

Using operations research in decision-making and problem-solving among non-governmental organizations in Iraq

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Abstract

This study aims to get to know the extent to of non-governmental organizations apply Operations Research in solving problems and making decisions, and sources of knowledge of these methods that are practiced in NGOs, in addition to identifying the obstruction and encounter problems the use of Operations Research in make-decision in NGOs.

We noted that the knowledge of operations research among employees in civil institutions and the extent of their application is below the average, and it seems that there is a need for more effort in defining operations research and its applications and that education and self-interest between workers is one of the main ways to obtain science of operations research in make decision. the study came out with several recommendations, the most important is that it is necessary to work on developing awareness of the importance and advantages of using operations research in making decisions and that workers in civil institutions need training through organizing training courses. More attention must be directed to the operations research in Related colleges, institutes and academic institutions.

Keywords : Operations research , decision making , half-partition method .



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1. Introduction

Decision-making is generally considered the essence of the management process, and it seeks to make the appropriate decision in line with the desired goals, according to the capabilities and resources available and in the light of current the situation (Mashreqi 1997).

As operations research in decision-making is a method for analyzing problems, it appeared during the Second World War and was used initially for military purposes, then it was used for civil purposes, especially in the field of industry. The objective of the institution is the best possible way to use resources. and operations research includes a set of methods such as linear programming, goal programming, the critical path method, inventory models, waiting lines, and other methods of operations research that help institutions make the appropriate decisions (Ashour 2003).

2. previous studies

The application of operations research techniques in the British financial markets, where between the programming or technology that has been widely applied in most financial markets, as the operations research used in the financial markets such as linear and nonlinear programming, the integer, the target method, and others, which led to the use of a group solution A large number of problems in the financial markets, as the researchers touched on the use of Monte Carlo simulation on a large scale in the financial markets as a basis for evaluating options and papers that lie with the techniques less used in the financial markets. And Markov chains for evaluating loan portfolios and testing market efficiency, as it proved that techniques and operations research play an important role in financial markets, as they provide huge improvements in real-time with the availability of data and speed in the computer, and this leads to an increase in the opportunity for operations research to play a greater role in financial markets. (Board et al.1999)

The research aims to identify the methods of decision-making and the extent of applying operations research in decision-making in the institutions in question, in addition to identifying the obstacles and problems that limit the application of operations research and highlighting the importance of its use and shedding light on it. (Abdul Rahim& Ahmed Aladdin 1998)

3. The theoretical side

3.1 The concept and nature of operations research

Ashour (2002) defines Operations Research as an approach based on scientific foundations to assist the administration in solving the problems it faces and making decisions regarding them.

It can be said that operations research is the application of advanced analysis methods to help make better decisions by using techniques such as mathematical modelling to analyze complex situations, and operations research gives executives the power to make effective and more productive decisions (electronic version Edelman 2007).

Operations research uses advanced analytical techniques to improve decision-making and is sometimes known as management science or industrial engineering. In filling positions subtly to support decision-making, logical analysis of business market

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analysis and market planning. (Online version Lancaster University School of Management 2005).

We note from the previous definitions of operations research in decision-making that it shares the use of scientific methods and mathematical models to improve decision-making, with an emphasis on :

- 1- Define the problem
- 2- Determine the goal
- 3- Finding and evaluating alternatives

From the foregoing, we can derive the definition of operations research for decision-making, which is an administrative process through which the quantitative scientific method, statistics and mathematics are used to study the problem, define goals and evaluate alternatives to make the optimal decision (Azzam, 2003).

• **Statistical methods**

The descriptive statistical method was used to analyze the results that will be obtained upon retrieval of the questionnaire using the SPSS statistical program with all its transactions and correlations, where it represents dependent variable (use of operations research in making decisions) and independent variables (specialization, years of experience, modern technologies).

• **Research hypothesis**

- There are no statistically significant differences between the use of operations research for make-decision and, the scientific specialization of the decision-maker at the level of significance 0.05.
- There are no statistically significant differences between the use of operations research for decision-making and the years of experience for the decision-maker at the level of significance 0.05.

