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Recognize and Ranking Effective Factors on Pasargad Bank Location Using MCDM and AHP and GIS in Iran (Case Study: Yasouj City)

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Abstract: The present study mainly aims to identify and rank the effective factors on the location of Pasargad Bank through using multi-criteria decision making techniques in Yasouj City. In other words, it has been tried to answer this question that which are the important criteria and sub-criteria for choosing the location of Pasargad Bank's branches? And what is the most appropriate place establish the branches in Yasouj City? In this study, 10 people from the experts of Pasargad Banke as well as 270 people from the customers who have deposit in this bank and they have used facilities were investigated. The required information was collected through two questionnaires for experts and customers. The reliability of these two questionnaires was estimated by using Cronbach's Alpha formula. Data analysis was performed through ArcGIS, expert choice softwares. The effective criteria and sub-criteria on the location of Pasargad bank were identified and ranked and the potential places for building the new branches were specified. Finally, with regarding the limitation of banks' budget we have chosen the suitable points from these potential points though using the mathematical model of maximum coverage. The results show that the number of 58 thousands demands of the studied region with maximum building of three branches in specified points in addition to one existed branch can be covered.

Key words: Location, Multi Criteria Decision Making (MCDM), Maximum Coverage Model (MCLP), AHP, GIS, Pasargad Bank

INTRODUCTION

The subject of cities development and sustainability had been one of the most important discussions among city thinkers and clear sighted in the recent years. Establishment of any town element in a special spatial-skeletal position from city level is a function of principal and rules and special mechanism that if it being observed, it will done for succeed and operational efficient of that element in a certain place.

Location decisions are now a major part of operations research and management science (named location science). Facility location, location science and location models are terms that can be used instead. Facility location is a branch of operations research related to locating or positioning at least a new facility among several existing facilitie (Farahani *et al*., 2010).

The first concerns managers of each institution are appropriate conversion and optimization of existing capital resources to the maximum possible income through investments in appropriate background, time and place. So, how and place to invest in today economic conditions will be a complex and risky operation (Guneri *et al*., 2006).

Facility location is a critical aspect of strategic planning for a broad spectrum of public and private firms the ramifications of siting facilities are broadly based and long-lasting, impacting numerous operational and logistical decisions. High costs associated with property acquisition and facility construction make facility location or relocation projects long-term investments. To make such undertakings profitable, firms plan for new facilities to remain in place and in operation for an extended time period. Facilities which are located today are expected to remain in operation for an extended time. Environmental changes during the facility's lifetime can drastically alter the appeal of a particular site, turning today's optimal location into tomorrow's investment blunder. Determining the best locations for new facilities is thus an important strategic challenge. Development and acquisition of a new facility is typically a costly, time-sensitive project. Before a facility can be purchased or constructed, good locations must be identified, appropriate facility capacity specifications must be determined and large amounts of capital must be allocated.

Facility location problems try to locate a number of facilities in order to serve a pre-determined number of demands. The purpose of Facility Location Problems (FLP) is to assign a set of facilities to a collection of demands (Didandeh *et al*., 2013).

The facility location problem addressed by the OR/MS community involves siting a set of facilities to serve a set of customer demands with the

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objective of minimizing total distance (or time or cost) between customers and facilities (Melo *et al*., 2009).

In general importance of the location study is just about enough that these studies are carried out again about active centers and in some cases lead to a change in the unit place.

The case of non-essential services like libraries, nursing homes, kindergartens, parking lots, supermarkets, banks, etc., that are planned to provide service to the entire set of potential customers. It is clear that the nature of these applications requires that service to users cannot be interrupted in the remaining planning horizon, once it has been started. Nevertheless, budget constraints avoid achieving complete coverage in one single period (Albareda-Sambola *et al*., 2009).

An extensively studied and widely used model in location theory is the Maximal Covering Location Problem (MCLP) (Moghadas and Kakhki, 2012). Facility location problems have received a great deal of attention from researchers, many of whom have chosen the MCLP as the most useful facility location model both from theoretical and practical points of view. The MCLP introduced by Church and Velle (1974) and its extensions have been applied both in public and private sectors (Lee and Lee, 2012). MCLP is more realistic in the sense that it incorporates a budgetary constraint to limit the number of facilities to be built and it does not require all the demand points to be covered. Given a set of m demand points and a set of n potential new facility locations in the plane, find the location of p (<n) new facilities such that the demands covered are maximized (Moghadas and Kakhki, 2012). In the MCLP model, customers are considered to be served or covered by the facility if it is located within the specified distance. In other words, decisions on the installation of the facility are based only on the distance between the customer and the facility. An MCLP of the private sector such as that for locating bank branches is investigated by Pastor (1994), Lee and Lee (2012).

The prospects of the integration of European financial markets in 1992 have substantially affected the competitive environment in the banking sector during the last few years. Competition has become stiffer than ever and therefore banks have been forced to develop appropriate mechanisms in order to improve their overall performance. Branch banks in particular are obliged to set up and put into effect the necessary decision support systems that will enable them to allow for local conditions in planning new locations, evaluating performance and providing marketing support to their geographically separate units (Boufounou, 1995).

