



THE STUDY OF EFFECTIVENESS OF OUTSOURCING ACTIVITIES ON ORGANIZATIONAL PRODUCTIVITY: THE CASE OF AN IRANIAN PUBLIC SECTOR

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Abstract

This study addresses an exploratory research question. What are indicators of the effectiveness of outsourcing activities on organizational efficiency? How has the ranking of the most effective indicators? And how is dependence between these indices? Although, various researches have already been conducted on this issue, but there have been no vital parameters with specific degree of effectiveness found on a network of factors so far. Hence, in this research, and by using the comments of the experts and the usage of Delphi technique, some 14 parameters were recognized. After that, a sample size of 120 active departments was determined. Then, by fuzzy Dematel technique, the parameters were divided into two groups: affecting and reception. And the most effective and most impressionable factors were identified in the effectiveness of outsourcing activities, then with the technique of Analytical Network Process (ANP) to be weight indexes. Moreover, structural equation modelling (SEM) was used to study the effect of independent variables of outsourcing and productivity is the dependent variable. The finding indicates that not only dependence exists between some indicators of outsourcing and productivity, but also there is Dependence among its components of productivity and outsourcing.

Keywords: ANP; Dymatl Techniques; Outsourcing; Structural Equations; Vikor

1. Introduction

Outsourcing has been under the spotlight as one of the most important organization development tools of creator of competitive advantage and increase of efficiency in modern world. According to limitations of resources that exist for each organization, weather in private sector or governmental one, outsourcing of process can be a method for increasing efficiency and efficacy of activities in wider fields for organizations. At this point, sometimes organizations have to make their process outsourced in major or minor forms (Lajevardi and Bolhari, 2010).

In this study the aim is investigating effect of using the outsourcing strategy on organizational efficiency of ABFA Company of Semnan City and the also proving existence or lack of existence of such an effect on organizational efficiency of urban sanitation company, since today efficiency has turned to a national priority in the economy of all the countries. Also we have tried to give a special attention to efficiency

dimensions; efficiency which is related to intra-organization problems and efficacy which is related to outsourcing problems during identifying efficacy indices of outsourced activities. So if we can identify internal efficiency indices and external organization efficacy, nearly the way of efficacy of outsourced activities will be identified on efficiency of organizations.

Kianmehr, (2002) introduced outsourcing strategy as a tool for improving organizations efficiency which can cause improvement of efficiency by using criterions such as reduction of production costs, increasing quality, increasing employees` satisfaction and in the end he dealt with outsourcing efficacy on organizational efficiency in Tolipers Company.

In this study, with the help of Delphi technique, indices and effective factors on efficacy of outsourced activities were identified and recognized. Then by using Dematel technique, the effect of each one of factors was measured on each other and matrix was established. The reason behind using the model is that the technique is used for studying and solving complex problems. Also complex structure of the problem can be improved and model can take part in recognizing scientific solutions with hierarchical structure (Trevitithick et al, 2003). Then output data of Dematel was weighted with the help of ANP and they data were ranked in Vikor, so that it can be specified that which indices should enter structural equations for determining level of dependency. According to efficiency and abilities of each one of methods motioned, applying combinational model was not observed anywhere and it can be argued that we are the first ones who use four method altogether(simultaneously), but there are some studies which are combination of three Dematel, ANP and Vikor methods. The methods mentioned will be much more efficient and effective in solving complex problems of decision-making some of which will be mentioned in the research:

Article title	Writer/year	Result
Improving performance of tourism industry policies with the help of combinational MCDM model	Lie et al/2012	The aim of the study is study and analysis of criterion and indices related to tourism industry policies and investigating the relations among them in Taiwan with the help of MCDM model including three methods of DEMATEL, ANP and VIKTOR. In this model. In this model DEMATEL method was used in order to investigate relations among criterion and determining level of being influential and affected of each one of tourism industry policies. ANP model was used in order to determine weights related to each policy. And finally policies were ranked by applying VIKTOR method.
Creating smart estimating systems for educational goals	Chen and Tizeng/2011	In this research a new MCDM framework was used in order to estimate and compare effectiveness of different educational methods for teaching in elementary schools. In order to investigate dependency among variables, DEMATEL technique was used and for obtaining weight of each one of indices, ANP method was used. Finally VIKTOR method was used for ranking indices.

