

THE REALITY OF USING QUANTITATIVE METHODS IN DECISION-MAKING AT MUTAH UNIVERSITY

Mohammad Al-soub¹

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ABSTRACT

This study aims to investigate the extent to which quantitative methods and methods are used in analyzing problems and making decisions at Mutah University. The study relied on the descriptive analytical approach and the Statistical Package for the Social Sciences (SPSS- Version 20). One of the most important results that the study reached is that the application of quantitative methods in decision-making at Mutah University, from the point of view of the study sample members, it is moderately applied.

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1. INTRODUCTION

Decision-making in general is the essence of the administrative process and the administration always seeks to make the right decision in proportion to the desired goals in accordance with the possibilities and resources available and in light of the current situation and the decision aims to find the necessary solutions to the administrative problems raised, whether financial or productive (Joseph & Gaba, 2020; Suksi, 2021).

The quantitative methods of decision-making as a method of problem analysis emerged during the Second World War and were initially used for military purposes and then moved to civilian purposes, especially in the field of industry. Operations research is the use of quantitative methods, methods and tools to address the problems facing management and assist in decision-making in order to achieve the objectives of the institution in the best possible ways, and it includes a set of methods such as linear programming, goal programming, critical path method, inventory models, waiting lines and other quantitative methods that help

institutions in making the appropriate decision (Briskorn & Dienstknecht, 2018; Yalcin et al., 2022).

The School of Management at the University of Lancaster has shown how much we need operations research because it makes the best possible use of available resources. Today's global markets mean that customers expect to deliver high-quality products and services when they need them, and organizations, whether public, private or private, need to provide these products and services as effectively and efficiently as possible, and this requires careful planning and analysis and is usually based on quantitative methods and models in decision-making (Alvarez et al., 2021).

The use of quantitative methods as a modern and useful method for governmental, private and private institutions requires researchers to start to demonstrate the importance of these methods to solve the problems facing institutions in order to help them make rational and sound decisions that ultimately lead to achieving the objectives of the institution and providing high-quality services that benefit the institution and the beneficiary.

¹ Corresponding author: Mohammad Al-soub
Email: mohmadsoub@yahoo.com

1.1 Study problem

The main problem addressed by this research is to determine the extent to which quantitative methods are used in administrative practices at Mutah University, as well as to identify the obstacles that limit their use in order to propose some recommendations that will overcome these obstacles and thus spread the use of these methods in administrative practices at Mutah University. The problem of the study lies in the question of what is the impact of the use of quantitative methods in administrative decisions at Mutah University?

The following questions arise from it.

1. The extent of knowledge about quantitative methods of decision-making and their application at Mutah University?
2. What are the reasons that limit the application of quantitative methods in decision-making at Mutah University?

1.2 Importance of the study

This study derives its importance from being related to an important administrative topic that falls within the interests of many academics and practitioners, for the importance of administrative decisions in the administrative development process, and its importance derives through a set of expected additions that can be provided to researchers in the academic field and practitioners in practice.

On the scientific and academic level: the researcher hopes to contribute to the development of scientific knowledge on the use of quantitative methods and operations research at Mutah University.

At the applied level, the researcher expects to draw the attention of decision-makers at senior administrative levels to the need to use scientific methods in the process of analysis and decision-making, to contribute to improving the quality of decision.

The importance that the study can add is to shed light on an important and vital topic, which is the reality of using quantitative methods.

1.3 Objectives of the study

1. Demonstrating the extent to which quantitative methods and methods are used in problem analysis and decision-making at Mutah University.
2. Identify the quantitative methods used by Mutah University in decision-making.
3. Identifying the problems and obstacles that guide decision makers at Mutah University.

1.4 The first main hypothesis

There were no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (gender, age, educational qualification, years of experience, job level).

To test this hypothesis, it was broken down into five sub-hypotheses:

1. There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (gender).
2. There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (age).
3. There were no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (academic qualification).
4. There are no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (years of experience).
5. There were no statistically significant differences at the level of significance ($\alpha \leq 0.05$) between the use of quantitative methods in decision-making and the demographic characteristics of decision makers attributed to (functional level).

1.5 Study variables

1.5.1 Dependent variable

Use quantitative methods in decision-making.

1.5.2 Independent variables

Demographic variables (gender, age, educational qualification, years of experience, job level).

2. THEORETICAL FRAMEWORK AND PREVIOUS STUDIES

2.1 Theoretical framework of the study

The conceptual framework of quantitative methods and their historical development.

