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Full Length Research Paper

Outsourcing priorities of government functions: Analytic network process approach

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Prioritizing some outsourcing functions of government is increasingly considered as a strategic necessity for developing nations. In recent decades, outsourcing management has been one of the main concerns for running public organizations, effectively and efficiently; the more there is citizen satisfaction and fewer costs, the more there will be emergence and expansion of outsourcing. In the complex environment of decision making (opposing criteria and alternatives), we need to utilize multi-criteria decision making (MCDM) techniques. Among them, analytic network process (ANP), as the most comprehensive framework of the analysis of public, governmental, and corporate decisions, is able to evaluate complex decision making problems through considering interdependences among criteria and alternatives. Yet, there is no sufficient published works concerning the use of ANP in defining outsourcing priorities of public organizations with typical examples. Therefore, the main purpose of this research is to go a step further by applying ANP to solving public problems. This paper also contributes to the common knowledge of outsourcing by providing a new approach to the field. ANP was used for outsourcing decision making as a multi-criteria problem based on four main dimensions of citizen satisfaction, namely; accountability, social justice, effectiveness and efficiency, for the purpose of helping officials to choose the best functions being outsourced in order to improve citizen satisfaction. We have discussed that educational, health, service, productive and cultural activities are the priorities to be outsourced respectively based on experts ideas. Some recommendations for future research are also given.

Key words: ANP, citizen satisfaction, government functions, Iran, outsourcing.

INTRODUCTION

Prioritizing outsourcing functions of government is increasingly considered as a strategic necessity by developing nations. Outsourcing decision as a multi criteria issue is not a simple decision, containing various criteria and alternatives. Therefore, outsourcing management has been one of the main concerns of public administrators for running their organizations effectively and efficiently from past up to the present. Before 1970s, governmental sector, in contrast to private sector, had much more authority and discretion compared with recent decades, which has resulted in less service quality, citizen satisfaction, social justice, accountability, effectiveness and efficiency according to the literature (Lien and Cian, 2006). Due to the powerful forces of globalization, deregulation and privatization, and in pursuit of more welfare as well as political and sociological maturity of human beings aware of their rights, the discretion has decreased gradually and relatively.

Decreasing the role of government in providing services and its subsequent theoretical foundations have, to a large extent, been developed with recommended principles of international organizations such as World Bank, IMF and WTO, and this has often led to better service quality and more citizen satisfaction. However, many countries with mixed economies, like Iran, have a combination of public, private and cooperative sectors, which indicates the role of public sector between these

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three sectors. Besides this, in pursuit of liberalization, it turns out that the outsourcing of more profitable activities to private and cooperative sectors will result in more accountability, effectiveness and efficiency at lower price. The presence of both private and cooperative sectors in communication, banking, fuel distribution and public transportation in Iran are some examples of outsourcing following smooth privatization and/or deregulation. Private sectors would be a pioneer of outsourcing for public sectors in achieving the goals such as accountability, effectiveness and efficiency.

In the field of outsourcing, using ANP for outsourcing to private sectors has been rarely utilized. Therefore, the main purpose of this research is to go a step further by applying ANP to solving public problems, in particular to the problems public sectors face in response to the demand of more citizen satisfaction. This paper also contributes to the common knowledge of outsourcing by providing a new approach to the field. Therefore, the operational purpose of this paper is to utilize MCDM techniques (ANP) for prioritizing of government functions. In this work, an ANP-based approach has been used for outsourcing, because (i) outsourcing is a multi-criteria decision problem; (ii) some outsourcing criteria are intangible and therefore difficult to solve; and (iii) interdependences among categories may exist.

This article tries to answer the question: “what are the most important priorities for outsourcing of government functions in Iran?” At the end, it has been discussed that educational and cultural activities are respectively the highest and lowest priorities to be outsourced according to the experts' ideas.

The paper is organized as follows: Firstly, section 2 gives a brief review of outsourcing literature. Then methodology of the research and analytic network process are presented in section 3. Section 4 describes the proposed model and section 5 deals with data analysis. Finally, section 6 presents the main conclusions derived from this research and future works.

RESEARCH LITERATURE

Outsourcing was introduced in 18th century for the first time, but was not welcomed until 1980s. In the early 1990s, outsourcing became an indispensable part of organizing and managing (Whang, 1992; Reyniers and Tapiero, 1995; Cheon et al., 1995; Ang and Straub, 1998). The U.S. government has practically used outsourcing in 1990s (Cant and Jeynes, 1998); the more there was improved service quality, citizen satisfaction, social justice, accountability, effectiveness and efficiency and fewer costs, the more there were emergence and expansion of outsourcing.

Many authors try to clarify outsourcing. Gibson (1996) defined outsourcing as “submitting activities and routine functions to external units”. Outsourcing is paying money to other organizations in order to execute whole or a part of organization activity (Cybernetics, 1996). Engelke (1996) argued that outsourcing is a decision by which certain good or service is received from outside of the company/organization. Finally, Kraker (1995) reported that outsourcing is finding new methods for using new good and service suppliers to use their knowledge and experience in our activities.