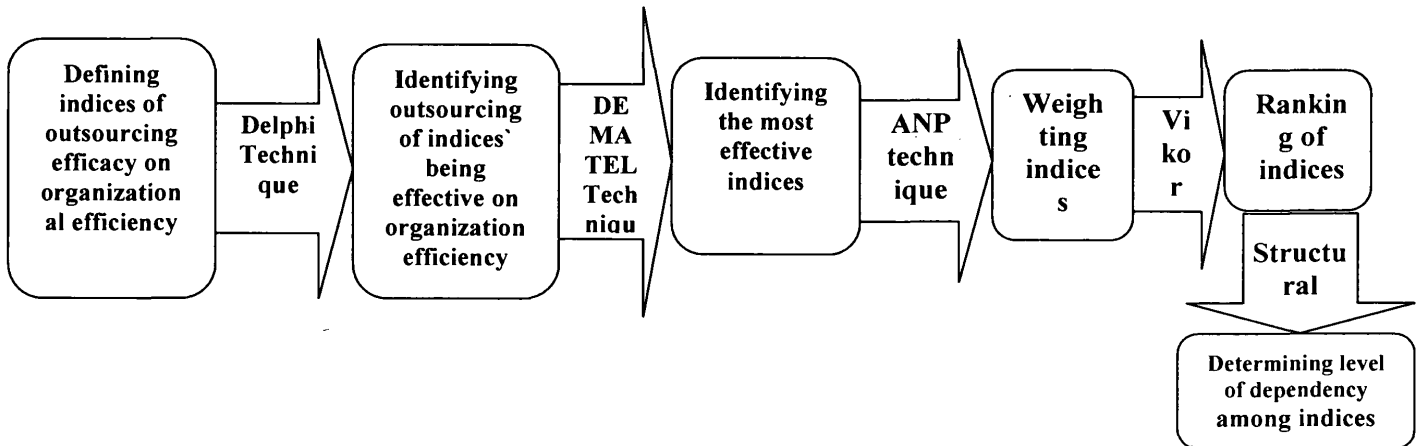
A combinational model containing three methods of DEMATEL, ANP and VIKTOR in order to estimate level of risk of information security	Yang et all/2011	The study presents an estimation model for improving information security in companies and organizations. The estimation model contains three models of ANP, DEMATEL and VIKTOR which are applied for solving problems related in order to show dependency between variables, despite the existence of equivalent and inconsistent criterion
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2. Study Design and Methods

The research has been in square and efficacy whose case study is ABFA Company. The research has started from Sep, 2011 and continued to April, 2012. Also the research society was all the managers and personnel of the company mentioned who are around 120 people. Using Morgan table, number of sample is 92 people. In this research, in order to investigate validity or content validity, some questionnaires were provided for some skilful experts and the accuracy of the questions and the way of analyzing them were approved. For investigating reliability of the research, Alpha kronbakh method was used whose 95% was determined which indicated approval of the reliability. Also research information was gathered in two fields: first, the information is related to the research literature which used library method, study of updated articles in efficiency field, outsourcing, DEMATEL, VIKTOR, ANP, structural equations and the latest valid sites. The second part of the information is related to analysis of information and specifying effective indices on organizational efficiency which were gained using questionnaire and statistical information of ABFA Company.

Extracting conceptual model of the research from the research literature

Figure 1: Conceptual framework of the research

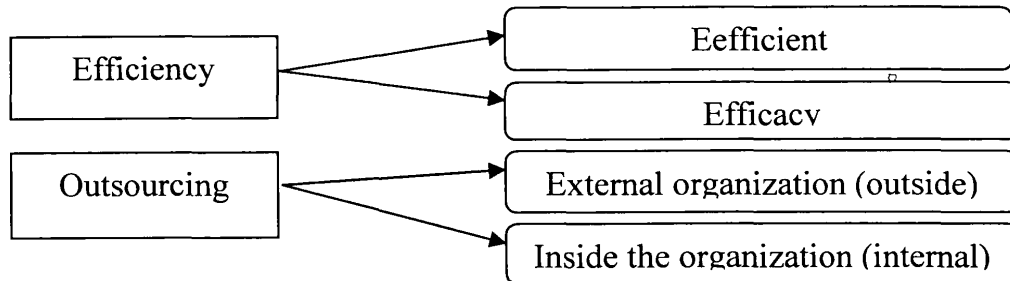


The information analysis is classified into two groups: the first is descriptive information of the respondents to the research questionnaire which was investigated according to sex, age and level of education (degree). Second is deductive information of the research which was gained from the results of the questionnaires distributed and their translations, like determining level of satisfaction of subscribers, meanwhile the technique applied in the article is Delphi, DEMATEL, ANP, Vikor and structural equations.

