



Math Teachers Evaluation in High School Using a Fuzzy Logic

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ABSTRACT

Math teachers selection is a multi-criteria decision problem including both quantitative and qualitative criteria and has a strategic importance for many institution. The conventional approaches to Math teachers selection problem tend to be less effective in dealing with the imprecise or vague nature of the linguistic assessment. Under many situations, the values of the qualitative criteria are often imprecisely defined for the decision-makers. To overcome this difficulty, fuzzy multi-criteria decision-making methods are proposed. In this paper, we present a multi-criteria decision making approach for selecting Math teachers under partial or incomplete information (uncertainty). The proposed approach comprises of two steps. In step 1, we identify the criteria for Math teachers selection. In step 2, experts provide linguistic ratings to the potential alternatives against the selected criteria. Fuzzy TOPSIS is used to generate aggregate scores selection of best alternative. This paper shows a successful application of fuzzy TOPSIS to a real Math teachers selection problem in Iran.

Key words: Selecting Teachers ; Multi criteria decision making; Fuzzy TOPSIS

INTRODUCTION

Multiple criteria decision making (MCDM) is the approach dealing with the ranking and selection of one or more vendors from a pool of providers. The MCDM provides an effective framework for comparison based on the evaluation of multiple conflict criteria. MCDM has been one of the fastest growing areas of operational research, as it is often realized that many concrete problems can be represented by several (conflicting) criteria. It was described as the most well known branch of decision making[2].The decision process of selecting an appropriate alternative





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usually has to take many factors into considerations, for instance, organizational needs and goals, risks, benefits, limited resources, etc. Several qualitative and quantitative criteria may affect mutually when evaluate alternatives, which may make the selection process complex and challenging. In addition, because of the vagueness of human being's thought, the selection is often based on inadequate information or personal judgments. Decision makers may find it hard to identify the best choice due to the lack of systematic methods to deal with multi criteria problems. Since some critical factors is basically determined by subjective perceptions and feelings towards each of the evaluated criteria, the fuzzy MCDM (fuzzy multiple criteria decision making, FMCDM) approach can explain more appropriately how decision makers make their evaluation of available alternatives and select the best solution. Therefore, since the evaluation is resulted from the different evaluator's view of linguistic variables, the evaluation process must be conducted in a fuzzy environment. The general procedure for making location decisions usually consists of the following steps:

- Decide on the criteria that will be used to evaluate location alternatives
- Identify criteria that are important
- Develop location alternatives
- Evaluate the alternatives and make a selection

The selection of a high school Math teachers is generally one of the most important and strategic decision in the optimization of logistic systems. It is a long-term decision and is influenced by many quantitative and qualitative criteria; however, some criteria are so important that they tend to dominate the decision in importance. Among the criteria taken into account in this paper are Creativity, Personality and Attitude. The conventional approaches to Math teachers selection problem tend to be less effective in dealing with the imprecise or vague nature of the linguistic assessment. In many situations, the values of the qualitative criteria are often imprecisely defined for decision-makers. In this paper, we present a multi criteria decision making approach to Math teachers selection under uncertain (fuzzy) circumstances. The rest of the paper is organized as follows: the literature review on fuzzy TOPSIS is given in Section 2. In Section 3,4 and 5, we present the preliminaries of Fuzzy MCDM with linguistic terms and Preliminaries of fuzzy set theory and Fuzzy TOPSIS. In Section 6, we present the evaluation framework for Math teachers selection based on fuzzy TOPSIS. In Section 7 we provide the conclusions and steps for future work.

Related Work

The decision problem of selecting information system can be described as a complex, multi-objective task, based on uncertain data. Therefore it can be defined as a multi-criteria decision making problem under uncertainty, whose solution requires reliable methods that can incorporate all risk factors in a methodical manner. Well known MCDM methods include the total sum (TS), the simple additive weighting (SAW) method, the AHP, the data envelopment analysis (DEA), the outranking approaches ELECTRE and PROMETHEE, and the TOPSIS method. The MCDM problems may be divided into two kinds of problem. One is the classical MCDM problems, among which the ratings and the weights of criteria are measured in crisp numbers. The other MCDM category is the fuzzy multi-criteria decision-making (FMCDM) problems, among which the ratings and the weights of criteria evaluated on imprecision, uncertainty and vagueness are usually expressed by linguistic terms and then set into fuzzy numbers. In classical MCDM, alternative rating and weights are measured in crisp numbers. Classical MCDM methods require the determination of alternatives rating and criteria weights are made which depend on decision makers' (DM) judgments/ preferences. Crisp values are commonly used to represent those ratings and weights. However, in practice, alternative ratings and criteria weights could not be assessed precisely, which may come from various sources, including unquantifiable information, incomplete information, unobtainable information, and (4) partial ignorance. Under many circumstances where performance rating and weights can not be given precisely, the fuzzy set theory is introduced to model the uncertainty of human judgments and such problems is known as fuzzy multiple criteria decision making (FMCDM). Bellman and Zadeh first introduced fuzzy set theory into MCDM as an





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approach to effectively dealing with the inherent imprecision, vagueness and ambiguity of the human decision making process. Since then, many researchers have been working on the process with uncertain data. Multi-criteria decision making (MCDM) has been widely used in selecting or ranking a finite set of decision alternatives characterized by multiple and usually conflicting criteria (attributes). Tremendous efforts have been spent and significant advances have been made towards the development of numerous MCDM methodologies for solving different types of problems such as selection forecasting, selecting robots for manufacturing companies and military threat assessment.

Fuzzy MCDM With Linguistic Terms

In fuzzy MCDM, performance ratings and weights are usually represented by fuzzy numbers. An alternative is calculated by aggregating all criteria weights and alternatives ratings, where alternatives with a higher utility are preferred. Since teachers quality is basically determined by subjective perceptions and feelings towards each of the evaluated criterion, the fuzzy MCDM (fuzzy multiple criteria decision making, FMCDM) approach can be more suitable to explain how experts make decisions to select the best teacher for education. While crisp data are inadequate to model the real life situations in MCDM, we apply linguistic variables to specifically describe the degrees of a criterion. In order to facilitate the making of subjective assessment by the decision makers (DM) using fuzzy numbers, two sets of linguistic terms are used for assessing criteria weights and performance rating on each qualitative criterion respectively. A linguistic variable is a variable which apply words or sentences in a natural or artificial language to describe its degree of value, and we use this kind of expression to compare each criteria by linguistic variables in a fuzzy environment as "Very Poor", "Poor", "Medium", "Good", and "Very Good" with respect to a fuzzy five level scale. The triangular fuzzy numbers are used to represent the approximate value, denoted as (a_1, a_2, a_3) where $1 \leq a_1 \leq a_2 \leq a_3 \leq 9$. Table 1 defines the linguistic terms and shows the membership functions of these linguistic terms.

Preliminaries of fuzzy set theory

To deal with vagueness of human thought, Zadeh first introduced the fuzzy set theory, which was oriented to the rationality of uncertainty due to imprecision or vagueness. A major contribution of fuzzy set theory is its capability of representing vague data. The theory also allows mathematical operators and programming to apply to the fuzzy domain. A fuzzy set is a class of objects with a continuum of grades of membership. Such a set is characterized by a membership (characteristic) function, which assigns to each object a grade of membership ranging between zero and one. With different daily decision making problems of diverse intensity, the results can be misleading if the fuzziness of human decision making is not taken into account. Fuzzy sets theory providing a more widely frame than classic sets theory, has been contributing to capability of reflecting real world. Fuzzy sets and fuzzy logic are powerful mathematical tools for modeling: uncertain systems in industry, nature and humanity; and facilitators for common-sense reasoning in decision making in the absence of complete and precise information. Their role is significant when applied to complex phenomena not easily described by traditional mathematical methods, especially when the goal is to find a good approximate solution. Fuzzy set theory is a better means for modeling imprecision arising from mental phenomena which are neither random nor stochastic. Human beings are heavily involved in the process of decision analysis. A rational approach toward decision making should take into account human subjectivity, rather than employing only objective probability measures. This attitude, towards imprecision of human behavior led to study of a new decision analysis filed fuzzy decision making.





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Definition 1. A fuzzy set \tilde{A} in a universe of discourse X is characterized by a membership function $\mu_{\tilde{A}}(x)$ which associates with each element x in X a real number in the interval [0, 1]. The function value $\mu_{\tilde{A}}(x)$ is termed the grade of membership of x in \tilde{A} .

Definition 2. A triangular fuzzy number \tilde{a} can be defined by a triplet (l,m,u) shown in Fig. 1. The membership function $\mu_{\tilde{a}}\left(\frac{x}{M}\right)$ is defined.

$$\mu_{\tilde{a}}\left(\frac{x}{M}\right) = \begin{cases} 0 & x < l \\ (x-l)/(M-l) & l \leq x \leq m \\ (u-x)/(u-m) & m \leq x \leq u \\ 0 & x > u \end{cases} \tag{1}$$

Let \tilde{a} and \tilde{b} be two triangular fuzzy numbers parameterized by the triplet (a1, a2, a3) and (b1, b2, b3), respectively, then the operational laws of these two triangular fuzzy numbers are as follows:

$$\tilde{a}(+) \tilde{b} = (a_1, a_2, a_3)(+)(b_1, b_2, b_3) = (a_1 + b_1, a_2 + b_2, a_3 + b_3) \tag{2}$$

$$\tilde{a}(-) \tilde{b} = (a_1, a_2, a_3)(-)(b_1, b_2, b_3) = (a_1 - b_1, a_2 - b_2, a_3 - b_3) \tag{3}$$

$$\tilde{a}(x) \tilde{b} = (a_1, a_2, a_3)(x)(b_1, b_2, b_3) = (a_1 \cdot b_1, a_2 \cdot b_2, a_3 \cdot b_3) \tag{4}$$

$$\tilde{a}(/) \tilde{b} = (a_1, a_2, a_3)(/)(b_1, b_2, b_3) = (a_1/b_3, a_2/b_2, a_3/b_1) \tag{5}$$

$$\tilde{a} = (ka_1, ka_2, ka_3) \tag{6}$$

Definition 3. A linguistic variable is a variable values of which are linguistic terms. The concept of linguistic variable is very useful in dealing with situations which are too complex or too ill-defined to be reasonably described in conventional quantitative expressions. For example, "weight" is a linguistic variable; its values are very low, low, medium, high, very high, etc. These linguistic values can also be represented by fuzzy numbers.

Definition 4. Let $\tilde{a}_1 = (a_1, a_2, a_3)$ and $\tilde{b}_1 = (b_1, b_2, b_3)$ be two triangular fuzzy numbers, then the vertex method is defined to calculate the distance between them.

$$d(\tilde{a}, \tilde{b}) = \sqrt{\frac{1}{3}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]} \tag{7}$$

Definition 5. Considering the different importance values of each criterion, the weighted normalized fuzzy-decision matrix is constructed as

$$\tilde{V} = [\tilde{v}_{ij}] n \times j \quad i = 1, 2, \dots, n, j = 1, 2, \dots, j \tag{8}$$





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Where

$$\bar{x}_{ij} = \bar{x}_{ij} \times w_i \quad (9)$$

A set of performance ratings of A_j ($j = 1, 2, \dots, J$) with respect to criteria C_i ($i = 1, 2, \dots, n$) called $\bar{X} = \{\bar{x}_{ij}, i = 1, 2, \dots, n; j = 1, 2, \dots, J\}$.

A set of importance weights of each criterion w_i ($i = 1, 2, \dots, n$).

Fuzzy TOPSIS

The TOPSIS is widely used for tackling ranking problems in real situations. Despite its popularity and simplicity in concept, this method is often criticized for its inability to adequately handle the inherent uncertainty and imprecision associated with the mapping of the decision-maker’s perception to crisp values. In the traditional formulation of the TOPSIS, personal judgments are represented with crisp values. However, in many practical cases the human preference model is uncertain and decision-makers might be reluctant or unable to assign crisp values to the comparison judgments. Having to use crisp values is one of the problematic points in the crisp evaluation process. One reason is that decision-makers usually feel more confident to give interval judgments rather than expressing their judgments in the form of single numeric values. As some criteria are difficult to measure by crisp values, they are usually neglected during the evaluation. Another reason is mathematical models that are based on crisp value. These methods cannot deal with decision-makers’ ambiguities, uncertainties and vagueness which cannot be handled by crisp values. The use of fuzzy set theory allows the decision-makers to incorporate unquantifiable information, incomplete information, non-obtainable information and partially ignorant facts into decision model. As a result, fuzzy TOPSIS and its extensions are developed to solve ranking and justification problems.

Fuzzy TOPSIS method tries to estimate as far as possible a particular alternative near the ideal solution. Distance of alternatives can be in positive or negative direction. The method calculates two values: the Fuzzy Positive Ideal Solution (FPIS), which represents a project benefit and the Fuzzy Negative Ideal Solution (FNIS), a cost of project. The method selects the alternative which has the smallest distance from the positive-ideal solution and the greatest distance from the negative-ideal solution .

The mathematics concept of Fuzzy TOPSIS can be described as follows.

Step 1: Determination of Linguistic Terms, Membership Functions and the weighting of evaluation criteria

Determine the linguistic variables for all criteria. Each linguistic variable is assigned a set of membership functions; determine weights of evaluation criteria and the ratings of alternatives are considered as linguistic terms.

Step 2: Construct the fuzzy decision matrix

Decision matrix is directly associated with linguistic variables and the criteria alternatives. If assumed that the number of criteria is n and the count of projects is m , fuzzy decision matrix will be obtained with m rows and n columns as in the following matrix:

c1 c2 cn





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$$\tilde{D} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \dots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \dots & \tilde{x}_{2n} \\ \dots & \dots & \dots & \dots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \dots & \tilde{x}_{mn} \end{bmatrix} \quad (10)$$

$$\tilde{x}_{ij} = (a_{ij}, b_{ij}, c_{ij}) \quad (11)$$

$$a_{ij} = \min\{a_{ij}^k\}, b_{ij} = \frac{1}{k} \sum_{k=1}^k b_{ij}^k, c_{ij} = \max\{c_{ij}^k\} \quad (12)$$

where A1,A2,...,Am alternatives, quality of teachers which must be ranked according to established criteria C1,C2,...,Cn , xij is the rating of alternative , Ai with respect to criterion Cj .

Also, it is necessary to aggregate weighted values of criteria , their importance in the evaluation of projects.

$$\tilde{W} = (\tilde{w}_1, \tilde{w}_2, \dots, \tilde{w}_n) \quad (13)$$

where W is the weight vector with the values of criteria.

