triangular fuzzy number. In the extent analysis method for each row of pair wise comparisons matrix, the vale which is a triangular fuzzy number, is calculated as follow:

In which K present row number and I and J respectively present options and indexes.

In this method after the calculation of S k you should get their largeness degree in relation with each other. In general, if M1 and M2 are two triangular fuzzy numbers M1 largeness degree on M2 is defined as follows.

Otherwise also if L 2 ?U 1 , put zero.

In this case we have:Hgt (M1?M2)= V(M 1 ?M 2 ,?..,M k)= V(M 1 ?M 2)and ? and V(M 1 ?M k)

Also for the calculation of indices in pair wise comparisons matrix performs the following. Thus, the weight vector of indicators will be as follow:

It is the non-normalize coefficient vector of fuzzy hierarchy process [1].

Since the used numbers in change extent analysis method are triangular fuzzy numbers, so we assumed that decision-makers are set these words set for weighting, you can see its fuzzy scale and diagram in the Table below (Table1and Figure4) II. In this study the aim of SWOT analysis is to prioritize strategy alternatives and selection of the best strategy for the organization (Table 2). At this stage, the interdependence between SWOT factors (Strengths, weaknesses, opportunities, threats) specified through analysis of each factor impact on other factors. After analysis these relationships were identified (Figure **??**).

6 Implement Of Decision Algorithm

Based on the dependences that exist among SWOT factors, we formed pair wise comparisons matrix based on fuzzy numbers and extent analysis method. (Table 4, 5, 6 and7).

W2 matrix is formed by the obtained vectors of each Table (WJ). This matrix shows relative importance weights of SWOT factors in the situation that we recognize the interdependence between them which is displayed in the following matrix.

7 d) The (fourth step) Priority determination of SWOT factors with the consideration of dependency among them

At this step we should calculate priority of SWOT factors according to the dependency that exists between these factors; this vector is obtained from the product of W2 matrix in W1 vector.

As we see significant differences exist between the results obtained in the weights of SWOT factors in comparison with situation which ignore inner dependence among these factors and the results have been changed respectively for strengths from 0.382 to 0.445 and for weaknesses from 0.108 to 0.153 for opportunities from 0.401 to 0.341 and for threats from 0.109 to 0.061.W SOWAT factors = W 2 × W 1 =

e) The (fifth step) Determination of relative importance degree of SWOT factors on sub branches At this stage, we should calculate the relative priority of sub branches of SWOT factors by using pair wise comparisons matrix. These matrices are as follow, respectively (Table 8, 9, 10 and 11).

Priority vectors obtained from the analysis of pair wise comparison matrix are as follow: g) The (seventh step) determining importance degree of strategy options with respect to each of the sub branches of SWOT factors

At this stage, we should calculate importance degree of strategy options with respect to each of the sub-branches of SWOT factors. Due to the calculations volume to illustrate how to do this stage we only calculate the first and last Tables and put their resultant vectors respectively in the first and last columns of W4 matrix (Table 13 and 14).

These Tables should be conducted for all of the strategic factors and W4 matrix is obtained by putting the resultant vectors from each Table in the appropriate column: This case was also solved with a hierarchical structure (assuming there is no dependency between SWOT factors). In pair wise comparisons matrix for determining the final priority of strategy options in the method of fuzzy analytic network process is like pair wise comparisons matrix used in the fuzzy analytic network process and the results were as follows:W alternative (FAHP) = =

In the analysis of fuzzy analytic network process, WO strategy with a final weight of 0.316 is selected as the best strategy. Also the priority of strategy options in the order is WO, ST, SO, WT. the analysis results of fuzzy analytical hierarchy process and fuzzy analytic network process have been compared in the Table below. As you see when we analyze the dependence among SWOT factors, this dependence impact on the strategies weights and strategies priority compared to the state that assumed these factors are independent from each other (Table15).