2.1 Effectiveness indices of outsourced activities in organizational efficiency

According to the problems mentioned, efficiency is formed from two main elements of “efficient” and “efficacy” and measuring each of them determine level of efficiency, so effectiveness observes inside of the organization and efficiency the outside part. Following model is drawn for explaining the indices of the research.

Figure 2: Model of the Research Indices



And in the end 14 main indices were identified among different indices with the help of Delphi technique. The indices are shown in Table 1.

Table 1: Efficacy indices of outsourced activities in organizational efficiency of ABFA Company

Index NO.	Index Title
	Increase of job speed
	Better control of activities
	Increase of services quality
	Using technique skill
	Increase of competitive feeling
	Risk reduction
	Achieving new ideas
	Increasing company focus on its main works
	Reducing company costs
	Changing constant price to varied year
	Parsimony in time of managers
	Reducing working forces
	Company capital`s being free
	Gaining higher skills and technologies which are not available in company

3. Empirical Results

Levels of DEMATEL Technique (Asgharpour, 2003)

First step: choosing scale for comparing criterion

Second step: doing pair (coupled) comparisons and preparing matrix of direct relation.

Table 2: Matrix \widehat{M}

	λ	λ	λ	λ	λ	λ	λ	λ	λ	λ	λ	λ	λ	λ	sum
.	0	1	3	0	2	1	0	2	4	3	4	3	0	3	26
.	4	0	4	3	0	4	2	3	4	3	3	1	1	0	32
.	1	1	0	2	4	3	1	2	3	3	3	1	0	1	25
.	4	4	4	0	0	3	2	1	3	2	1	2	1	0	27
.	3	1	3	2	0	1	4	2	1	0	0	0	0	4	21
.	2	3	3	1	3	0	0	4	3	3	1	1	2	2	28
.	2	2	4	3	4	4	0	2	3	3	0	0	2	4	33
.	4	4	4	3	2	3	2	0	3	1	2	1	2	3	34
.	0	0	2	1	3	4	0	1	0	3	0	0	3	2	19
)	0	0	1	0	1	3	0	1	2	0	0	0	4	1	12
)	3	4	1	1	0	2	2	3	1	0	0	1	0	2	20
)	0	0	0	0	2	0	0	0	4	4	1	0	2	2	15
)	2	2	3	3	4	4	2	2	3	4	1	1	0	4	35
)	4	4	4	4	4	4	4	3	3	2	3	4	2	0	45

In this step, basic matrix \widehat{M} is gained based on level of relation and effect of each one of criterions of each other and through coupled comparisons' matrix.

Third step: gaining normalized matrix (M). Matrix (M) is gained using relations (1) and (2).

$$s = \frac{1}{\text{Max} \sum_{j=1}^n \alpha_{ij}} = 0.022 \tag{1}$$

$$M = S \cdot \widehat{M} \tag{2}$$

Forth step: calculating general relations(C)

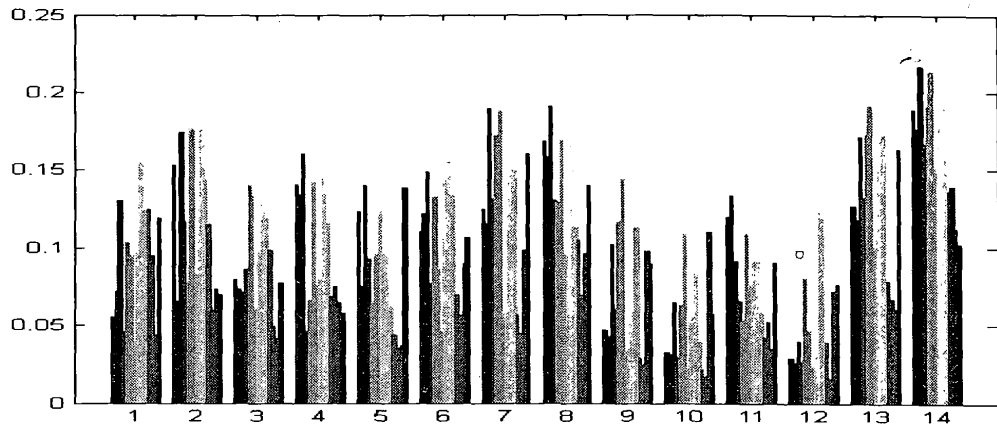
After calculating the matrix normalized (M), matrix of general relation (C) is gained through relation (3). In this relation matrix (I) is the same matrix.

