

Study and rank factors affect outsourcing in Electric Power Distribution Company of Shiraz with Fuzzy Topsis

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Abstract : The purpose of this study was to identify and rank factors influencing outsourcing in Electric Power Distribution Company of Shiraz, and provide guidelines for improving the effectiveness and Structuring outsourcing .In this research based on the results of previous research and use Delphi process and Interviews with professionals , Factors influencing effectiveness of outsourcing in electric power distribution companies have been identified and classified And Then in Shiraz Power Distribution on the base of this model and use interviews with experts using the technique of fuzzy Topsis outsourcing situation was analyzed. Then challenges and priorities affecting the effectiveness of outsourcing are presented and priority of them is given. Model and results can be used for improving the effectiveness and structuring of outsourcing in distribution companies and other similar organizations.

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1.Introduction

Outsourcing as one of the new public management mechanisms were common in Western countries and some non-strategic activities were transferred to private sector organizations. This work was done with this assumption that private sector organizations have less cost and better quality.

Thus, outsourcing becomes a common practice in government and effective mechanism for downsizing the government . Short-term results of outsourcing cause that largest organizations in the private sector absorb this approach to manage their tasks with effectiveness . And while the motto "small is beautiful" become a role model in most companies and organizations. (Alvani, 2008: 1)

Different definitions of outsourcing proposed that although are differences in verbal , in concept and meaning are similar . (Alvani and Ashrafzadeh, 2004: 3) . Outsourcing is transfer part of the organizational task to outside organization . Outsourcing are activities that the organization does for other organizations.

Gradually apply this method, create a chain of participation in organizational activities.

Outsourcing is defined transferring non-core activities to an external company such as a subcontractor who specializes in a particular field.

Outsourcing is transferring some repetitive and periodic internal task and delegation of their authority in decision making to external contractors . (Moghadasi , 2007: 1) . outsourcing is decision making to provide certain goods and services from outside the organization. (Raiborn& Butler , 2009) . outsourcing generally refers to goods and services provided by external organizations. (Hlkvm and Heath, 2007).

outsourcing in companies is done for different reasons, that the main reason is cost reduction. (Monia belcourt, 2006: 2).

Other items can include:

- Increasing effectiveness by focusing on the core competencies
- gain expertise, skills and technology
- Attract new ideas and innovation
- Reduce investment on assets and use it for other purposes
- gain market share and business opportunities through a network of providers
- Optimization of financial flows through the fixed costs and variable costs (Amirkhani and Jahanian, 2009: 3)

More selective outsourcing options for the organization and provides the opportunity to organizations using the facilities of other companies, reduce their production costs. Outsourcing helps them

to focus their attention Klydyshan technologies. This approach, flexibility and change them in the face of market volatility increases.

Outsourcing provides development opportunities for organization. Outsourcing in general can be said that if used correctly, is a powerful tool that can bring success in the business . But if you use it in contemplation, it may be dont get expected benefits and Be associated with irreparable damage and losses on long-term benefits .

Outsourced activities in Electricity Distribution Company of Shiraz

In Shiraz electric distribution company , in 2008, according to the revision in organizational chart and need to move in line organizational downsizing and and need for coordination between the structure and outsourcing strategy, organizational structure Experienced extensive changes. That led to identify and develop the company's outsourcing activities . For this purpose, and necessity of separating the main activities from others ,organizational key competencies in and main activities were developed in main chart and non-core competencies were considered in the shadow chart.

The shadow chart is assigned to outsourced tasks. And now many of the operational activities, including accidents , repair, connection and disconnection, Distribution of Bills, installation and replacement of meters, test equipment for measuring, collecting unauthorized spilt, modification and optimization, Lighting, network development, informatics services, police services and the supply of rental vehicles is performed by the contractor companies.

By study of existing literature on outsourcing in the electricity distribution companies,for example : Torabi and Kharazmi 2004 in regional electric power of Tehran , Mostafavi 2004 in Mazandaran electric power distribution company , Daneshi 2008 in ahvaz electric power distribution company , Shirani in isfahan electric power distribution company , hashemi and arbabi 2007 in Chahar Mahal electric power distribution company , Barband 1994 in Mashahad electric power distribution company , we find Although micro-level analysis concerning the effectiveness of outsourcing in some electricity distribution companies have been done , but there is no comprehensive and coherent system for improve outsourcing activities and the need to provide a comprehensive and practical model for improving the effectiveness of outsourcing and identification and ranking of outsourcing challenges, the importance of this research is twofold.

