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USE OF METHODS OF OPERATION MANAGEMENT IN THE SELECTION OF HOSPITAL LOCATION: A COMPARATIVE STUDY

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Abstract
One of the most important decisions that the organization has to take is to locate them. Because the place would have significant consequences on the activities of the organizations. This study is looking at finding the ideal location for the establishment of a new hospital in Thi Qar governorate after increasing the population it of about 2152154 and few the number of hospitals in it reach only 7 hospitals. Leading to increased demand and inadequate services provided by these hospitals compared to the population density of the province. Which calls for the establishment of new hospitals ensure easy access the population majority to it. so, this study focuses on finding the optimal location for a new hospital based on precise scientific bases represented by the methods of the operations management of the special location selection by comparing the administrative units of the province and choosing the alternative that has the least distance. The study ended with several results, the most important of which is that the city of Nasiriyah is the best alternative to choose the location of a new hospital compared to other cities because it is characterized by the smallest distance separated from other alternatives by the load distance. The ideal location for the establishment of a new hospital in Dhi Qar province is in the north of the city of Nasiriyah, which is the location extracted by the median.

Keywords: operations management, hospital, location, Median, Load-Distance.

Introduction

Research Problem:

This study examines In finding the optimal location for the establishment of a new hospital in the province of Dhi Qar and commensurate with the size and distribution of the population. As a result of the increase the population number of province and the difference in its spread to the different administrative units, The predominant nature of the distribution of these facilities is usually concentrated in the centers of cities and is based on old and non-scientific considerations, which calls for the locations of these services to be chosen in precise scientific ways that ensure easy access for all.

Research Tools:
First: Median.
Second: Load-Distance**.**

Location Selection:
The decision to choose the location from the strategic decisions of this decision has significant impacts on various aspects of the organization such as fixed and variable costs and the price of selling goods or providing services as well as the organization's ability and ability to compete in the market. This shows that determining the most suitable location and choice of any industrial or service organization is a difficult issue that has a strategic dimension due to the importance and importance of financial investments in addition to the time consumed for the construction and construction of the location. Due to the importance of these decisions at the level of all organizations, they require careful planning and in-depth studies that precede the decision making of location selection, especially that centers such as banks, hospitals, restaurants and others have a direct impact on demand. (Dasci, 2011: 179).
Within the service domain, service organizations are subject to the decision-making of the location for somewhat different considerations in the manufacturing organizations, since proximity to the raw materials or coverage of the total costs of operations is no longer the main factor for choosing the location , Access to the location By customers is the main factor in the service location such as banks, supermarkets, hospitals and others, but this does not apply to all service organizations. (Stevenson, 2018: 356). The government usually sets specific standards and controls in the light of which the location of public utilities is chosen and in accordance with the nature of the work and activity of those facilities and the services they provide. As is the case in health institutions, where hospitals are considered one of the most important decisions related to the lives of the population, which should not be taken at random. (Moussa & Elwafa, 2017: 283). It is noted that the choice of public utilities locations such as the library, for example, is usually planned by the government or the responsible authorities in the city, which consider the possibility of making the library service to the largest number of people so that the average distance of the library from the customer as short as possible. (Eiselt et al., 2015: 4).
In the health field, location the organization is a critical factor in the strategic planning of health care programs for access to health care facilities. Studies have suggested that distance to hospitals is a major factor when patients choose health care. (Afshari & pang, 2014: 1). A number of researchers interested in assessing the hospital's multiple factors have recommended a wide range of criteria, including distance from major roads, travel time, pollution, land cost, government policies, capital, employment and future expansion. The success of this facility depends on its ability to attract potential patients. Naturally, the location selection of this facility deals with issues related to environmental factors, economic, distance, community suitability or Fights. (Chatterjee & Mukherjee, 2013: 1-2).

Basic Factors For Location Select
The most important factors dealt with by most researchers that influence the decision-making of the location selection can be summarized as follows:

1-The Availability of the Land, 2-The Availability of Transport, 3-The Availability of the Workforce, 4-Proximity to Markets, 5-Proximity to Energy Sources, 6-Proximity to Suppliers and Resources, 7-Tax and Laws, 8-Social Factors and Environmental.

Location Selection Methods

Because of the multiplicity of these methods and the difference in dealing with factors, which depend on quantitative factors and other depend on qualitative factors. Some of these techniques, which are considered one of the most popular ways to choose a location, will mention the most important ones: Factors weighted, Method Matrix Achieve Goals, Analytic Hierarchy, Break-Even Analysis, Center-of-Gravity, Geographic Information Systems, Transportation Method, Median, Load-Distance.