$$C = M \cdot (I - M)^{-1} \tag{3}$$

Table 3: Matrix(C) = $M \cdot (I - M)^{-1}$

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}
X	0.0550	0.0721	0.1306	0.0455	0.1032	0.0948	0.0392	0.0966	0.1555	0.1236	0.1244	0.0944	0.0432	0.1186
X	0.1530	0.0656	0.1743	0.1169	0.0769	0.1768	0.0829	0.1324	0.1776	0.1436	0.1151	0.0596	0.0733	0.0696
X	0.0790	0.0732	0.0712	0.0860	0.1400	0.1335	0.0601	0.0968	0.1316	0.1194	0.0986	0.0491	0.0410	0.0772
X	0.1410	0.1340	0.1606	0.0464	0.0662	0.1423	0.0758	0.0809	0.1463	0.1154	0.0684	0.0748	0.0648	0.0579
X	0.1229	0.0752	0.1399	0.0923	0.0638	0.0952	0.1241	0.0963	0.0953	0.0617	0.0441	0.0351	0.0369	0.1385
X	0.1102	0.1215	0.1485	0.0771	0.1326	0.0869	0.0465	0.1464	0.1480	0.1338	0.0698	0.0566	0.0894	0.1067
X	0.1248	0.1152	0.1897	0.1309	0.1719	0.1885	0.0564	0.1206	0.1651	0.1495	0.0572	0.0450	0.0986	0.1605
X	0.1685	0.1586	0.1909	0.1307	0.1290	0.1695	0.0970	0.0807	0.1707	0.1132	0.1049	0.0688	0.0961	0.1401
X	0.0469	0.0429	0.1023	0.0605	0.1163	0.1438	0.0335	0.0679	0.0575	0.1130	0.0298	0.0243	0.0978	0.0893
X	0.0328	0.0309	0.0650	0.0298	0.0626	0.1084	0.0229	0.0550	0.0843	0.0389	0.0213	0.0171	0.1098	0.0574
X	0.1194	0.1333	0.0912	0.0652	0.0528	0.1088	0.0757	0.1143	0.0918	0.0579	0.0420	0.0522	0.0349	0.0901
X	0.0289	0.0257	0.0399	0.0266	0.0798	0.0466	0.0232	0.0301	0.1229	0.1199	0.0388	0.0154	0.0723	0.0767
X	0.1269	0.1177	0.1712	0.1316	0.1730	0.1912	0.0999	0.1227	0.1686	0.1727	0.0783	0.0669	0.0602	0.1636
X	0.1888	0.1767	0.2166	0.1667	0.1915	0.2139	0.1517	0.1616	0.1988	0.1572	0.1363	0.1391	0.1123	0.1017

Figure 3: $(C) = M \cdot (I - M)^{-1}$



Fifth s

Calculating values D+R and D-R by applying relations (4), (5) and (6)

$$(i,j=1,2,3,\dots)$$

(4)

$$T = t_{ij}$$

$$D = \sum_{j=1}^n t_{ij}$$

(5)

$$R = \sum_{i=1}^n t_{ij}$$

(6)

D= Total of each row

R = total of each column

According to the values gained, some criterions have higher and positive values than D-R which in fact indicate being more influential than other criterions. So they are higher in priority to others and called cause group. Those with negative values have more effectiveness and are lower in priority so they are called effect group.