8 III.

9 Discussion and Conclusion

In this study the technique of fuzzy analytic network process was selected as an analysis tool according to its capabilities. Analytic network process in decision making considers some angles of the issue which does not exist in fuzzy analytical hierarchy process. Internal dependence is of the most important strategic planning issues. With this technique we could identify and measure the dependence between SWOT factors and we could also identify and measure the dependence between SWOT factors and also we could specify quantitatively each of these factors' impact on the strategy alternatives. SWOT factors and strategy options changed to a model of fuzzy analytic network process. As we observed SWOT matrix network model is designed in four levels, the purpose (the best strategy selection), SWOT factors, sub branches of SWOT factors and the strategy options. Also to illustrate the impact of dependency among SWOT factors on both the weights of SWOT factors sub branches and priority of strategy options, we also use the method of fuzzy analytical hierarchy process in the SWOT analysis in order to compare the results of these two approaches.

In both methods of fuzzy analytical hierarchy process and fuzzy analytic network process we used the same pair wise comparisons matrices; however, different results were obtained, the results of these two approaches were compared in Table 15. As you observed both weights and strategies rank was different from each other in fuzzy analytical hierarchy process and fuzzy analytic network process. Although these differences are predict Table because analytical hierarchy process does not consider the dependency among SWOT factors in the analysis and sole problem with the assumption that these factors are independent from each other. While in the method of analytic network process the dependence among SWOT factors takes in to consideration and with respect to these dependencies this issue can be analyzed. For this reason, fuzzy analytic network process can be a better modeling for the real world problems in comparison with a hierarchical approach. Other organization and companies that want to use this method in their strategic planning process should pay attention to this point that dependency among SWOT factors and its sub branches are largely related to organization types and their activities. In this study we only analyze dependency among SWOT factors, but it is possible that for other organizations dependency among sub-branches of SWOT Factors is more important than dependency among SWOT factors. In general it can be concluded in the cases that there is internal interaction or dependence among SWOT factors (strengths, weaknesses, opportunities, threats) or among it s sub branches, the method of analytic network process must be used to prioritize strategic options, using these approaches and techniques enables organizations to take correct strategic decision. Also in the cases that there is no dependence among SWOT factors or among its sub branches or dependency is such that it can be ignored, the technique of analytical hierarchy process can be used. a) Practical Proposals 1. It is recommended that the management of Frab Company focus on its goals and resources on WO strategy which is professional reinforcing of manpower and infrastructure in the area of thermal power plants. 2. It is recommended that before organization decides to implement strategic planning, by comprehensive training create necessary organizational knowledge and attitude and when running by using special structures such as self managed teams and using the methods like brainstorming pave the way for better and effective results. 16. Sarkis,J, 2002, A model for strategic supplier selection, Journal of Supply Chain Management ,38: 18-28. 17. Shrestha, R, Alavalapat, K, Kalmbacher, R.S (2004).

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10 G

Using Fuzzy Analytic Network Process (FANP) in a SWOT Analysis L ? m ? L ? u ? m ? u ? [1] [2] [3] [4]

[1] GUsing Fuzzy Analytic Network Process (FANP) in a SWOT Analysis strategy is placed in the first level, criteria (SWOT factor)in the second level, sub criteria (sub branches of SWOT factors) in the third level and in last level

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[3] GUsing Fuzzy Analytic Network Process (FANP) in a SWOT Analysis

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Figure 1: G

$$
\begin{array}{cc}
 & \begin{array}{cccccccccccccc} C_1 & & & & & & C_k & & & & & & C_n & \end{array} \\
 & \begin{array}{cccccccccccccc} e_{11} & e_{12} & \cdots & e_{1m1} & \cdots & e_{k1} & e_{k2} & \cdots & e_{k\,mk} & \cdots & e_{n1} & e_{n2} & \cdots & e_{n\,mn} \end{array} \\
\begin{array}{c} \\ C_1 \\ \\ \vdots \\ C_k \\ \\ \vdots \\ C_n \\ \\ \end{array} &
\begin{array}{c} e_{11} \\ e_{12} \\ \vdots \\ e_{1m1} \\ \vdots \\ e_{k1} \\ e_{k2} \\ \vdots \\ e_{k\,mk} \\ \vdots \\ e_{n1} \\ e_{n2} \\ \vdots \\ e_{n\,mn} \end{array}
\mathbf{W} = \begin{bmatrix} W_{11} & \cdots & W_{1k} & \cdots & W_{1n} \\ \vdots & & \vdots & \vdots & \vdots \\ W_{k1} & \cdots & W_{kk} & \cdots & W_{kn} \\ \vdots & & & \vdots & \\ W_{n1} & \cdots & W_{nk} & \cdots & W_{nn} \end{bmatrix}
\end{array}
$$