There has been the question, from the time outsourcing was prevailed, that “is outsourcing specifically related to the organization’s secondary and non-strategic activities or it contains main and strategic activities as well?”; some scholars support and some others do not accept this assumption (Prahalad and Hamel, 1990; Gay and Essinger, 2000).

More specifically, the next question is raised: “is outsourcing specifically related to the public activities or it contains private sector as well?” Burnes and Anastasiadis (2003) reported that outsourcing is more effective and successful in public sector than private.

Moreover, with their comparative studies, Domberger (1998) and Burnes and Anastasiadis (2003) found that North American countries, England, France, Germany, Japan and Australia have increasingly tended to use outsourcing and have applied it in both private and public sectors. China, as a case pacing through development quickly, by using outsourcing in public and private sectors, has become one of the best countries in this field. Among the main motivators, success of private sector in the use of outsourcing caused public sectors to use outsourcing. In this respect, private sectors used outsourcing for the first time, which resulted in decreased price, increased efficiency and more customer satisfaction. Private sector has knowledge and capabilities that can provide the public sectors with success (Osborne and Gaebler, 1992).

It should be noted that in most literature, outsourcing is wrongly equaled with contracting out of the organization. While “contracting out” is a short-term and usually costly relationship, outsourcing is a long-term and benefitable relationship and is riskier than contracting out (Anon, 1995).

The basis of outsourcing concept relies on the fact that organizations using outsourcing are trying to capture experts to whom they assign a series of their functions and use their knowledge and experience in those actions (Embleton and Wright, 1998:2). According to the literature, there are several motives that actuate institutions and organizations toward outsourcing. These motives can be categorized in economic, strategic and environmental classes (Table 1).

Many studies presented the advantages and disadvantages of outsourcing (Geitzmann and Larsen, 1997; Domberger, 1998; Currie and Willcocks, 1997; Kliem, 1999). Some are as shown in Table 2.

When used by government, it can be seen that MCDM techniques make it easy to evaluate different (opposing)

Table 1. Multiple impulses of outsourcing (Lau and Zhang, 2006).

Outsourcing impulses	Key results	Author(s)
Economic motives		
1) Cost reduction and economy	• Further benefit ability • Operation effectiveness improvement	Trunick (1989) Richardson (1990) Gonzalez et al. (2005)
2) Reduced need to investment	• Further emphasis on key sectors • Improvement of investment rate of return	Corbett (1998) Razzaque and Sheng (1998) Trunick (1989) Lynch (2004) Embleton and Wright (1998) Claver et al. (2002)
Strategic motives		
1) Strategic planning for emphasis on key points	• Gaining competitive advantage • Performance improvement • Client/customer satisfaction • Promotion in human resource skills • High competition	Corbett (1998) Razzaque and Sheng (1998) Trunick (1989) Lynch (2004) Embleton and Wright (1998) Claver et al. (2002)
2) Increased flexibility	• Ability of providing different goods and services • Increased ability of accountability • Risk reduction	Quinn and Hilmer (1994) Corbett (1998) Embleton and Wright (1998), Razzaque and Sheng (1998) Kakabadse and Kakabadse (2000) Jennings (2002) Lynch (2004)
Environmental motives		
1) IT development	• Actuating organization to use developed information systems in order to increase efficiency and economy	Lynch (2004)
2) Globalization	• Gaining competitive advantage	Clott (2004)
3) Society pressures	• Providing goods and services with less cost and higher quality	Jennings (2002)

Table 2. Advantages and disadvantages of outsourcing.

Advantages	Disadvantages
Cost reduction	Lose control
Time economy	Further need for coordination
Emphasis on core and strategic issues	Further dependency to outdoor organizations and institutes
Hidden costs clarification	High risk
Increased flexibility	
Increased accountability	
Quality improvement	
Easy access to resources and skills	
Gaining competitive advantage	