The concept of quantitative methods: Quantitative methods are considered a mathematical method through which economic, administrative and marketing problems are addressed with the support of available resources of data, tools and methods used by decision makers to address problems. (Brandenburg et al., 2014; Puskaric 2024).

Definition of quantitative methods: It can be defined by several definitions, including: "The set of methods, formulas, equipment and models that help solve problems on a rational basis." (Mohammed, 2022)

- From this definition, we can include the various of these methods under the broader title of operations research, where there are several definitions, the most prominent of which are.

- Definition adopted by the British Operations Research Society as "the use of scientific methods to solve complex dilemmas in the management of large systems of manpower, equipment, raw materials, and money in

factories, government institutions and in the armed forces" (Gupta et al., 2022).

The American Operations Research Association adopted the following definition:

"Operations research is linked to scientific decision-making on how to design the functioning of scaling systems, the workforce according to the conditions requires its allocation in scarce resources" - The American Operations Research Association adopted the following definition: "Operations research is linked to scientific decision-making on how to design the functioning of the scale-up systems, the workforce according to the conditions requires its allocation in scarce resources".

3. HISTORICAL DEVELOPMENT OF OPERATIONS RESEARCH

Operations research is not an ancient history, and it is considered one of the sciences that contributed during the Second World War (1936) to the victory of the land, air and British forces, and the idea at the time was that improving the use of existing weapons and missions would yield better results in the short term, than if the focus was on the use of available resources. (Kuo, 2022). The great credit is due to the scientist G. Dantzig, who discovered the Simplex algorithm with advanced capabilities in solving linear programming problems, this is due to the use of the science of war operations research in Britain, while in America, both B. James, Chairman of the National Defense Research Committee, and B. Rannivar, Chairman of the Committee on New Weapons and Equipment, were behind the use of operations research by conducting studies similar to British studies by forming a special team to address some complex problems, Such as the problem of transporting various equipment and materials and distributing them to the various military units deployed in different regions of the world (Den Boer et al., 2020).

In October 1942, General Spatz, Commander-in-Chief of the Eighth Air Force, sent a letter to the commanders-in-chief of the Air Force recommending that groups of scientists should be included to analyze operations in their units, and through that he formed the first team for this purpose in Britain, followed by the US Navy, which in turn formed two teams in two huge projects: Naval Equipment Laboratory, Tenth Fleet headed by: M. Philip and J. Ellisa, and due to the success achieved in the day, military leaders continued their interest in this science through the Operations Research Agency, which later turned into the Operations Research Corporation, this encouraged the use of this science in many other countries, led by Canada, which formed a team whose task is to produce military equipment through the optimal use of available resources.

After World War II, businessmen who were looking for solutions to their problems were encouraged to introduce this science in the management of economic projects, in

Britain, a team of those interested in the formation of the Operations Research Club, which was named after the Operations Research Society of the United Kingdom, which supervised the issuance of a quarterly scientific journal, starting in 1950, which is the first of its kind.

The use of this science has developed remarkably, especially in light of its coinciding with the great scientific development that has been achieved in the field of automated calculations.

3.1 Importance and Uses of Operations Research Science

The importance of operations research is summarized as follows:

- A means of helping to make quantitative decisions using modern scientific methods.
- Operations research science is one of the scientific means to help make decisions in a more accurate manner and away from randomness resulting from trial and error.
- Operations research is both an art and a science, as it is related to the efficient allocation of available resources as well as its new ability to reflect the concept of efficiency and scarcity in applied mathematical models.
- This science seeks to search for new rules and foundations for administrative work, in order to reach the best levels in terms of comprehensive quality, and standards of international specifications (ISO).
- It helps to address complex problems with analysis and solution that are difficult to deal with in their normal form.
- They help to save the cost of solving various problems by reducing the time required for solution.

They help to focus attention on the important characteristics of the problem without going into details of the characteristics that do not affect the decision, and this helps in identifying the appropriate elements of the decision and using them to reach the best. (Cinelli et al., 2020).

3.2 Making management decisions

The concept of decision-making: It is the essence and core of the administrative process in any project and in general it is defined as the choice of the perceived, conscious and based on verification and calculation in choosing the appropriate alternative from among the alternatives available in a particular situation, in other words decision-making is not the automatic response and direct reaction unconscious, but it is the selection of the appropriate alternative among the alternatives available in a particular situation. In other words, decision-making is not an automatic response and a direct unconscious reaction, but rather a conscious choice based on management and calculation in the details of the goal to be achieved and the means to be used. (Liljenström, 2022).