Figure 2: G

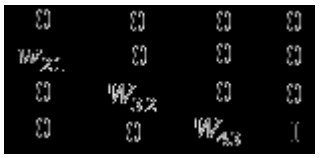


Figure 3:

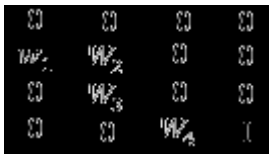


Figure 4:

4 

Figure 5: W 4 :

Figure 6:

Figure 7: G

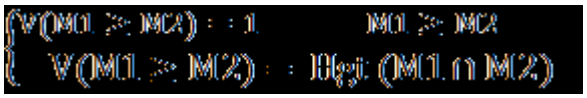


Figure 8:

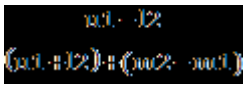


Figure 9: G

2 

Figure 10: 2 G

Figure 11: W4=h)

2 

Figure 12: 2 G

1 

Figure 13: Figure 1 :

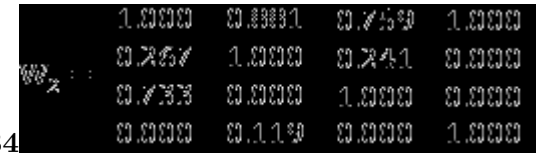
234 

Figure 14: Figure 2 :Figure 3 :Figure 4 :

56 $$\begin{bmatrix} 1.000 & 0.881 & 0.795 & 1.000 \\ 0.276 & 1.000 & 0.245 & 0.000 \\ 0.733 & 0.000 & 1.000 & 0.000 \\ 0.000 & 0.119 & 0.000 & 1.000 \end{bmatrix} \times \begin{bmatrix} 0.382 \\ 0.108 \\ 0.401 \\ 0.109 \end{bmatrix} = \begin{bmatrix} 0.445 \\ 0.153 \\ 0.341 \\ 0.061 \end{bmatrix}$$

Figure 15: Figure 5 :Figure 6 :

[Note: 1 . Analytical Hierarchy Process 2 . Analytic Network Process3 .Fuzzy Analytic Network Process b)]

Figure 16:

2

Figure 17: Table 2 :

3

W J	T	O	W	S	SWOT factors
0.382	(1,1.42,1.88)	(0.73,0.96,1.29)	(1.88,2.38,2.88)	(1,1,1)	Strength (S)
0.108	(0.75,1.17,1.63)	(0.43,0.54,0.75)	(1,1,1)	(0.35,0.42,0.53)	Weakness (W)
0.401	(1.63,2.13,3.26)	(1,1,1)	(1.33,1.85,2.35)	(0.77,1.04,0.38)	Opportunities (O)
0.109	(1,1,1)	(0.38,0.47,0.62)	(0.62,0.86,1.33)	(0.53,0.71,1)	Threat (T)

Figure 18: Table 3 :

1

Verbal scale of relative importance	Triangular fuzzy scale	Triangular fuzzy scale in the other side
Same	(1,1,1)	(1,1,1)
Equal importance	(1/2,1,3/2)	(2/3,1,2)
Relatively more important	(1,3/2,2)	(1/2,2/3,1)
More important	(3/2,2,5/2)	(2/5,1/2,2/3)
Very important	(2,5/2,3)	(1/3,2/5,1/2)
Exactly very important	(5/2,3,7/2)	(2/7,1/3,2/5)
Weaknesses(W)	strength (S)	Internal factor
-Being a young company (W1)	-staff professional skills (s1)	
-lack of acquisition in equipment and	-no restriction in recruiting of skilled	
certain machinery(W2)	manpower(S2)	
-lack of experience in oil projects (W3)	-there are strong information system	
-lack of quality control system(W4)	and software (S3)	
-lack of equipment and proper	-the spirit of team work(S4)	
infrastructure(W5)	-good relationships with technology owners(S5)	
	-Expertise in water project (S6)	External factor
		-