Step 3: Normalize the fuzzy decision matrix

Normalization of fuzzy decision matrix is accomplished using linear scale transformation. The calculations are done using formulas (14),(15).

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{a_j^+}, \frac{b_{ij}}{a_j^+}, \frac{c_{ij}}{c_j^+} \right) \text{ and } c_j^+ = \max_{c_{ij}}(\text{benefit}) \quad (14)$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{a_{ij}}, \frac{a_j^-}{b_{ij}}, \frac{a_j^-}{c_{ij}} \right) \text{ and } a_j^- = \min_{a_{ij}}(\text{cost}) \quad (15)$$

If in the teacher quality assessment we use the criteria whose value indicates the benefit, we use formula (14).Otherwise, for the criteria which represent the cost in normalization of matrix formula (15) is used. In the quality evaluation the cost benefit criteria will be used. The normalized fuzzy decision matrix can be represented by Eq.(16):

$$\tilde{R} = [\tilde{r}_{ij}]_{m \times n}, i = 1,2, \dots, m; j = 1,2, \dots, n \quad (16)$$

where rij is the normalized value of xij=(aij, bij, cij).

Step 4: Calculate the weighted fuzzy decision matrix

The weighted normalized fuzzy decision matrix V is computed by multiplying the weights (wj) of evaluation criteria with the normalized value rij from fuzzy decision matrix. The weighted normalized decision matrix can be represented by Eq. (17):





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$$\tilde{V} = [\tilde{v}_{ij}]_{n \times j}, i = 1, 2, \dots, n; j = 1, 2, \dots, J \quad (17)$$

Where:

$$\tilde{v}_{ij} = \tilde{r}_{ij}(\cdot) \tilde{w}_i \quad (18)$$

Step 5: Determine the fuzzy positive-ideal solution (FPIS A+) and fuzzy negative-ideal solution (FNIS A-)

According to the weighted normalized fuzzy decision matrix, in this step we determine the positive and negative displacement from the ideal solution. Their ranges belong to the closed interval [0,1]. FPIS and FNIS are defined as triplet

(1,1,1) or (0,0,0), otherwise the values determined by using the following formula:

$$A^+ = (\tilde{v}_{11}^+, \tilde{v}_{21}^+, \dots, \tilde{v}_{n1}^+) \quad (19)$$

$$A^- = (\tilde{v}_{1n}^-, \tilde{v}_{2n}^-, \dots, \tilde{v}_{nn}^-) \quad (20)$$

Where $\tilde{v}_j^+ = (1,1,1)$ and $\tilde{v}_j^- = (0,0,0)$ $j=1,2,\dots,n$.

Step 6: Calculate the distance of each alternative from FPIS and FNIS

The distance (d_i^+ and d_i^-) of each alternative A^+ from and A^- can be calculated as:

$$d_i^+ = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^+), i = 1, 2, \dots, m \quad (21)$$

$$d_i^- = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^-), i = 1, 2, \dots, m \quad (22)$$

The distance between two fuzzy numbers $\tilde{a} = (a_1, a_2, a_3)$ and $\tilde{b} = (b_1, b_2, b_3)$, can be calculated as:

$$d_r(a, b) = \sqrt{\frac{1}{3} [(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]} \quad (23)$$

Step 7: Calculate the closeness coefficient





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The closeness coefficient CCI is defined to determine the ranking order of all alternatives. The index CCI indicates that the alternative is close to the FPIS(a_i^+) and far from the FNIS(a_i^-). The closeness coefficient of each evaluated teacher

quality can be calculated as:

$$CC_i = \frac{d_i^-}{d_i^+ + d_i^-} \quad (24)$$

Step 8: The ranging order of all alternatives

The ranking of alternatives is carried out based on the calculated closeness coefficients. The alternative with the highest coefficient represents the best alternative.

The Evaluation Framework

Criteria Selection

In the first phase, criteria and sub-criteria to be used in ranking determined. One of the important steps of the proposed model is to determine all the important criteria and their relationship with the decision variables. This step is crucial because the selected criteria and sub criteria can influence the final choice. Here in this project the criteria and sub-criteria are selected based on the Existing literature & expert’s opinion. The alternatives taken are eminency math teachers in Kerman. The criteria and sub-criteria selected are described in Table 2.

Alternatives evaluation and selection using fuzzy TOPSIS

The second step involves allocation of linguistic ratings to the 3 criteria & 16 sub criteria and the potential alternatives for each of the criteria & sub criteria by the decision makers or experts. The linguistics terms are then transformed to fuzzy triangular numbers. Then, fuzzy TOPSIS is applied to aggregate the criteria & sub criteria and the alternative ratings to generate an overall score for math teachers selection. The highest score is selected as the best alternative for math teachers. After determining the linguistic variables, the next step is to define the decision matrix based on the same input linguistic variables and criteria values like in the crisp evaluation. The aggregated ratings of projects with respect to 3 criteria & 16 sub criteria can be computed and fuzzy decision matrix formed, as shown in Table 3.

Next step is constructing the normalized decision matrix. The normalized decision matrix can be calculated by applying Eq (14) as follows.

After decision matrix normalization, the next step is to calculate the weighted Fuzzy decision matrix. The results of this operation are shown in Table 5.

The ranking order of all alternatives can be obtained once the closeness coefficient is determined. This method allows the decision makers to select the most feasible alternative. The closeness coefficient of each alternative is calculated by applying Eq. (18) as follows. Table 6 shows the final result and candidates rating. According to these closeness coefficients, the ranking order of the three candidates will be **T3, T1 and T2**.





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CONCLUSION

A eminence math teacher selection is a multi-criteria decision-making problem including both quantitative and qualitative. In this paper, we present a multi-criteria decision making approach for math teachers selection under fuzzy environment. The proposed approach comprises of two steps. In step 1, the criteria & sub criteria for math teachers selection are identified. These criteria are Creativity: non Cognitive, cognitive, motivational ;Personality: Extraversion, Neuroticism, Agreeableness, compatibility, Responsibility; Attitude :Job dependency, matching job with business, design job, Associates, Environmental stress and complexity of work, Balancing in career and family life , training, evaluation and promotion, physical conditions work. In step 2, the teachers provide linguistic ratings to the criteria & sub criteria and the alternatives. Fuzzy TOPSIS is used to aggregate the ratings and generate an overall performance score for measuring each alternative. The alternative with the highest score is selected as the best math teacher selection.

As a future step to this paper could be the comparison of the proposed approach to other MCDA methods, like AHP or even more to the outranking methods, such as ELECTRE III and PROMETHEE II. Moreover, situations should be studied, in which a group of experts, each one of different importance, are involved in the decision making process.

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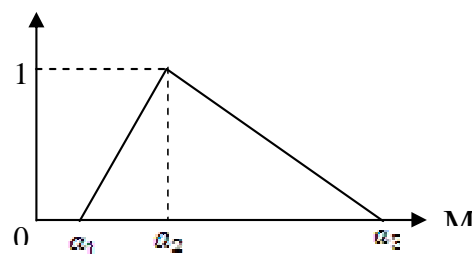


Fig 1. Triangular fuzzy number \tilde{a} .





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Table 1. Linguistic terms and membership function

Linguistic terms	Very Poor (VP)	Poor(P)	Medium (M)	Good(G)	Very Good (VG)
Membership function	(1,1,3)	(1,3,5)	(3,5,7)	(5,7,9)	(7,9,11)

Table 2.Criteria and Sub-Criteria

Criteria	Sub-criteria
Creativity (C1)	C11: non Cognitive, C12: cognitive, C13: motivational
Personality (C2)	C21:Extraversion,C22: Neuroticism, C23:Agreeableness-C24:compatibility,C25: Responsibility
Attitude (C3)	C31:Job dependency,C32:matching job with business, C33:design job,C34:Associates, C35:Environmental stress and complexity of work, C36: Balancing in career and family life ,C37:training, evaluation and promotion,C38: physical conditions work

Table 3.Aggregation Fuzzy Decision Matrix

Criteria & sub Criteria	T1	T2	T3
C1	(7,9,11)	(5,7,9)	(7,9,11)
C2	(5,7,9)	(5,7,9)	(7,9,11)
C3	(1,3,5)	(3,5,7)	(3,5,7)
C11	(3,5,7)	(3,5,7)	(1,3,5)
C12	(5,7,9)	(5,7,9)	(5,7,9)
C13	(1,3,5)	(5,7,9)	(1,3,5)
C21	(3,5,7)	(3,5,7)	(1,3,5)
C22	(1,1,3)	(1,1,3)	(1,1,3)
C23	(3,5,7)	(5,7,9)	(5,7,9)
C24	(5,7,9)	(5,7,9)	(7,9,11)
C25	(5,7,9)	(7,9,11)	(7,9,11)
C31	(5,7,9)	(7,9,11)	(3,5,7)
C32	(5,7,9)	(5,7,9)	(3,5,7)
C33	(5,7,9)	(5,7,9)	(3,5,7)
C34	(3,5,7)	(3,5,7)	(5,7,9)
C35	(5,7,9)	(5,7,9)	(3,5,7)
C36	(7,9,11)	(7,9,11)	(7,9,11)
C37	(5,7,9)	(7,9,11)	(7,9,11)
C38	(5,7,9)	(1,1,3)	(1,3,5)





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Table 4. Normalized Aggregation Fuzzy Decision Matrix

Criteria & sub Criteria	T1	T2	T3
C1	(0.64,0.82,1)	(0.56,0.78,1)	(0.64,0.82,1)
C2	(0.54,0.64,0.82)	(0.56,0.78,1)	(0.64,0.82,1)
C3	(0.09,0.27,0.45)	(0.33,0.56,0.78)	(0.27,0.45,0.64)
C11	(0.33,0.56,0.78)	(0.33,0.56,0.78)	(0.11,0.33,0.56)
C12	(0.56,0.78,1)	(0.56,0.78,1)	(0.56,0.78,1)
C13	(0.11,0.33,0.56)	(0.56,0.78,1)	(0.11,0.33,0.56)
C21	(0.33,0.56,0.78)	(0.27,0.45,0.64)	(0.09,0.27,0.33)
C22	(0.11,0.11,0.33)	(0.09,0.09,0.27)	(0.09,0.09,0.11)
C23	(0.33,0.56,0.78)	(0.45,0.64,0.82)	(0.45,0.64,0.33)
C24	(0.56,0.78,1)	(0.45,0.64,0.82)	(0.64,0.82,0.56)
C25	(0.56,0.78,1)	(0.64,0.82,1)	(0.64,0.82,0.56)
C31	(0.45,0.64,0.82)	(0.64,0.82,1)	(0.27,0.45,0.64)
C32	(0.45,0.64,0.82)	(0.45,0.64,0.82)	(0.27,0.45,0.64)
C33	(0.45,0.64,0.82)	(0.45,0.64,0.82)	(0.27,0.45,0.64)
C34	(0.27,0.45,0.64)	(0.27,0.45,0.64)	(0.45,0.64,0.82)
C35	(0.45,0.64,0.82)	(0.45,0.64,0.82)	(0.27,0.45,0.64)
C36	(0.64,0.82,1)	(0.64,0.82,1)	(0.64,0.82,1)
C37	(0.45,0.64,0.82)	(0.64,0.82,1)	(0.64,0.82,1)
C38	(0.45,0.64,0.82)	(0.09,0.09,0.27)	(0.09,0.27,0.45)

Table 5. Weighted Normalized Aggregation Fuzzy Decision Matrix

Criteria & sub Criteria	T1	T2	T3
C1	(0.21,0.27,0.33)	(0.19,0.26,0.33)	(0.21,0.27,0.33)
C2	(0.15,0.21,0.27)	(0.19,0.26,0.33)	(0.21,0.27,0.33)
C3	(0.03,0.09,0.15)	(0.11,0.19,0.26)	(0.09,0.15,0.21)
C11	(0.11,0.19,0.26)	(0.11,0.19,0.26)	(0.04,0.11,0.19)
C12	(0.19,0.26,0.33)	(0.19,0.26,0.33)	(0.19,0.26,0.33)
C13	(0.04,0.11,0.19)	(0.19,0.26,0.33)	(0.04,0.11,0.19)
C21	(0.07,0.11,0.16)	(0.05,0.09,0.13)	(0.02,0.05,0.07)
C22	(0.02,0.02,0.07)	(0.02,0.02,0.05)	(0.02,0.02,0.02)
C23	(0.07,0.11,0.16)	(0.09,0.13,0.16)	(0.09,0.13,0.07)
C24	(0.11,0.16,0.20)	(0.09,0.13,0.16)	(0.13,0.16,0.11)
C25	(0.11,0.16,0.20)	(0.13,0.16,0.20)	(0.13,0.16,0.11)
C31	(0.06,0.08,0.1)	(0.08,0.1,0.13)	(0.03,0.06,0.08)
C32	(0.06,0.08,0.1)	(0.06,0.08,0.1)	(0.03,0.06,0.08)





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C33	(0.06,0.08,0.1)	(0.06,0.08,0.1)	(0.03,0.06,0.08)
C34	(0.03,0.06,0.08)	(0.03,0.06,0.08)	(0.06,0.08,0.1)
C35	(0.06,0.08,0.1)	(0.06,0.08,0.1)	(0.03,0.06,0.08)
C36	(0.08,0.1,0.13)	(0.08,0.1,0.13)	(0.08,0.1,0.13)
C37	(0.06,0.08,0.1)	(0.08,0.1,0.13)	(0.08,0.1,0.13)
C38	(0.06,0.08,0.1)	(0.01,0.01,0.03)	(0.01,0.03,0.06)

Table 6. Fuzzy Topsis Result

Teacher	d_i^+	d_i^-	CCi	Ranking
T1	16.68	2.43	0.8729	3
T2	16.46	2.02	0.8907	1
T3	16.75	2.37	0.8761	2





Knowledge, and Practice on Baking Soda Usage of People Living in the Mirabeh Vilage with an Environmental and Healthy Approach, Kermanshah, Iran

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ABSTRACT

In developing countries, the preparing of food with high quality as a social behavior importance has become a problem because of not well-educated people, making the risk of unhealthy food in different societies. A descriptive survey design was adopted. Face to face, sampling technique was used to select 97 women as respondents. Data collection was carried out using questionnaire, during two stages in this study (pretest and posttest). Descriptive statistics was used for data organization and simple percentages and frequency count was used for data analysis. The result at the beginning of study indicated that approximately 19% of household in this village using baking soda to prepare bread or Kebab. Observation from the responses shows that respondents' knowledge was not adequate; however, about 80% of household did not use baking soda for food preparation. Lastly, findings revealed that there was a proper change in people practice and 100% of the households relinquish their unhealthy behavior by not using of backing soda. In conclusion, this study showed that the knowledge, and practice of people need to assess, and it is necessary to train people in until change their behavior to positive form.

