

USE APPLICATIONS OF OPERATIONS MANAGEMENT IN SELECTION OF HEALTH SERVICES PRODUCTION CENTERS LOCATIONS IN THIQAR PROVINCE: CASE STUDY OF HOSPITALS

***RaedFaiq Al hamdany, **Dr. Ahmed KarimJassim**

**University of Sumer - College of Administration and Economics*

***Supervisor: University of ThiQar - College of Administration and Economics*

ABSTRACT

The decision to choose the site is one of the important issues that have taken a strategic dimension and brought with it the attention of governments and industrial and service organizations whether at the international or local levels because of its direct impact on the organization's activities, goals, and strategy. The study aims to employ the applications of operations management in the selection of service location, especially in the public sector. The study adopted a quantitative approach to compare alternatives and find the optimal alternative through the use of some methods of operations management of site selection (center of gravity, loading distance), and focused on the proximity factor (the distance necessary to access the site) as a decisive factor to choose the site. 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. 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 center of gravity.

Keywords:*operations management, location, center of gravity, Load-Distance method, hospital.*

INTRODUCTION

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 will affect the organization's access to sources of raw materials, employees, beneficiaries, and markets for its products and services. In addition, the site affects the degree of competition from other organizations in the region. Therefore, the organization's future success or survival depends to a large extent on the decision to locate, and there are many factors, in fact, may make the site more important for non-profit organizations as these organizations often provide services that are difficult to assess and therefore rely heavily on factors including location, thereby enhancing its position in the eyes of consumers and financiers. (Bielefeld& Murdoch, 2004:221). In the field of health services, especially hospitals, the site is very important when chosen and takes into account the factors of distance and proximity to customers and the population numbers that serve. This

study is looking at finding the ideal location for the establishment of a new hospital in DhiQar province 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 site selection by comparing the administrative units of the province and choosing the alternative that has the least distance.

LOCATION CONCEPT

The site is defined as "the process of determining geographic sites for a firm's operations, which could include a manufacturing plant, a distribution center, and a customer service center". (Krajewski et al,2013:403). And defined both (Russell & Taylor,2011:299) The site selection process "is one of gradually and methodically narrowing down the pool of alternatives until the final location is determined". And consider The positioning decision is a very important decision and greatly affects the efficiency and effectiveness of the organization, which is reflected in the level of services provided to customers, as well as its impact on the competitive advantage of the organization as a whole (Wisner et al,2012:376). The decisions of the site are closely linked to the organization's strategies. Organizations that follow the low-cost strategy tend to choose where the labor costs or materials costs are low or the site is chosen near markets and raw materials to reduce transport costs. (Stevenson,2018:344).

LOCATION SELECTION METHODS

Many researchers and those interested in the field of operations management have developed models and techniques to solve the problem of selecting and locating the site in general and service facilities in particular, such as hospitals, libraries, fire stations, etc. The objectives of these techniques were to ensure access to sites with low costs or close to their centers. (Batta et al,2014:819). Due to the multiplicity of these methods and their differences in dealing with the factors which depend on quantitative factors and the other depends on qualitative factors will be addressed to some of these techniques, which are considered of the most important ways to choose the site are:

1- Factors weighted. 2- Cost-Volume Analysis. 3- median. 4- Load-Distance method. 5- Center-of-Gravity Method. 6- Analytic Hierarchy. 7- Geographic Information Systems. 8- Matrix Achieving Goals.

The focus of this study will be on the most important methods of operations management to select a new hospital location, is the center of gravity method and load-distance method.

RESEARCH METHODOLOGY

A) Research Problem:

As a result of the increase the population number of thiqr province and the difference in its spread to the different administrative units, The predominant nature of the distribution of health service 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. Through the use of operations management applications to find the optimal location can be chosen in the future to create or create a new hospital.

Research Tools:

The researcher adopted the quantitative methods for the management of operations, and the most important methods that have been used are:

First: center of gravity.

Second: Load-Distance.

As well as the use of Google Earth for obtaining the coordinates of administrative units in the province of ThiQar.

DATA ANALYSIS

First: Use the Center-of-Gravity Method to find hospital location

Quantitative method used to select or determine optimal location which low costs transport raw materials from suppliers or costs transport goods to markets which provide them.(Chopra &Meindl,2016:120).This method takes into account the location of the markets, the volume of goods shipped to those markets and the shipping costs for the purpose of finding the best location of the distribution center. According to this method, the site is found by determining the coordinates (x, y) on the map and determining the center of gravity. (Heizer et al,2017:348)

Shows table (1) special accounts the center of gravity depending on the number of population the province of Dhi Qar, and coordinates the administrative units (the districts and areas) which educe by used system google earth.