In this study using survey method and the Delphi process, challenges and opportunities of outsourcing in electric power distribution companies have been

identified and are presented in the form of a self-assessment model.

Then based on this model effectiveness of outsourcing was measured in Shiraz electric distribution company , and challenges , strengths and weaknesses are identified and prioritized.

Other electricity distribution companies and companies with similar structure, can be benefit the results to know their strengths and weaknesses and take steps to improve.

2. Material and Methods

The present study aimed to identify and rank the factors effect outsourcing in Shiraz electric distribution company . Well structured and effective guidelines for improve outsourcing is presented.

Based on the type and purpose , this study is Applied Research and methodologically is descriptive survey . And the Delphi method is used to collect data. In this research , process of outsourcing in Shiraz electric power distribution company has been studied closely and all stages (from preliminary discussions to analyze the results), test with Delphi method.

Through library research and semi-structured interviews and the Delphi process and obtaining the views of academics in this field, challenges and effective factors of outsourcing in electric power distribution companies, were identified and classified.

And on the base of evaluation model original questionnaire develop key criteria for successful outsourcing.

The initial survey through the Delphi process was put to the test and after the correction and editing, the final questionnaire was developed to identify and analyze internal and external factors effect outsourcing.

As shown in the table 1 , the internal factors classified in the three sectors , 1- plan,2- implement and 3-monitoring the performance and external factors also have been divided into four sections based on the PEST model, 1-economic, 2-political and legal, 3- technological, and 4-cultural and social .

In this study, 12 subfactors are examined. That include internal factors: 1 - Background and Goals, 2 – Planning, 3 - Select the Activity, 4 - Selection of contractors, 5 – Contract, 6 - Control and Monitoring, 7 - Evaluating the performance, 8 - Management of relationships and solve problems . and external factors include: 9 - economic factors 10- legal political factors, 11 - technological factors, 12-social and cultural factors . that this 12 factors from the Delphi process was designed to 30 questions. (Table 1)

Model and the questionnaire, were completed by 16 outsourcing specialists in Shiraz electric

distribution company . And importance of each of these barriers were also analyzed.

The ranking was done using fuzzy topsis techniques and barriers Were prioritized. Then, using the ranked factors , proposals were their value when transferred to the numbers will be ignored.

presented to policy makers and decision makers in Shiraz electricity distribution company . Polici makers can use this results to spend limited resources to important obstacles to get the best results in the field of outsourcing.

Table 1: internal and external factors affecting the outsourcing and related measures.

External factors				Internal factors							
Social and cultural factors	Technological factors	Political factors, legal	Economic factors	Performance monitoring		Implementation		Plan			
				Relationship management and problem solving	Performance Evaluation	Control and monitoring	Contract	Contractor selection	Choice of activities	Planning	Background and Objectives
One question	One question	six questions	Three questions	two questions	One questions	Five questions	Two questions	Two questions	One questions	Two questions	Four questions

Reliability and validity of Measurement Tool

Validity: In order to formulate the final questionnaire and the modification , Delphi technique is used, the content validity of this questionnaire is verified by academic professionals .

Reliability: Cronbach's alpha coefficient to assess the validity of the questionnaire has been used in this research project. Coefficient obtained is 0.82, indicating good reliability of the measure.

Multi-criteria decision making techniques

Two major categories of methods using data from a multi-criteria decision making exist.

Model derived from a class of methods known as non-compensatory model and another model is known as compensatory model.

Non-Compensatory model includes the ways in which trade is not allowed among indicators, namely the weakness of an index is not offset by advantages in other indicators. Compensatory model, including methods that allow the exchange of their indices . (Azar and Momeni, 2006: 86). Since that study ranked barriers to effective outsourcing with fuzzy Topsis , fuzzy logic and fuzzy topsis is explained shortly .

Fuzzy logic

Measurements and evaluation criteria, based on organizational behavior and research needs are different. But what is always constant, is the measuring method and process .