Data analysis

First: Use the Median Method to find hospital location

A median is one of the parameters of central tendency and is centered in the data and is used to choose the most appropriate locations, especially the service and based on the idea that the optimal location is to ensure that half of the volume of flow to the location from a certain direction and half the volume of flow from the other direction of the location. Any flow on the location is two-way. This rule is based on the assumption that all candidate locations exist in a single row. According to this method, the location is chosen based on the determination of the value of the central cargo to be transported to the location and the designation of the four locations by identifying the parallel areas in which the amount of the central cargo is located (Fitzsimmons J & Fitzsimmons M, 2011: 247).

A) **Find coordinate (x) for the location**:

In order to determine the coordinates of the new location, the movement must be two-way from west to east and from east to west on the same axis until the location is located between two locations, i.e. the city that precedes it and approaches the value of the broker or the city and its subsequent city. Medium or containing it. Thus, we have identified the space of the new location.

Table (1) Accounts for the horizontal coordinates of the location

The direction from west to east			
	city	Population Flow	
1	Batha	50437	
2	Al Fajr	65367	
3	Qalat sukar	108009	
4	Al Rifai	167896	1443
5	Al Neser	107211	
6	Al-Shatrah	254749	
7	Charraf	128004	
8	Nasiriyah	562247	

The direction from east to west			
1	Al-Chibayih	45992	
2	Al Manar	10090	
3	Al Fuhud	49065	
4	Al- Tar	21752	
5	Al Islah	48231	
6	Al- Karma	64489	
7	Ukaikah	51938	1270
8	Suq Al Shoyokh	132472	
9	Syed dkheel	63602	
10	AL dawayah	92392	
11	Fudaliyah	59257	
12	Orr	68954	
13	Nasiriyah	562247	

It is noted from the table above that when the movement from west to east starting from the city of Batha with a population of (50437) people until reaching the city of Nasiriyah, the total number of population of the cities that were passed in addition to the population of the city of Nasiriyah has reached (1443920) that accounts for half the total population flow of 1076077, the closest location to the median value.

When the movement is from east to west, the first city to be crossed is Chabaish, with a population of about 45992. The movement of this side ends at the city of Nasiriyah with a total of 1270481. Thus, the city of Nasiriyah also represents the eastern side of the new location. This means that the new location is located horizontally in the city of Nasiriyah.

B) **Find the coordinate(y) for the location:**

In order to find the coordinates of the new location in this case, the orientation or movement will be vertically and in two directions also from south to north and from north to south on the same axis to determine the location between the coordinates of the cities.

Table (2): Accounts for the vertical coordinates of the location

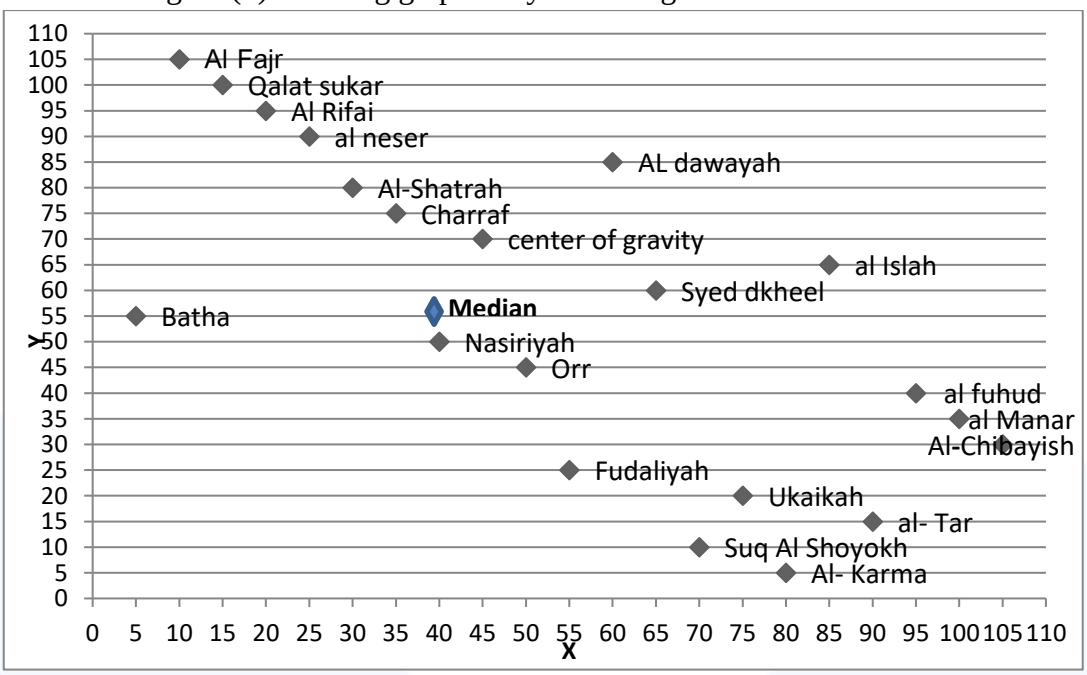
Direction from south to north			
1	Al- Karma	64489	
2	Suq Al Shoyokh	132472	
3	Al- Tar	21752	
4	Ukaikah	51938	
5	Fudaliyah	59257	
6	Al-Chibayih	45992	111
7	Al Manar	10090	
8	Al Fuhud	49065	
9	Orr	68954	
10	Nasiriyah	562247	
11	Batha	50437	