Table (1) Calculations of the center of gravity

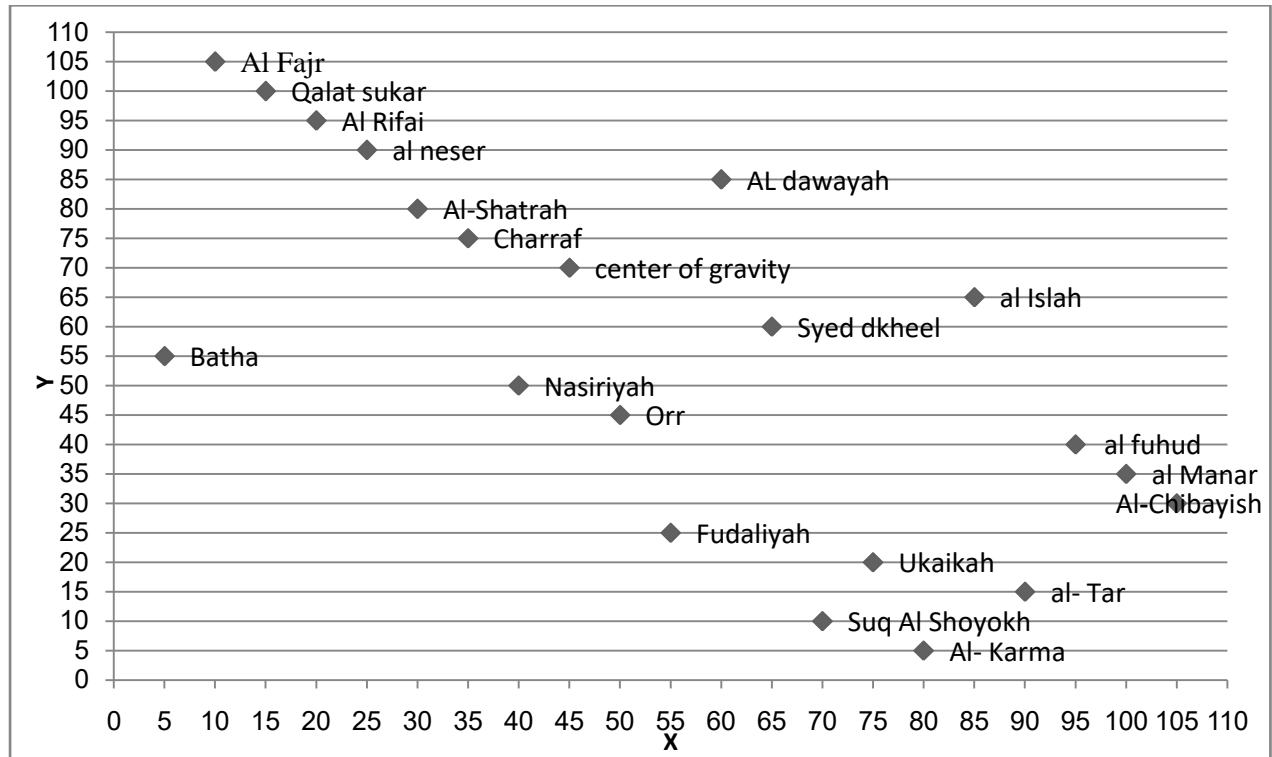
	region	Po	x	y	Po*x	Po*y
1	Nasiriyah	562247	620863.99	3435304.09	349078915785.53	1931489418690.2
2	Al Islah	48231	652538.41	3449494.8	31472580052.71	166372583698.8
3	Batha	50437	584393.01	3441496.8	29475030245.37	173578774101.6
4	Syed dkheel	63602	636753.37	3445915.64	40498787838.74	219167126535.28
5	Orr	68954	624867.38	3435133.59	43087105320.52	236866201564.86
6	Al Rifai	167896	605052.03	3509971.46	101585815628.88	589310168248.16
7	Qalat sukar	108009	601509.61	3525281.54	64968451466.49	380762133853.86
8	Al Nesor	107211	606394.14	3489393.78	65012122143.54	374101396547.58
9	Al Fajr	65367	591310.8	3531479.22	38652213063.6	230842202173.74
10	Suq Al Shoyokh	132472	639864.33	3418516.48	84764107523.76	452857715138.56
11	Ukaikah	51938	641091.4	3421332.91	33296953195.2	177697188679.58
12	Al- Karma	64489	650230.08	3417754	41932687629.12	220407537706
13	Fudaliyah	59257	629448.43	3425437.22	37299225616.51	202981133345.54
14	Al- Tar	21752	657160.06	3420771.57	14294545625.12	74408623190.64
15	Al-Chibayih	45992	688712.99	3426345.29	31675287836.08	157584472577.68
16	Al Manar	10090	676541.77	3426381.87	6826306459.3	34572193068.3
17	Al Fuhud	49065	664611.65	3427816.96	32609170607.25	168185839142.4
18	Al-Shatrah	254749	611760.12	3475459.78	155845278809.88	885369903495.22
19	AL dawayah	92392	630951.24	3485115.94	58294846966.08	321996831928.48
20	Charraf	128004	618264.16	3463351.37	79140285536.64	443322828765.48
	Total	2152154			1339809717350.32	7441874272451.96