In an era that competition is govern on all economic reigns, the importance of finding the right place for economic activity is no secret, so that the select a place for new firms, the cost of production and distribution of goods or services is minimal for potential customers. In the meantime, the issue of location for firms that have multiple branches are more sensitive because the problem is more complex firms that financial institutions and banks are include these firms. The selection of appropriate and optimization place for new branches can give more income for bank. In the meantime, the numbers and place of branches is so important because it is determination of rate and availability facility to banking services, the numbers of a bank or financial institution is more, more regions are put in the range of branches attractiveness.

In the finding a place of competitive facilities while facility place of each competitor has effect on the market share rate of the other competitors, each firms try to select best place for their facilities by considering their own competitors' decision.

Being appropriate of a certain place for activity of a service depends on factors that select and evaluate during its location. In this regards, we can counter various factors that are effective on location decisions (Yang and Huei, 1997). When establishing a bank branch or ATM are considered different factors: location, land prices, the quality of the course, access to the poles and the city centers, security, development projects and ambient services (Yang and Huei, 1997; Adams, 1991).

Surely no paper can cover all aspects of facility location. Those seeking a more general overview of facility location research can refer to one of the many published review articles or texts including Refs: Aikens (1985), Daskin (1995), Francis *et al*. (1983), Krarup and Pruzan (1979), Leonardi (1981), ReVelle *et al*. (1970), Francis *et al*. (1983) part I and II, Hale and Moberg (2003), ReVelle and Eiselt (2005), Farahani *et al*. (2012), ReVelle *et al*. (2008).

Some of the literature in which some well-known multi attribute decision making such as ANP, AHP, ELECTRE, MAUT, TOPSIS, SMAA are utilized for solving siting problems. Sometimes Geographical Information Systems (GIS) come to the help of location problems (Farahani *et al*., 2010). Interested readers can refer to these books to find out more about usual facility location models Church and Murray (2009), Daskin (1995), Drezner (1995), Drezner and Hamacher (2002), Francis and White (1974), Francis *et al*. (1992), Handler and

Mirchandani (1979), Love *et al.* (1998), Nickel and Puerto (2005), Mirchandani and Francis (1990) and Francis *et al.* (1992).

Inappropriate places of Pasargad bank branches can be a serious problem, ahead of qualitative and quantitative promotion of banking services and ignoring it provide reduction of the performance of the organization and staff and in a more general look, it may be used to discontent citizens some irreparable harm. In addition to the bank power, stakeholders of solve this problem in the public and private sector, generally are community and other residents of the province which mentioned cases will double the need to address the issue raised, means identifying suitable locations of Pasargad bank branches in Kohgiluye and Boyer Ahmad by this aim that identify the criteria and mathematical models for optimization location of these branches in the city of Yasouj by quantitative methods of research in operations (approach combines the multi-criteria decision-making methods and mathematical modeling).

Literature review: Lai and colleagues in an article entitled study and implementation of fire sites planning based on GIS and AHP noted locate fire stations by combining GIS and AHP and concluded that the combination of the above methods is very useful for locating urban and simplifies the complex issues. Miliotis *et al.* (2002) in research on mapping and geographic information systems and operations research to determine the number of bank branches in order to cover the demand of a particular geographical area and determine the appropriate location specified number of branches is a sub so as to give maximum coverage to demand sub-criteria. In this study, at first, it has used from GIS to determine demand distribution and it has obtained possible places to establish branches and it has calculated appropriate entrance for coverage model. In fact, making maximum demand coverage is equal to determine location status of branches in a way that it is created most satisfaction for customers. Selection of appropriate locations create this location that bank allocate more share from potential customers to himself. It was tested for Greece to evaluate the performance of its model. Model results have administered based on a set of estimated parameters like availability space, distance between supply and demand points and has provided their output.

Pastor (1994) is used from location allocation model in a study to determine location banking units. In this model, it is considered two objectives simultaneously include: choose the best location and allocation of potential customers to the banking units. The method used involves three stages. First, it was designed a network of banking units based on the location allocation model based on maximum coverage of the benefits. In the second stage, it has used from spatial interaction potential customers to estimate the travel pattern. With this model can determine the size of each banking activities in a way that provides the greatest access for customers. In the third stage non-linear programming model to provide a final answer regarding the answer was considered in recent models. Recent linear programming model produce a little non-post answer that experts and managers could select a subset according to accessible budgeting level as a banking network by expert judgment.