The direction from north to south			
1	Al Fajr	65367	1085
2	Qalat sukar	108009	
3	Al Rifai	167896	
4	Al Neser	107211	
5	AL dawayah	92392	
6	Al-Shatrah	254749	
7	Charraf	128004	
8	Al Islah	48231	
9	Syed dkheel	63602	
10	Batha	50437	

Note from the above table in the case that the orientation from the south to the north begins to pass the area of Kerma Bani Said first and the population of about (64489) people to be the total population flow in the city of Batha (1116693), which is the variant at which the amount of flow to regulate the value of the mediator. So Batha is the southern side of the new location. As for the direction from the north to the south, Fajr is the first location to pass through the y axis to the other cities. The population of this city is around 65367 and the movement of this trend ends at al-Batha city with a total of (1085898) Thus, the Batha area is the closest alternative to the value of the mediator and represents the northern side of the new location.

In summary, the ideal location for a new hospital in the province of Dhi Qar according to the model of the mediator is located on the horizontal line of the city of Nasiriyah and the vertical line of Batha city to the north of the city of Nasiriyah. The location can be graphically represented as in Figure (1).

Figure (1) Locating graphically according to the median model



Therefore, the city of Nasiriyah represents the best option to locate the hospital in accordance with the method of mediator. In order to ensure the optimization of the city of Nasiriyah as a

proposed alternative to the establishment of a new hospital in it and whether Nasiriyah is the most powerful option to find the location of the hospital compared to other cities, and on this basis will be verified and study alternatives available through the use of the method of distance loading, which depends in essence on population density And distance between cities.

Use the Load-Distance Method to find hospital location

It is a mathematical model used to select locations based on proximity factors. This method depends on the distance between locations and proximity to markets, target, suppliers, as well as other resources and facilities of the organization. The choice of location which reduces the total load multiplied by the distance traveled by the load can be used time rather than distance. (Krajewski et al., 2013: 393). According to the following formula:

$$\text{LD} = \sum_{i=1}^{n} \text{LiDi}$$

As:

LD = The value of the load distance

Li = i Number of loads or units transferred from the proposed location to the location

Di = i The distance between the proposed location and the location

Depending on this method, the location of the hospital will be chosen based on the choice between the available alternatives and the (20) administrative units of the governorate for which the hospital is located. The alternatives will be chosen on the basis of the distance separating each unit from the other units and the number of population to be transferred to the location assumed. Thus selecting the location that has the least distance between other locations after the distance is multiplied by the population number.

Table (3): calculations of the distance of alternative (Gharraf)

	City	Li	Di	Li*Di
1	AL dawayah	92392	44	4065248
2	Al-Shatrah	254749	19	4840231
3	Al Fuhud	49065	83	4072395
4	Al Manar	10090	94	948460
5	Al-Chibayih	45992	109	5013128
6	Al- Tar	21752	80	1740160
7	Fudaliyah	59257	48	2844336
8	Al- Karma	64489	72	4643208
9	Ukaikah	51938	64	3324032
10	Suq Al Shoyokh	132472	58	7683376
11	Al Fajr	65367	86	5621562
12	Al Neser	107211	33	3537963
13	Qalat sukar	108009	70	7560630
14	Al Rifai	167896	54	9066384
15	Orr	68954	38	2620252
16	Syed dkheel	63602	44	2798488
17	Batha	50437	67	3379279
18	Al Islah	48231	59	2845629