In this process, persons that have sufficient expertise and information , change qualitative information to separate values, in these methods, uncertainties associated with the judgments of people and change

Professor Lotfi Zadeh was the first man that talk of fuzzy logic. According to his belief , human logic can

chew concepts and knowledge that have not well-defined borders.

Fuzzy logic Encompasses a wide range of theories and techniques are essentially based on four concepts . (Langary J. Yen, 1999:18).

Fuzzy set , verbal variables, probability distribution (membership function), fuzzy “if then” rules.

Fuzzy set is a collection of elements with a membership degree (μ) belong to the set. If the required information are quantitative , Are expressed in numerical form , but when qualitative research is done the knowledge is with ambiguity and information cant represent in exact numbers .

As mentioned in most studies, most managers can not give an exact number to express their opinion and then in a realistic perspective use verbal assessment instead of specific numerical values . (Lotfi Zadeh, 1975)

In Lotfi Zadehs point of view on fuzzy logic, fuzzy values are correct , for example: true, very true, wrong, probably wrong and etcetera. These values are expressed as verbal values . and these values compared to the exact values, are reference.

Then approximate logic (also called fuzzy logic) is a qualitative nature in most cases.

Usually an appropriate verbal statement is set to explain the ambiguity of information . Then meaning of statements represents by fuzzy numbers in distance [0,1] and the membership functions.

Because of the verbal evaluation is done by individuals approximately , can be said that Triangular and trapezoidal membership functions are suitable for dealing with this ambiguity and try to obtain more accurate values is impossible and unnecessary. (Dladv and Vksmn, 1998)

Several researchers showed that the fuzzy membership function can represent the relative importance of verbal statements in our minds.

So we can use the fuzzy membership function to convert ideas into verbal numerical in interval scale. (Hsiao, W.F., Lin, H., Chang, T, 2007)

So that the application of this approach in the field of information retrieval, medical education, select suppliers and the decision making is growing. Considering the above cases need to present a simple model based on fuzzy logic for dealing with uncertainties in the measurement tools.

The required data to rank the challenges, have been collected through the questionnaire .

This questionnaire is based on spectrum and fuzzy numbers introduced by Ching. The values of these numbers according to the verbal statements are described below.

Table 2: Chings Fuzzy Numbers

Very low	(3, 0, 0)
Low	(5, 3, 0)
Medium	(8, 5, 2)
High	(10, 7, 5)
Very high	(10, 10, 7)

Ranking outsourcing challenges in Shiraz electricity distribution companies by fuzzy topsis

There are different models for priority ranking of different factors. Multi-criteria decision making models are the most famous families that include various techniques such as TOPSIS, AHP and etcetera. The applicability of these methods cause more and more usage of them and today their use throughout the world has also spread.

In this research considering the fitness between model and Topsis, this method used for ranking.

This method was introduced in 1981 by Huang and Youn . In this way any kind of MCDM model with M alternatives and N criteria can be represent as a geometric M point in an N dimensional space.

Topsis technique is based on the concept that the optimum option has the least distance from the positive ideal solution.

The stages are described blow :

The first step: The fuzzy decision matrix opinions is as follows:

$$\tilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \dots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \dots & \tilde{x}_{2n} \\ \dots & \dots & \dots & \dots \\ \dots & \dots & \dots & \dots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \dots & \tilde{x}_{mn} \end{bmatrix} \quad \tilde{W} = [\tilde{w}_1, \tilde{w}_2, \dots, \tilde{w}_n]$$

In this matrix:

i: Number of components

j: Number of respondents

\tilde{x}_{ij} :view of person I about component j that calculat as fuzzy numbers.

$$\tilde{x} = (a_{ij}, b_{ij}, c_{ij})$$

\tilde{W}_{ij} : The importance of each person’s view as a fuzzy number is expressed as follows

$$\tilde{W}_j = (w_{j1}, w_{j2}, w_{j3})$$

It should be noted that in this study due to the same degree of importance, for all the population \tilde{w}_{ij} were defined as follows:

$$\tilde{W}_j = (1,1,1) \forall j \in n$$

Step Two: Scale less matrix to make decisions:

In this step , The decision fuzzy matrix should convert into a scale less matrix . Gain \tilde{R} matrix, is sufficient to use one of relations:

Equation 1:

$$\tilde{R} = \begin{bmatrix} \tilde{r}_{ij} \end{bmatrix}_{m \times n}$$

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right)$$

$$c_j^* = \max_i c_{ij}$$

Equation 2:

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{ca_j^-}{c_{ij}} \right)$$

In this regard the following equation is obtained for each individual:

$$a_j^- = \min_i a_{ij}$$

Third step: Determine Scale weighted matrix \tilde{V} with \tilde{w}_{ij} :

$$i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n,$$

$$\tilde{v}_{ij} = \tilde{r}_{ij} \cdot \tilde{w}_j \quad \tilde{V} = \begin{bmatrix} \tilde{v}_{ij} \end{bmatrix}_{m \times n}$$

Step Four: Determine the fuzzy positive ideal (FPIS, A +) and fuzzy negative ideal (FPIS, A-), for all components .

$$A^+ = (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*)$$

$$A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-)$$

In this study Chens fuzzy positive ideal and negative ideal have been used .

$$\tilde{v}_j^* = (1,1,1)$$

$$\tilde{v}_j^- = (0,0,0)$$

Step Five: Calculate the total distance of each components from the fuzzy positive ideal and negative ideal :

If A and B are two fuzzy numbers as follows, distance between these fuzzy numbers is calculated by equation 3:

$$\tilde{A} = (a_1, b_1, c_1) \quad \tilde{B} = (a_2, b_2, c_2)$$

Equation 3:

$$D(A, B) = \sqrt{\frac{1}{3} [(a_2 - a_1)^2 + (b_2 - b_1)^2 + (c_2 - c_1)^2]}$$

Given the above description on how to calculate the distance between fuzzy numbers , the distance of components from positive and negative ideas are obtained:

$$d_i^- = \sum_{j=1}^n d(\tilde{v}_{ij} - \tilde{v}_j^-) \quad i = 1, 2, \dots, m$$

$$d_i^* = \sum_{j=1}^n d(\tilde{v}_{ij} - \tilde{v}_j^*) \quad i = 1, 2, \dots, m$$

Step Six: Calculate the relative closeness of each component from a positive ideal. This is defined as:

$$CC_i = \frac{d_i^-}{d_i^* + d_i^-} \quad i = 1, 2, \dots, m$$

Step Seven: Ranking Options:

Based on the descending CC_i sort the options .

3. Results

This survey was done on Shiraz electricity distribution company’s specialists. In this regard, 16 persons that have sufficient knowledge and practical capabilities in outsourcing were selected. (including managers and executive chiefs). they answered to the questionnaire. And results were analyzed by Spss software.

Prioritizing barriers in effective outsourcing is as follows, high numbers indicate the item close to the positive ideal that is most important.

Evaluation results include that external factors and internal factors affecting outsourcing ranked in descending order and summarized in the table below.

Table 3: Internal factors influencing outsourcing

Cli + (close to the ideal positive)	Priority in terms of internal factors	
0.679	Planning	1
0.597	Performance Evaluation	2
0.595	Select of activities	3
0.589	Relationship management and problem solving	4
0.514	Background and Objectives	5
0.647	Control and monitoring	6
0.426	Contract	7
0.372	Contractor selection	8

Table 4: External factors affecting outsourcing

Cli + (close to the ideal positive)	External factors in terms of priority	
0.530	Economic factors	1
0.520	Political and legal factors	2
0.496	Technological factors	3
0.473	Social and cultural factors	4

4. Discussions

According to the above table, in the internal factors , outsourcing planning is the highest priority for action. In this regard outsourcing team with sufficient authority and responsibility in this area should be established and strengthened.

This support acceptance of outsourcing among managers and employees and also overcome the resistance . The second priority is to evaluate the performance of outsourcing activities. In this regard company must represent the document information and economic analyze about effectiveness of outsourcing. selection of activities for outsourcing is the third challenge . in this regard company must analyze the value chain and identify core competency and non core competency . Relationships and solve problems with contractors are ranked fourth. In this regard development shared benefit and long relationship with partner must be considered.

Some strengths of company in outsourcing are: selecting contractors, the process of contract and how to control and monitor the contractor.

Also in external factors economic factors has highest importance. In this area Inadequate salaries and compensations of contractor companies , and lack of economic incentive for the contractor companies are important . Legal and political factors also have

the second priority in external factors that must be considered in policy making.

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