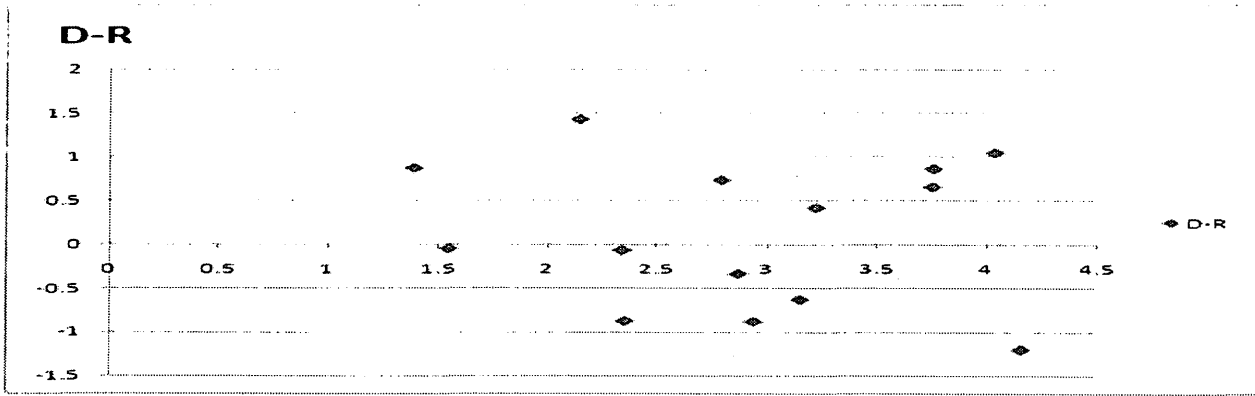
Table 4: Final result of DEMATEL

(D-R) Effect group	(D-R) Cause group
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Sixth step: drawing relating map

The map of relation is drawn by values gained from D-R and D+R to clarify internal relations, level of influencing or efficacy of criterions (Opricovic & Tzeng, 2004).

Figure 4: Map of cause and effect relation



Steps of ANP technique

Then for providing weight to indices, ANP technique was used as follows (Saaty, 1996). First step: creating network structure, second step: doing coupled comparisons, third step: compatibility test, fourth step: forming and analysis of Super matrix which is in fact output matrix of DEMATEL; table of no 3. Fifth step: choosing best option of decision. By calculating weights of decision-making options and their priorities, the most weight or the highest level of priority can be chosen as the top (best) option. But it must be noticed that the final answer of ANP is not necessarily optimum answer.

Table 5: Ranking of ANP

Gaining higher skills and technologies which are not available in company	0.1184
Increasing company focus on its main works	0.0935
Company capital`s being free	0.0918
Achieving new ideas	0.0894
Better control of activities	0.0796
Risk reduction	0.0751
Using technique skill	0.0676
Increase of competitive feeling	0.0666
Increase of job speed	0.0643
Increase of services quality	0.0627
Parsimony in time of managers	0.0601
Reducing company costs	0.0540
Changing constant price to varied year	0.0396
Reducing working forces	0.0371

In this spite, we use weights gained through ANP method titled W_j needed for Vikor method. In this step, ideal and positive negative values of each one of indices are calculated according to weights gained from analysis network process (ANP). The calculations are shown in Table 6.

Table 6: Table of ideal positive negative values

indices	ANP weight	positive ideal	negative ideal
	0.0643	0.1888	0.0289
	0.0796	0.1767	0.0257
	0.0627	0.2166	0.0399
	0.0676	0.1667	0.0266
	0.0666	0.1915	0.0528
	0.0751	0.2139	0.0466
	0.0894	0.1517	0.0229
	0.0935	0.1616	0.0301
	0.0540	0.1988	0.0575
	0.0396	0.1572	0.0389
	0.0601	0.1363	0.0213
	0.0371	0.1391	0.0154
	0.0918	0.1123	0.0349
	0.1184	0.1636	0.0574

Table 7: Desirability matrix and lack of it

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14
X1	0.538	0.445	0.313	0.556	0.409	0.458	0.562	0.318	0.197	0.183	0.067	0.232	0.574	0.272
X2	0.018	0.059	0.019	0.028	0.066	0.018	0.043	0.018	0.012	0.009	0.015	0.051	0.04	0.07
X3	0.043	0.043	0.052	0.036	0.023	0.03	0.045	0.031	0.03	0.02	0.021	0.046	0.058	0.051
X4	0.02	0.019	0.021	0.058	0.061	0.029	0.04	0.041	0.025	0.024	0.04	0.035	0.041	0.067
X5	0.027	0.045	0.029	0.035	0.061	0.047	0.014	0.033	0.049	0.054	0.053	0.056	0.065	0.016
X6	0.037	0.027	0.029	0.048	0.032	0.057	0.061	0.009	0.027	0.015	0.043	0.05	0.022	0.04
X7	0.036	0.036	0.014	0.023	0.013	0.014	0.066	0.028	0.021	0.006	0.061	0.068	0.016	0.003
X8	0.012	0.011	0.014	0.024	0.042	0.025	0.04	0.058	0.019	0.035	0.026	0.053	0.02	0.021
X9	0.047	0.048	0.035	0.033	0.029	0.023	0.05	0.038	0.054	0.02	0.05	0.05	0.01	0.038
X10	0.039	0.038	0.034	0.039	0.037	0.025	0.04	0.032	0.032	0.04	0.04	0.039	0.001	0.04
X11	0.026	0.017	0.043	0.044	0.06	0.038	0.035	0.022	0.046	0.05	0.049	0.042	0.06	0.042
X12	0.037	0.037	0.037	0.037	0.03	0.037	0.037	0.037	0.02	0.012	0.031	0.037	0.019	0.03
X13	0.036	0.036	0.024	0.023	0.012	0.012	0.037	0.027	0.02	0.027	0.046	0.054	0.062	0
X14	0	0	0	0	0	0	0	0	0	0	0	0	0	0.069

