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Evaluation of the Balance Between Urban Districts and Optimizing Districting System, Case Study: Mashhad, Iran

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ABSTRACT

One of the new things that makes manage today's cities very difficult is the physical-Spatial transformation of the cities that leads to the emergence of new needs in urban zoning issue. When urban and spatial relationships become more complex, regional imbalances increased to. This phenomenon leads to a problem called functional fragmentation in the urban management. Mashhad as a metropolis, despite huge changes in the physical-Spatial structure of its tissue among decades, has constant districting system. This issue reveals the necessity of monitoring and evaluation in Mashhad city's districting system in terms of the balance between urban districts. For this purpose the authors provide a conceptual model of evaluation and optimization of urban districting system proposed in two phases and six steps. The first step is to evaluate the existing zoning, relying on theoretical research, evaluation criteria were selected based on expert scoring and then have weighted by Expert Choice software. The standard matrix reached from raw matrix that shows final calculated weights for each districts. The result of this calculation will show the results of evaluation graphically. The authors in the second phase used the results of the first phase in order to propose the new balanced districting system for Mashhad based on the selected criteria of the research and several sub criteria.

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INTRODUCTION

Urbanism and urbanization in recent times, due to the domination of the industrial economy and transportation machinery and large-scale urban development, human scale has lost many of its credit (Hekmatnia and Ghambari haft cheshmeh, 2008: 98). The classification criteria of the structural components of the comprehensive plan based on the availability and size of the population is an indicator of central elements (Ziyari, 2009: 35). In fact, by the advent of the automobile, the old city neighborhood that has disrupted the normal formation because the essence of the neighborhood gathered to share the spirit of community involvement, while a car call for the separation, and independency. As a result, the classification system of neighborhood disturbances and complications faced and need for new urban division introduced new models of physical-spatial development. The advent and promotion of procedures and the division, the hierarchy of networks of the separation land, settlement activity, the unit of adjacency and so on, a new character to the physical-spatial organization of cities on which the classification is at odds with the neighborhood (Bassett, 1992: 18).

The problem:

The project of "the role of a master plan for the development of large cities" which has been carried out on Mashhad has proven the existence of the problem of functional fragmentation. In this report, inconsistencies of departments in municipal services and integrated urban management have been suggested as one of the major problems identified in Mashhad and the formation process of dealing with the urban management unit (Guide, 1382). This heterogeneity is shown in the form of zoning and the friction between them in the city. Accordingly, the need to improve and propose solutions for improving the structure of urban management and urban divisions is clear, it is necessary that meet the needs of municipal zoning and districting plan as a basis for optimal management of urban (Farhood *et al*, 2009: 31-30). In the districts of performance urban

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management authorities, this necessity exists for this interaction while the functional fragmentation just is proven in the city of Mashhad. One of the consequences of fragmentation is the fragmentation in district boundaries, in which a variety of functional features create a variety of services and zoning creates disharmony in the city. We provide a uniform and holistic zoning plan that can be used as a basis for integrated urban management.

Theoretical Foundations:

Nowadays city management, in response to more complex cities and consequently, the physical-spatial transformation of urban tissue, the need for new structures and processes that are encountered in urban management resulted in a complete contrast with the traditional management system that is based on self-help neighborhoods (Bassett, 1992: 18). In fact, the formation of different organizations have been transformed that each are in charge of one of the utilities and the physical-spatial division of the city and its administrative devolution to administrative level with the aim of facilitating the administration of wisdom, of the major consequences of the physical-spatial transformation of urban tissue.

Discussion of integrated urban management has been considered as the concept of holistic approach to urban management structures and processes, as the identity element for sustainable urban management, necessary and interesting theorists around the world. *McGill* defines the integration as integrating urban management, urban planning, infrastructure provision and integration of institutional and organizational integration (McGill, 1995, 1998, 2001). The analysis of this observation, we can say Management expertise and knowledge is beyond a field larger than an optimal management in an urban district and therefore requires effective communication between all variables in the system of urban management. *Rakodi* (1991) and *Sharma* (1989) know the urban management as responsible for the strategic and operational aspects to consider that in addition to trying to meet the daily needs for the city and its inhabitants, looking at all aspects of urban development and hence the need to engage effectively with the areas of power, politics, society and economy of the city (Rakodi, 1991, 2003, Sharma, 1989).

Terms of zoning (by means of districting) conceptualize mainly in two aspects of land allocation for a specific purpose and application controls the height of the building. The next aspect is focused on population density. The zoning by-law are defined to regulate the use of land and building height and density of buildings in specific areas for the purposes of security coordination, health, the general welfare of the public. (Schwieterman and Caspall, 2006: 50).