From an administrative and practical point of view, there is a difference between decision-making and decision-making, the first we explained its concept above, while decision-making, which is now the focus of scientific research to issue rational decisions resulting from industry, in the sense that decision-making has inputs that lead to outputs, and this means studying the disorders of decision-making to be rational and implementable in line with the prevailing production conditions. (Owida et al., 2022).

It includes all the stages that would lead to the decision-making process, while the latter means the stage of selection and implementation of decision-making.

3.3 Stages of decision-making

1. The stage of awareness of the problem: any awareness of the decision-maker that there is a specific problem and a decision must be taken to solve it.
2. Determining the criteria of the decision: any criteria by which we can judge the feasibility or futility of the decision taken, for example: the criterion may be the choice of that act that achieves the largest net current value in the case of investment decisions that include a number of potential machines for purchase.
3. Determine the weights of the criteria necessary for decision-making.
4. Identify the available sources and exclude the bad ones.
5. Selection and evaluation of each alternative: by identifying variables that can be easily measured (revenues, costs, time.....).
6. Choosing the optimal alternative from the alternatives and issuing the decision: This is done through 3 premises: expertise, experience, research and analysis. The last premise is the most used and effective method of identifying the problem.
7. Decision making and implementation with follow-up and evaluation: As the task of the decision-maker does not end only when it is implemented, but also goes beyond following up the results of implementation in order to identify the principle of success of the chosen or optimal alternative in treating the problem or achieving the desired goal (Sinha & Kapur, 2021).

3.4 Types of decisions

There are different types of decisions made by managers or decision makers, and these types:

First: Take the decision to achieve the goal or the results reached, and these are:

1. The optimal decision.
2. The best decision.
3. Possible decision.

Second: There are other types of decisions that depend on the availability of the factor of certainty or uncertainty and can be determined by the following types:

- 1- Decision-making in the case of complete certainty: It is the simplest and rarest type so that the decision-maker can determine the results of

each of the available alternatives with certainty, and the reason is due to the availability of data and information.

- 2- Decision making in case of uncertainty (risk): Where the decision in this case is characterized by the fact that the decision-maker is fully aware of the possibilities of any of the cases that affect the various decision alternatives, and there are criteria that the decision maker can use in this area, including the standard of expected financial value, the criterion of losing lost opportunities.

3.5 Decision making in case of complete uncertainty

In this case, the risk ratio is very high due to the lack of experiences in the past for the decision maker, in such a case the decision maker must make his decision based on the automated criteria to determine the best alternative and make his decision based on the following criteria to determine the best alternative and make the appropriate decision. (Tan et al., 2021).

1. The maximum standard: where the decision-maker chooses the alternatives that achieve the greatest financial return, i.e. taking the optimistic alternative.
2. Maximum minimum standard: In this case, the decision maker is characterized by a kind of pessimism and chooses the least benefits.
3. Minimum maximum standard: In this case, the decision-maker is characterized by cautious optimism, that is, by choosing the best results for each alternative and then choosing the lowest of these results.
4. Minimum minimum standard: Here the decision maker behaves with a great degree of pessimism, and this is in a great state of uncertainty for the decision-maker, so he chooses the lowest return for each alternative.
5. The criterion of remorse: This criterion suggested the world savage standard based on psychological studies, where he sees that the decision-maker after making the decision and obtaining a certain return may feel remorse because he knows in that period the state of nature that occurred and therefore he wishes he had chosen an alternative other than the one and then chosen has reached the world savage that the decision-maker must make an effort to reduce his regret.

3.6 Quantitative approach methods in decision-making

Some specialists in administrative sciences, specifically with the methods of the quantitative approach to business management, have gone to focus on operations research more than the rest of the other names, in other words, they went to consider that the quantitative approach to business management is based on one basic rule, which is operations research, for the following reasons:

1. It is a science that depends on optimization in results and solutions.

2. Addressing problems characterized by limited resources and listing alternatives.
3. It is involved in addressing many problems in the practical reality of business organizations, in addition to that it is already raised from military science.

There are many methods used in operations research, each according to the issue or problem to be solved, including:

- Linear programming method and programming with integers.
- Style of transport models.
- Business networking style.
- Inventory control method.
- Markov analysis method.
- Queue lines style.

3.7 Previous studies

- 1- The research aimed to study Juaidi et al. (2022). the spread of quantitative methods in analyzing problems and decision-making in the ministries of the Palestinian National Authority in terms of the application of these methods, knowledge of them, the desire to learn more of them, how to learn them, the problems of their application, the best ways to disseminate them and raise awareness of them.