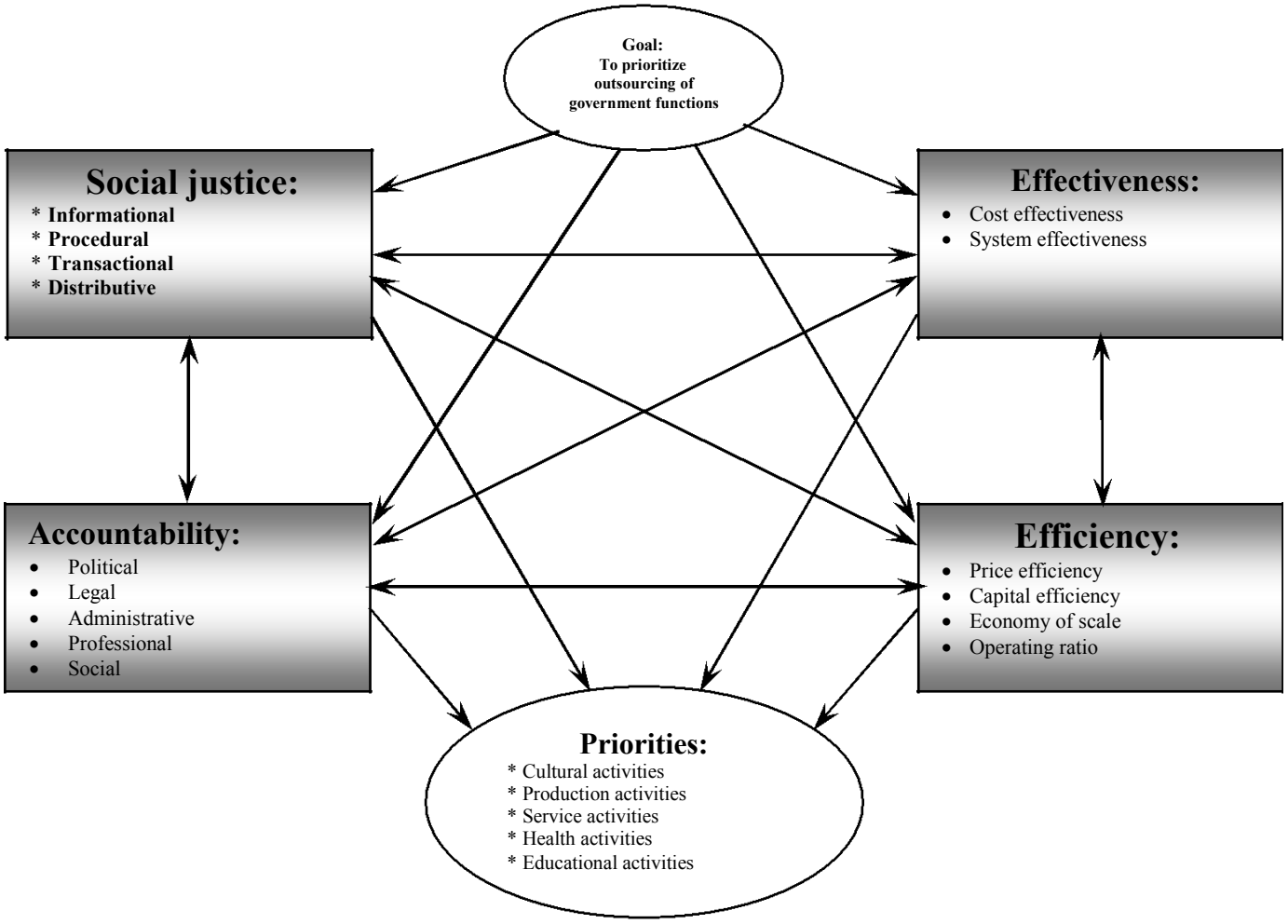

Figure 1. The research model.

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alternatives of complex decisions in outsourcing fields and the commercial outsourcing of government functions to the private sectors. This paper focuses on outsourcing initiative operated by the government of Iran.

METHODOLOGY

The proposed model

Studies in the field of outsourcing range from theory to practice and the use of operational research (OR) is increasing. Public problems as multilateral phenomena can be analyzed by MCDM techniques. Experts (professors and practitioners of public administration) were asked about their priority for outsourcing. Now, considering four criteria of efficiency, effectiveness, social justice, and accountability as the main dimensions of citizen satisfaction according to the literature (Denhardt and Denhardt, 2007: 119; Frederickson and Smith, 2003; Jan-Erik, 2005: 185; Meier and Hill, 2005: 57; Kellough, 1998; Frederickson, 1994), their priority was examined. Based on the experts' ideas, we categorize suitable functions of Iranian government for outsourcing into 5 most important categories. Therefore, the research model is shown in Figure 1. In the complex environment of decision making (opposite criteria and alternatives), we need to utilize MCDM techniques for analyzing the alternatives (The proposed model).

Outsourcing management is a crucial factor; therefore, a cost-benefit analysis should be done (Belcourt, 2006) . Paying certain attention to this issue and adopting decision maker supportive tools in making a good decision about outsourcing, decision making techniques such as ANP and AHP able to calculate quantitative and qualitative criteria were introduced as supportive tools for decision makers (Yang et al., 2007). It should be considered that subjects addressed by outsourcing of government's functions and activities are related to evaluating alternatives and prioritizing relevant criteria, therefore, OR method used here must be regarded as the MCDM techniques. Multi attribute decision making methods, such as AHP, ANP, TOPSIS, ELECTRE, study qualitative and quantitative attributes and suggest the best options from decision makers' point of view.

Among these methods, ANP is able to evaluate complex decision making problems considering interdependences among criteria and alternatives (Arisoy, 2007: 37). Selecting the best option for outsourcing is not a simple decision. Complexity arises as related criteria increase. AHP is one of the most prevailed approaches applied facing with such multi-criteria decisions. Though, a fundamental constraint in using AHP is the dependence assumption

of variant criteria in decision. On the other hand, ANP considers interdependencies among decision indices, and in its approach, makes it possible to do a more systematic analysis (Jharkharia and Shankar, 2007: 275).

ANP overview

In 1980, Saaty introduced the analytic hierarchy process (AHP) as a multi-criteria decision support methodology. Subsequently, the AHP has been widely used in a variety of fields. The basic characteristic of the AHP is to decompose the decision making process into a hierarchical structure in which the relationships of elements in different levels are independent. To meet more practical decision making properties, the analytic network process (ANP) extends the AHP to problems with dependences and feedback among the criteria by using a ‘‘supermatrix’’ approach (Saaty, 1996).