Zoning is a tool that uses a model of working on earth in the society in a way that memberships are fully in contact with each other so that proper space is provided for each type of development. Density of development in each area of the city zoning controls as with any urban district to public facilities such as streets, schools, recreational facilities and utility systems to the desired service given (Mir Shafi, 2001: 14-15.).

The need to balance the volume of urban management is more difficult than in big and small cities; various agencies responsible for urban services has led to the classification of the service units, since the overall growth of cities, the central management alone is not sufficient (Ghanbari Haftcheshmeh and Hekmatnia, 2008: 97).

Method:

The purpose of this paper is to design a model for urban zoning system evaluation and optimization of city zoning system in the form of descriptive analysis was reached in two phase and several steps.

The first phase is to evaluate the following zoning, in the second phase of evaluation results are used in order to offer new and improved zoning system. There are several steps in the first phase, criteria and indicators defined zoning derived from theoretical research and then in the second step, these criteria are rated by experts in urban management. In the third step the results of the vote on the Expert Choice software are used to calculate the net weight of the criteria. In the fourth step, the raw data matrix formulation Mashhad city and its standard matrix is computed to obtain the weight of each region. After reach to the final weight districts, Mashhad evaluation map of districts is obtained. The second phase of the research will be pursued in two steps. First research criteria and sub-criteria are defined to control of the results, and the second step is to balance and optimize the zoning map of the city of Mashhad is obtained according to the first step. (Figure 1).

Case Study:

The administration of the metropolitan area of some 30,000 hectares as Mashhad is not possible (Farnahad Consulting Engineers, 2008, 52), but by dividing it into urban districts. But these districts are determined as unilateral, the variety of zoning (to fit a variety of urban management organizations) will be added to the problems of urban management. Now Mashhad metropolis is divided into 13 districts (Figure 2). Mashhad Municipality of Mashhad is responsible for managing the overall policy and the mayors has the responsibility for implementing these policies and regional policies to better manage the area under its management.

As the figure suggests, the geometric distribution is very uneven in terms of area and population, and their relationship can be problematic. Figure 1 shows the gap better.

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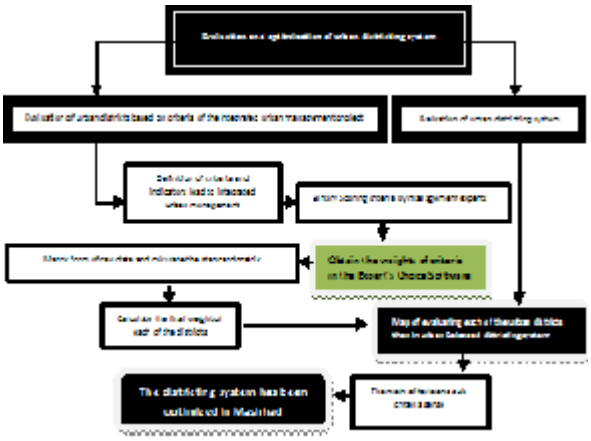

Fig. 1: The research model.
Source: The authors

Fig. 2: The current zoning of the Metropolis of Mashhad (12 plus the District Samen) (Source: Mapping of the authors based on data from Mashhad VP Social and Cultural Council (management of districts, updated August 2009).

Results:

Zoning indicators are obtained based on the theoretical literature, field studies, and a visit to the city manager in charge of the organization chart, respectively. Each of these indicators is important for an organization but to achieve the uniform zoning plan, it should be weighted according to their share in the final play map. The zoning standards of the organizations involved in similar projects in Mashhad existing zoning include the population and area (a measure of municipal zoning and health care); Number of subscribers (standard zoning department of telecommunications and electricity, water, sewage and gas companies), number of students (criteria Zoning Department of Education).These measures, along with other criteria, resulting in a variety of urban zoning, each corresponding to a particular organization.

To achieve a homogeneous urban zoning plan, it must meet these criteria that are weighted relative to each other to obtain a single map. Scoring criteria is conducted according to experts scoring in urban management. Scoring is based on the 9 quantities in Table (Table 1) is based on excellence and attention to evaluate the criterion i over criterion j is determined by experts.

Table 1: Saaty's 9 Scale for comparing quantitative measures binary.

Description	Definition	Rating (extremely important)
In achieving this objective, two criteria have equal importance.	Equal importance	1
Experience shows that to achieve the importance of i is greater than j.	Slightly more important	3
Experience shows that i was much more important than the j.	More important	5
Experience shows that i was much more important than the j.	Much more important	7
Much more important than the j i definitively is proven.	Absolute importance	9
When there is moderate mode.		

Source: Zebardast, 1380: 15, quoting Thomas L. Saaty.