In this step, S and R values are calculated through desirability matrix and lack of it gained. R values for each one of indices are the highest row values in each one of indices and S values for indices are total row values for each one of indices. Calculations are shown in Table8.

Table 8: Values S and R

	R	S
X1	0.574048	5.124288
X2	0.070456	0.464844
X3	0.057759	0.527437
X4	0.067282	0.522938
X5	0.064879	0.584964
X6	0.061339	0.49809
X7	0.068008	0.403949
X8	0.057522	0.397176
X9	0.054	0.525383
X10	0.0396	0.47424
X11	0.0601	0.573643
X12	0.0371	0.439203
X13	0.061793	0.414833
X14	0.069011	0.069011
MAX	0.574048	5.124288
MIN	0.0371	0.069011

In this step, final values Q are calculated for each one of Indies in three confidence levels $v=1, v=0.5, v=0$ and final ranking is conducted. Calculations conducted in table 10 are related to $v=0.5$, they are so close to $v=1$ and they are in the middle which is shown.

Figure 5: Situation of different conditions of ranking indices with the help of VIKOR method

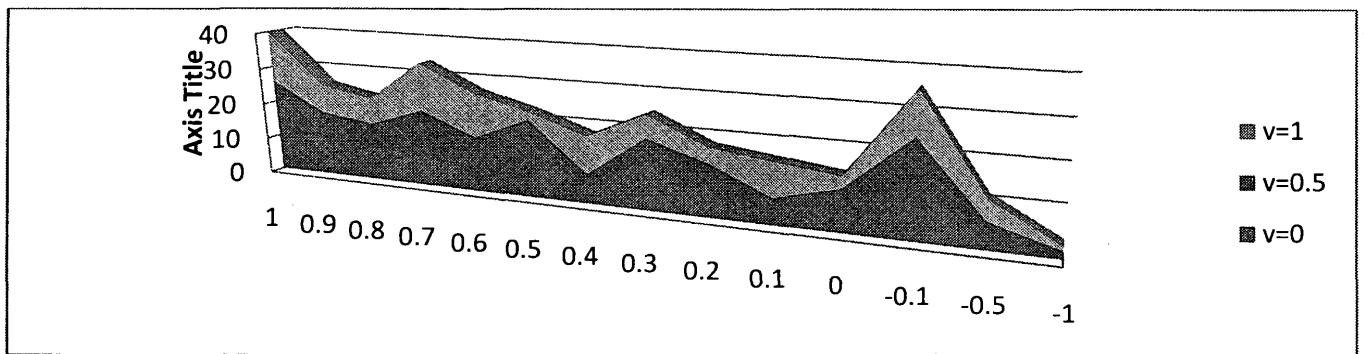


Table 9: Final ranking of indices using VIKOR method (Opricovic and Tzeng 2004) $V=0.5$