The analytic network process (ANP) is the most comprehensive framework for the analysis of public, governmental, and corporate decisions. It allows the decision maker to include all the factors and tangible or intangible criteria that have a significant effect on making a best decision (Tuzkaya et al., 2008).

Preferences of decision makers can be analyzed without using complicated mathematical formula by applying certain tools and techniques. In majority of decisions related to outsourcing, analyzing criteria and mutual relations is a key factor for determined services that can be outsourced. Therefore, criteria, sub-criteria, and network structure should be considered for any single decision (Arisoy, 2007: 56).

This factor can play a very important role in making the best decision (Saaty, 1996). In recent years, applying the method has been very common dealing with MCDM problems. This method provides a hierarchical framework for a complete systematic analysis of all influencing factors on a problem, and develops procedures and principles by which the best option is selected among a group of alternatives. ANP is the complementary form of AHP. AHP is considered a special case of ANP. AHP phases are as follows: 1) Problem definition; 2) Hierarchy building; 3) Designing questionnaire; 4) Dual comparisons; 5) Consistency test based on consistency ratio; and 6) Selecting alternative (Cheng et al., 2006). If AHP is equipped with a feedback mechanism in solving a problem, in which mutual relationships are considered, then solution will be based on ANP. Many researches have concentrated on studying the differences of these two methods (Eddie and Cheng, 2005; Coulter and Sarkis, 2005; Jharkharia and Shankar, 2007; Dyer and Forman, 1992). Generally, AHP is applied in hierarchical decision models, and for complicated network structure decision models, ANP is preferred. Since ANP makes it possible to study dependencies in a model, it is able to evaluate multilateral relations among decision elements. Dependencies can be:

i) Inner dependencies.
ii) Unrelated levels dependences.
iii) Mutual relations.

These kinds of dependencies have been described in some researches (Eddie and Cheng, 2004:1023). ANP is used for complicated decision making. Analytic network process systematically studies all kinds of relations and dependencies in decision making system.

A decision problem, which is analyzed using ANP, is solved through utilizing a control structure or network. Decision network is a network which is consisted of clusters, elements, and relations. Cluster is a set of related elements in a network or subnetwork. Clusters and elements are determined for any control criteria. Any interaction and feedback inside the cluster is recognized as inner dependencies, and any among clusters is considered as outer dependencies.

Control hierarchy is control criteria and control sub-criteria for which priorities are obtained with usual method; regarding systematic (network) objective studying, criteria are used for comparing system (network) clusters and sub- criteria are used for comparing elements. A general question is that (in the same cluster or other cluster) how many times is an element preferred to a given element from the pairs being compared?

Inner and outer dependencies are the best ways through which decision makers can determine and show influencing and impressionability concepts among clusters and elements regarding a certain element. Then, dual caparisons are done systematically, comprising all relation compounds of clusters and elements. ANP, like AHP, uses range of 1 - 9. This comparison scale enables the decision maker to unite the knowledge and experience intuitionally and determine, regarding the dominant criterion, by how many times an element can affect the other one. This scale is an integer. Decision maker is able to select his/her preference about any pair of elements verbally among pairs of “equal importance”, “rather more important”, “more important”, “much more important”, “extremely more important”. These descriptive preferences in the next phase are translated to numbers of 1, 3, 5, 7, and 9, respectively. Also, numbers of 2, 4, 6, 8, are used as intermediate numbers in a comparison between two continuous judgments. Reversed numbers of these preferences are placed about the other side of comparisons.

After implementing dual comparisons, synthesized results will be obtained. At the end, synthesized results from control systems will be compounded for determining the best output. Result will be a set of alternatives preferences.

Some examples of the effective ANP applications on decision making areas are as follows: performance measurement (Yurdakul, 2003), strategy selection (Buyukozkan et al., 2004), logistics service provider (Jharkharia and Shankar, 2007), Outsourcing Application Development Group (Farkasovsky and Greda, 2004), Business Process Outsourcing (Huang and Liao, 2008), and information technology outsourcing decision (Faisal and Banwet, 2009).

We have adopted an ANP-based outsourcing approach for the following reasons: (i) outsourcing is a multi-criteria decision problem; (ii) some outsourcing criteria are intangible and therefore difficult to solve; and (iii) interdependencies among categories may exist among outsourcing criteria, namely accountability, social justice, effectiveness and efficiency. We cannot consider accountability without social justice for the activities that may be outsourced and also it is true for the other criteria.

ANP phases

Solution process using ANP method has been suggested in a variety of ways. But, here in this article a mixture of Cheng and Saaty viewpoints was emphasized. Based on the method, ANP is described as follows:

Phase 1 - modeling

A network was formed for any control criteria. Here, all criteria influencing the decision are spotted. Every network contained several clusters. A cluster was appointed to alternatives. Related criteria were gathered in a cluster.