The researcher used the descriptive method in his research and the data was collected by a questionnaire was distributed to 425 employees of seventeen ministries and the researcher used the descriptive statistical method to analyze the results and the researcher reached many results, including that the quantitative methods are largely unknown to decision-makers in the ministries of the Palestinian National Authority, the results were below average, It was also shown through research that the desire to know and use quantitative methods in decision-making above the average has been shown through research that university education contributes to the spread of knowledge of quantitative methods, but it seems that its contribution is weak. The main obstacles to the application of quantitative methods are the lack of specialists, the lack of adequate funding, and the lack of computers and accurate data.

In the end, the researcher recommended the need to pay attention to training and qualifying workers on how to use quantitative methods and the use of qualified persons and specialists in work in the ministries of the Palestinian National Authority, in addition to finding a specialized department in the ministries and introducing computers and programs for the use of quantitative methods in decision-making.

2. Study AlAmer et al. (2020) used the descriptive method, where the information was collected through a survey list that was randomly distributed to three managers in 100 major Saudi establishments, and the researcher used statistical descriptive analysis.

The decision-making process has been identified in five dimensions related to the dimension of tension and

inclusion, political behavior, conflict in decision-making, side communications and decentralization in strategic decision-making, and the relationship between the strategic decision-making process, the type of economic activity of the enterprise, the age of the members of the establishment, the age of senior management members, their educational level and the level of experience they have in the educational level have been studied.

As well as the study of the relationship between these dimensions and a set of factors include the characteristics of the external environment surrounding the institution and the characteristics of the internal environment and the size of the facility and the characteristics of decision-makers has shown the results of the study that the process of strategic decision-making varies according to the type of economic activity as well as according to the age of senior management members and their level of education and experience and the study showed that the characteristics of the internal environment have an impact on the decision-making process as well as the external environment.

The researcher concluded by presenting many recommendations that benefit institutions in the Kingdom of Saudi Arabia.

4. SCIENTIFIC RESEARCH METHOD USED IN THE STUDY

The study relied on the descriptive approach (field method) in collecting data by means of a questionnaire developed for this purpose. And analyzed statistically to answer the questions of the study in addition to the desktop and computer survey to take advantage of the available references to build the theoretical background, so the study relied on the quality of primary and secondary sources in collecting information.

Study population:

The study population included all the administrative employees at Mutah University, which numbered (1320) employees. (Human Resources Management at Mutah University).

4.1 Study sample

The study sample consists of (100) individuals. They were selected by the intended random sample method.

4.2 Statistical methods used in the study

The data to be obtained statistically was processed using the statistical program Spas Version 16

To answer hypothesis questions and test, descriptive statistics scales will be used to describe the characteristics of the study sample, depending on frequencies and percentages, and in order to answer the study questions, and to know the relative importance of dimensions using arithmetic averages and standard deviations.

5. DISCUSS THE CONCLUSIONS

Characteristics of the study sample members Table 1.

Looking at Table 1 on the distribution of the study sample members according to their demographic and functional characteristics, the following is noted at each level:

As for the distribution of the members of the study sample according to the gender variable, the percentage of males was 52% compared to 48% of females, as for the age variable, it is clear through the table that the predominant percentage is the age group that falls between (40 less than 50 years) and has ranked first by 33%.

Table 1. Characteristics of the study sample members

variable	group	Repetition	Percentage
Gender	male	52	52%
	female	48	48%
age	Less than 30	26	26%
	30 - less than 40	19	19%
	40 - less than 50	33	33%
	50 – or more	22	22%
Qualification	High School	18	18%
	diploma	25	25%
	Bachelor	39	39%
	Graduate	18	18%
Experience	Less than 5 years	26	26%
	5 – less than 10 years	13	13%
	10 - less than 15 years	15	15%
	15 years and more	46	46%
Career Level	manager	3	3%
	Head of Department	9	9%
	employee	88	88%

It was followed in second place by the age group between (less than 30 years) by 26%, in third place by the age group between (50 years and over) by 22%, and in the last place was the age group between (3 less than 40 years) by 19%. As for the academic qualification variable, the bachelor's degree ranked first with 39%, then the community college diploma degree with 25%, then the graduate and high school degrees with 18% each. As for the variable of work experience, the predominant percentage that falls between (15 years and more) by 46%, followed by the category between (less than 5 years) by 26%, the third place the category that falls between (from 10 years to less than 15 years) by 15%, and in the last place the group that falls between (from 5 years to less than 10 years) by 13%. As for the distribution of the members of the study sample according to the variable of the functional level, the majority of the members of the study sample constituted the category of employees by 88%, then the category of heads of departments by 9%, and in the last place the category of managers by 3%.