aiming higher skills and technologies which are not available in company
 X_{14}

X_8 ; Increasing company focus on its main works

X_7 ; Achieving new ideas

X_{13} ;Company capital`s being free

X_{12} ;Reducing working forces

X_2 ;Better control of activities

; X_{10} Changing constant price to varied year

X_6 ; Risk reduction

X_9 ;Reducing company costs

X_4 ;Using technique skill

X_3 ;Increase of services quality

X_{11} ;Parsimony in time of managers

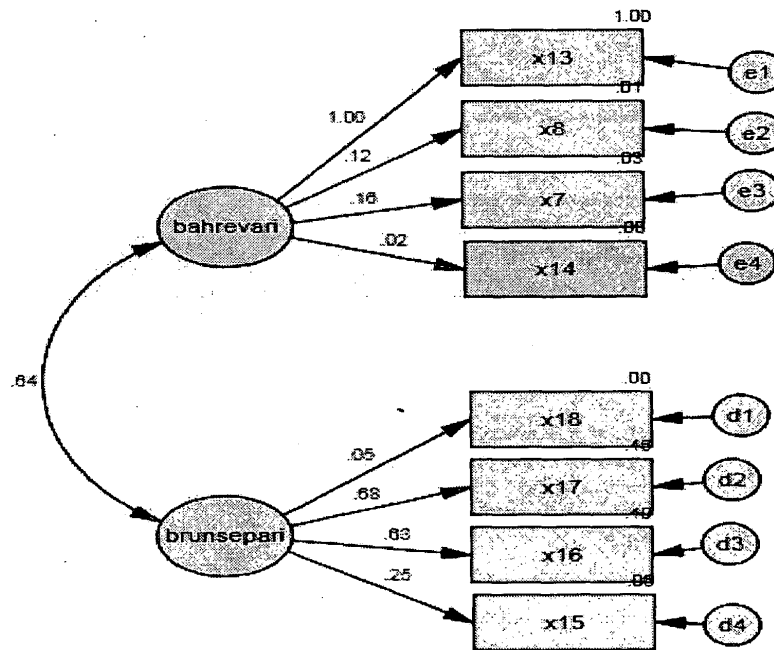
X_5 ;Increase of competitive feeling

; X_1 Increase of job speed

In structural equations, first-time two-factor analysis model was used.

Regarding the first step of SEM, creation theory, we have already talked. But on the second step, creating model (Human, 2005), in which two factors gaining higher skills and technologies which are not present in company and achieving new ideas related to effectiveness and two factors of increasing focus of company on its main activity and making company capital free are all related to efficiency index. Also with the help of studying the research profile and Delphi technique, four factors were determined for two indices of internal organization and external organization. Then with the help of Amos software, model of figure 6 was gained. Third step of SEM is making tools: we also measured the model indices which were in DEMATEL group and ANP had the highest level of weights and were among the first four priorities in VIKOR. Fourth step of SEM is, gathering data: gathering of data was conducted by questionnaires and with the help of SPSS software. Fifth step of SEM, model test: this process is conducted by Amos software which identified software of our model and is available in Figure 6.

Figure 6: Creating model in SEM

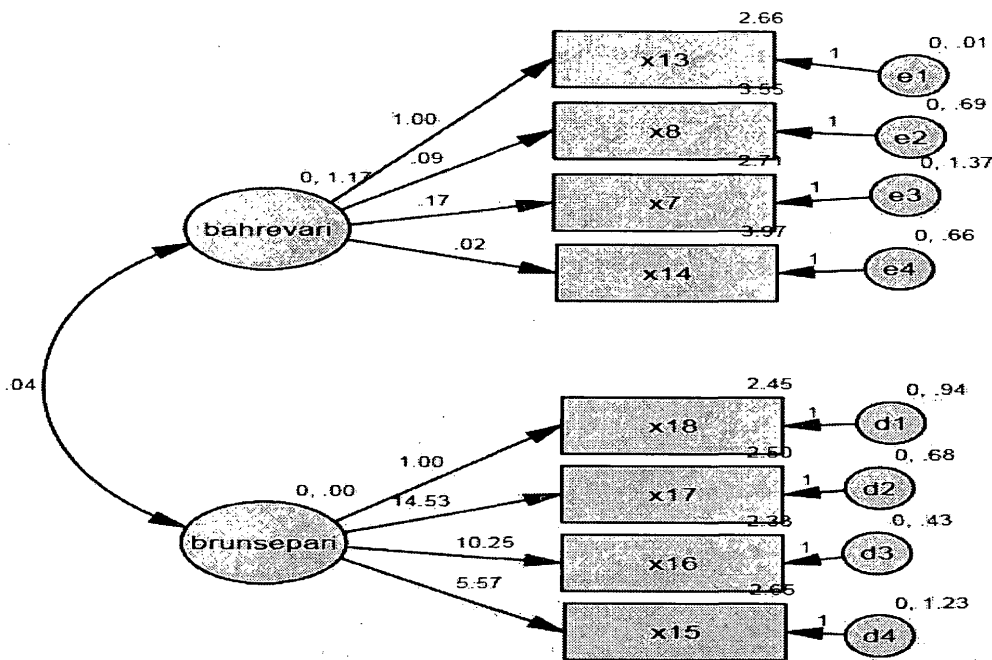


In above picture, it is quite clear that there is 0.64 % dependency between outsourcing and organization efficiency. Also factor load (standard) shows a value between zero and one (positive) which indicates existence of dependency. But in cases when the factor loads are less than 0.3, a weaker relation was considered and it is rejected. Factor load between 0.3 and 0.6 is acceptable; in the model mentioned there are only two factors of equipment ability and legal factors have big effects on dependent variable of outsourcing. Also in χ^2 model to freedom degree or relative χ^2 , it can be observed that value 2.6 is gained, which indicates dependency among two variables of efficiency and outsourcing. Since in this test value 1-5 is fine, but values 2-3 are extremely good.