$$x = \frac{\sum x_i p_o}{\sum p_o} = \frac{1339809717350.32}{2152154} = 622543.6085662643$$

$$y = \frac{\sum y_i p_o}{\sum p_o} = \frac{7441874272451.96}{2152154} = 3457872.565091513$$

According to these coordinates, the ideal location for a new hospital according to the center of gravity is located to the north of the city of Nasiriyah between the reform and the area of Gharraf and away from the center of the province about 22 km and the city of Gharraf 7 km. The administrative units of Dhi Qar Governorate can be represented graphically and the center of gravity is determined within them as shown in Figure (1).

Figure (1): Graphic representation of the cities of the province and determination of the center of gravity



And for the purpose of ensuring the optimization of the site that has been identified and whether the city of Nasiriyah is the best alternative for the establishment of the hospital. Therefore, the available alternatives will be examined to verify the optimum of the site identified. This will be done through the use of one of the methods of managing operations, which is widely used to compare alternatives and site selection. This is the method of loading distance based on the normal distance between alternatives to ascertain the possibility of alternative Nasiriyah to choose the location of the hospital.

Second: Use the load distance method to find the 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 customers, 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). Depending on this method, the location of the hospital will be chosen based on the choice of available alternatives, namely, 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 proposed site. And therefore choose the site that has the least distance between the other sites after the distance is multiplied by the population number according to the following formula:

$$LD = \sum_{i=1}^n Lidi \quad (1)$$

As follows:

1- The first alternative: the city of Nasiriyah

Table (2) Accounts for the first alternative (Nasiriyah district)

	region	Li	di	Po*di
1	Al Islah	48231	41	1977471
2	Batha	50437	40	2017480
3	Syed dkheel	63602	24	1526448
4	Orr	68954	9	620586
5	Al Rifai	167896	78	13095888
6	Qalat sukar	108009	94	10152846
7	Al Nesor	107211	57	6111027
8	Al Fajr	65367	111	7255737
9	SuqAlShoyokh	132472	32	4239104
10	Ukaikah	51938	35	1817830
11	Al- Karma	64489	43	2773027
12	Fudaliyah	59257	19	1125883
13	Al- Tar	21752	50	1087600
14	Al-Chibayih	45992	89	4093288
15	Al Manar	10090	75	756750
16	Al Fuhud	49065	64	3140160
17	Al-Shatrah	254749	42	10699458
18	AL dawayah	92392	66	6097872
19	Charraf	128004	28	3584112
	Total			82172567

2- The second alternative: the city of al Islah

Table (3) Accounts for the second alternative (al Islah district)

	region	Li	di	Op*di
1	Nasiriyah	562247	41	23052127
2	Batha	50437	79	3984523
3	Syed dkheel	63602	22	1399244
4	Orr	68954	42	2896068

5	Al Rifai	167896	109	18300664
6	Qalat sukar	108009	126	13609134
7	Al Nesor	107211	88	9434568
8	Al Fajr	65367	142	9282114
9	Suq Al Shoyokh	132472	63	8345736
10	Ukaikah	51938	67	3479846
11	Al- Karma	64489	56	3611384
12	Fudaliyah	59257	53	3140621
13	Al- Tar	21752	49	1065848
14	Al-Chibayih	45992	75	3449400
15	Al Manar	10090	59	595310
16	Al fuhud	49065	33	1619145
17	Al-Shatrah	254749	75	19106175
18	AL dawayah	92392	99	9146808
19	Charraf	128004	59	7552236
	Total			143070951