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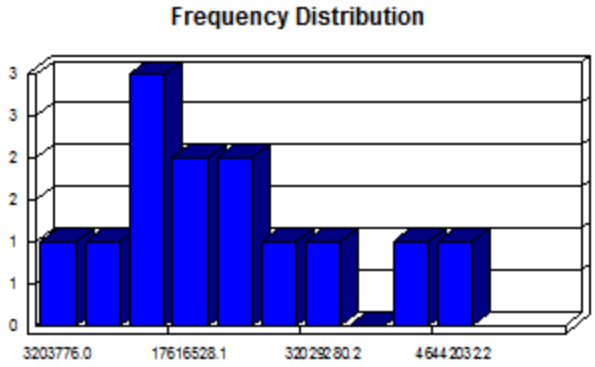

Graph 1: Distribution of the geometric area between districts of Mashhad.
Source: The authors draw

International comparison of criteria by experts is reflected in the following table, based on the final weight of the criteria has been made by the Expert Choice software (Table 2).

Table 2: Binary comparison of criteria by management experts and calculate weights of criteria by Expert Choice software.

Criteria	*Population (x1)*	*Area (x2)*	*Number of (x3) Subscribers*	*Number of (x4) students*	*The final weights of the criteria by the Expert Choice software*
(x1) Population		*5*	*1*	*3*	*0.390*
(x2) Area	*1/5*		*1/5*	*1/4*	*0.68*
Number of Subscribers (or users (x3	1	5		3	*0.390*
(x4) Number of students	*1/3*	4	*1/3*		*0.152*

Source: The authors

Below are judging inconsistency coefficient of less than 0.1 and is acceptable (Figure 3).

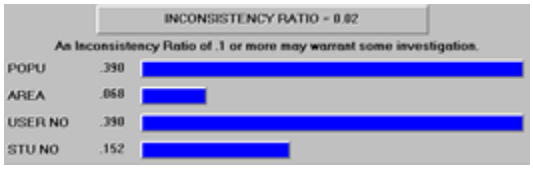

Fig. 3: Incompatibility Factor judging criteria and weighted graph study.
Source: The authors

After determining the weight of each index, and calculation of the Zoning determines the importance of each index, as the process continues.

Adjustment Index: The index is a scale for those who are used to the standard z-matrix in which columns and rows indicate the measures are indicative of the region. Data in this table are based on field observations and refer to relevant documents and reports of urban management have been determined by the authors. (Table 3).

The standard values obtained from the standard weight corresponding to that obtained in the previous step for each criterion multiplied and the results in the column "final weight of each region" is given in the table above. The results of the analysis are depicted in the following diagram. As a result of the evaluation graph represent the profound difference in weight between the standards of the paper the city of Mashhad (see Figure 2).

Urban districting optimization plan based on evaluation results:

In order to provide optimal zoning map of the city, relying on the results of the evaluation phase, the login information of each region in the evaluation of GIS up Graphically view the status of each zone. The districts where the conditions are more For relegated to the position of equilibrium, some lost their local area and, in turn, have fewer areas for improvement, though the area has more gain (Figure 4).

In the next phase, the proposed zoning will be moderated by performance criteria.

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Table 3: Matrix data (raw matrix).

Index / District / Region	(Population (people	(Area (m²	(Number of subscribers (split	(Number of students (persons
Samen Region	26813	3203776	6703	13406
Region 1	172547	14756806	43137	86274
Region 2	361249	35878210	90312	180624
Region 3	301784	26059787	75446	150892
Region 4	204050	12375485	51013	102026
Region 5	156892	20608000	39223	78446
Region 6	191965	14627691	47991	95982
Region 7	193089	48943902	48272	96544
Region 8	103205	18072131	25801	51602
Region 9	249554	45086780	62389	124778
Region 10	218745	22476203	54686	109372
Region 11	166208	16032478	41552	83104
Region 12	25263	27695228	6316	12632
Total	2371364	305816477	592841	1185682
mean $\bar{X}$	182412.615	23524344,4	45603.15	91206.31
SD $6_j = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n}}$	91536	3.7	22884	43768

Source: The authors

Table 4: Standard- z- matrix.

index / District / Region	Population ((people	(Area (m²	Number of subscribers ((split	Number of (students (persons	The final weight of .each region
Samen Region	-1.69987	-5492046	-1.6998842	-1.77756	-3734593
Region 1	-0.10778	-2369605	-0.10776744	-0.11269	-1611332
Region 2	1.953727	3338883	1.953716571	2.042992	2270442
Region 3	1.304092	685254.8	1.304092379	1.363683	465974.5
Region 4	0.236381	-3013205	0.236403164	0.247205	-2048979
Region 5	-0.2788	-788201	-0.27880397	-0.29154	-535977
Region 6	0.104357	-2404501	0.104345831	0.109114	-1635061
Region 7	0.116636	6870151	0.116625153	0.121954	4671703
Region 8	-0.86532	-1473571	-0.8653273	-0.90487	-1002029
Region 9	0.733497	5827685	0.733519053	0.767037	3962826
Region 10	0.396919	-283281	0.39690832	0.415045	-192631
Region 11	-0.17703	-2024829	-0.1770298	-0.18512	-1376884
Region 12	-1.71681	1127266	-1.71679558	-1.79525	766539.3