5.1 Answer the study questions

Results related to the first question

How much knowledge about quantitative methods of decision-making and their application at Mutah University?

To answer this question, the arithmetic averages and standard deviations of the answers of the study sample members were calculated towards the extent of knowledge about quantitative methods in decision-making and their application at Mutah University.

The arithmetic mean, standard deviation and the level of response of the study sample members towards the dimension paragraphs (table 2). The extent of knowledge about quantitative methods in decision-making and their application

Table 2. Data paragraphs 1-5.1

Paragraph number	Paragraph	mean	Standard deviation	Level
1	How well do you know quantitative methods of decision-making (operations research)	3.48	1.18	medium
2	How much do you want to learn about quantitative methods of decision-making	3.29	1.07	medium
3	How well you use quantitative methods in your work	3.16	1.17	medium
4	How long do you want to use quantitative methods in your work	3.37	1.07	medium
5	To what extent quantitative methods are applied in your work	3.36	1.10	medium
5-1		3.33	1.08	medium

It is clear from the results of the statistical analysis of all paragraphs related to the dimension of material incentives Table (2) that the general trend towards the dimension was average, as the general arithmetic mean was (3.33), with a standard deviation of (1.08). The response media of the study sample on the contents of the

dimension ranged between the mean (3.48) as a maximum in paragraph (1) How well do you know the quantitative methods of decision-making (operations research) and the middle (3.16) as a minimum in paragraph (3) The extent to which you use quantitative methods in work. The standard deviation (1.18) as the upper limit of the dispersion is attributable to paragraph (1) and the standard deviation (1.07) as the minimum is attributed to paragraph (2).

Results related to the second question

What are the reasons that limit the application of quantitative methods in decision-making Mutah University?

To answer this question, the arithmetic averages and standard deviations of the answers of the study sample were calculated towards the reasons that limit the application of quantitative methods in decision-making. The arithmetic mean, standard deviation and level of response of the study sample members towards the dimension paragraphs Reasons that limit the application of quantitative methods in decision-making (Table 3).

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Table 3. Data paragraphs 6 - 10-6

Paragraph number	Paragraph	mean	Standard deviation	Level
6	Lack of modern technologies, programs and computers	3.57	0.99	medium
7	Lack of interest and conviction of management in quantitative methods	3.12	1.12	medium
8	Lack of knowledge of these methods	3.83	0.94	medium
9	Inadequacy and accuracy of data	3.34	1.30	medium
10	Difficulty dealing with quantitative methods	3.66	1.12	medium
10-6		3.50	1.10	medium

It is clear from the results of the statistical analysis of all paragraphs related to the dimension of the reasons that

limit the application of quantitative methods in decision-making Table (3) that the general trend towards the dimension was average, as the general arithmetic mean was (3.50), with a standard deviation of (1.10).

The response groups of the study sample on the contents of the dimension ranged between the mean (3.83) as a maximum in paragraph (8) lack of knowledge of these methods and the medium (3.12) as a minimum in paragraph (7) lack of interest and conviction of management in quantitative methods.

The standard deviation (1.30) as the upper limit of the dispersion is attributable to paragraph (9) and the standard deviation (0.94) as the minimum is attributable to paragraph (8).

6. CONCLUSIONS

1. The results showed that the dimension of knowledge about quantitative methods in decision-making and their application represents an average importance among the members of the study sample.
2. The results showed the reasons that limit the application of quantitative methods in decision-making represent an average importance among the members of the study sample.
3. The study showed that the application of quantitative methods in decision-making at Mutah University from the point of view of the members of the study sample is applied in an average manner.

6.1 Recommendations

- Training employees at Mutah University on quantitative methods of decision-making.
- Opening specialized departments in quantitative methods in universities and linking theoretical study with practical reality by using practical cases and encouraging workers to apply quantitative methods.
- Working on the design and development of modern management information systems that take into account the appropriateness of the nature of Mutah University's activity and the preparation of qualified competencies to use these systems, which would reflect positively on the accuracy and efficiency of the data required to assist in rational decision-making.

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Mohammad Al-soub

Mutah University, Jordan.

mohmadsoub@yahoo.com

ORCID: 0009-0002-6280-9924