19	Nasiriyah	562247	28	15742916
	Total			92347677

Table (4) Total distance for all alternatives

	city	Total distance
1.	Nasiriyah	82,172,567
2.	Charraf	92,347,677
3.	Orr	93,854,603
4.	Al-Shatrah	101,575,359
5.	Fudaliyah	106,595,706
6.	Syed dkheel	113,760,904
7.	Al Neser	117,464,075
8.	Suq Al Shoyokh	122,493,838
9.	Ukaikah	130,896,402
10.	AL dawayah	141,426,356
11.	Al Islah	143,070,951
12.	Al Rifai	148,217,623
13.	Al- Karma	157,987,891
14.	Al- Tar	160,689,236
15.	Batha	161,259,565
16.	Al Fuhud	171,061,018
17.	Qalat sukar	177,908,516
18.	Al Manar	194,803,970
19.	Al Fajr	211,108,460
20.	Al-Chibayish	224,707,191

It is noted from the above results that (20) alternative, which is the city of Nasiriyah is the best alternative to choose the location of the hospital within it as it was characterized by being the lowest value was 82172567 and then came to Al Gharaf as a better alternative after Nasiriyah with a value of 92347677 and came to Ur after Al Gharaf ranked third among the candidate cities to choose from Including the value of 93854603. The city of Chabaish ranked last and the value of 224707191 to be the farthest alternative after dawn and as in Figure (2).

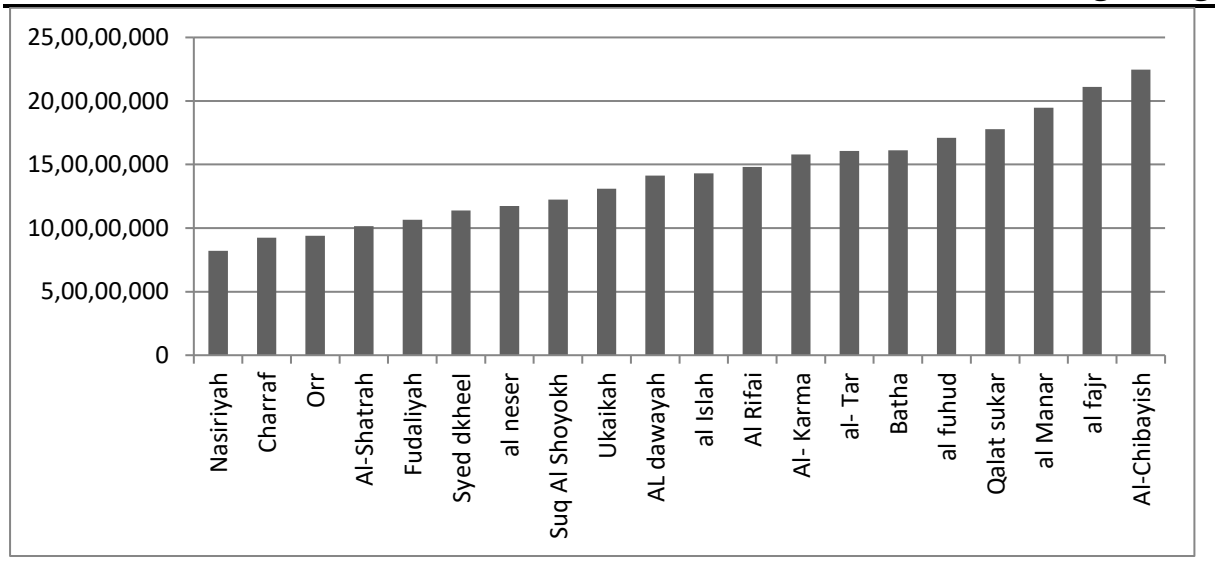


Figure (2): Graphic representation of distances of alternatives

Conclusions

It is clear that the ideal location for the establishment of a new hospital in the province of Dhi Qar will be in the center of the province (Nasiriyah district) and specifically in the north-eastern part, which was found using the base of the mediator. Because it is distinguished by the lowest distance from all the cities of the province, so it is the location that the beneficiary can access it as little time as possible or less distance required. The presence of the hospital in this location has other advantages as it is close to different means of transport and medical educational institutions represented by medical and pharmacy colleges and medical institutes located in the city of Nasiriyah and also close to the sources of electric power (Nasiriyah power station). In addition to the proximity of the main drug stores in the province, which facilitates the transfer of medicines and other medical supplies to the hospital at the least cost and less time. The location that has been reached is characterized by not concentrated in the center of the city, but in the outskirts and hence beyond the traffic jams and sources of noise and pollution and so it is consistent with the latest trends in the selection of locations is non-confinement in the centers of cities, but the selection of locations of organizations and even the public, The outskirts of cities in the open areas, which adds to the opportunity to expand in the future or the inclusion of centers and other sections of the hospital due to the availability of large land.

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