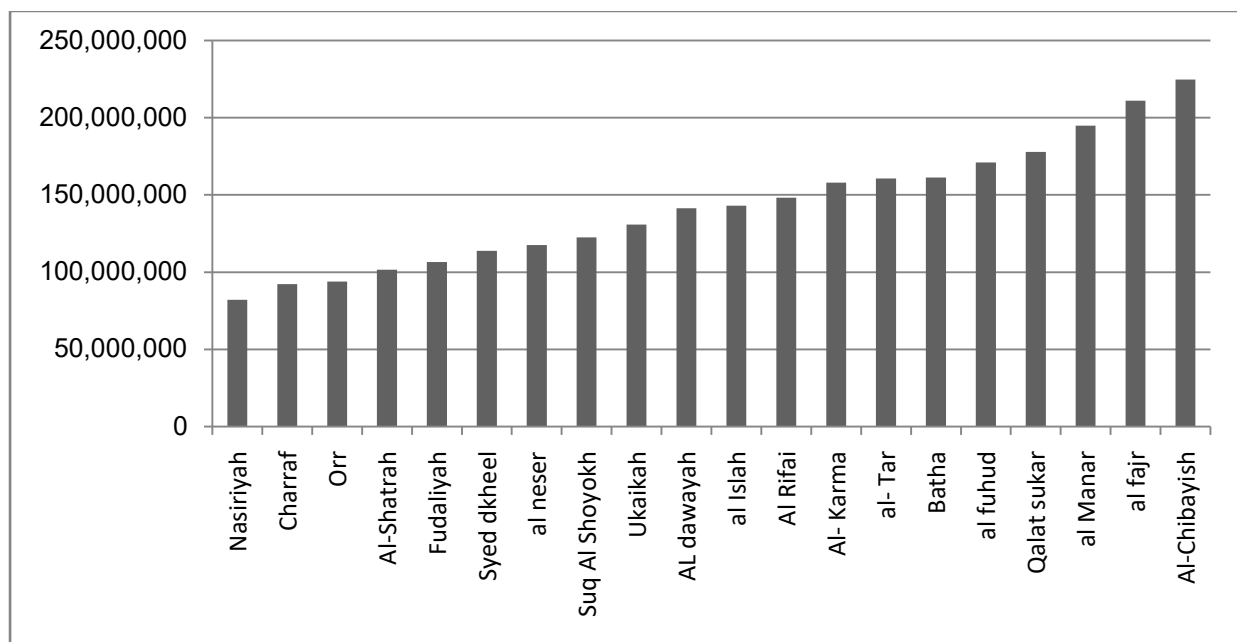
Thus, calculations are made for other alternatives, the results of which are as follows:

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 Nesor	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 the first 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 Orr after Al Gharaf ranked third among the candidate cities to choose from Among them, they amounted to 93854603. The district of Chabaish ranked last and the value of 224707191 to be the farthest alternative after al-fajr as in Figure (2), which shows the representation of the values of alternatives.

Figure (2): Graphic representation of distances of alternatives



Therefore, the city of Nasiriyah is the best alternative to determine the location of the hospital which is what the previous method and thus the location that was determined using the method of center represents the ideal location for the establishment of the hospital as it lies within the administrative boundaries of the city of Nasiriyah.

CONCLUSIONS

The purpose of this paper is to present a vision for managers and decision-makers about the extent to which quantitative methods, especially operations management methods, can be used to solve problems related to site selection, especially in the field of services. The study proved that the methods of managing operations are important and efficient means of implementation to solve the problems facing the organization, whether it is an industrial or service organization. The best location for the establish of a new hospital in the province of Dhi Qar in the city of Nasiriyah, the administrative center of the province, which was reached using the method of a center of gravity, and is characterized as the closest to the areas of the province and thus easy access by customers.

so, it is necessary to pay attention to the decision-making process of choosing the site, especially in the field of health services because it has a direct impact on the life of service applicants, and should that the choice is based on scientific methods accurate, Taking into account the results reached when planning for the establishment of a new hospital in the province and choosing its location. add Engage the experienced and efficient managers in the planning processes of the sites of organizations, especially those affiliated to the public sector, because the administrative sciences provide a number of different methods of different quality and quantity, which have the ability to deal with a large number of factors that would affect the choice of location.

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