MATERIALS AND METHODS

The purpose of this research is to find effective factors and index in the positioning and increase the bank's customers. This research is to apply the findings results for solving specific problems within organizations and it is trying to answer a problem and the practical problems that exist in the real world, therefore, this study is considered as an applied research in terms of purpose. At first, we gather the necessary information to identify the criteria and sub-criteria. In the present study data were collected using the library method (population data centers and health statistics 1394, library studies, essays, thesis) and field studies (completed questionnaires and picked coordinate branches of different banks in the city of Yasouj). Two groups of experts (including 10 women) and customers have deposited in Pasargad Bank branch of Yasouj (including 1000). A sample of experts in the study has formed 270 people the entire population of professionals and customers sample size according to Cochran formula with a level of 5%. The necessary information is obtained by providing two questionnaires between the two communities on the theme of paired comparisons of obtained criteria and sub-criteria. The reliability of the questionnaire used for identifying factors influencing the location of bank branches (35 of proposal) have the appropriate reliability, Cronbach's alpha coefficients higher than 0.7. They were studied after reviewing the preliminary results of the questionnaires, the 6 criteria and 15 sub criteria for inventory experts and five criteria and 20 sub-criteria for main index questionnaire and effective for the analysis base of customer at different stages. The aim of this questionnaire is weight extraction criteria and sub-criteria through paired comparisons. That finally it is calculated in analyzed expert choice software and their coefficients. We need a set of data for each sub-criterion. Some data layers to analyze in GIS Software has done by the municipality and the Center for Health and it is used from Google Earth in some places where it is not clear in this layer. This means

that the coordinates of the location is record through Google Earth device and then is used as layer in GIS. In this study, it is used from four-level hierarchy to solve the problem selection that includes the main purpose, main criteria, sub-criteria and layers. So, the decision to place here is formed from the set of location options (Land), a set of criteria (the main target, the target component, etc.) and their related weight. After preparing the layers is the turn of the weight of the layers and their combinations. The spots were identified for the establishment of branches by GIS software and the construction of all branches is not possible for the institution due to cost constraints. Using MCLP mathematical models, we will be able to identify best places through potential points which are able to have maximum coverage to the population of the study area. This software Lingo (LINGO) is much simpler (Fig. 1).

Background research: Thunen (1875) developed the general framework for the economic analysis of Location Theory (Badri, 2007). He initiated thought about the optimal location for agriculture, considering land and transportation costs (Lee and Wilhelm, 2010). Of the early theorists, Launhardt whose research appeared in 1885, provided the most significant contributions (Badri, 2007). Launhardt (1885) explained the differences in the location of industry by variations in cost and demand factors at alternative locations. He demonstrated the importance of transportation costs. Weber developed a comprehensive theory in 1909 for the location of manufacturing activities (Weber, 1929; Isard, 1956; Badri, 2007). We define the best location which is usually called "Weber optimum location" as the point that minimizes total transportation cost. Weber location-production theory is very simple and has a lot of assumptions which are not likely to be true in the real world. However, this theory is a basis for some theories such as "the Moses location-production theory" which was developed by Moses (1958) and McCann (2001). Isard (1956) attempted to develop principles for a general theory of location by combining the thoughts of earlier location theorists (Lee and Wilhelm, 2010). Location theory gained renewed interest in 1964 with a publication by Hakimi (1964) who sought to locate switching centers in a communications network and police stations in a highway system. To do so, Hakimi considered the more general problem of locating one or more facilities on a network so as to minimize the total distance between customers and their closest facility or to minimize the maximum such distance (Daskin, 1995).

Then a lot of people in the 1980s and 1990s did extensive research for the invention of models to location and classification models.

Porter (2000), on the other hand, tries to incorporate several factors into his model. This makes this model be more interesting and realistic.

RESULTS AND DISCUSSION

Data analysis: Our research method is carried out in four phases. Based on the results of studies conducted by Alhnbly in Jordan (Al-Hanbali, 2003), Miliotis and colleagues in Greece (Miliotis *et al*., 2002), Zhao and colleagues in Australia (Zhao *et al*., 2004), Yang and colleagues in China (Yang and Huei, 1997; Almossawi, 2001), Aldjany and colleagues in Saudi Arabia (Aldajani and Alfares, 2009) in Iran and Pasargad Bank's experts can summary criteria and factors as Table 1-4 and it was considered through fill out a questionnaire criteria for site selection, the initial selection criteria. At this point, experts and customers through two questionnaires