Key words: bread, food, soda, health effects, Mirabeh.



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INTRODUCTION

Bread, the most important products of wheat is the main food source for most countries, especially Iran (Sabeghi,2004). Despite major changes and variety of food, bread has first place in the food basket Iranians that supply 46.2% and 59.3% of energy for urban and rural people, respectively (Zozle et al.,2006). Wheat flour, water, salt and yeast (sourdough) are the main components of bread (Goftari et al.,2013). Leaven is cause of the dough processing. There is phytic acid in the wheat and flour naturally, which can be combined with iron and calcium and insoluble them in water that resulting unattainable by human body. The acid produced by fermentation of phytase enzyme can be deteriorated that make available the bread nutrients (Rangraz Jeddi et al.,2011). phytase enzyme only cab be produced when the sourdough is sufficient with enough time (Brune et al.,1992. Larsson and Sandberg,1991). However, by using baking soda the phytase enzyme cannot be produced, therefore the minerals in the bread is non-digested (Rangraz Jeddi et al.,2011). Leaven is single yeast that can change starches and sugars in the flour into carbon dioxide and alcohol, and breaking the long chains of starch, that digestion will be better and easier for bread in human digestive tract(Katina,2005) .Generated Carbon dioxide can produce porous texture and alcohol makes sponge form in bread (Rangraz Jeddi et al.,2011) . In addition, alcohol and acid from the fermentation process, with the elimination of pathogens causing quality for bread. PH coming down from acid production and create colloidal form gluten, the bread will be more lastin (Nayini and Markakis,1983). Unfortunately, despite the benefits of the very essence of leaven, research suggests that only 45-55% of bakeries used this material (Zozle et al.,2006), and the use of baking soda in bread is varied from 2-47% (Malakotian et al.,2005). Today a variety of reasons including boredom and lack of skilled workers, lack of awareness of health risks of Baking Soda (Hoseinpoor et al.,2003), to save time and expedite the processing of flour using illegal chemical additives such as sodium bicarbonate and Sodium Meta Bisulfite instead of yeast have increased (Zozle et al.,2006. Rajabzadeh, 2000). Sodium bicarbonate or baking soda, as a chemical material is used in industry (Hoseinpoor et al.,2003).Use baking soda to prepare bread is illegal and harmful because it decomposes on heating temperature and produce carbon dioxide. Use baking soda in cakes and bread can reduce the quality of bread and increase the bread waste (Rezakhah,2001. Jahed Khaniki et al.,2005). In addition, baking soda has effects on human health. Baking soda with neutralize stomach acid impairs digestion and absorption of minerals, especially bivalent elements that can cause gastroenteritis(Mohamadi,2003. Pasdard et al.,1999). Thereby reducing the acidity of the stomach, digestive disorders, epigastric pain, indigestion and delayed gastric emptying occurs.(Institute of standard and industrial research of Iran ,1999). Research Institute of Standards in Iran, in December 1991 under the provisions of Standard No. 2628, and the Ministry of Health in 10/3/2002 inhibited the using of the baking soda in the bread (Asemi et al.,2004) . The average consumption of bread in low-income families and rural communities is substantial purpose and many of the problems of malnutrition and iron deficiency can be solved by improving the quality of flour and bread. Therefore, the aim of our study is to determine the level of knowledge, and practice on baking soda usage of people living in the Mirabeh Village, Kermanshah, Iran during a intervention study.

MATERIALS AND METHODS

The study was conducted in Mirabeh Vilage, which is situated in the Kermanshah, iran. Data was collected using a structured pre tested questionnaire designed by the researchers, that 97 from 358 families (houshoold women) in this village have been selected for this study. Questionnaires were analyzed using excel computer software package version 20. The designed questionnaire had three sections; demographic questions , knowledge and practice questions. The effect of main vatiabale namely; age, income, family size and education on the knowledge and practice level have been investigated during to satges of this study.





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RESULTS

All of the respondents were females (100%). 20.61% of the respondents had diploma, 31.95% had primary education and 47.42% without education. The respondents' age has been mentioned in Table 1 that about 50% of them were in age more than 50 years old. More than 80% of respondents are in family with Moderate income (Table 1).

In the initial survey, questionnaires showed that 19 households (19.58%) of the 97 families living in the village of Mirabeh using baking soda in baking traditional bread and roast. From the 19 households, only 2 household apply baking soda in preparing food and other use it in baking bread (Table 2). Also, only 17 households (17.52%) of the total households in the village have information about baking soda and 3 families use baking soda(3.9%) for health care, such as cleaning bathrooms, toilet and so on (Table 2).

It should be noted that 19 households consuming baking soda on a monthly basis that use very small amount of baking soda in baking traditional bread and Kebab. However, those menthimed family have used baking soda in short duration but result show presence of some diseases such as enimia, gastritis and tooth deterioration which can be developed by malnutrition. In the second stage, and after 3 months of training, questionnaires were completed. The results showed that none of the households use baking soda for cooking and training has been quite successful.

DISCUSION AND CONCLUSION

Psatar et al. (1999) have been counducted a study on the amount of baking soda that come from bakers in Kermanshah. The results showed that more than 8 % of bakers using baking soda in their produced breads. Another study that has been carried out by Maghsoodi in 2003 show The mean elimination of baking soda in the range of 35.04% in 1382, and 46.96 % use soda. Positive results mean annual consumption of soda in Tehran is 60.78% (648 out of 1067 cases), which is three times more than the national average(Maghsoodi, 2003). in another study Asemi et al in 2004 investigated the level of non-consumption of bread in teredational breads(Lavash and Barbari) in the city of Kashan in terms of the use of baking soda according to the standard 2628, based on pH monitoring. The results showed that bakers used Baking soda in both mentioned bread9.82 % and 39.14 %, respectively (Asemi et al., 2004. Jahed Khaniki et al.,2005). According to this study, about 19 families (19.58%) of baking soda used in baking traditional braeds. The elderly women had lowest percentage of using soda. Although the kowlage of more residents of the village was minimal about harmful effects of soda but only few families used this chemical to prepare foods. According to studies made, perhaps one of the reason to apply baking soda in this villlage and same populations is lack of knowlage about effcts of this material that is key point to manage malnutrition. . In conclusion, this study showed that the knowledge, and practice of people need to assess, and it is necessary to train people in until change their behavior to positive form.

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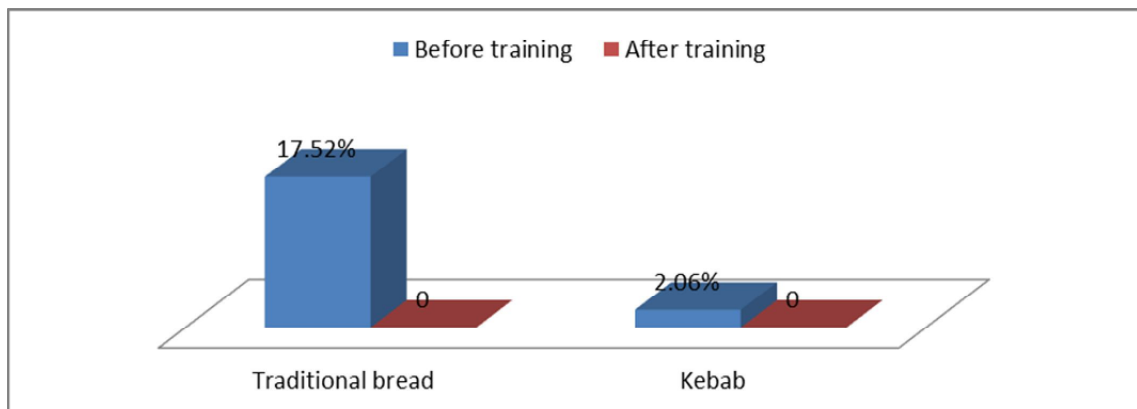


Figure 1: Applications of baking soda before and after training





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Table1: Questionnaire Demographic Information

Percentage	Number	Variable
		<u>Age</u>
21.64	21	20-35
27.83	27	35-50
50.51	49	>50
		<u>Education Level</u>
47.42	46	without education
31.95	31	primary education
20.61	20	Diploma
		<u>Income Level</u>
3.09	3	Low
88.65	86	Moderate
7.22	7	Good

Table 2: Percentage of households using baking soda in food before and after training

After training		Before training		Using baking soda in food
Percentage households	Number households	Percentage households	Number households	
0	0	17.52	17	Traditional bread
0	0	2.06	2	Kebab





AMM Heuristic Method to Constrain Renewable Resources Projects

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ABSTRACT

Constrain resources can have an important influence on the Scheduling of projects and increase the time of completing. These delays increase the indirect costs and total cost of the project. Renewable resources such as skilled labor and reliable, is less available to project managers and is a key challenge in project management. Thus, studying status of constrain resources project is very influential in the success of it. So far, several different ways to impose restrictions on the Scheduling of the project was presented that it also covers the methods of the old and new innovative approaches. The heuristic method AMM ((Ali Masihi Method) is applied for calculating the project schedule activities and the constrain sources in the network simultaneously. In this method, it is assumed that the required resources and activities within the available resources in the project are determined. Therefore, along with the estimated time schedule, the constrain resources are applied. Since the new method is an heuristic and graphical method freedom in a small number of projects after drawing power grid and column chart is used, will be determined. The results show for the optimal use of resources in parts of the network by changing the start time of an activity we can impose changes on the network and therefore decreased the time of performing project. Reducing the duration of project is the main demands of stakeholders and project management.

Key words: project scheduling, Resource constraints, CPM, heuristic approaches





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INTRODUCTION

After Gantt presented his own bar chart, a group of scientists in 1950 and a Group, led by Dr. John W. Mauchly invented CPM in 1957. This technique has always been used. Larkin J in his book reviews the network planning. Hoare HR present studies on the role of network analysis in project management and Martino RL presented project management control. The role of network and computing in successful project management Taylor WJ &. Walting and the role of CPM in the management structure O'Brine expressed in his book. Davis EW proposed the role of resource allocation in the project network. Muth & Thompson stated the laws of resource allocation priorities in their book and then Martino RL. proposed his degree six law. And Gordon J concluded that the latest date for the application of criteria to allocate resources is ways better than other relationships. Sabzeparvar states calculation of the allocation of resources in his book. Restrictions applied in series and in parallel were analyzed by Riner Kolish and according to the impact of the constraint resource of the project, project planning for constraint resource RCPSP is a major and effective concern. And in this regard extensive research is done on RCPSP and new methods were presented by Brucker and Herrolden stated the exact algorithm for multivariate RCPSP. A complete study of heuristic algorithms carried out by Kolisch and Hartmann. And Viana and Pinho proposed a multivariate analysis with a combination of melting optimization algorithm (SA) and (TS) Tabu search to reduce the negative effects of delay caused by constraint resource for designing project schedule. AL-Fawzan and Haouari suggested a time consuming method, but with reducing the side effects for unwanted conditions. To meet this goal, they used developed and intelligent program for modeling resource Constraint. Shadrokh and Kianfar presented genetic algorithm to solve the program of project scheduling called funding source. In this research project delay is permitted with respect to fines. Rabbani et.al stated a new method for RCPSP in random networks by integrating new methods and traditional resource management. Naber and kolish did not consider an activity resource as constant and applied as variable or cross-sectional in timing project schedule. In this paper, after CPM calculations, resource limitations are also applied, then, using innovative new method for simultaneous calculation of the time and resource constraints will be applied in the project. The differences between the two methods were quite tangible and more open horizon is visible as a result of resource limitations.

MATERIAL AND METHODS

With simultaneous application of limits and activity time valuable points can be achieved. Thus to solve the problem, the transposition and the number of resources needed for each activity as well as a sources in environmental projects must be considered. To compare this method with (The Parallel Scheduling Scheme) the mentioned method is presented.

The introduction of parameters

D_{ij}	activity time(ij)
ES_{ij}	The earliest start (ij)
EF_{ij}	The earliest finish (ij)
LS_{ij}	Latest start (ij)
LF_{ij}	Latest finish (ij)
T	Period of time calculated for restrictions source
T_t	End time of last activity
NEF_{ij}	New time of the earliest finish (ij)
TF_{ij}	Floatation of total activity (ij)
EAS	The total eligible activities
OSS	ordered and ready to start Total activity





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AMM calculation methods

To solve the problem from framework CPM network used within the changes therefore, we the new system rules must be used.

AMM network rules

-The networks are in forms of networks vectors, but the vectors have indicated scale and show over time work.

-When work first began later than the earliest ES start activity node or earlier than the latest EF end node activities, this period is shown by dotted.

-Parts of vectors which are dotted are not related to the activity time. Since dummy activities are displayed dotted they have no time.

-Vectors network diagram at the bottom of a column of the same timescale should be drawn so that the source used, respectively soon begin activities are arranged from bottom to top.

Explanations

-It is best to allocate resources to several activities that start in a same time period, short time activity be prior so that sources are discharged earlier.

-The new float (effective float) in this method is only for activities and this float may affect the following activities or time of overall project.

Thus, at the start of the network, activities that do not need Prerequisite will be considered as starting activity and if there is a source for all of them to the end it will be drawn according to the time and resource consumption will be displayed in time supply curve Otherwise the activity will start with shorter time with display source. After observing the primacy of activities, sources will be free due to their activity and the following activities will be started. In compliance with the rules a path will be drawn to the end.

Calculation of method (The Parallel Scheduling Scheme)

Estimate project duration:

The time is calculated using CPM in the way forward and the earliest time will be end of the last activity of the project. To calculate the total float of each activity and critical path, calculations are done through the following path. If $LF_{(ij)} = LF_{(ij)}$ is established, it is critical activities.

$$EF_{(jK)} = \text{MAX}\{EF_{(i1)}, EF_{(i2)}, \dots, EF_{(im)}\} + D_{(jK)}$$

$$Tt = EF_N$$

$$LF_{(ij)} = \text{MIN}\{EF_{(j1)} - D_{(j1)}, EF_{(j2)} - D_{(j2)}, \dots, EF_{(jm)} - D_{(jm)}\}$$

$$= \text{MIN}\{ES_{(j1)}, ES_{(j2)}, \dots, ES_{(jm)}\}$$





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Calculating time of project by considering the Constraint Sources of the project:

Constraint sources changes the time of execution and increase the run time so the number of available resource for the project, the duration of each activity, its prerequisite, LS of each activity and at the end the number needed resource for each activity from estimated parameters of constraint resource is like parallel programming method (The Parallel Scheduling Scheme). Assuming a project has N activity, completion time is calculated according to the following steps.