3.2 Factors that help in the development of operations research

The science of operations research is rapidly developing due to the presence of factors, the most important of which are:

- A** - Perhaps the most important factor that helped the emergence of this science is the follow-up of researchers and scientists who worked continuously to reach solutions to various problems.
- B** - The emergence of computer science and electronic computers and their amazing development led to the development of the science of operations research, where it was possible to obtain better and faster results.
- C** - The formation of associations and committees specialized in operations research and their dissemination of research led to the dissemination of this science.
- D** - The transmission of teaching this science in universities and institutes led to its spread (Azzam 2003, p. 14) (Al-Hiti 2000, p. 15)

3.3 Obstacles to the application of operations research

Many obstacles impede the application of operations research, which is used to solve administrative problems (Ashour 2002, p. 27) (Soo, 2005), and the most important obstacles are:

- Failure to obtain the support and endorsement of decision-makers in the institution.
- Not obtaining the support and endorsement of influential people in the decision-making process.
- Not taking into account those affected by the results and recommendations.

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- The inability to contact the above-mentioned categories.
- Not applying appropriate methods to the problem.
- Not taking into account the cost factor.
- Not taking into account all quantitative and descriptive factors.

4. The applied side

The study population was selected from the workers in active civil institutions, and they are (Chairman of the Board of Directors, Executive Director, Treasurer and Secretary), that is, four items. 161 questionnaires, and after examining the questionnaire, none of them were excluded due to the fulfilment of the conditions required to answer the questionnaire. Thus, the number of questionnaires subject to study is 161, or 80.5% of the study sample.

The internal consistency of the extent of knowledge about operations research in decision-making was calculated and applied to the study sample of 30 individuals, by calculating the correlation coefficients between each item and the total score of its domain.

The first field: discusses the extent of knowledge about operations research in decision-making and its application, and it consists of 6 paragraphs

Table 1 Correlation coefficients between each paragraph of the extent of knowledge about operations research in decision-making and its application

sequencing	Paragraph	correlation coefficient	Moral level
1	How well do you know operations research for decision-making?	0.822	0.000
2	How much do you want to learn about operations research and decision-making?	0.734	0.000
3	How often do you use operations research in your work?	0.865	0.000
4	How often do you want to use Operations Research in your work?	0.605	0.000
5	To the extent that you know how to apply Operations Research in your work	0.660	0.000
6	To what extent do you know how Operations Research is applied in your organization?	0.729	0.000

The tabular value of r is at the level of significance of 0.05 and the degree of freedom of 28 is 0.361

Table No. (1) shows the correlation coefficients between each of the paragraphs of the field above (extent of knowledge about operations research in decision-making and its application), which shows that the correlation coefficients shown are a function at the level of significance (0.05), Also, the calculated r-value is greater than the tabular r-value at the level of significance of 0.05 and the degree of freedom of 28, which equals 0.361, and this indicates the credibility of the paragraphs in this field.

The second field: discusses operations research for decision-making that is followed in the private sector .

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Table 2 Correlation coefficients between each paragraph of operations research for decision-making that is followed in the private sector

sequencing	Paragraph	correlation coefficient	Moral level
7	Linear programming	0.605	0.000
8	Decision tree	0.485	0.008
9	Pert method	0.765	0.000
10	Prediction models	0.784	0.000
11	Queue theory	0.743	0.000
12	Inventory forms	0.866	0.000
13	Statistical analysis	0.795	0.000
14	Simulation models	0.680	0.000
15	Financial models	0.656	0.000
16	Project management models	0.584	0.001
17	Quality measurement models	0.627	0.000
18	Critical path	0.688	0.000
19	Appointment forms	0.639	0.000
20	Transfer models	0.819	0.000
21	Procurement forms	0.388	0.034

The tabular value of r is at the level of significance of 0.05 and the degree of freedom of 28 is equal to 0.361

Table No. (2) shows the correlation coefficients between each paragraph of the second field (operations research for decision-making that is followed in the private sector), which shows that the correlation coefficients indicated at the 0.05 level function, as well as the calculated r value greater than the tabular r value at Significance level 0.05 and degree of freedom 28, which equals 0.361, and this indicates the credibility of the paragraphs in this field.