Figure 19: Table 1 :

7

W j	W	S	Threats
1	(1.32,1.71,2.1)	(1,1,1)	Strengths (S)
0	(1,1,1)	(0.48,0.59,0.76)	Weakness (W)

Figure 20: Table 7 :

8

Strengths (S)	S1	S2	S3	S4	S
Technical skills of the staff(S1)	(1,1,1)	(1.2,1.7,2.2)	(1,1.43,1.9)	(0.43,0.68,0.97)	(
No restriction in recruiting of skilled manpower(S2)	(0.45,0.59,0.83)	(1,1,1)	(1.08,1.5,1.93)	(0.46, 0.67,0.97)	(
There are strong information system and software(S3)	(0.53,0.70,1)	(0.52,0.67,0.93)	(1,1,1)	(0.73,0.91,1.17)	(
The sprit of team work(S4)	(1.03,1.47,2.34)	(1.03,1.5,2.17)	(0.86,1.09,1.38)	(1,1,1)	(
Good with the technology relationships owners(S5)	(0.75,1.03,1.47)	(0.65,0.88,1.28)	(0.91,1.20,1.56)	(0.75,1.02,1.55)	(
Expertise in water projects(S6)	(0.56,0.77,1.25)	(0.67,0.88,1.16)	(0.91,1.2,1.56)	(0.73,1,1.52)	(

Figure 21: Table 8 :

9

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Figure 22: Table 9 :

4

Figure 23: Table 4 :

5

Figure 24: Table 5 :

6

W j	T	O	W	Strengths
0.267	(1.25,1.67,2.13)	(0.41,0.52,0.71)	(1,1,1)	Weakness (W)
0.733	(1.75,2.25,2.75)	(1,1,1)	(1.41,1.94,2.45)	Opportuni (O)
0	(1,1,1)	(0.36,0.44,0.57)	(0.47,0.6,0.8)	Threats (T

	W j	T		S		Weakness 2
	0.881	(1.21,1.60,2)	(1,1,1)	(1,1,1)	(0.50,0.63,0.83)	–Strengths (S) Threa (T)
	0.119					

W j		W		S		Opportuni D D D D D D D) G (
Weaknesses (W)		W1	W2	W3		W4
Being a young company (W1)	(1,1,1)	(1.05,1.31,1.63)	(0.75,1.08,1.43)	(1.5,2,2.5)	(1.38,1.	
Lack of a question in equipment and certain machinery (W2)	(0.61,0.76,0.96)	(1,1,1)	(0.64,0.9,1.21)			
Lack of experience in oil projects (W3)	(0.7,0.93,1.34)	(0.82,1.11,1.57)	(1,1,1)		(1.1,1.6,2.1 (1.5,1.93,2	
Lack of quality control system (W4)	(0.4,0.5,0.67)	(0.53,0.7,1)	(0.48,0.63,0.91)	(1,1,1)	3)	
Lack of equipment and proper infrastructure (W5)	(0.45,0.56,0.72)	(0.65,0.91,1.47)	(0.42,0.52,0.67)	(0.88,1.23,	1.83)	

Figure 25: Table 6 :

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Threats	T1	T2	T3	T4
Instability in the economic environment (T1)	(1,1,1)	(1.6,2.1,2.6)	(1.3,1.8,2.3)	(1.6,2.03,2
The presence of competitors with well-known brand names (T2)	(0.38,0.48,0.63)	(1,1,1)	(1.37,1.78,2.2)	(1.27,1
government policies in line with privatization (T3)	(0.43,0.56,0.77)	(0.45,0.56,0.73)	(1,1,1)	(1.3,1.67,2
Low labor productivity in the country(T4)	(0.4,0.49,0.63)	(0.48,0.6,0.79)	(0.48,0.6,0.77)	(1,1,1)
Significant market share of competitors (T5)	(0.43,0.56,0.77)	(0.58,0.77,1.14)	(0.5,0.64,0.83)	(0.7,0.97