Sixth step of SEM Results

Efficacy of outsourcing on organizational efficiency which this can be the result of lack of true performance in outsourcing. In a relation with numbers` being meaningful, it must be argued that since in this research we are seeking hypotheses test in confidence level of 0.95 or error of 0.05, if for test t there is a number between -1.97 and +1.97, then it will be meaningful. In the model mentioned, the numbers gained for test t are shown for investigating cause relations of variables.

Figure7: Sixth step of SEM. Analysis model of approving factor (meaningful coefficients)



Main hypothesis: outsourcing has a meaningful effect on organizational efficiency

Assumption H0: outsourcing has no meaningful effect on organizational efficiency.

Assumption H1: outsourcing has a significant effect on organizational efficiency.

According to Figure 6, standardized coefficient between two variables is 0.64. Meaningful coefficient between these two variables is 0.04 and since the number (value) is less than 1.96 showing the relation is not meaningful. So zero assumptions is approved and assumption one is rejected. This means that although outsourcing has an effect on organizational efficiency, the effect is not meaningful; it is so little which can not even be considered. This may be due to false performance of outsourcing in the company studied. But it is observed that all the outsourcing factors have significant effect. All the positive numbers indicated dependency among indices and all the negative ones are result of lack of dependency. So the results show that not only there is dependency between some outsourcing indices and efficiency, but also there is dependency among auto-efficiency elements and outsourcing. Although these dependencies are so minor that they lack efficacy. Also value of RMSEA test (deviation test in ach freedom degree) is reported as 0.1 indicating approval of the model. The less the RMSR model, the better, since the test is a criterion for average difference between data observed and model data.

4. Discussion

In a research conducted by Mahmoudi (2010), the same variables of our research were investigated with the help of structural equation technique. He also concluded that there is no meaningful relation between outsourcing conducted in organization of case study and efficiency elements. This means that outsourcing

process is not conducted well. This is while meaningful and positive relations can be observed between efficiency elements and this set the stage for improvement of organizations with low costs.

-Also in a research conducted by Ferdousipour (2010), effective variables such as cost, income, customer satisfaction and ratio of efficiency were calculated and finally he concluded that outsourcing caused the increase of quality, reduction of production costs, employee's satisfaction, increase of employment, improvement of supervision, better control, dealing with main works, main organization's being small and finally causes efficiency of organization.

In another research called "investigating effect of outsourcing or using external organization resources on efficiency", Kianmehr, Mohammad Reza, 2002. He also introduced outsourcing strategy as a tool for improving efficiency of organization which causes improvement of efficiency of organization using criterions such as reduction of production costs, increasing quality and increasing employees' satisfaction.

So it can be concluded that in spite of variables' being in different researches conducted by researchers, still in some of them outsourcing is effective on organizational efficiency and there is dependency among them and in some like our research it lack meaningful effect of outsourcing independent variable on dependent variable of organizational efficiency, the reason behind above is lack of correct performing of outsourcing in different organizations.

5. Conclusion

The aim of the research is investigating efficacy of outsourced activities on organizational efficiency, case study, ABFA Company. After studying the research profile and with the help of professors and experts, 14 main indices were identified in company on efficiency and 4 indices were identified on outsourcing which for investigating indices we distributed questionnaire of which were women respondents and 62 people were men. Also 23 people of the respondents has diploma, 46 has BA and 14 ones had MA and 9 of them had PhD degree. 10 of them were between 25-30 years old, 35 people were between 36-40 years old, 21 of them were between 41-45 years old and 14 of them were 12-46 years old and 51 of them were more than 51. After those 4 techniques of DEMATEL, VIKOR, ANP and structural equations were applied since ratio of χ^2 to degree of freedom is between 2-3. So value χ^2 is suitable and downward. In other words, data observed is mainly identical to conceptual model of the research; we concluded that outsourced activities of the company studied did not have a meaningful effect of organization efficiency which these results from lack of true performance of outsourcing process in the company mentioned. In general, researchers believe that for investigating efficacy of a variable over another one, structural equation technique is the best method, since not only it deals with our relations between the researches variables only in qualitative and quantitative forms, but also it mentioned our relation between indices of each variable in quantitative form.

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