The Split-Half Coefficient

This method was used to measure the stability of the questionnaire, where the Pearson correlation coefficient was found between the rate of odd-ranked questions and the rate of even-ranked questions for each of the questionnaire axes, and the correlation coefficients were corrected using the Spearman-Brown correlation coefficient for correction according to the equation below:

$$\text{Stability Coefficient} = \frac{2r}{r+1}$$

Where: r represents the correlation coefficient, and the table below shows that the stability coefficient is relatively large for the questionnaire items.

Table 3 Split-Half Coefficient

the field	domain address	correlation coefficient	Stability coefficient	Moral level
The first	How well do you know about operations research in decision-making and its application?	0.68087	0.81014	0.000
The second	Methods of obtaining knowledge of operations research for decision-making	0.70541	0.827261	0.000
The third	Decision-making methods used in NGOs	0.72571	0.841057	0.000
The fourth	Types of operations research for decision-making that are followed in NGOs	0.74351	0.852889	0.000
The fifth	The reasons that limit the application of operations research in decision-making in NGOs	0.65975	0.794999	0.000
Vi	The best ways to activate the use of operations research in NGOs	0.73358	0.846318	0.000

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VII	Reasons for using operations research in decision-making in NGOs	0.77257	0.871695	0.000
VIII	The extent to which computers and technical programs are used to assist in decision-making in NGOs	0.68872	0.815671	0.000
	all paragraphs	0.72657	0.841634	0.000

The tabular value of r at a significance level of 0.05 and a degree of freedom of 28 equals 0.361.

4.1 Analysis of the Study Paragraphs

1- Analyze the paragraphs of the first field

Table 4 Extent of knowledge about operations research in decision-making and its application

sequencing	Paragraph	SMA	relative weight	t value	significance level
1	How much do you want to learn about operations research and decision-making?	4.02	80.38	16.015	0.000
2	How often do you want to use Operations Research in your work?	3.89	77.74	13.284	0.000
3	How well do you know operations research for decision-making?	3.19	63.75	2.580	0.011
4	To what extent do you know how Operations Research is applied in your organization?	3.02	60.38	0.257	0.797
5	How often do you use operations research in your work?	2.97	59.37	-0.398	0.691
6	To what extent do you apply Operations Research in your work	2.94	58.87	-0.741	0.460
	the total	3.34	66.81	6.413	0.000

The tabular t-value is at the level of significance of 0.05 and the degree of freedom of 103 is equal to 1.98.

- Through the results of the table above, we see that there is a great desire among the majority of decision-makers to learn about operations research for decision-making, and their desire to use these methods is evidence of their awareness of the importance of this science, and therefore this will have a major role in spreading the use and application of operations research in civil institutions in the future.
- The above table shows that the arithmetic mean is equal to 3.34, and the relative weight is equal to 66.81%, this is better than the neutral relative weight of 60%, and the calculated t account is equal to 6.413, which is better than the tabular t value, which is equal to 1.97, and level of significance is equal to 0.00, which is less than 0.05, which indicates however, the knowledge of the respondents about operations research in decision-making and its application is medium.

2- Analysis of the sections of the second domain

Table 5 Types of operations research for decision-making that are used in decision-making methods in the private sector

Sequencing	Paragraph	SMA	Relative weight	t value	Significance level
1	Financial models	3.55	71.07	6.064	0.000
2	Project management models	3.53	70.57	5.667	0.000
3	Procurement forms	3.33	66.67	3.384	0.001
4	Statistical analysis	2.83	56.58	-1.715	0.088
5	Quality measurement models	2.80	56.00	-1.959	0.052

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6	Appointment forms	2.76	55.16	-2.293	0.023
7	Decision trees	2.68	53.68	-3.343	0.001
8	Transfer models	2.62	52.47	-3.598	0.000
9	Simulation models	2.58	51.63	-4.159	0.000
10	Inventory forms	2.51	50.20	-4.970	0.000
11	Linear programming	2.49	49.80	-5.102	0.000
12	Prediction models	2.17	43.40	-10.084	0.000
13	The critical path	2.11	42.21	-10.627	0.000
14	Queuing theory	2.03	40.67	-11.614	0.000
15	Pert method	1.90	37.95	-15.929	0.000
	the total	2.71	54.16	-4.368	0.000

The tabular t-value at the significance level is 0.05 and the degree of freedom of 103 is 1.98