Figure 26: Table 11 :

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Opportunities	O1	O2	O3	O4	O5	O6	W j
The country abundant energy resources and reserves(O1)	(1,1,1)	(1.38,1.73,2.13)	(1.1,1.63,2.1)	(1.1,1.6,2.1)	(1,2,1.7,2.2)	(0.78,1.2,1.6)	0.245
Restrictions foreign contractors for (O2)	(0.47,0.58,0.72)	(1,1,1)	(0.47,0.57,0.78)	(0.86,1.13,1.47)	(1.27,1.63,2.1)	(0.87,1.28,1.7)	0.167
Continued growth in domestic and international demand for energy(O3)	(0.48,0.61,0.89)	(1.34,2.14,1)	(1,1,1)	(1.1,1.6,2.1)	(1.3,1.8,2.3)	(1,1.43,1.9)	0.216
The existence of specialist contracting unit(O4)	(0.48,0.63,0.96)	(0.88,1.16,1.63)	(0.63,0.91,1)	(1,1,1)	(1.4, 1.9, 2.4))	(0.6,1.03,1.5)	0.158

Figure 27: Table 10 :

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0.061	brand names (T2)						
	government policies in line with privatization (T3)				0.196	0.012	19
	Low labor productivity in the country(T4)				0.026	0.002	21
	Significant market share of competitors (T5)				0.078	0.005	20
Professional skills of employees (S1)		SO	WO		ST	WT	W j
Market development-the foreign goal market(SO)		(1,1,1)	(1.36,1.77,2.18)		(1.08,1.43,1.83)	(0.88,3.	
Professional reinforcing of manpower and infrastructure in the area of thermal power plants (WO)		(0.46, 0.57,0.74)	(1,1,1)		(1.2,1.7,2.2)	(1.1,1.53,2.	301
Development and implementing of new technologies (ST)		(0.55,0.7,0.96)	(0.45,0.59,0.83)		(1,1,1)	(1.1,1.53,2.	211
Cooperation and strategic partnership (WT)		(0.58,0.77,1.4)	(0.54,0.65,0.91)		(0.5,0.65,0.91)	(1,1,1)	0.134

Figure 28: Table 13 :

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SWOT Factors factor	weights	SWOT sub factors	Sub factors weight	Weights and general priority of sub factors		
		Technical skills of the staff (S1)	0.191	0.085	1	
		No restriction in recruiting of skilled manpower(S2)	0.163	0.072	6	
		There are strong information systems and	0.128	0.057	8	
Strengths(S)		software(S3)				
0.445		The spirit of team work (S4)	0.189	0.084	2	
		Good relationships with the technology owners(S5)	0.177	0.079	4	
		Expertise in water projects(S6)	0.152	0.068	7	
		Being a young company (W1) Lack of a question in	0.298	0.046	10	Year
		equipment and certain	0.197	0.030	13	
		machinery (W2)				
Weaknesses (W)		Lack of experience in oil projects (W3)	0.271	0.042	12	
0.152		Lack of quality control system (W4)	0.090	0.014	18	
		Lack of equipment and proper infrastructure (W5)	0.144	0.022	16	
		The country' s abundant energy resources and reserves(O1)	0.245	0.083	3	
		Restrictions for foreign contractors (O2)	0.167	0.057	8	
		Continued growth in domestic and international	0.216	0.074	5	
Opportunities (O)		demand for energy(O3)				
0.342		The existence of specialist contracting unit(O4)	0.158	0.054	9	
		The weakness of the region countries (O5)	0.085	0.029	14	
		Company s access to the world update technology (O6)	0.128	0.044	11	
Threats		Instability in the economic environment (T1) The pres-	0.431	0.026	15	D
		ence of competitors with well-known	0.269	0.016	17	D
						D
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						D
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Figure 29: Table 12 :

This research is trying through using theoretical concepts of fuzzy sets and triangular fuzzy numbers with

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