The first step LS is calculated for all activities and the first time is considered zero.

Step Two Set (EAS) or prerequisite activities that they performed at the T is formed.

Step Three According to (EAS), series (OSS) are formed based on LS ascending order and time of execution

Step Four available resources, respectively (OSS) with respect to the amount needed for each activity will be allocated to the activities and we plan the end time. And if all project activities were planned, we stop and otherwise, we can go forward the current planning time until smallest time of ending activity or activities that are planned in last stages. And the number of resources that have been released at T time will add to the existing resources.

$$D_{ij} - LF_{ij} = LS_{ij}$$

$$T = T_m$$

$$R = R + R_j$$

$$NEF_j = T + D_{ij}$$

$$T_t = NEF_{N \rightarrow}$$

Floating calculation of activities and critical activities in Conventional method on the basis of CPM calculations of each of the activity is as below:

$$EF_{ij} - LF_{ij} = TF_{ij}$$

RESULTS AND DISCUSION

Usually after applying limited project activities the position of the float is less considered and the floating range of activities make changes that reduce the project completion time. To view the difference between the two proposed methods we solve our problem by both ways.

AMM method

By using transposition, and resources required for activities and aforementioned rules Vector network with a column chart that represents the number of consumption resource per unit of time has been drawn and the start and finish activities time and consumer resource diagram during project is indicated. In the vector graph, some vectors are seen as dotted. In this part of dotted vectors if the bar graph in the range of corresponding there is free source to the size of consuming resource activity, and as mentioned above floating can be achieved too. But in this initiative because of being graphical one more thing is visible So that sometimes floating of two activities may be related to each other. And by changing floating (effective float) we can change other floating. Such a perspective on Activities will





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challenges project managers. In addition to better understanding of the limited resources in the project will increase their ability for floating to help finishing float activity.

Method (The Parallel Scheduling Scheme)

The first method using CPM temporal activities, such as the earliest, latest end time and LS for each activity can be calculated. With this information path and critical activities is also indicated. Then, using the LS activities and method (The Parallel Scheduling Scheme) the constraint sources are applied. In this way, the activity that their completion time is considered as a time period but the next activities won't start due to lack of resources or lack of prerequisite, has floatation. And can have floatation to the next start period when the source consumption of these activities is necessary. Activities that don't have such floatation are critical and delay in implementation causes delay in project.

Case Study

Consider 9 activity projects with the following characteristics
Constraint sources intended to solve the problem is 5 source per unit of time

Method (The Parallel Scheduling Scheme)

In the CPM without restrictions of resource constrain, these projects have a completion time of 44 units .
Applying Restrictions in accordance with the following steps for a maximum of 5 times in the project is done.
In this method project ends in 51 days. And floating activities are not shown.

AMM methods

According to the heuristic methods, activities 1 and 2 due to a lack of prerequisite and the total resource is 5 , they can start(Figure 2part 1). Further activities are carried out with regard to the resources required and the transposition activity. Activity that started earlier will be in lower source column (Figure 2part 2) and finally result in the following figures(Figure 2part 3).

As you can see, the Activity 3 of section 16 to 17 has one floating day and from 25 to 32 has 7 floating day. Point that can be seen with the help of heuristic methods is that with delay at beginning of activity 6 we can make floatation for activity 5, for example, activity 6 can be started on 23 and finished 31. Thus Activity 6 has 1 day floatation and activity 5 has 2 days floatation. Most noteworthy, as shown in the figure below If Activity 7 instead of 6 starts on day 17 it will be ended on day 28 and on day 21 activities 6 can start so that it will be finish on day 29 In this case, in addition to 1 day floatation of Activity 3 and 7, Activity 8 can start on day 29 and activity 9 can start on day 38 and finally will finish on day 48, while due to (The Parallel Scheduling Scheme) method time for ending project is 51 days.

CONCLUSION

Constraint Sources and has great impact on the completion of project scheduling. These Delays cause indirect costs and consequently whole project cost. This creates a challenge in managing the project. Thus, the status of the constraint Sources is very influential in the success of it. So far, several different ways are presented to impose restrictions on the scheduling of project's resources. But these methods because it did not display freedom limits, possibility of displacement cannot imagine. On the other hand the methods without restriction, present scheduling





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program and then the Constraint imposed on the project which is a time consuming action. In presented heuristic methods In addition to simultaneous computing of allocated resources activities are also visible and critical path and critical activities can be identified. The achievement of this research is a new definition is that with change we can effect on flotation activities. And at the end with this sometimes by changing the time of start we can reduce the overall project time. Because there is always constraint Sources in the project so calculating without taking into account the allocation of resources will exposure projects to high risk. heuristic approach helps project managers to identify critical or floatation activities.

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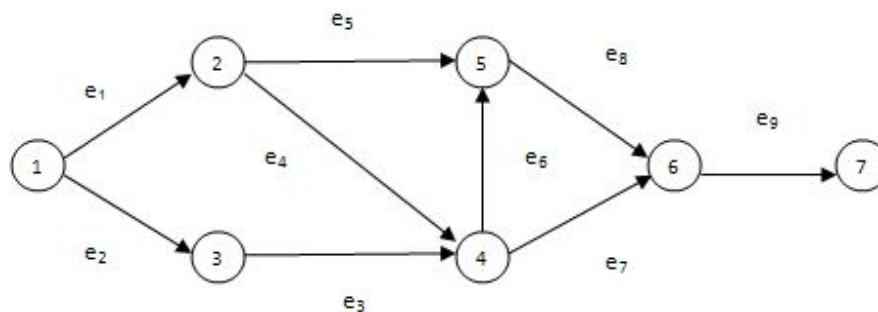


Figure 1 Project Network





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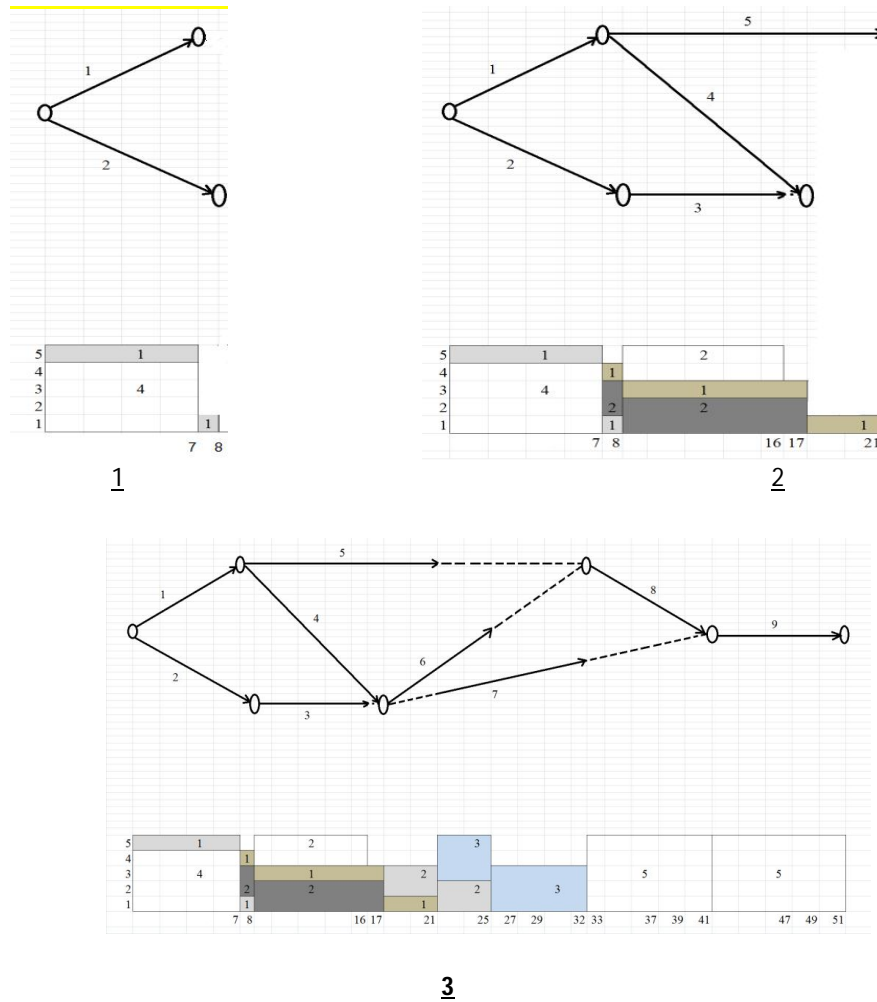


Figure 2 network and column resources charts in AMM method

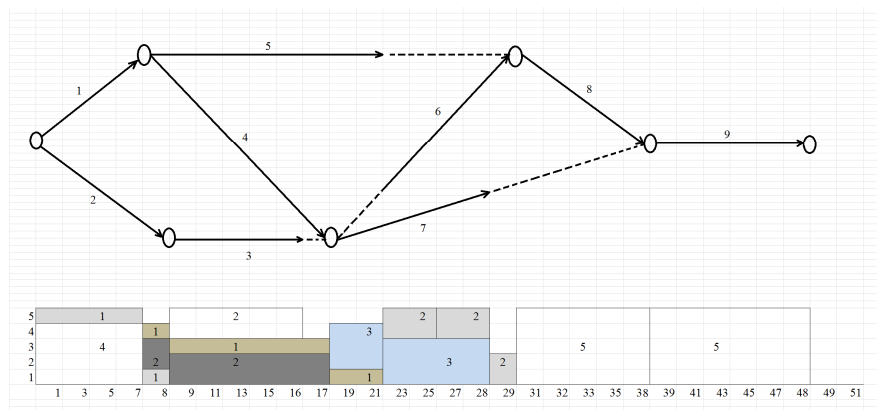


Figure 3 shows changes in the project and column charts resources in AMM method





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Table 1 Project Specification

1	2	3	4	5	6	7	8	9	activity
		2	1	1	3,4	3,4	5,6	7,8	perquisite
7	8	8	10	14	8	11	9	10	time
4	1	2	2	1	2	3	5	5	source

Table 2 Calculation by the Parallel Scheduling Scheme Method

R=2 T=8	R=4 T=7	R=5 T=0	
3	5 4	2 1	Task
9	21 7	1 0	LS
8	14 10	8 7	Duration
2	1 2	1 4	R
16	21 17	8 7	NEF
R=3 T=21	R=4 T=17	R=2 T=16	
7	7 6		Task
23	23 17		LS
11	11 8		Duration
3	3 2		R
32	25		NEF
R=5 T=41	R=5 T=32	R=2 T=25	
9	8	8	Task
34	25	25	LS
10	9	9	Duration
5	5	5	R
51	41		NEF





Optimization of the Multi-Mode Resource –Constrained Time -Cost Trade off Project Scheduling Problem by using Modified Genetic Algorithm

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ABSTRACT

Project cost is one of the most critical factors in a project decisions. So, its reduction will lead the project to more success in its environment and will encourage stakeholders to invest in project. The key for calculating project costs is the resources constraint, so that without considering that, any cost resulted from all kinds of calculation methods would be wrong and might cause project failure. In this paper, achieving the real cost of multimode projects was facilitated using modified genetic algorithm. In this algorithm basic information including some sorts of running methods and required time, cost and resource of each method, were considered as problem information and data by project managers and the cost resulted from effect of resources constraint would be achieved through taking into account the new and heuristic method in gaining ordinary time of project and engaging the resources constraint in running time. Another new issue that was considered in this paper is project sensitivity to existing number of a resource in project environment and given its change as problem input, different costs of project per different number of a resource could be assessed and eventually, it might help project manager in choosing optimum execution path.

Key words: Time cost trade-off, Meta heuristic Algorithms , Multi mode projects , resource constraint



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INTRODUCTION

The critical path time is an essential and determinant component in calculating project cost. Given having the time of activities running and their transposition relative to each other, project total time can be calculated using CPM method. Always, increase in project time causes increase in indirect and consequently total costs of a project. In optimizing time – cost (direct), reduction of one component often causes increase of the other. These cases are without considering the resources constraint in project running environment. As far as we know, while project resources are more limited or have fewer amounts its running time will be more, because sometimes resource shortage prevents activities from being carried out concurrently and this issue itself causes increase in total time and as a result, total cost of a project. In most of time-cost optimizing models, the relationship between increase and reduction of these two factors is considered as linear functions and the target is to complete project at desired time and with minimum possible cost. To solve this balance using linear functions, a number of studies were carried out (Elmaghraby and salem 1981), (Fulkerson 1961),(Goyal 1975),(Hindelang and muth 1979),(Kelly and walker 1961), (Siemenes 1971), (Tareghian and taheri 2005). However, in other models cost function is Address: No 68 ,St 17, Kianpars,Ahwaz,Iran. presented as descending function by (Falk and horowitz 1972). as ascending function by (Kapur 1973) and as successive activities cost function by (Moder et al 1983) or in reality, solution of time-cost balancing problem is exerted as DTCTP that was designed by (Prabudah et al 1995). DTCTP solutions are divided into two groups: precise and heuristic. The objective methods are based on dynamic programs such as researches of (Rabbinson 1975) and (Hindelang and Muth 1979), stage algorithms such as researches of (Patterson and Harvey 1979) and project network decomposition by (Demeulemeestre et al 1996). None of the precise solutions can solve major problems with so many activities. Indeed, DTCTP is known as a NP-hard problem (Dunne et al 1997). Of course, no any work with high efficiency was found for objective methods. There are some heuristic methods to solve DTCTP, which were discussed by (Bagherpour et al 2006), (Daisy 2005), (Feng et al 1997), (Azaron et al 2005 and 2007), (Jin and ji 2005), (Leu et al 2001), (Zheng et al 2004)and (Tailiu 2003). In addition, metaheuristic studies were carried out in this regard by considering quality and its inclusion in time-cost balancing by (Shahsavari Pour et al 2010). Given the influence of resources constraint on project, project planning for RCPSP resources constraint is an important and effective issue. In this regard, many studies were conducted on RCPSP and new approaches were introduced by (Brucker et al 1999). A precise algorithm for multi variable RCPSP was presented by (Herrolen et al 1998). A complete research was done using heuristic algorithms by (Kolish and Hartmann 1998). (Viana and Pinho 2000) presented a multi-variable approach by combining Simulated Annealing algorithm (SA) and Tabu Search (TS) to reduce the negative impact of time delay caused by resources constraint for scheduling problem design. (Al-Fawzan and Haouri 2005) presented a time-consuming method that reduced complications and disruptions for unwanted situations. To accomplish this target, they used a smart and developed program to model two-objective resources constraint. (Shadrokh and Kianfar 2007) presented a genetic algorithm to solve the project scheduling plan which was called "resource capital". In this research, project delay was allowed by measuring some penalties. (Rabbani et al 2005) introduced a new approach for RCPSP in stochastic networks via merging modern and traditional methods of resources management. RCPSP problem chromosomes (Mendes et al 2007)in GA are selected randomly and the program is formed based on priorities described in GA. (Alvarez - Valdes et al 2008) conducted some researches using stage techniques and some evolutionary algorithms, which act based on stochastic selection (GRASP) and communicative path of project program affected by a portion of renewable resources. (Damak et al 2009) considered the different running modes for each activity and reduction of the project time span for RCPSP. They designed an evolutionary algorithm to solve this problem. (Goncalves et al 2008) wrote a GA for multi model scheduling problem with resources constraint in which the problem chromosomes were chosen randomly. Scheduling was established based on an intuition that made a parametric active program using GA according to priorities, delay time and specified completion deadline. (Valls et al 2008) presented a heuristic GA for RCPSP. This algorithm introduced some changes in GA such as a specific reproduction for RCPSP, a local optimizer that acts for general program, a new method for selecting parents, who are to form families and a two-phase strategy in which second phase begins with selection of the best program of neighboring population in first phase. (Kazemi and Tavakoli 2011) presented a mathematical model using PSO to solve resources constraint planning problem in multi