Phase 2 - mutual dependencies setting and implementing dual comparisons among clusters or elements

For every control criterion, a matrix of clusters filled with one and zero digits was composed. Placing digits (1 or 0) depends on

whether a cluster on the left side of matrix affects the cluster on top of the matrix or not (if there is influence, one is used; otherwise zero is used) . This process was similarly repeated for all criteria. If a criterion affects the other criterion, one; otherwise zero was placed. Then, for developing eigenvectors and forming super matrix, dual comparisons were implemented. These comparisons are as follows:

a) Cluster comparisons: These processes were carried out for the clusters which affect certain clusters regarding one criterion. Resulted weights were used for putting weights in their own block in supermatrix.
b) Elements comparisons: Dual comparisons were performed. Elements of a cluster considering their effect on an element in the other cluster or the same cluster were compared.
c) Alternative comparisons: Alternatives are compared regarding all elements.

Phase 3 - super matrix formation

The outcome of the previous phase is unweighted supermatrix. This matrix shows the dual comparison of criteria. In unweighted matrix, it is possible for columns not to be stochastic. Unweighted super matrix blocks were multiplied by respective preference of cluster to form the stochastic matrix. In this matrix (stochastic matrix), columns were summed up. Resulted supermatrix was powered as many times that there is no significant difference between matrix powered by k and k+1. For obtaining final priorities of all elements in limited matrix, every block was normalized. At the end, the highest priorities were selected (Bayazit, 2006; Saaty, 2001).

PROPOSED MODEL FOR OUTSOURCING GOVERNMENT'S FUNCTIONS USING ANP

Data gathering for the model

Since MCDM methods use expert's ideas, this research was conducted through the distribution of a comprehensive questionnaire to scholars, practitioners, and officials who have theoretical and practical experiences in outsourcing fields. Gathered data were summed up through geometric average in order to be integrated and be ready for analysis by software. That is, we calculated geometric average of experts' ideas and the resulted average being rounded by the nearest integer, was considered as the main criterion. The questionnaire regarding the qualitative and quantitative criteria was distributed for the outsource-prioritizing model. The consistency ratios of all the pair-wise comparison matrices were calculated.

Research phases

Based on methodology framework, this research was conducted as following phases:

Phase 1 – modeling

In the first step, research problem was charted. Prioritizing government functions for outsourcing toward achieving vision objectives and reducing the risk of these functions by government itself was considered as the main problem. This phase was introduced as the first level of the model. This issue was addressed as the control criterion, so a network was depicted to it. Depicted network consisted of clusters and components inside these clusters. In this study, the network generally had three levels. The first level was objective level. Criteria level (criteria which influence functions ready to be outsourced) formed the second level and third level which were composed of alternatives (Figure 2).

Phase 2 - mutual dependencies setting and dual comparisons

The strategic and fundamental part of the model was formed in this phase. In this phase, we implemented dual comparisons. Since there is just one cluster for studying the objective, there is no need for dual comparison. But there would be comparisons among clusters and alternatives. In dual comparisons among internal elements of a cluster, question asked here was, for example: "regarding research objective of outsourcing priorities of government functions, how many times is efficiency index preferred to effectiveness index?" Here, we have had a dual comparison matrix for four criteria. Since in criteria cluster four key criteria have been introduced, we have six dual comparisons (Table 3). Normalized column of the matrix which is normalized using Satty normalizing method is used as cluster coefficient. Weighted matrix was obtained as a result of multiplying normalized column by unweighted matrix.

In comparing elements inside the clusters, comparisons should embrace these kinds of dependencies, because they have a kind of inner dependencies that could indirectly influence the goal. Asked question in this phase was: "regarding research objective of outsourcing priorities of government functions in respect to responsibility criterion, what is the preference of each pair of factors compared with each other?" Since there are four criteria in this cluster, and every criterion was seen as a controller (for example, responsibility in above question,), we had four 3*3 dual comparison matrices. Therefore, 12 dual comparison questions were asked, in general. In Table 4, dual comparisons matrix for inner dependencies with responsibility control criterion was given. Numbers in normalized column of this matrix were applied as unweighted supermatrix blocks. For instance, normalized column numbers were shown in seventh column of unweighted matrix after normalization in respective column.

Phase 3 - final dual comparisons

This phase was done among the alternatives. Research question in this stage was: "regarding research objective of outsourcing priorities of government functions in respect to responsibility criterion, what is the preference of each of below alternatives in achieving the objective?" The number of comparison in this stage depends on the number of criteria. Since we studied four basic criteria, we had four dual comparison matrices. Research alternatives contained government functions consisting of educational, cultural, health, productive, and service functions. Therefore, 40 dual comparisons were implemented for the four matrices. In Table 5, dual comparison matrix for studying functions ready to be outsourced were examined in respect to responsibility criterion. Normalized column numbers of this matrix also are shown in unweighted matrix. For instance, normalized column of the following matrix can be seen in the seventh column of unweighted supermatrix.