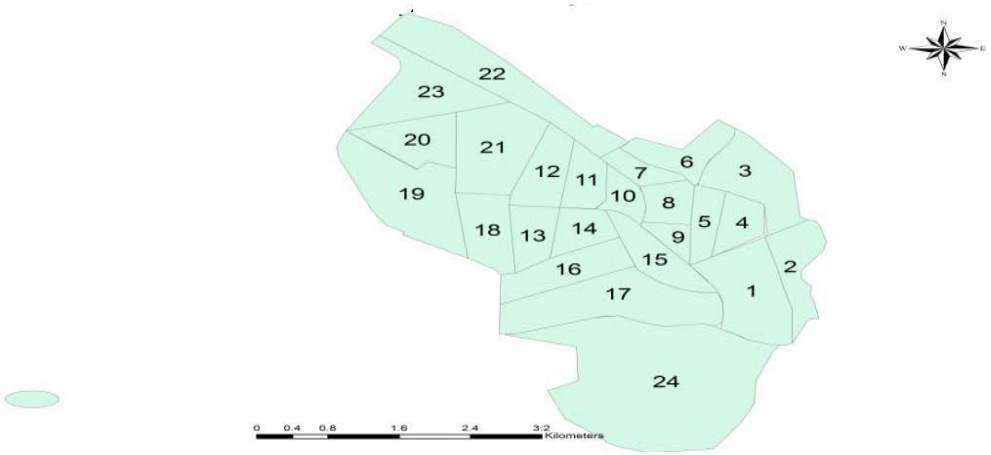

Fig. 1: Area study, Yasouj

Table 1: Questionnaire measures of experts

Category	Standards
Population Characteristics	Income customers
	The population density of the area
Cost	Construction costs (purchase of land and construction) or rentals to set up a branch
Access to urban facilities	Close to parking; near to malls and shopping centers; near the hospital; near the hotel and restaurant; close to the market; near the offices of the company
Competition	Close to rival bank branches
	Close to his own bank branches
Flexibility	Land for future development
	Earth near the facility (facility for development)
Traffic system	Close to downtown
	Proximity to intersections and three squares and main roads

Table 2: Measures of customer questionnaire

Standards	Sub-standards
Quality of banking services	Facilities
	Receive and payment
	Deposit and savings accounts
	Electronic Services
	Extended warranty
Building Beauty	Branches appearance
	Discipline branches
	The distribution of staff
	Getting organized and wear uniforms
Urban facilities	Proximity to major roads
	Near the petrol station
	Close to work
	Proximity to location
Reason of the relationship with the bank	Diversity and speed of service delivery
	Lower fees, more profitable to deposit facility
	Having more branches
	Monopoly in the provision of services
Quality area	The stylish street where the building the banks
	Convenient parking space existence near the branches
	Regional security in bank margins

were collected with the following criteria. First of all we describe the research data obtained from the questionnaires will be discussed experts and customers.

It is time to implement Analytic Hierarchy Process. The AHP (Analytic Hierarchy Process) was developed by Saaty (1980) to determine the relative importance of a set of alternatives in a complex, unstructured and multi criteria decision problem (Chen and Tsai, 2016). There are three basic steps in using AHP the design of the hierarchy to describe the decision problem; the prioritization of various attributes in each level of the hierarchy by pairwise comparisons and the integration of the pairwise comparisons to develop the overall evaluation of these alternatives (Partovi, 2001).

The first and second steps of the process have done according to experts and Pasargad Bank customers' questionnaire in this way that the index is of the same criteria and sub-criteria decision options in the questionnaires (Fig. 2 and 3).

Now, it's time to calculate the weights of the criteria and sub-criteria by information obtained from experts and customers questionnaire that the weighting and data analysis are calculated in software Expert Choice Version 11.

Among the criteria measured with the competition criteria by weight 0.353 rated and sub-criteria of proximity to malls and shopping centers by weight 0.275 have the first level of importance in criteria and sub-priority for the experts. Inconsistency rate derived from measures 0.03 <0.1 calculated that the rate is appropriate incompatibility (Table 5).

Table 3: Experts data

Sexuality		Age (years)		Duration (years)			Education		
Male	Female	<40	>40	<14	14-24	14-35	Associate degree	Bachelor	MA
9	1	8	2	98	1	1	1	7	2

Table 4: Customer data

Sexuality		Age (years)				Education			
Male	Female	25-30	30-35	35-40	40-45	Diploma	Associate degree	Bachelor	MA
171	99	90	117	9	54	27	36	171	36

Table 5: The final weight of sub experts

Standards	Standards weight (A)	Sub-standards	Sub-standards weight (B)	Final weight (A)×(B)
Population characteristics	0.107	Customers Income	0.667	0.071
		The population density of the area	0.333	0.036
Exposure	0.049	Constitution cost (land purchase and building) or rent for branches initiation	0.049	0.002
Access to urban loans	0.07	Close to parking	0.252	0.018
		Close to malls and city centers	0.394	0.275
		Close to hospital	0.039	0.003
		Close to hotels and restaurants	0.098	0.007
		Close to market	0.156	0.011
		Close to offices and firms	0.061	0.004
Competition	0.353	Close to branches of competitor's bank	0.353	0.125
Flexibility	0.169	Land existence for future development	0.667	0.113
		Loans for development	0.333	0.057
Traffic system	0.253	Proximity to intersections and three squares and main roads	0.667	0.169