model projects in which negative and positive financial flows were considered as well. No research was found for cost-time balancing by taking into account resources constraints for multi-mode projects. In this study, there are some modes for each activity, each of which includes time, cost and required resource special for that mode and all of them are integers. After calculating project running time for each selected running mode (using stochastic methods) given critical path and resources allocation (if needed in project), time and consequently, total cost of project was calculated. Using the path of modified genetic algorithm, a set of desired and appropriate answers was separated. Given the innovations in fields of (1) the new method (coding) for calculating total costs of project through critical path, (2) Calculating the effect of resources constraint on project cost and time, (3) analyzing project cost sensitivity to the number of existing resources; optimum answer or answers could be obtained faster with more accuracy.

In section 2, the problem description and the method for calculation of optimization components including cost, time and the effect of resources constraint on both of them; will be discussed. In next section, algorithm description, functioning mode of reproduction components and mutation, in addition to modifications of genetic algorithm and finally, objective function and used variables, will be described. Section 3 refers to problem solving and its general schematic and in next section a practical example is presented to make subjects more tangible.

Proposed Model

Problem definition

In order to solve the problem of project resources allocation, it is necessary to calculate the project total running time. The effect of this time on project cost is indirect and resources constraint will cause increase in project time and consequently in project cost. This increment already was obvious, but for multimode projects, calculation of the amount of project cost and time increase is more time consuming.

Formation of running methods or chromosomes

In such these researches, it is necessary to determine all of the project activities in data tables and then to note the activities' prerequisites and post-requisites. Given that project is multimode, the number of execution methods, required time, cost and resource of each mode of an activity, are supposed to be problem data.

For each activity, of all possible execution methods one is selected randomly. This is repeated for the other activities and hence, one chromosome with N genes is formed randomly in which N is the number of activities. Now, according to above method, random chromosomes are formed equal to the required population. Therefore, there are equal project execution methods to the number of selected population (stored as chromosomes), so that each chromosome has its own attributes in terms of required time, cost and resource for that activity.

Parameters

D ij	Activity Duration(ij)
ES ij	Earliest start of Activity (ij)
EF ij	Earliest final of Activity (ij)
LS ij	Latest start of Activity (ij)
LF ij	Latest final of Activity (ij)
T	Section time
Tt	Finish time of last activity
new EF ij	New earliest final of Activity (ij)
TF ij	Total flout of Activity (ij)





Cd	Direct cost of project or chromosome
Ci	Indirect cost of project or chromosome
Cid	Indirect cost of project per day
Cj	Direct cost of activity j
Ct	Total cost of project or chromosome
CN	Cost of chromosome N
C1	Cost of chromosome number 1 in cycle
S	Total cost of population
TN	Time of chromosome N
tj	Time of activity(j) that it can start and had not been done yet
RT	Free source of Section time
R	Free source before Section time
Rj	Source of activity (j)
F	Fitness function

Calculation of balancing components

Calculation of project time

The total time of project will be obtained by CPM method in the path ahead. Each chromosome has N activities or N genes, which each activity has transposition relative to the other, thus at first prerequisite activities of related row will be read for each activity. Given having or not having prerequisite, time calculation will be done in this way that the time for prerequisite activities is summed by activity time and among them, the greatest time will be recorded as that activity completion time: $EF_{(k)} = \text{Max}tim_{(j)}$ and for the first activity that has no prerequisite EF would be $Modtime$.

$$EF_{jk} = \text{MAX}\{EF_{ij}, EF_{iz}, \dots, EF_{im}\} + D_{jk}$$

Finally, $EF_{(N)}$ or the last activity is considered as project total time or $Cromtime = T_t$. This is a very fast method and one can go across this path in backward path given the post-requisite rows and consequently calculate critical path and activities' floatation such that in backward path, completion time of activities is stored in $MINTIM = LF$ array and hence, when $LF_{(j)} = EF_{(j)}$, that activity will be critical.

$$LF_{ij} = \text{MIN}\{EF_{ij_1} - D_{ij_1}, EF_{ij_2} - D_{ij_2}, \dots, EF_{ij_m} - D_{ij_m}\} = \text{MIN}\{ES_{ij_1}, ES_{ij_2}, \dots, ES_{ij_m}\}$$

Calculation of project time considering the resources constraints

The resource constraint causes change in an activity running time and increase in time of execution method. Therefore, existing number of resources for project, time of each activity, its prerequisites, LS of each activity and finally required number of resources for each activity are of the parameters for resources constraint calculation by the Parallel Scheduling Scheme. In this study, to find LS of each activity and use the critical path method and its running, at first, completion time of each activity $EF_{(j)} = \text{Max}tim_{(j)}$ is obtained and thereby calculation of $LS_{(j)}$ will be according to the following method.

$$LS_{ij} = LF_{ij} - D_{ij}$$





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In this method, at first activities of which prerequisites were done, are placed in one period of time (T) and activities are sorted according to ascending LS and if their LS is equal, they are placed according to ascending time in OSS. Then, the resource of the first activity is subtracted from all of existing resources. If the remaining resource is greater than required resource for next activity, this process will be iterated until the point in which existing number of resources became obsolete or no other activity remained in this period. Completion time of each activity equals with the time of that activity plus the period time.

$$\text{new EF}_N = D_N + T$$

Time of next period equals with the least completion time of activities, which are not selected so far and free resource of period equals with remaining resource from past state plus released resource in time T. Again in this state, activities of which prerequisites are done and no completion time is allotted are placed in EAS and again the past path will be passed, until all of activities complete. Therefore, completion time of the last path is considered as total time of the project.

$$T_t = T_{\text{time}} = \text{new EF}_N$$

The above operations could be summarized as follow

- Step 1: for all activities, LS is calculated and first period is considered zero.
- Step 2: EAS set or set of all activities of which prerequisites were done in period T, is formed.
- Step 3: according to EAS, OSS set is formed by ascending LS and activity running time.

Step 4: the existing resources are allocated to activities as far as possible by order of OSS and considering required amount of each activity and their completion time are planned. While, all of project activities are planned the process will be stopped, otherwise, the current planning time is advanced to the least completion time of activity or activities planned in past phases and the number of released resources in time T is added to the existing resources.

$$\begin{aligned} T &= \text{Minimum } t_j \\ R_T &= R + R_j \\ T_t &= \text{new EF}_N \end{aligned}$$

Calculation of project cost

Project cost is defined as the sum of direct and indirect costs.

Direct cost

$$C_j = \sum_{j=1}^N C_d =$$

Indirect cost:





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In the state of resources constraint, instead of project total time from CPM method, the time resulting from affecting resource constraint is placed in equation.

$$C_i = T_t * C_{id}$$

At last, project cost will be equal to:

$$C_t = C_d + C_i$$

The manner of effect of resource constraint on running time and project cost are determined as such.

Description of problem solving algorithm

To solve time-cost problem considering resources constraint in a multimode project, constraint and calculations must be exerted on a large number of project running methods. If the number of activities is n and the number of modes is K , total number of execution methods will be k^n , which solving such this problem and obtaining best answer of time will be too time-consuming. Using evolutionary algorithm to reduce calculations time and increase the speed of optimizing, is of the best choices.

Evolutionary algorithms such as genetic algorithm are desired methods to find the best paths of completing a project with a large number of running paths. The base of genetic algorithm is to modify one generation relative to previous generation through considering cross over and mutation and setting Roulette Wheel to select optimum answers. This general cycle is iterated as far as total answer being one of the best possible answers.

Modified genetic algorithm

In this paper, a new modified algorithm was used to achieve optimum answer faster. In this algorithm, using race modification total answers were optimizes as well as larger convergence speed.

Initialization

As said before, chromosomes or execution methods are generated in binary form with equal number to required population. These chromosomes have genes each of which has its own attributes in terms of time, cost and required resource. So, these chromosomes will contain the following information:

A series of execution modes that is one of possible methods

Each gene has its own time

Each gene has its required resource

Each gene has its own cost

Each chromosome has a scheduling scheme and its own completion without resource constraint

Has completion time considering the effect of resource constraint





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Model Information

Number of genes or task		N
Population	P	
Generation	G	
Cross over rate	CR	
Mutation rate	MR ₁	
Race modified number	SN ₁	
MR	Mutation rate in cycle	
SN	current race modified number in cycle	
g	current generation in cycle	
int ()	Integer of ()	

Crossover

Whenever a number between (0, 1) is smaller than CR, two dissimilar chromosome are selected randomly from initial population and at beginning a random number between (1, N) is selected. Then genes prior to the random number are replaced in two chromosomes. Next, another random non-repeated number is selected less than N and subsequent genes of these two chromosomes are replaced.

Mutation

For two random non-repeated point of chromosome, two other random nodes are selected

In order to decrease the effect of mutation and chaos at final stages, the corresponding coefficient will be decreased as follows:

$$MR = MR_1 - 1.15(g * MR_1 / G)$$

In this manner, race modification is performed on initial chromosomes as such that initial set is sorted in ascending order according to cost and some of them (problem data) are selected as initial members of population and the remaining population are selected randomly from initial population and all of these new members are located instead of initial population. To reduce the effect of this action on final rounds modified number is reduced as follows.

$$SN = SN_1 - \text{int}(g * SN_1 / G)$$





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Compelling mutation

Sometimes, the existing resource in project environment is less than required resource in one mode of an activity. In these occasions, another mode of this activity could be placed in chromosome randomly to overcome this drawback. This will generate a compelling mutation in the path that might cause more chaos and better answers. Of course, this should be done before calculation of activities LS.

Roulette wheel and objective function

Using Roulette wheel (and considering the fitness function), answers by less time and cost are confronting with more chance of selection, since they assign more range in cycle to themselves and are located in a new generation with population equal with initial population.

$$S = \sum_{N=1}^K C_N$$

$$F = \sum_{N=1}^K (S - (\text{int}(C_N - 0.9 * C_1)^2) + (3 T_N)^2) / S$$

Problem solving

Method of problem solving

The output of chromosomes from race modification, crossing over and mutation are put in a set by k members and for each chromosome, a total time and total cost are calculated as follows:

Existing resource is compared with required resource and if necessary, mutation takes place

LS of chromosomes activities are calculated from critical method

Resources constraint is exerted on chromosomes and total time is achieved

Using total time, indirect cost will be calculated

Total cost is calculated considering direct and indirect costs

Optimum answers are selected using Roulette wheel (considering fitness function) and are located in a new generation by a number equal with initial population

After passing G stages, the output of algorithm will be the best answers of this problem.

Cycle and schematics of algorithm

Figure1. Figure 2.



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For example, a project with 9 activities in figure4 and characteristics of activities in table1 is showed. Each activity has located its corresponding characteristics below. This problem has 1.500.000 execution methods. Its code is written in Excel environment with VBA (Visual Basic Application). In order to reach the optimum answer, a modified genetic algorithm with two crossover and two mutation points was used.

The program was run using a Pentium4 computer with CPU 3.6 GH and with the following running specifications of algorithm.

The time for time-cost exchange is 70 seconds and optimum answer is

The time for time-cost exchange considering resources constraint is 170 sec and answer per different resources is

Table 4 gives complete information about the effect of resource constraint on project cost and time.

As can be observed in table 4 and above diagrams, project has three modes considering given resources. The first segment is as a uniform line in time and cost and it reveals that resources constraint has no effect on time and cost. In next segment, the ascending slope of time and cost is moderate and effect of constraint on these two factors is not yet critical. And in last segment, ascending slope of time and cost is intense and the project success is at stake.

CONCLUSIONS

To achieve a correct and optimal execution method in multimode projects, constraint plays an important role as well as time and cost. Usually, project are assumed without resource constraint, while this in not true really and constraint has a significant influence on cost and time of a project. The following mentioned results in this paper will help project managers in multimode projects to have a better understanding of project and its optimal execution methods.

In this study, for each method, one mode was considered and each mode has its own specifications. Problem solving method is planned in such way that the output result determines that which modes are the best and least cost execution methods.

The method of obtaining total time of a project through critical path considering new innovated method of CPM implementation, improved the speed of obtaining total time of project, so that this program attains its target with far less time in comparison with previous similar programs.

At last, since this program has ability to run with different constraints of resources and resulted answers are of the best answers, analysis and assessment of project sensitivity to resources constraint can be done in that manner. These sets of information inform stakeholders of a project as well as its managers about the critical zone of a project resource constraint and made decision-making with more foresight.