DATA ANALYSIS AND SUPERMATRIX FORMATION

All data inside the dual comparisons matrix are called unweighted supermatrix (Table 6) after normalization. In the next stage, unweighted supermatrix was multiplied by normalized column of Table 4, so weighted supermatrix

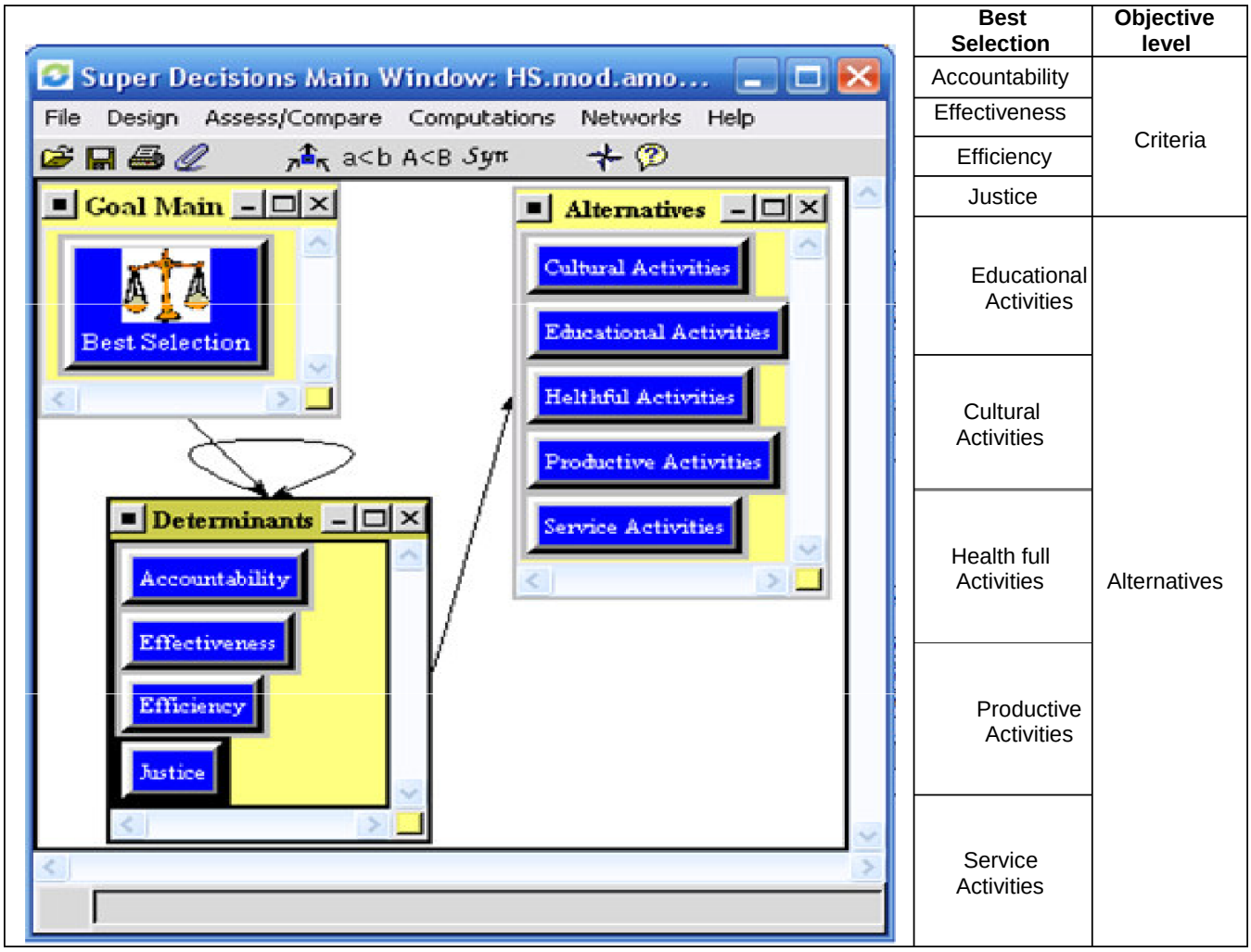

Figure 2. Dual comparisons among clusters or elements.

Table 3. Dual comparisons among clusters or elements.

	Accountability	Effectiveness	Efficiency	Justice	Normalized
Accountability	1.0000	2.0000	4.0000	0.2500	0.2011
Effectiveness	0.5000	1.0000	3.0000	0.2000	0.1250
Efficiency	0.2500	0.3333	1.0000	0.1111	0.0526
Justice	4.0000	5.0000	9.0000	1.0000	0.6214
CR = 0.02					

Table 4. Dual comparisons matrix for inner dependencies.

	Effectiveness	Efficiency	Justice	Normalized
Effectiveness	1.0000	3.0000	0.1667	0.1620
Efficiency	0.3333	1.0000	0.1111	0.0682
Justice	6.0000	9.0000	1.0000	0.7694
CR = 0.05				

Table 5. Dual comparison matrix.

Accountability	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities	Normalized
Cultural activities	1.0000	0.5000	0.3333	2.0000	0.5000	0.1256
Educational activities	2.0000	1.0000	0.2500	0.5000	0.3333	0.1132
Healthful activities	3.0000	4.0000	1.0000	4.0000	2.0000	0.4079
Productive activities	0.5000	2.0000	0.2500	1.0000	0.5000	0.1154
Service activities	2.0000	3.0000	0.5000	2.0000	1.0000	0.2368
CR = 0.07						

Table 6. Unweighted matrix.