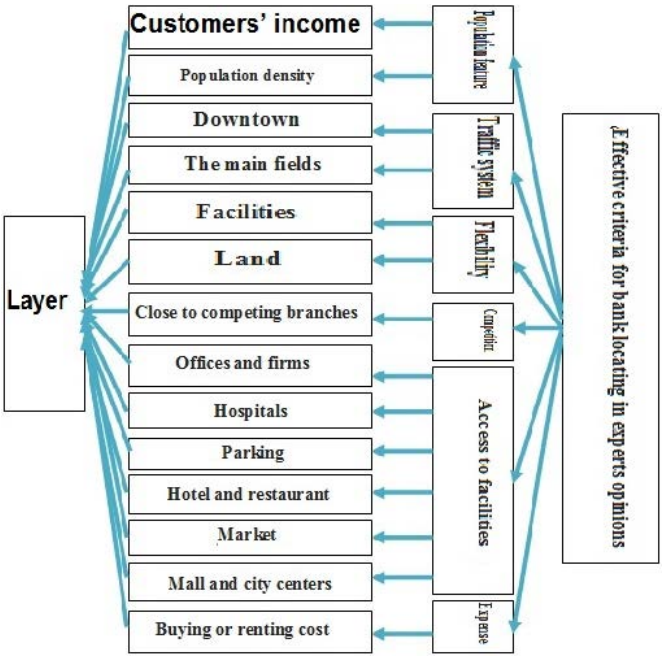

Fig. 2: Hierarchical structures of location decisions by experts

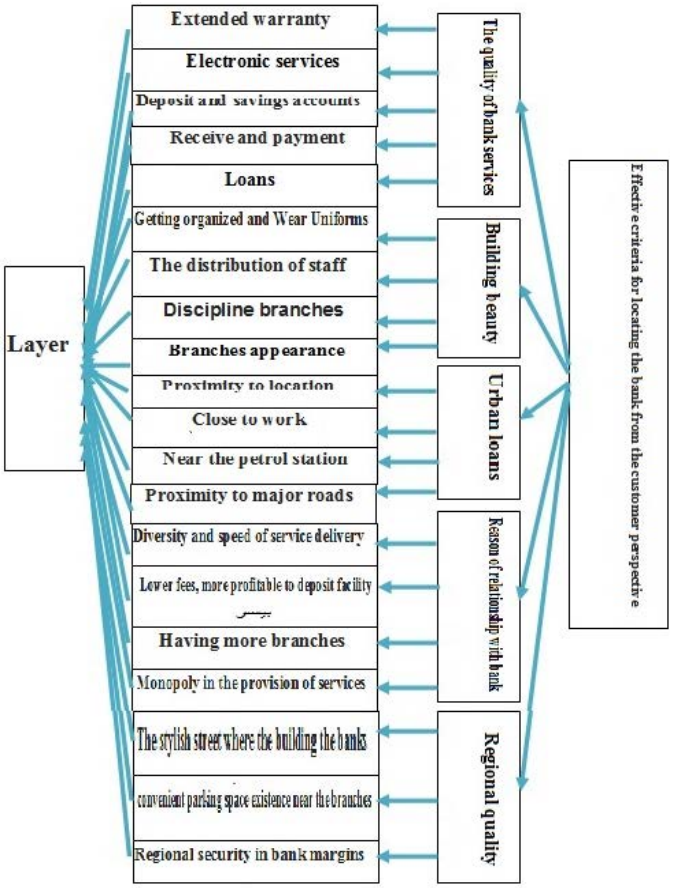

Fig. 3: The structure of hierarchical location decisions by customers

Table 6: Final weight of customers' sub-criteria

Standards	Standards weight (A)	Sub-standards	Sub-standards weight (B)	Final weight (A)×(B)
The quality of bank services	0.471	Loans	0.471	0.002
		Receive and payment	0.268	0.127
		Deposit and savings accounts	0.143	0.067
		Electronic services	0.075	0.036
		Guarantees	0.044	0.021
Building beauty	0.268	Branches appearance	0.513	0.138
		Discipline branches	0.275	0.074
		The distribution of staff	0.138	0.037
		Getting organized and wear uniforms	0.074	0.02
Urban loans	0.143	Proximity to major roads	0.513	0.073
		Near the petrol station	0.275	0.04
		Close to work	0.138	0.02
		Proximity to location	0.074	0.011
Reason of relationship with bank	0.075	Diversity and speed of service delivery	0.513	0.038
		Lower fees, more profitable to deposit facility	0.275	0.021
		Having more branches	0.138	0.01
		Monopoly in the provision of services	0.074	0.006
Regional quality	0.044	The stylish street where the building the banks	0.571	0.026
		convenient parking space existence near the branches	0.286	0.013
		Regional security in bank margins	0.143	0.006

Services quality standard by 0.471 weight and sub-criteria of branches' appearance by 0.138 weights is in the first degree of importance among measured standards in terms of customers. It has stated that obtained inconsistence rate is calculated from standards 0.01 <0.1 that has appropriate inconsistence rate (Table 6).

In this stage, we provide data layers and allocate calculated weights to each one of layers. Location in geographical information system is including following stages.

Standards are identifying in terms of consistency and in-consistency with bank in this stage and it is determine an adytum for each standards. If standards is consistent with bank, this means that it is better to be closer that standard to bank and if this standard is in-consistence with bank, this means that it is better to that standard be far from bank, standards, customer income, population, parking lots, malls and shopping centers, hospitals, hotels and restaurants, market day, office, bank competitor, land, downtown squares and intersections were consistent with the bank among the criteria that means that it is better the bank be closer. The only criterion incompatible with the Pasargadae bank is its own branches that it is better to minimum distance between stations were 500 m insiders (Table 7).