Source: The authors

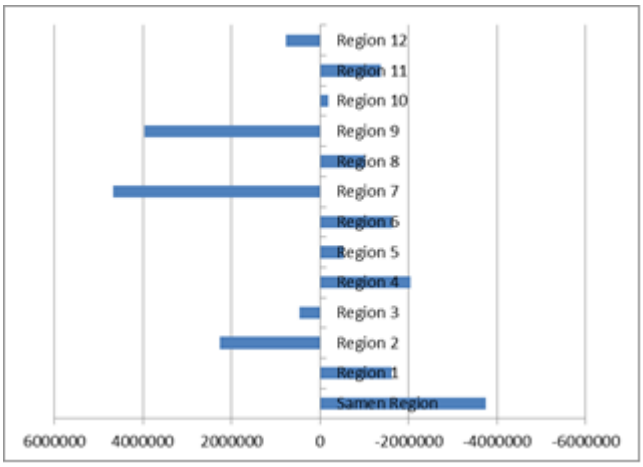

Fig. 4: Results of equivalence evaluation of urban districts in Mashhad.
Source: The authors

Figure 4 shows the gap between the districts of Mashhad as well as the balance.

The authors aimed to balance the proposed new zoning districts, the boundaries of the district within the district have used to redefine the zoning system. This research was redefined on the basis of criteria, along with the following criteria were used to review the proposed zoning plan. These factors are:

1- Avoid crossing the border districts with natural obstacles such as rivers and stream lines

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2- Considering the main lines of communication network with huge crossing traffic as the boundaries of districts
3- avoid from community separation by the proposed districting system
4- Initial Homogeneous districts and heterogeneous districts with all of its surrounding districts
5- optimal geometry of each region/district
6- Considering the former border of the city districts
7- Considering the size and number of districts according to city size and population

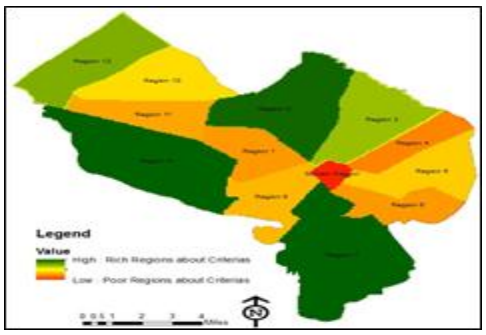

Fig. 5: Zoning map of Mashhad based on evaluation results.
Source: The authors

Accordingly, based upon search criteria and with respect to sub-criteria, the balanced zoning plan was proposed that in it, the district has lost seven of its districts and the district of Samen is added. Districts 2, 4, 5, 6 and 8 as well as their surrounding districts are reinforced with the loss of adjacent districts of Samen. Samen Zone also in Mashhad becomes more widely accepted center for coordinating certain circumstances is more religious core. The exchange of the zones between the districts with the district is conducted in order to strengthen the core of Mashhad between Samen and harmonious structure with identities as well. District 9 is that the status quo has been exceeded; one of the districts with the district of the shared district 11 to find his new form. Zone 1 connects an district of the district 11 to itself. With this decision, the districts are excluded from imbalance and balance and as a result the overall shape of zoning geometrical and physical-spatial sense of Mashhad city is improved, it heals in addition, the status of all the other elements of the study district, very close to balance (Figure 5).

Fig. 6: Balanced and optimized Mashhad districting map (optimized based on the results of evaluation).
Source: The authors

Conclusion:

Reform of urban management and urban divisions requiring that has been fixed as the basis for the realization of integrated management of urban. Mashhad city's zoning study is provided to assess the current situation in order to establish integrated management of urban systems based on conceptual model. The process was followed to six-step and two-step during the evaluation, the current status of a city zoning based on the evaluation results, the optimal zoning plan was proposed in Mashhad. In the evaluation criteria and metrics extracted from theoretical studies were reviewed. The scoring criteria were then weighted and the weight of each district respectively. This weight represents a split between urban zones of Mashhad that were in balance. The authors in order to reform of the Mashhad city zoning, relying on the criteria and sub-criteria to consider new zoning system suggested that were modified in the 11 districts and two remained unchanged to assure the proposed zoning map of the city of Mashhad.

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