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Figure1. Sample of changing in crossover

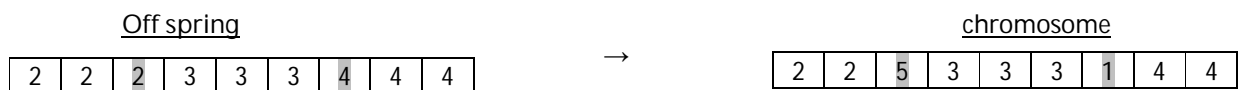


Figure 2. Sample of changing in mutation





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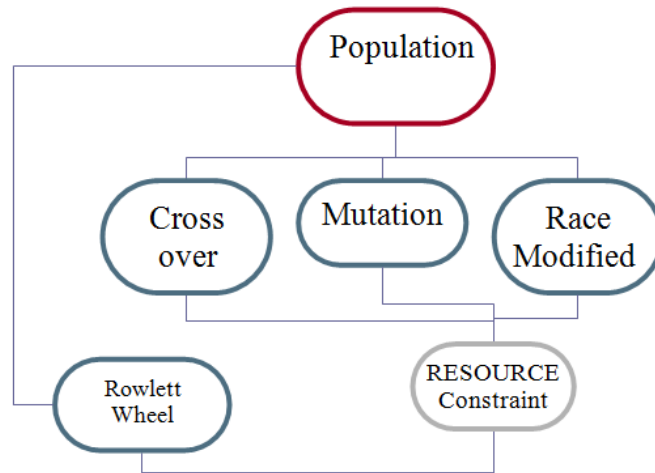


Figure 3. Cycle of algorithm

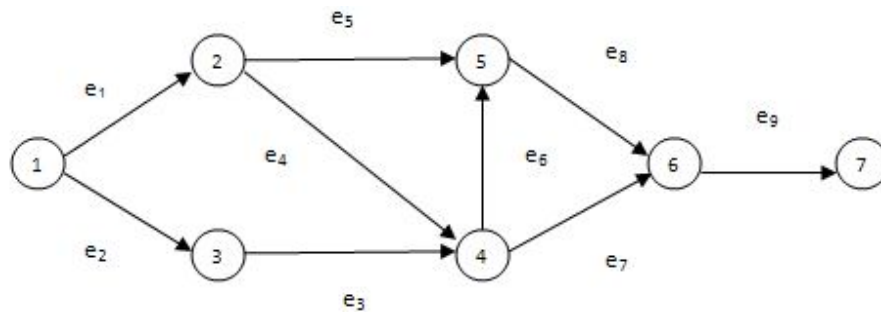


Figure 4. Project network

Project time

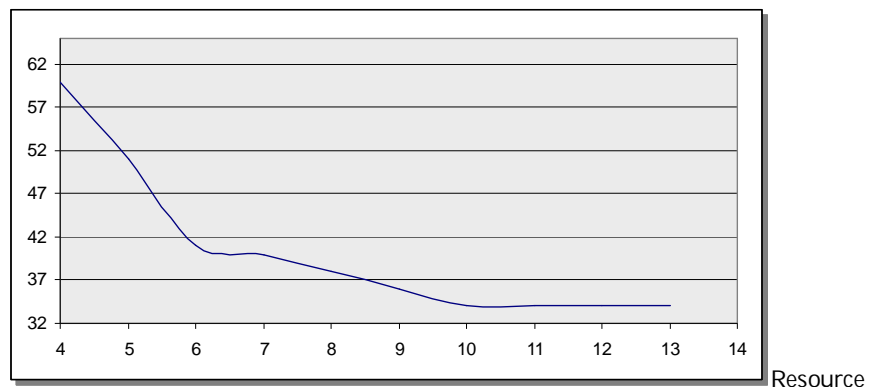


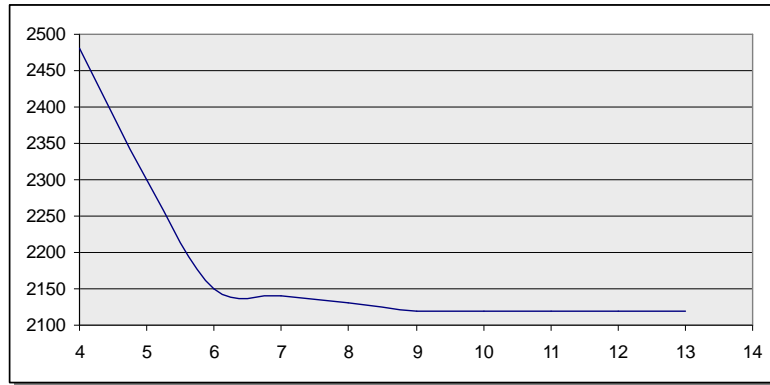
Figure 5. Graf of time and resource





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Project cost



Resource

Figure 6. Graf of cost and resource

Table 1. The example document

Task	1	2	3	4	5	6	7	8	9
Pre requisites			2	1	1	3,4	3,4	5,6	7,8
Post requisites	4,5	3	6,7	6,7	8	8	9	9	
Execution mod	5	5	5	5	6	5	4	5	4
Mod time 1	7	8	8	10	14	8	11	11	11
Mod time 2	6	7	7	9	13	7	10	10	10
Mod time 3	5	6	6	8	12	6	9	9	9
Mod time 4	4	5	5	7	11	5	8	8	8
Mod time 5	3	4	4	6	10	4		7	
Mod time 6					9				
Mod cost 1	160	140	110	100	160	130	150	140	150
Mod cost 2	180	150	120	130	170	140	180	150	170
Mod cost 3	190	170	140	140	180	150	190	160	180
Mod cost 4	200	180	150	150	200	170	200	170	200
Mod cost 5	230	200	170	165	220	190		265	
Mod cost 6					240				
Mod source 1	4	1	2	2	1	2	3	3	4
Mod source 2	5	2	3	3	2	3	4	4	5
Mod source 3	6	3	4	4	3	4	5	5	6
Mod source 4	7	4	5	5	4	5	6	6	7
Mod source 5	8	5	6	6	5	6		7	
Mod source 6					6				





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Table 2. Algorithm Information

Resource constrain	R	source
First race modified Number	Sn	20
Population	p	100
Over head per day	Over head	20
Cross over rate	CR	0.7
Mutation rate	MR	0.15
Generation	GA	120

Table 3. The time-cost algorithm answer

T time	Cost	Chromosome
34	2120	4,2,2,1,1,5,1,4,4

Table 4. The answers of algorithm by using variable resource constrain

resource	T time	Cost	Chromosome
4	60	2480	1,2,1,1,1,3,1,2,1
5	51	2300	1,1,1,1,1,1,1,2,2
6	41	2150	2,1,1,1,1,4,1,1,3
7	40	2140	2,1,1,1,1,3,13,4
8	38	2130	3,2,1,1,1,3,1,3,4
9	36	2120	4,2,2,1,1,5,1,4,4
10	34	2120	4,2,2,1,1,5,1,4,4
11	34	2120	4,2,2,1,1,5,1,4,4
12	34	2120	4,2,2,1,1,5,1,4,4
13	34	2120	4,2,2,1,1,5,1,4,4





Maximum Entropy Habitat Suitability and Distribution Modelling of Persian Gazelle (*Gazella subgutturosa*)

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ABSTRACT

One of the most suitable habitats for species of Persian gazelle (*G. subgutturosa*) is National Park Bamoo. This species has been removed from some suitable habitats by human threats and conflicts; and populations of this species are limited in some areas. Predictive models of species distribution can predict the distribution of species in their habitats and be used for purposes of conservation and management. Maximum entropy method is used for modeling of habitat the Gazelle by the maxent software. The points of species present were as the dependent variable and the predator, vegetation, altitude, distance from trough, topography, aspect; slope and soil were used as independent variables. Jackknife analysis revealed that all variables in the model are contributing to different degrees. The variables, vegetation, distance from trough and predator, had the highest impact on the determination of the potential Gazelle's habitats and the least impact related to buildings and roads. So that the most suitable habitat was located on the response curves by the vegetation 10 to 20%, a distance of about 2500 meters from trough also optimal distance of Leopard and hyena predator' s was about 5000 meters the potential habitat of Gazelle, with classes the slope of 0 to 10% and the maximum altitude of 1700 m. The accuracy of model prediction for gazelle habitat of training and test data were 0.993 and 0.992 (AUC), than random (AUC =





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0.5). Logistic minimum and maximum threshold of training and test data were 5.8 and 0.390 respectively. Map of suitable habitats, Map produced by threshold of sensitivity and specializing the training data, showed suitable habitat in the areas which was recorded in most of Gazelle presence. The patches of habitat and limiting the gazelle were caused by human activity such as roads and buildings in the past.

Key words: Habitat suitability modeling, maxEnt, maximum Entropy, National Park Bamoo, Persian gazelle

INTRODUCTION

The Earth is currently undergoing a catastrophic loss of biodiversity (Lawton and May, 1995). An unknown but large number of species are already extinct while many others are at risk (Pimm and Raven, 2000; Primack, 2008). The fragmentation of a habitat into discontinuous patches negatively affects population recruitment (Robinson et al., 1995; Smith and Hellmann, 2002), survival (Harris, 1984) and movement (Shirley, 2006) of terrestrial animal species. In poorly connected landscapes, where individuals have to move across the matrix to reach adequate pieces of habitat for different purposes (i.e. foraging, reproduction, dispersion and predator avoidance) becomes higher than in continuous landscapes. This fact consequently influences the dynamics, spatial structure and persistence of populations (Turchin, 1991). The importance of fragmentation for species may change through time, for example, individual movements reflecting variations in resource availability (Blake and Loiselle, 1991). Modelling species distribution offers a major approach to identify the key environmental factors determining both current and future spatial patterns of occurrence. Besides exploring basic ecological questions (Guisan and Zimmermann., 2000) such models also have practical applications to nature management, such as detecting new populations of threatened species (e.g. Rebelo and Jones., 2010), providing support to species conservation or reserve planning (Carvalho et al., 2010; Doko et al., 2011), identifying gaps in geographic distribution and assessing the degree of protection coverage granted by nature reserves (Doko et al., 2011; Domiguez-Vega et al., 2012). Therefore, models can be successfully employed to establish new protected areas, ecological corridors or to assess the effects of changes in land management (Sowa et al., 2007). Some of the more recent modelling approaches are based on presence data only, they are vital to complement the information obtained by local studies in the large-scale, for regional scale management of biodiversity, such models have been used to detect core regions of geographic distribution, recognize or plan continuous corridors or stepping-stone interconnections (Baum et al., 2004; Drag et al. 2011). The species' realized niche may be smaller than its fundamental niche, due to human influence, biotic interactions (e.g., inter-specific competition, predation), or geographic barriers that have hindered dispersal and colonization; such factors may prevent the species from inhabiting (or even encountering) conditions encompassing its full ecological potential (Pulliam, 2000; Anderson and Martínez-Meyer, 2004). Certain biological characteristics expose species to greater risk of extinction. For Instance, the risk of extinction could be higher in species that are characterized by a small population size (Mace and Kershaw., 1997), small geographical range sizes (Manne et al.,1999), and in those species that are also categorized as trade species, which inhabit an area with a high human activity rate (Hawkins et al.,2000). Therefore, any species that display these characteristics should be more sensitive to habitat change and more vulnerable to extinction. Based on several previous studies, the goitered *G. subgutturosa* (*Gazella subgutturosa*) could be considered to be at risk of extinction since it possesses most of the high risk factors in its list of biological attributes. *G. subgutturosas*, being small ungulates, are selective in their food habits (Bell,1971., Whittaker, 2005., Bagherirad et al.,2014). The earlier dispersal rate of the goitered *G. subgutturosa* was about 450-700 km, and *G. subgutturosas* migrated over long distances to find pastures and water, especially during the summer time (Bell, 1971, Clark et al., 2006). However, to date, this distance has decreased to 50-60 km because of the low population size of the *G. subgutturosa* herds (Baskin and Danell, 2003), habitat changes, and fragmentation (Kingswood and Blank., 1996). Most people are interested to live catch new born *G. subgutturosas* and local people often keep them as pets. Moreover, the goitered *G. subgutturosa* is most threatened by habitat loss and fragmentation (Mallonand Kingswood., 2001. Clark et al., 2006). Authors have observed differences in the environmental characteristics of sites



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with and without predation (Jackson et al., 1996), and this may be an indicator of conditions inherent to the sites that influence on the risk (Stahl et al., 2002). Among the proposed environmental variables that may be related with the frequency of attacks are the vegetation type (Rosas- Rosas et al., 2010), altitude (Lui et al., 2006), topography (Stahl et al., 2002; Michalski et al., 2006; Kissling et al., 2009), density of wild prey (Treves et al., 2004; Bagchi and Mishra, 2006; Kolowski and Holekamp, 2006), distance to protected areas, human settlements, roads, and water sources (Lui et al., 2006; Van et al., 2007; Gusset et al., 2009; Rosas-Rosas et al., 2010). Maximum entropy (Maxent) model (Phillips et al., 2004) is a species distribution model (SDM) originating from the statistical mechanics (Jaynes, 1957). It is a general purpose environmental model for predicting the potential distribution of species. The method has several advantages; it requires only species presence (or occurrence) data and environmental information (Elith et al., 2011). Presence-only modeling methods simply require a set of known occurrences together with predictor variables such as topography, soil, biogeography etc. (Phillips and Dudik, 2008). The objectives of this study are to: (1) using the Maximum Entropy Modelling (Max- Ent) to determine the potential and current distribution of *G. s. subgutturosa*; (2) determining the most important habitat features for predicting the presence of *G. s. subgutturosa* and, (3) comparing the predicted distribution with the current system of protected natural areas in National Park Bamoo.

MATERIALS AND METHODS

Study area

Bamoo National Park is located in the northeast of Shiraz city (Fars province) in southwestern Iran and between eastern longitudes of 52° 29' and 52° 56' and northern latitudes of 29° 39' and 29° 50'. The area has a range of about 46,913 hectares (Figure 1). The park's highest point, mountaintop Bamoo is 2700 m above sea level and minimum height is 1700 meters. The climate is cold semi-arid with winter precipitation. Average annual precipitation and temperature is 392.9 mm and 17.9 ° C in the reagent stations (Shiraz). The northwest and west winds are dominant. Plant communities of. Figure 1.

Bamoo National Park with an area of about 100,000 hectares in 1962 was declared as the exclusion zone and gradually decreased of its area. In 1967 the name was changed to protected area and in 1970 was named Wildlife Park and then National Park. Bamoo Wildlife National Park includes 32 mammal species. *Vulpes cana*, *Panthera pardus saxicolor*, *Hyaena hyaned*, *Felis chus*, *Gazella subgutturosa*, *Capra aegagrus*, *Ovis orientalis* are 5 species of mammals that park has been introduced as indicator species. As well as two species of *Panthera pardus saxicolor* (leopard) and *Hyaena hyaena* (Striped hyaena) are the predator species. Persian *G. subgutturosa* (*Gazella subgutturosa*) is the largest grass-fed steppe plains in Iran, as well as in most areas of the plain has been scattered abundantly in the past. The population of this species declined rapidly in recent years, so that of category near threatened in 2003 was placed into the category of vulnerable by classification 2006 IUCN. Persian *G. subgutturosa* is present in 15 protected areas of Iran. Bamoo National Park is a mountainous region, therefore, it is not a suitable habitat for *Gazella subgutturosa* however, and significant population of *G. subgutturosas* can be seen on the plains. This is due to various environmental landscapes. The main *Gazella subgutturosa*'s habitat is Chah mahakei tang region. *G. subgutturosas* are mainly eating grass family plants. The distribution of *Gazella subgutturosa* in the Bamoo national park has been shown by the map (Figure 2).