- From the table above, it is clear that the results of t calculated for the first to third paragraphs were positive and greater than the tabular t, which indicates the use of these types of operations research for decision-making in the private sector.
- Through the results of the above table, we note that the financial models ranked first in the types of operations research used in the private sector, which indicates interest and orientation towards making a more accurate decision.
- As for the results of using project management and procurement models, which come in the second and third rank, this is attributed to the nature of the work of the private sector, which is dominated by the large number of projects and procurement. This concern is focused on obtaining satisfaction.
- As for the results of using linear programming, prediction models, and queuing theory, and their occupation of the last ranks, this is due to the lack of spread of these methods and the relatively little knowledge of these methods by workers in the private sector, because these methods are known only by specialists.
- It is clear that the arithmetic middle of all paragraphs is equal to 2.71, and the relative weight is equal to 54.16%, which is smaller than the neuter relative weight of 60%, while the studied t-value is 4.368, which is smaller than the classified t-value, that is equal to 1.97, and the level of significance is equal to 0.000, which is less than 0.05, which indicates that the types of research The processes for decision-making that are followed in the private sector are few.

4.2 The results of the hypothesis test statistically

The null hypothesis was accepted, which says that there is no correlation and statistically significant differences between the use of operations research for decision-making in the private sector due to the specialization of the decision-maker.

5. Conclusions and recommendations

5.1 Conclusions

1. There is a desire to learn about operations research for decision-making and its application among workers in the private sector, and this appears through the results of the study, as the desire for knowledge and application was great.
2. It turned out that the operations research that is used in the private sector is limited. Most of the methods used are financial models, project management and procurement models. This is because the private sector wants to attract financiers.

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3. The null hypothesis was accepted, which explains that there is no correlation and statistically significant differences between the use of operations research in make-decision by special sectors due to the speciality of the make-decision.

5.2 Recommendations

1. It became clear through the study that the knowledge and use of operations research for decision-making in the private sector is average. It also became clear that there is a desire to know the use of operations research among decision-makers in the private sector. Through these results, it can be inferred that the decision-maker feels the importance of operations research in improving the decision-making process. Therefore, responsible in the private sector must be trained on operations research for decision-making.
2. One of the main determinants that result from this study for the use and application of operations research in the private sector for the study sample is the lack of specialists in this field and to overcome this it is possible to establish specialized centers in operations research for decision-making, with the need to provide all the material and human capabilities of these centers.
3. Work on designing and developing modern management information systems that are appropriate to the nature of the private sector's activity, and preparing qualified workers to employ these systems, which would reflect definitely on the precision and organization of data to assist in resolution-making.
4. job on developing realization of the value and qualities of using operations research for decision-making by holding seminars while open meetings between decision-makers in the special sector.

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استخدام بحوث العمليات في اتخاذ القرار وحل المشكلات لدى المؤسسات الأهلية في العراق

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المستخلص :

تهدف هذه الدراسة الى التعرف على مدى تطبيق المؤسسات الأهلية لبحوث العمليات في حل المشكلات واتخاذ القرار ومصادر المعرفة بهذه الاساليب التي تمارس في المؤسسات الأهلية ، فضلا عن تحديد المعوقات والمشكلات التي تواجه استخدام بحوث العمليات في اتخاذ القرارات في المؤسسات الأهلية . نلاحظ بأن هذه الدراسة وضحت المعرفة بالأساليب الكمية لدى العاملين في المؤسسات الأهلية ومدى تطبيقها دون المتوسط ويبدو بأن هنالك حاجة لمزيد من الجهد في التعريف لبحوث العمليات وتطبيقها ، وان التعليم والاهتمام الذاتي لدى العاملين هو من الطرق الرئيسية للحصول على المعرفة لبحوث العمليات في اتخاذ القرار . وقد خرجت الدراسة بعدة توصيات أهمها : لا بد من العمل على تنمية الوعي لأهمية ومزايا استخدام بحوث العمليات في اتخاذ القرار وأن العاملين في المؤسسات الأهلية بحاجة الى تدريب على بحوث العمليات من خلال تنظيم الدورات التدريبية ، لا بد من توجيه مزيد من الاهتمام في بحوث العمليات في الكليات والمعاهد والمؤسسات الأكاديمية ذات العلاقة .

الكلمات المفتاحية :- بحوث العمليات ، اتخاذ القرار ، طريقة التجزئة النصفية .