At this point you should be prepared layers necessary of criteria. The layers are: income customers, offices and companies, market days, hotels and restaurants, hospitals, malls and shopping centers, public parking, close ground facilities for the development of land for development, downtown, squares and crossroads, branches competitor, price land, population density area (Fig. 4). At this stage, privacy must be determined for each of the layers, according to the boundaries specified above. Below is an example of this layer (Fig. 5).

Table 7: The boundaries in terms of the criteria

Standard	Compatible/incompatible	Privacy (Metro)
Income customers	The more money, the location is desirable	500
The population	The more population, the place is better	500
Parking	It is better to distance was less	1000
Mall	It is better to distance be less	500
Hospital	It is better to distance be less	1000
Hotel and restaurant	It is better to distance be less	500
Market	It is better to distance be less	500
Offices	It is better to distance be less	500
Competitor bank	It is better to distance be less	100
Own bank	It is better to distance be more.	500
Land	It is better to distance be less.	500
City center	It is better to distance be less.	1000
Squares and crossroads of three main roads	It is better to distance be less.	500

At this stage, layer must be achieved on assembly and final output. We have used from Boolean method that is very accurate and desirable in this thesis to locate Pasargad Bank in the city of Yasouj. The work in this way is that in the third stage should any of the layers with respect to privacy for which we defined the optimal value of 1 and 0 or negative values as well. Finally, all output maps of the third stage will have two values 0 and 1 and output map will be zero and one in this stage by multiplying these maps in each other (Fig. 6).

At this point, we can delineate areas because in this range, the result of software is geographic information system and as well as to better display the desirable range for locating Pasargad Bank; we should transfer the output layer to our satellite images.

At this stage, we should intervene the results of expert choice program and weight resulting in a final location that should be selected in the selection locations. By incorporating the analytic hierarchy process (leading to weighted layer) and sub-criteria based on expert planning horizon of Experts on the location of the bank as well as bank customers in selecting indicators

Fig. 4: Petrol and gas station map in the city of Yasouj

Fig. 5: Final location map of Pasargad Bank on satellite images

that the better we will be able to choose the desired. Suggested areas of the mentioned processes are 11 points. Due to the limited budget of the bank, it is better to have one or more branches of the potential points to be selected. At this stage, we use from mathematical models MIP. The purpose of this model is maximizing the total demand have covered.

It has written the results of this study as well as an approximate population of each area in Table 8 (table covers) and finally MCLP mathematical model and solve our model using LINGO softwar (Table 8). Max $27y_1+8y_2+8y_2+20y_4+12y_5+11y_6+15y_7+8y_8+7y_9+9y_{10}10y_{11}+9y_{12}$ subject to:

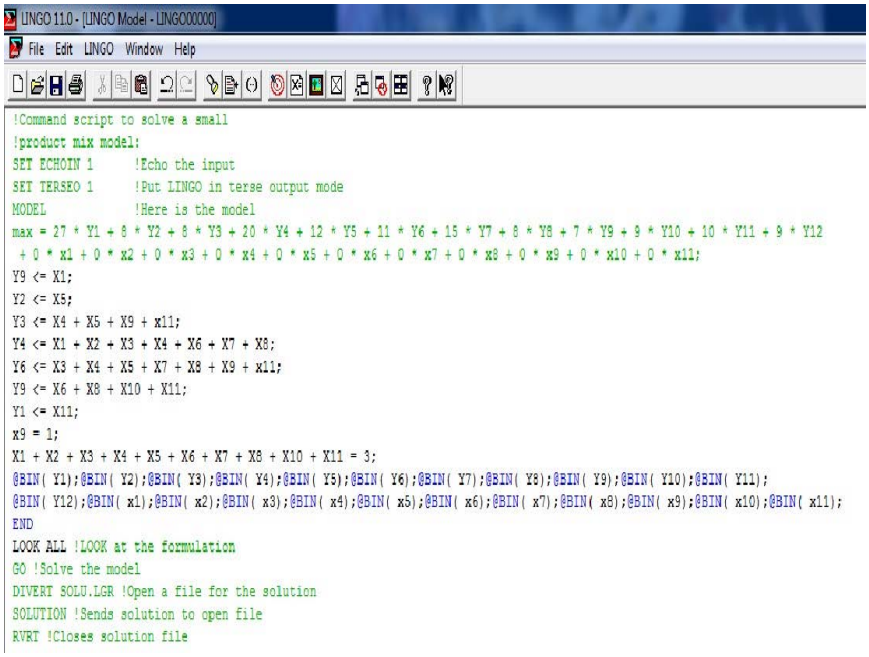

Fig. 6: LINGO software

Table 8: Cover table

Place regional branches demand	1	2	3	4	5	6	7	8	9	10	11	Approximate population by a thousand
1	0	0	0	0	0	0	0	0	0	0	1	27
2	0	0	0	0	0	0	0	0	0	0	0	8
3	0	0	0	1	1	0	0	0	1	0	1	8
4	1	1	1	1	0	1	1	1	0	0	0	20
5	0	0	0	0	0	0	0	0	0	0	0	12
6	0	0	1	1	1	0	1	1	1	0	1	11
7	0	0	0	0	0	1	0	1	0	1	1	15
8	0	0	0	0	0	0	0	0	0	0	0	8
9	1	0	0	0	0	0	0	0	0	0	0	7
10	0	0	0	0	0	0	0	0	0	0	0	9
11	0	0	0	0	0	0	0	0	0	0	0	10
12	0	0	0	0	0	0	0	0	0	0	0	9