Occurrence data collection

A total of 30 records for the *G. subgutturosas* species were collected from field visit in the National Park Bamoo. A Global Positioning System (GPS, Garmin 12) was used to determine the coordinates for all collections in the field. After maintaining one record 100m² cell; as Maxent automatically removed duplicates; we had 30 unique records for *G. subgutturosa*.





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Variables

An important step in formulating the ecological model (MAXENT) is using a set of suitable features, such as environmental factors limiting the geographical distribution of species, and also the limiting attribute of the probability distribution of the used species. Attribute types include: Linear, quadratic, hinge, product and threshold (Phillips et al., 2004). The data of the present species and habitat layers were used for analysis. Randomly 70% of the data of species' presence assigned for the training data and the remaining 30% for the test. In order to use the maximum entropy model for modeling *G. subgutturosa* habitat, a list of all probable variables affecting the *G. subgutturosa* habitat preference in the study area were initially prepared. Some of the most important factors are: elevation, slope, aspect, and distance to the village, vegetation types, trough, and water resource. Map of elevation, slope and aspect were drawn using a digital elevation model (DEM), these variables were used continuously. Human Development: These variables include roads and Buildings. Basic data and layers prepared by field works or of the relevant organizations. Digital maps were converted to the raster with the specified size of cell. In the next step the variables of the Bio-geographic were extracted of them.

The bio-geographical variables can be divided into two general categories: The habitat variables (variables absorbing species) and disturbance variables (derived from human development).

Disturbance variables (human development) were used just of the topographic distance function.

In the raster produced by this function, each cell value is equal to the geometric distance to the nearest source cell (human development) with respect to the slope and height.

Predictive modeling

We used the maximum entropy model (Maxent version 3.3.3; Phillips et al., 2006; <http://www.cs.princeton.edu/wschapire/maxent/>) because it performs better with small sample sizes relative to other modeling methods (Elith et al., 2006; Pearson et al., 2007; Kumar and Stohlgren, 2009). Maxent (Phillips et al., 2006) uses presence-only data to predict the distribution of a species based on the theory of maximum entropy. The program attempts to estimate a probability distribution of species occurrence that is closest to uniform while still subject to environmental constraints (Elith et al., 2011). Maxent automatically includes variable interactions and can handle continuous and categorical predictor variables. It uses a set of features (e.g., linear, quadratic, product, threshold and hinge) that are functions of environmental variables that constrain the geographic distribution of a species. It also uses a regularization parameter, which is determined empirically, to control model over fitting. Maxent generates an estimate of habitat suitability for the species that varies from 0 (lowest suitability) to 1 (highest suitability). Finally, Maxent generates response curves for each predictor variable and has a jackknife option that estimates the relative influence of individual predictors.

Maxent is a general-purpose method for making predictions or inferences from incomplete information. Its origins lie in statistical mechanics (Jaynes, 1957). When approximating an unknown probability distribution, the question arises, the best approach is to ensure that the approximation satisfies any constraints on the unknown distribution that we are aware of, and that subject to those constraints, the distribution should have maximum entropy (Jaynes, 1957). This is known as the maximum-entropy principle. For our purposes, the unknown probability distribution, which we denote π , is over a finite set X , (which we will later interpret as the set of pixels in the study area). We refer to the individual elements of x as points the species present. The distribution π assigns a non-negative probability $\pi(x)$ to each point x , and these probabilities sum to 1. Our approximation of π is also a probability distribution, and we denote it $\hat{\pi}$. The entropy of $\hat{\pi}$ is defined as.





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$$H(\pi) = - \sum_{x \in X} \pi(x) \ln \pi(x)$$

The model for a species can be built by a number of environmental layers along with layer of points the species present. And suitability of each cell in the habitat will be displayed as a function of environmental variables. High value of each cell shows the suitable conditions for the species. In model of MAXENT, using the points the species present (X_1 to X_m) and limited geographical space of X unknown probability distribution π is calculated. Entropy of π is defined as follows:

Ln: Natural logarithm

X: Set of pixels in the region

X: points the species present

We used 10-fold cross-validation for testing the model performance. We ran 5 replicates for species. We used the jackknife procedure and percent variable contributions to estimate the relative influence of different predictor variables. The Area under the ROC (receiver operating characteristic) curve (AUC) was used to evaluate model performance. AUC is a measure of model performance and varies from 0 to 1 (Fielding and Bell, 1997). An AUC value of 0.50 indicates that model did not perform better than random whereas a value of 1.0 indicates perfect discrimination (Swets, 1988); Maxent calculates AUC value slightly differently (see Phillips et al., 2006).

Current 15 bio- geography variables were not reduced to fewer variables for species after examining cross-correlations among them to account for multicollinearity. We used $r \leq \pm 0.80$ (Pearson correlation coefficient) as a cut-off threshold to determine the exclusion of highly correlated variables. The reduced number of predictor variables for *G. subgutturosa* was zero, (Table 1). Using Maxent-generated response curves, we also examined relationships between the habitat suitability for a species. To convert from the continuous suitability index maps to binary habitat and no habitat maps, a probability threshold is needed to determine potential changes in habitat for species. The choice of a threshold value is critical because model results and outputs vary based on the applied threshold. We used "10th percentile training presence threshold" to define habitat and non-habitat (or unsuitable areas) *G. subgutturosa* species.

Correlation between layers

The correlation between the variables can lead to the statistically skewed and inaccurate predictions (Carnes, 2011) so were calculated before the implementation of the analysis of the correlation between environmental variables. Variables with a high correlation (greater than 75%) were removed of the analysis.

Predictor variable importance

In order to evaluate the importance of each environmental predictor variable, the jackknife operation was used. Jackknife sequentially excludes one environmental variable from the analysis and runs the model using the rest of the variables. Once again, the model would be run separately using the excluded variable only. Therefore, the share of each environmental variable on the total gain of the model (containing all of variables) can be calculated. In the next step, two variables can be selected as the most important ones: The one which reduces the total gain of the model more than all the other variables when omitted and the other one which shared the maximum gain when employed alone (Negga, 2007).



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RESULTS

In this paper the main results consist of species distribution maps, importance of predictor variables, and model evaluation within the Maxent model.

Predictor variable importance

Jackknife analyses was carried out for individual predictor importance in the development of the full model in relation to the overall model quality or the 'total gain' (grid bar) at 1×1 km. Jackknife analyses revealed that vegetation, distance to trough, leopard predator, geology and Hyena predator were the five most effective predictors when used in isolation in the habitat suitability of *G. subgutturosa* (Fig. 3); buildings and roads made only small contributions towards model development. The predictors decreased the training gain the most when omitted. Other parameters have low gain when used in isolation.

Response curves

There is a response curve for each of the environmental variables used in the Maxent model. These response curves represent relationships of environmental variables and the distribution of the species' suitable habitat (Fig.4). vegetation, distance to trough, leopard predator, geology and Hyena predator were the main variables influencing potential *G. subgutturosa* habitat.

The response curves associated with these factors show that there may be environmental thresholds for the ideal presence of species *G. subgutturosa*. Based on response curves (Fig. 4) considering vegetation, habitat suitability of *G. subgutturosa* was highest around 10–12. Increase in the distance of trough caused a reduction in the presence of species. The higher species' presence was found in the distance between 0 and 5000 meters from trough. The optimum distance of leopard predator and Hyena predator is about 5000m. Comparison of the effect of slope on *G. subgutturosa* distribution graph was done based on habitat suitability and the slope. The presence of species declined due to increasing the slope region so that the best slope was 0 to 10 % for habitat suitability of *G. subgutturosa*. The species' presence and habitat suitability increased with increasing the height above sea level so that the most habitat suitability was observed in an altitude of about 1700 meters. And also presence of species decreased with increasing altitude up to 2000 m. So that at altitudes over 2000 m of the presence of species was unlikely.

Predicted geographical distribution

ROC curve (Fig.5) shows the average specialization and marginality for *G. subgutturosa*, it compares the number of points correctly diagnosed for the presence and absence of species. Changes range is between one and zero, being closer to 1 and the top of the waiting line indicates a better model of random. That is correctly predicted the presence or absence of species. The area under the curve (AUC) for the training data was 0.993 (the model accuracy for prediction of *G. subgutturosa* habitat) and for test data was 0.992, which means that the model prediction is higher than chance (AUC = 0.5). Furthermore, the binomial test of omission was less than 0.0001 indicating the model estimations were significantly better than random predictions. Graph (Figure 6) shows the number of presence points which mistakenly been diagnosed with absence, it has led to be below the normal line and displayed based on the absence data.

The minimum training presence logistic threshold and maximum test sensitivity plus specificity logistic threshold values were 5.8 and 0.390.





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Species distribution maps

The species distribution map (Fig 7) of the *G. subgutturosa* was derived using training sensitivity and specificity threshold ($G. subgutturosa = 0.278$). So that habitat suitability of the Ghazal generated by Maxent showed the areas with the best predicted conditions for *G. subgutturosa*. This map has a value in the range 0 to 1. This map was obtained of the used variables and the presence of the species and the most habitat suitability was found in areas the value 1 and close to it. Also a wide area was unsuitable for *G. subgutturosa*'s habitat. The extent of suitable and optimal habitats were 273 and 164 km², respectively.

DISCUSSION

In this study, the habitat of the Persian gazelle (*Gazella subgutturosa*) assessed by Maximum entropy method in the National Park Bamoo. This method is used especially when the information of absence, for reasons such as the ability of the species in camouflage and high dispersion is not trusted in addition; there is the issue of time and budget available. Since in this study, samples were collected in the time and place of specific sections, the absence may be not accurate consequently, the analysis of this model over other models are predictive. The area is very broad and impassable in some areas, so it is not recommended to use the models of presence and absence, on this basis, due to the unavailability of species, presence models were used preferably.

According to the results of the Jackknife analysis (Figure 3) all variables contributed in the model output to varying degrees, so that most of the contribution allotted to the variables of the vegetation, distance to trough, leopard prey-eating, geology and hyena prey-eating. The variables, including distance to roads and buildings and geographic aspect caused the least of the contribution in the selection of gazelle habitat. Roads and buildings caused habitat fragmentation and create patches of habitat in the past. These patches are located in areas with good vegetation and appropriate distribution of trough, low slope and flat which is surrounded by the mountain ranges. This mountain range is the habitat of predator, the leopard and hyena. Habitat destruction is the greatest threat to biodiversity in the world which fragmentation of large habitats occurs as a result of it (Maki et al., 2012). The roads have been identified as one of the most important factors of habitat fragmentation (Geneletti., 2003; McGarigal, 2001., Underhill, 2002). Due to the effects on wildlife corridors, they are preventing movement between the two separated regions (Eigenbrod et al., 2008). Species that cannot cross the road are limited to very small patches, this makes the size of population and the probability of their survival reduction; it also increases the margin habitats that facilitate the entry of invasive species (Gelbard and Belnap. 2003).

Maki et al (2012) Using HEP method studied Gazelle habitat units in the wildlife sanctuary of Qomishlo in the state before and after the road construction. They showed that due to freeway construction up to 7710, units of habitat for species Ghazal lost. Landscape ecology approach also indicated a loss of habitat and fragmentation of the territory that indicates the negative effects of freeway on gazelle population with their movement in habitat patches only. Hu and Jiang (2012) Jackknife analysis showed the importance of environmental variables and revealed that the variable contribution was affected by the extent selection in SDMs for *G. subgutturosas*. Additionally, their results showed that the niche overlap was associated with geographic distance (GD) among *G. subgutturosa*'s species. Also they indicate that ecological differentiation may play an important role in both the origin and ongoing development of species in this related group of *G. subgutturosas*.

Hu and Jiang (2010) showed that environmental predictors; elevation, maximum temperature of the warmest month, mean temperature of the wettest and warmest quarter and isothermally were the five most effective predictors for Przewalski's *G. subgutturosa*, they also showed that the mean AUC across scales ranged from 0.9758 and 0.9017 to 0.9999 and 0.9994 for the training and testing data respectively. AUC decreased slightly as the scale increased. Although the AUC values for finer scales were higher than those for coarser scales, the decreases between 1×1 and



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32×32km were only 0.0241 and 0.0977 for the training and the testing data, respectively. In this study, AUC for the training data was 0.99 (the model accuracy for prediction of *G. subgutturosa* habitat in the National Park Bamoo (Fig 4)). When dealing with rare species, only a small number of occurrence records are available (Gibson et al., 2007) and this can affect model accuracy (Pearce and Ferrier, 2000; Stockwell and Peterson 2002). Therefore, reducing the minimum number of occurrences required would considerably increase the proportion of species to which SDMs can be applied (Pearson et al., 2007). In this respect, Maxent outperforms some other methods, which are accurate and stable across all sample-size tested categories (Elith et al., 2006; Hernandez et al., 2006). This was supported by our results, which are highly accurate up to 0.99 despite small sample sizes.

Based on the response curves (Fig. 5) and the *G. subgutturosa* species' distribution map (Fig. 2), the produced potential distribution map is highly correspondent with environmental variables and most points of presence of the study area. The most habitat suitability was found in areas with maximum presence. In addition, the response curves showed, the effect of vegetation is stronger on *G. subgutturosa*. Moreover the main variables predictive of suitable habitat of *G. subgutturosa*, the slope (0-10%) and elevation (1700m) are influential. Therefore, the potential distribution of *G. subgutturosa* depends on low elevation and slope. In other words, the predicted distribution map of *G. subgutturosa* demonstrates low tolerance of this species to topography.

A wide area of the National Park Bamboo was unsuitable for *G. subgutturosa* habitat (Fig 7), this is due to the non-adaptability *G. subgutturosa* to diverse habitat conditions. Base on the *G. subgutturosa* habitat could be separated with high accuracy by the Maxent model. It is also revealed that Maxent modeling is very effective at determining habitat distribution for *G. subgutturosa*. Because it relies only on presence data, it lacks many of the complications associated with presence-absence analytical methods (Phillips et al., 2006). The results of Maxent modeling provided key information about the environmental tolerances of the *G. subgutturosa* species in the study area that can be used for protecting susceptible habitat of National Park Bamoo.