Unweighted matrix	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities	Accountability	Effectiveness	Efficiency	Justice	Best selection
Cultural activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0628	0.2086	0.0325	0.0553	0.0000
Educational activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0565	0.1361	0.0274	0.2378	0.0000
Healthful activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.2038	0.0903	0.0908	0.1293	0.0000
Productive activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0586	0.0215	0.1849	0.0300	0.0000
Service activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.1184	0.0435	0.1645	0.0476	0.0000
Accountability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1086	0.0891	0.1485	0.2011
Effectiveness	0.0000	0.0000	0.0000	0.0000	0.0000	0.0809	0.0000	0.0352	0.2698	0.1250
Efficiency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0340	0.0329	0.0000	0.0817	0.0526
Justice	0.0000	0.0000	0.0000	0.0000	0.0000	0.3852	0.3585	0.3757	0.0000	0.6214
Best selection	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

was formed (Table 7).

At the end, weighted supermatrix using Superdecision software is powered as many times that there is no significant difference between continuous matrices of k and k+1, in this phase limited supermatrix (Table 8) is resulted. Obviously, rows are equal in limited supermatrix of all numbers. In this matrix, the highest priority is educational activities with score of 0.1524. Health, cultural, service and productive activities are in the next priorities, respectively. In the final phase, using normalization of weights for a variety of studying functions priorities were obtained as shown in Table 9

Conclusion

Successful outsourcing depends on many factors, besides it is risky and complex. There may be relations and dependencies among the outsourcing factors. Therefore, outsourcing should be analyzed in a holistic manner. This would be an initiative which shows that outsourcing priorities can be analyzed by using MCDM techniques in developing nations. The new approach has been applied to a real case study of governmental functions of Iran. In this study, ANP was used for decision making based on four main factors, namely, accountability, social justice, effectiveness and efficiency, for the purpose of helping officials to choose the best functions to be outsourced in order to increase citizen satisfaction.

Table 7. Weighted matrix.

Weighted matrix	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities	Accountability	Effectiveness	Efficiency	Justice	Best selection
Cultural activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0628	0.2086	0.0325	0.0553	0.0000
Educational activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0565	0.1361	0.0274	0.2378	0.0000
Healthful activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.2038	0.0903	0.0908	0.1293	0.0000
Productive activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0586	0.0215	0.1849	0.0300	0.0000
Service activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.1184	0.0435	0.1645	0.0476	0.0000
Accountability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1086	0.0891	0.1485	0.2011
Effectiveness	0.0000	0.0000	0.0000	0.0000	0.0000	0.0809	0.0000	0.0352	0.2698	0.1250
Efficiency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0340	0.0329	0.0000	0.0817	0.0526
Justice	0.0000	0.0000	0.0000	0.0000	0.0000	0.3852	0.3585	0.3757	0.0000	0.6214
Best selection	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 8. Limited matrix.

Limited matrix	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities	Accountability	Effectiveness	Efficiency	Justice	Best selection
Cultural activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0959	0.0959	0.0959	0.0959	0.0492
Educational activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.1523	0.1523	0.1523	0.1523	0.1523
Healthful activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.1300	0.1300	0.1300	0.1300	0.1300
Productive activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0492	0.0492	0.0492	0.0492	0.0727
Service activities	0.0000	0.0000	0.0000	0.0000	0.0000	0.0727	0.0727	0.0727	0.0727	0.0959
Accountability	0.0000	0.0000	0.0000	0.0000	0.0000	0.1016	0.1016	0.1016	0.1016	0.1016
Effectiveness	0.0000	0.0000	0.0000	0.0000	0.0000	0.1349	0.1349	0.1349	0.1349	0.1349
Efficiency	0.0000	0.0000	0.0000	0.0000	0.0000	0.0506	0.0506	0.0506	0.0506	0.0506
Justice	0.0000	0.0000	0.0000	0.0000	0.0000	0.2130	0.2130	0.2130	0.2130	0.2130
Best selection	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Combining ANP and outsourcing principles to introduce a new model of prioritizing government functions would be the main contribution of this paper. Based on description of outsourcing in governmental sectors, it can probably be thought of as an effective solution for helping governmental systems in serving citizens with better quality and quantity.

To achieve the goal, we focused on different governmental functions suitable for outsourcing based on experts' (professors and practitioners of governmental organizations) ideas. Among them, the first five priorities (cultural, productive, health, service and educational activities) were selected. ANP method was used for prioritizing these five

Table 9. Weights for variety of studying functions.

Graphic	Alternatives	Total	Normal	Ideal	Ranking
	Service activities	0.0959	0.1917	0.6295	3
	Educational activities	0.1523	0.3045	1.0000	1
	Healthful activities	0.1300	0.2600	0.8539	2
	Cultural activities	0.0492	0.0984	0.3231	5
	Productive activities	0.0727	0.1454	0.4773	4

activities regarding the criteria. Results show that educational, health, service, productive and cultural activities are respectively the priorities to be outsourced based on experts' ideas. The results and its reasons could have been expatiated as follows:

i. Educational activities: In global village age, society's prominence criterion is beyond the race, skin, color, birthplace, and so on. The only criterion that makes a society distinct from another is knowledge and knowledge workers. Educational systems of a country has out-standing role in creating such competitive advantage. On the other hand, knowledge-based economy in the recent years confirms this claim and emphasized the necessity of a better education and manner of society members toward more dynamic and powerful society. Results of this research indicate that educational activities in outsourcing Iran's governmental functions have higher priority compared to other functions. It is probable that this is because of high importance of education or weak-ness of educational system in serving students. We hope that governmental organizations in cooperation with non-governmental organizations (NGOs) would overcome these shortcomings. Also, some works have been done in this regard and some groups with benevolent inten-tions help governmental organizations. Of course, it is remarkable that besides outsourcing of this function, government still does its conducting task. Government conducts organizations which help it toward vision objectives and society goals.
ii. Health activities: Health and remedial services are among the criteria which play a very important role in people's evaluations of their life quality. With no exception, quality of health and remedial services offered by government has outstanding effect on people satis-faction. Recently, private health centers have been established in order to offer better health and remedial services. By regulating these private health centers, it would not be probable that their costs outweigh their benefits that would result in more citizen satisfaction.
iii. Service activities: Service activities are among the other functions of the government for which the municipality is main representative.
iv. Productive activities: Productive sector has always been considered in comparison with public sector as a more successful part in society members' vision. Of course, it is often possible that because of heavy initial investment expenditures, private sector lacks such launching factories and so public sector does it lonely.
v. Cultural activities: Culture is a unique heritage by which the society members identify themselves. And because of its prominent importance, maintaining and leading the culture is allocated to a part of the society that is known to be benevolent and departed from personal benefits. Governments are the best option, because private sectors are looking for personal benefits and it is possible that in crucial moments do not completely act along with the societal benefits. Based on the above reasons and research results, society experts catego-rized cultural activities in the last priority. This shows that government is the best choice for doing cultural activities. Of course, government can, in some cases, use charity organizations in doing tasks better and better.

In this research, an ANP- based approach has been presented to formulate and solve outsourcing priorities. The proposed methodology could be expanded to other aspects of public issues such as decision priorities in network governance. From the results obtained in this research, we can conclude that MCDA techniques are suitable tools for outsourcing decisions, as they allow overcoming the difficulty of such decisions in public sectors due to their qualitative nature. Moreover, the new methodology presented here is a good alternative to recent outsourcing approaches.

This research promises proper further researches in the context of outsourcing; that is applying models and methods utilized in other fields and research areas with more applicable results.

The ANP method deals only with crisp comparison ratios. However, uncertain human judgments with internal inconsistency obstructing the direct application of the ANP are frequently found (Rung and Cheng, 2007). To cope with this problem, the research based on fuzzy ANP (FANP) (Mikhailov, 2003; Mikhailov and Singh, 1999) method, which derives crisp priorities, including the weights of the criteria and the scores of alternatives from crisp, interval and fuzzy judgments using its core technique, called "fuzzy preference programming" (FPP) would be useful. Moreover, fuzzy optimization models could be used to compare with the results achieved in this research.

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APPENDICES

Appendix 1. Paired comparisons for best selection.

Comparisons for determinants	Accountability	Effectiveness	Efficiency	Justice
Accountability	1	2	4	0.25
Effectiveness		1	3	0.2
Efficiency			1	0.111
Justice				1
Inconsistency: 0.02				

Appendix 2. Inner dependencies for justice criteria.

Comparisons for criteria	Accountability	Effectiveness	Efficiency
Accountability	1	0.5	2
Effectiveness		1	3
Efficiency			1
Inconsistency: 0.008			

Appendix 3. Inner dependencies for accountability criteria.

Comparisons for criteria	Effectiveness	Efficiency	Justice
Effectiveness	1	3	0.167
Efficiency		1	0.111
Justice			1
Inconsistency: 0.05			

Appendix 4. Inner dependencies for effectiveness criteria.

Comparisons for criteria	Accountability	Efficiency	Justice
Accountability	1	4	0.25
Efficiency		1	0.111
Justice			1
Inconsistency: 0.03			

Appendix 5. Inner dependencies for efficiency criteria.

Comparisons for criteria	Accountability	Effectiveness	Justice
Accountability	1	3	0.2
Effectiveness		1	0.111
Justice			1
Inconsistency: 0.03			

Appendix 6. Paired comparisons for accountability criteria.

Comparisons for alternatives	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities
Cultural activities	1	0.5	0.333	2	5
Educational activities		1	0.25	0.5	0.333
Healthful activities			1	4	2
Productive activities				1	0.5
Service activities					1
Inconsistency: 0.07					

Appendix 7. Paired comparisons for effectiveness criteria.

Comparisons for alternatives	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities
Cultural activities	1	2	3	7	4
Educational activities		1	2	5	4
Healthful activities			1	5	3
Productive activities				1	0.333
Service activities					1
Inconsistency: 0.03					

Appendix 8. Paired comparisons for efficiency criteria.

Comparisons for alternatives	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities
Cultural activities	1	1	0.333	0.25	0.2
Educational activities		1	0.2	0.2	0.167
Healthful activities			1	0.5	0.333
Productive activities				1	5
Service activities					1
Inconsistency: 0.04					

Appendix 9. Paired comparisons for justice criteria.

Comparisons for alternatives	Cultural activities	Educational activities	Healthful activities	Productive activities	Service activities
Cultural activities	1	0.333	0.333	2	1
Educational activities		1	3	5	6
Healthful activities			1	6	3
Productive activities				1	0.5
Service activities					1
Inconsistency: 0.03					