$$x_1 \geq y_9$$

$$x_5 \geq y_2$$

$$x_4 + x_5 + x_9 + x_{11} \geq y_3$$

$$x_1 + x_2 + x_3 + x_4 + x_6 + x_7 + x_8 \geq y_4$$

$$x_3 + x_4 + x_5 + x_7 + x_8 + x_9 + x_{11} \geq y_6$$

$$x_6 + x_8 + x_{10} + x_{11} \geq y_7$$

$$x_{11} \geq y_1$$

$$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 + x_{10} + x_{11} = 3$$

$$x_9 = 1$$

$$x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_{10}, x_{11} \in \{0, 1\}$$

$$y_1, y_2, y_3, y_4, y_5, y_6, y_7, y_8, y_9, y_{10}, y_{11}, y_{12} \in \{0, 1\}$$

Places x_7, x_5, x_4 were selected for the construction branch among the potential sites for the construction branch location with regard to 3 (p = 3). Places of y_3, y_4, y_6 with a total of 39 thousand are covered by the construction of the three branch locations.

CONCLUSION

It has been used from one or two areas in which science location mapping, and GIS operations research in most studies but in this study, all three areas were used to achieve a stronger research. To identify effective measures in determining the location of branch locations, the science of operations research in the use of hierarchical analysis and model MCLP and GIS is used to locate potential hotspots that the combination of these three areas would strengthen the results. Banks then have the competitive advantage that they can consolidate its position in the target market by delivering superior value. The present study is an applied research location in the

financial and credit institutions and can also be used to decide to build a branch in the future. The following locations were chosen for the establishment of branches after entering data to model and solve it.

Selected locations:

- Yasouj; corner three-way martyr of Beheshti Hospital
- Yasouj; the end of Northern Street of Sardar Jangal
- Yasouj; last open Jomhoory Street next to the Bank Saderat Iran

With the construction of this branch are no longer covered by 39 thousand will be studied by 19 thousand demand covered by existing branch (branch built), a total of 58 thousand demand in the region.

REFERENCES

Adams, P., 1991. Choosing a choice ATM site: ATM buyer's guide. Credit Union Manage., 14: 15-17.

Aikens, C.H., 1985. Facility location models for distribution planning. Eur. J. Oper. Res., 22: 263-279.

Al-Hanbali, N., 2003. Building a geospatial database and GIS data-model integration for banking: ATM site location. Proceedings of the Commission IV Joint Workshop on Data Integration and Digital Mapping Challenges in Geospatial Analysis, Integration and Visualization II, September 8-9, 2003, Stuttgart, Germany.

Albareda-Sambola, M., E. Fernandez, Y. Hinojosa and J. Puerto, 2009. The multi-period incremental service facility location problem. Comput. Operat. Res., 36: 1356-1375.

Aldajani, M.A. and H.K. Alfares, 2009. Location of banking automatic teller machines based on convolution. Comput. Ind. Eng., 57: 1194-1201.

Almossawi, M., 2001. Bank selection criteria employed by college students in Bahrain: An empirical analysis. Int. J. Bank Market., 19: 115-125.

Badri, M.A., 2007. Dimensions of industrial location factors: Review and exploration. J. Bus. Public Affairs, 1: 1-26.

Boufounou, P.V., 1995. Evaluating bank branch location and performance: A case study. Eur. J. Operat. Res., 87: 389-402.

Chen, L.F. and C.T. Tsai, 2016. Data mining framework based on rough set theory to improve location selection decisions: A case study of a restaurant chain. Tourism Manage., 53: 197-206.

Church, R. and C.R. Velle, 1974. The maximal covering location problem. Pap. Reg. Sci., 32: 101-118.

Church, R.L. and A.T. Murray, 2009. Business Site Selection, Location Analysis and GIS. John Wiley and Sons, New York, ISBN: 9780470191064, Pages: 306.

Daskin, M.S., 1995. Network and Discrete Location: Models Algorithms and Applications. Wiley Interscience, New York.

Didandeh, A., B.S. Bigham, M. Khosravian and F.B. Moghaddam, 2013. Using Voronoi diagrams to solve a hybrid facility location problem with attentive facilities. Inform. Sci., 234: 203-216.

Drezner, T., 1995. Competitive Facility Location in the Plane. In: Facility Location: A Survey of Applications and Methods, Drezner, Z. (Ed.). Springer-Verlag, Berlin, Germany.

Drezner, Z. and H. Hamacher, 2002. Facility Location: Applications and Theory. Springer-Verlag, Berlin, Germany.

Farahani, R.Z., M.S. Seifi and N. Asgari, 2010. Multiple criteria facility location problems: A survey. Applied Math. Modell., 34: 1689-1709.

Farahani, R.Z., N. Asgari, N. Heidari, M. Hosseininia and M. Goh, 2012. Covering problems in facility location: A review. Comput. Ind. Eng., 62: 368-407.

Francis, R.L. and J.A. White, 1974. Facility Layout and Location an Analytical Approach. 1st Edn., Prentice-Hall, Englewood Cliffs, NJ., USA.

Francis, R.L., L.F. McGinnis and J.A. White, 1983. Locational analysis. Eur. J. Operat. Res., 12: 220-252.

Francis, R.L., L.F. McGinnis and J.A. White, 1992. Facility Layout and Location: An Analytical Approach. 2nd Edn., Prentice-Hall, New Jersey, USA., ISBN: 9780132992312, Pages: 589.

Guneri, A.F., F. Tiryaki and G. Akkaya, 2006. Using analytic hierarchy process (AHP) in location selection for a yarn factory: A case study. Int. J. Ind. Eng.-Theory Applic. Pract., 13: 334-340.

Hakimi, S.L., 1964. Optimum locations of switching centers and the absolute centers and medians of a graph. Operat. Res., 12: 450-459.

Hale, T.S. and C.R. Moberg, 2003. Location science research: A review. Ann. Operat. Res., 123: 21-35.

Handler, G.Y. and P.B. Mirchandani, 1979. Location on Networks: Theory and Algorithms. MIT Press, Cambridge, MA.

Isard, N., 1956. Location and Space Economy. MIT Press, Cambridge, MA.

Krarup, J. and P.M. Pruzan, 1979. Selected families of location problems. Ann. Discrete Math., 5: 327-387.

Launhardt, W., 1885. Mathematische Begrundung der Volkswirtschaftslehre. Teubner Publisher, Leipzig, Germany.

Lee, C. and W. Wilhelm, 2010. On integrating theories of international economics in the strategic planning of global supply chains and facility location. Int. J. Prod. Econ., 124: 225-240.

Lee, J.M. and Y.H. Lee, 2012. Facility location and scale decision problem with customer preference. Comput. Ind. Eng., 63: 184-191.

Leonardi, G., 1981. A unifying framework for public facility location problems-part 1: A critical overview and some unsolved problems. Environ. Plan. A, 13: 1001-1028.

Love, R., J. Morris and G. Wesolowsky, 1988. Facility Location: Models and Methods. North-Holland Publishing Co., Amsterdam, The Netherlands.

McCann, P., 2001. Urban and Regional Economics. Oxford University Press, Oxford, UK.

Melo, M.T., S. Nickel and F. Saldanha-da-Gama, 2009. Facility location and supply chain management: A review. Eur. J. Oper. Res., 196: 401-412.

Miliotis, P., M. Dimopoulou and I. Giannikos, 2002. A hierarchical location model for locating bank branches in a competitive environment. Int. Trans. Opeart. Res., 9: 549-565.

Mirchandani, P.B. and R.L. Francis, 1990. Discrete Location Theory.John Wiley and Sons, John Wiley and Sons, New York, ISBN: 978-0-471-89233-5.

Moghadas, F.M. and H.T. Kakhki, 2012. Queueing maximal covering location-allocation problem: An extension with M/G/1 queueing systems. Adv. Decis. Sci., Vol. 2011. 10.1155/2011/605629.

Moses, L., 1958. Location and the theory of production. Q. J. Econ., 72: 259-272.

Nickel, S. and J. Puerto, 2005. Location Theory: A Unified Approach. Springer-Verlag, Berlin.

Partovi, F.Y., 2001. An analytic model to quantify strategic service vision. Int. J. Serv. Ind. Manage., 12: 476-499.

Pastor, J.T., 1994. Bicriterion programs and managerial location decisions: Application to the banking sector. J. Operat. Res. Soc., 45: 1351-1362.

Porter, M.E., 2000. Location, competition and economic development: Local clusters in a global economy. Econ. Dev. Q., 14: 15-34.

ReVelle, C.S. and H.A. Eiselt, 2005. Location analysis: A synthesis and survey. Eur. J. Operat. Res., 165: 1-19.

Revelle, C., D. Marks and J.C. Liebman, 1970. An analysis of private and public sector location models. Manage. Sci., 16: 692-707.

Revelle, C.S., H.A. Eiselt and M.S. Daskin, 2008. A bibliography for some fundamental problem categories in discrete location science. Eur. J. Operat. Res., 184: 817-848.

Saaty, T.L., 1980. The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation. 2nd Edn., McGraw-Hill International Book Co., New York, USA., ISBN: 9780070543713, Pages: 287.

Weber, A., 1929. Theory of the Location of Industries. University of Chicago Press, Chicago.

Yang, J. and L. Huei, 1997. An AHP decision model for facility location selection. J. Facil., 15: 241-254.

Zhao, L., B. Garner and B. Parolin, 2004. Branches bank closures in Sydney: A geographical perspective and analysis. Proceedings of the 12th International Conference on Geoinformatics, June 7-9, 2004, University of Galve, Sweden, pp: 541-548.