CONCLUSION

The Maxent method allowed us to model successfully the potential distribution Gazelle using only presence data and environment variables. We showed that the model can be used to display potential habitat for species of gazelle in a large scale. The model was able to determine the different contributions of the environment variables in predicting the gazelle habitat and also showed its effectiveness in predicting the occurrence of gazelle species in recognized habitat patches. This was due to the protective activity on the habitat patches created by human activities. Since the model allows the identification of the potential habitat, it can be considered in the management of large scale. In addition, differences in the relative importance of the variables used to predict the distribution of Gazelle, in the allocation of conservation activities according to the environmental needs of the species. High accuracy of the model using only the presence data was one of the strength points of this method. Consequently this model can be used to predict the distribution of animal species in the different regions.

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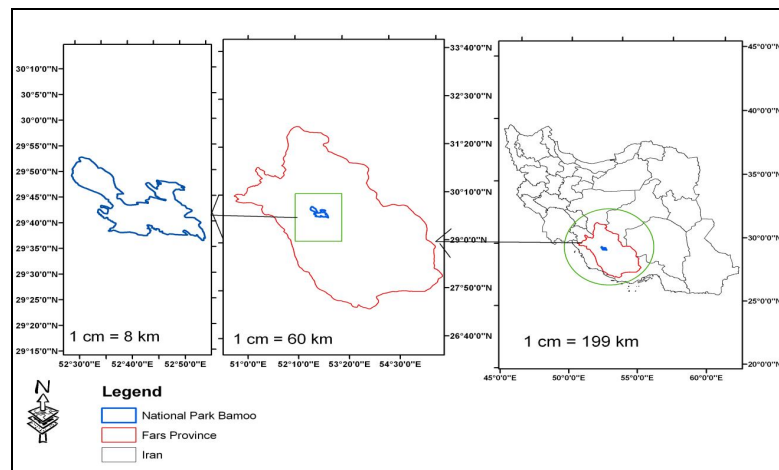


Figure 1. Map the geographical location of the National Park Bamoo





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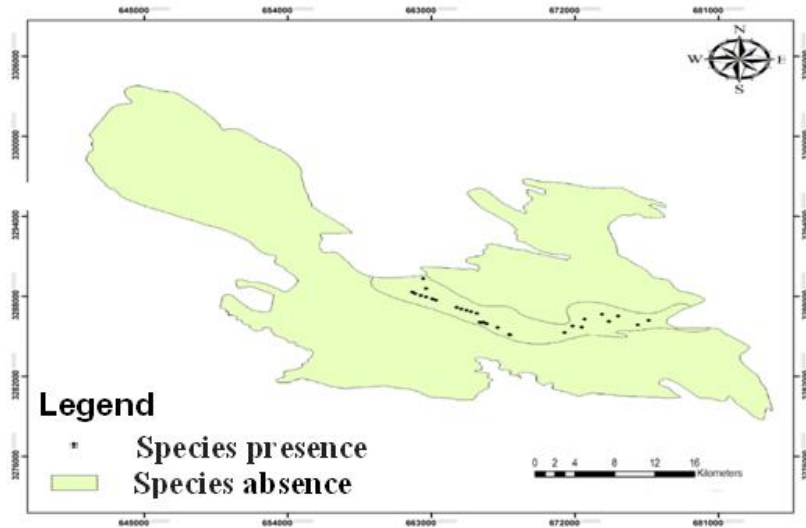


Figure 2. Map points (GPS) of the distribution gazelles in Bamoo National Park

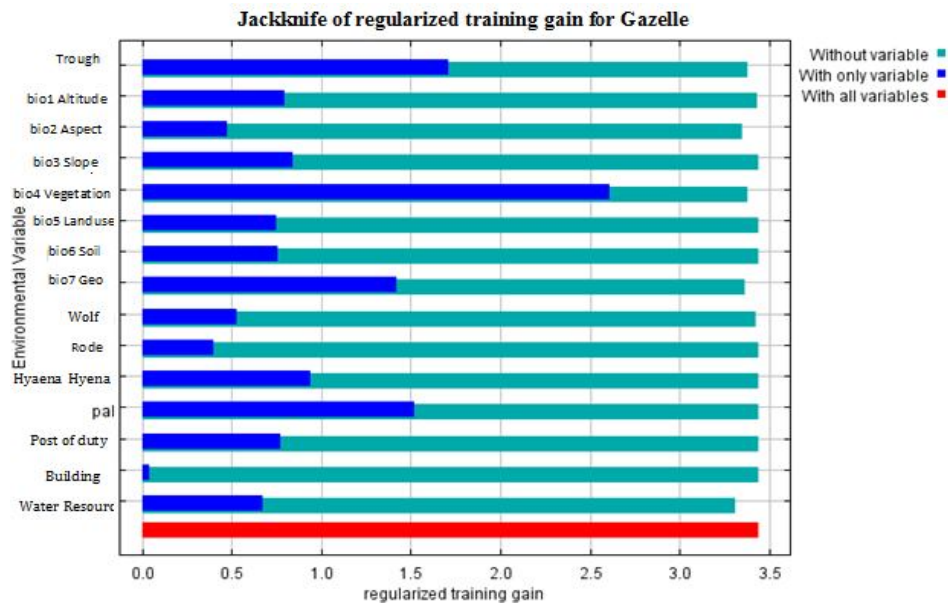
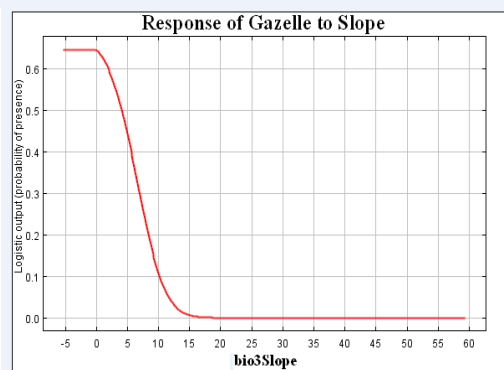
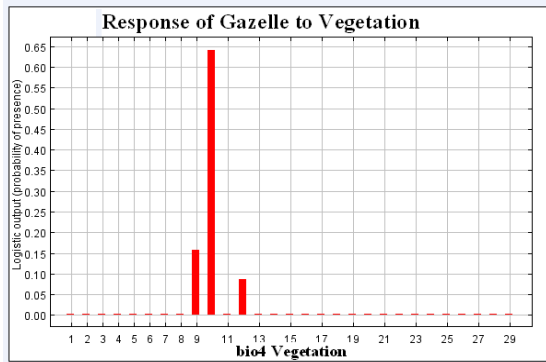
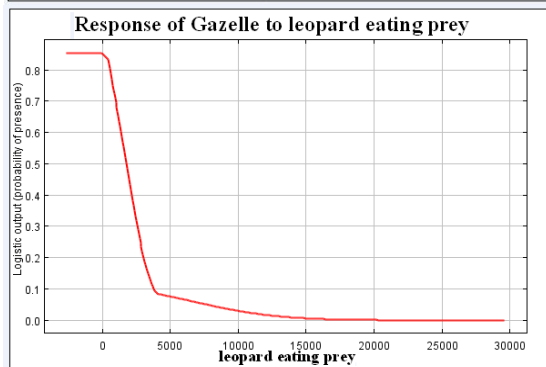
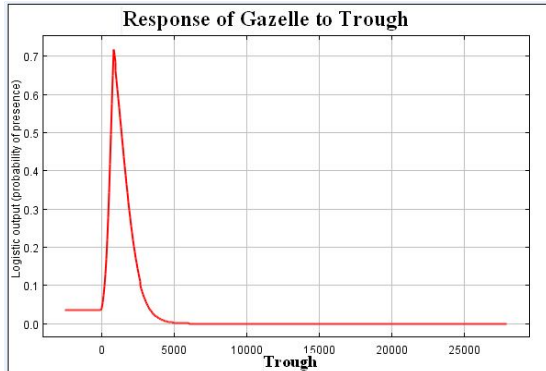


Fig 3. Jackknife of regularized training gain using all variables





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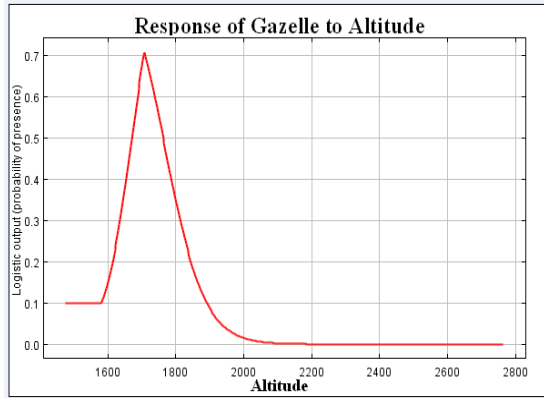


Fig.4. Response curves of the most influential predictors for *G. subgutturosa*

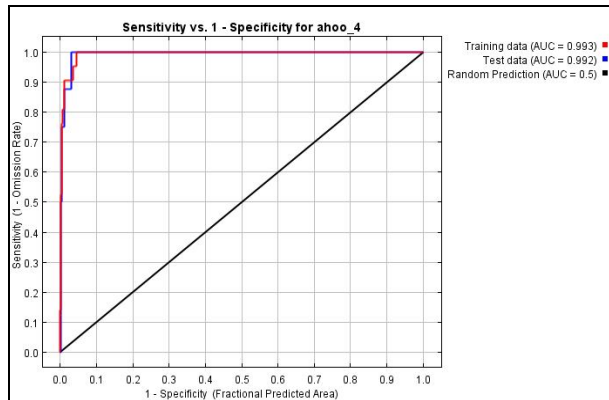


Fig5. ROC curves of sensitivity vs. specificity

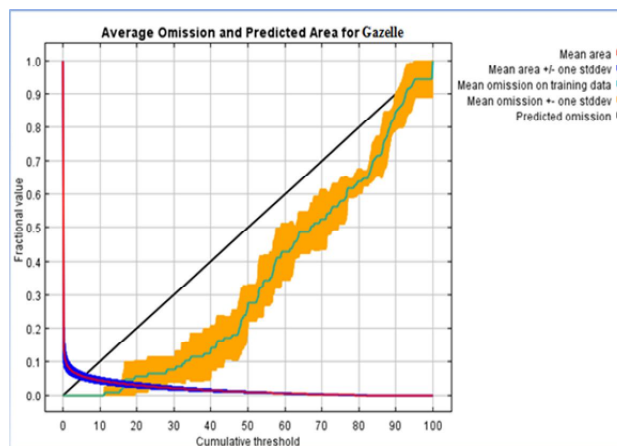


Fig.6. Comparison of points the presence or absence





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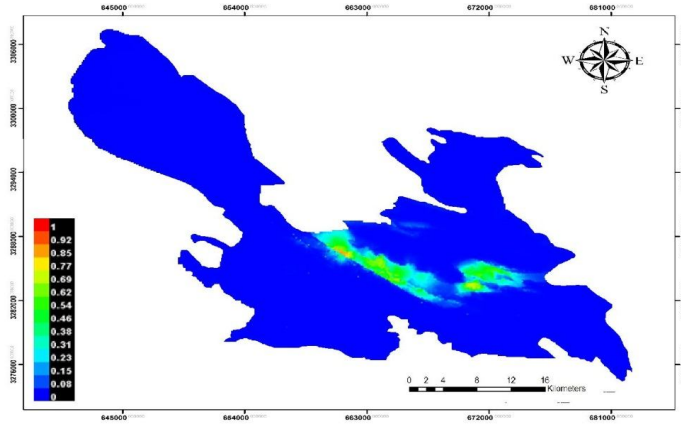


Fig7. Map of habitat suitability





RESEARCH ARTICLE

The Role of Environmental Impact Heavy Metals (Lead, Cadmium, Chrome) in Water of Meshkinshahr River for Agricultural

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ABSTRACT

This study was conducted in order to investigate amounts heavy metals such as cadmium, lead and chrome in surface water sources in Meshkinshahr region by using 5 stations during both high and low rainfall seasons in year 2013. Sampling works and their measurements was accomplished based on Metedo standard and by using atomic absorption device (model Perkin Elmer 2380). Furthermore, one-way and two-way t-tests were run to compare the measured values with the standard values. Results from t-test for high rainfall season showed that mean values for lead and chrome were higher than limits set by WHO and EPA and Iranian standard value; whereas mean value for cadmium were higher from limits set by WHO and EPA, but lower than Iranian standard value. In contrast, during low rainfall season, mean values for chrome and lead were lower than all the standard values; whereas, mean value for cadmium was higher than limits set by WHO and EPA and lower than Iranian standard value. Results from paired samples t-test suggested that amount of lead in the water was lower in low rainfall period than in high rainfall period.

Key words: water pollution, heavy metals, agricultural standard, Meshkinshahr



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INTRODUCTION

The rate of increase in urban, agricultural, and industrial activities has raised scientists' concerns about environmental issues and in particular about water pollution (Gharibi et al, 2012). Wastewater from these activities may contain various heavy metals including Zn, Cu, Pb, Cd, Ni, As, Al, depending upon the type of activities it is associated with (Singh et al, 2010). These elements accumulating in groundwater induce a potential contamination of food chain and endanger the ecosystem safety and human health (Xin et al, 2008). Thus, the investigation and management of water resources quality is important. A comparative assessment of numerous physical and chemical parameters and soluble constituent, including toxic and non-toxic heavy metals, is necessary in determining the degree of pollution in environmental systems. However, interpretation of data sets and suggestion about final water quality comprising analyses of several metals is complicated. One approach of simplifying multivariate data is to generate and use a single value, which may subsequently be used for comparative purposes (Miyai et al, 1985; Nimic & Moore, 1991). In national and international scenarios, approaches which make numerous water quality variables integrated, in a specific index, are increasingly desired. Consequently, several authors have developed a number of water quality indices (WQIs), employing various mathematical and statistical methods, over the past four decades, some of which have been implemented by water management and environmental agencies and are aiding decision-makers in water resource management, public health, and ecosystem protection. Comparing determined limits of different indicators of water quality, WQI assesses water quality by adding the multiplication of the respective weight factor by an appropriated quality value for each parameter. However, WQI and other similar indices such as Subjective Water Quality Index (WQIsub), WQImin, and Canadian Water Quality Index (CWQI), have a series of weaknesses. For instance they assign the value of water quality using a limited number of parameters. Moreover, some pollutants such as toxic and nontoxic heavy metals, hydrocarbons and pesticides are not considered in most of these indices. On the other hand, despite the fact that their formulations are rather simple, and the number of variables involved are too limited, some parameters can influence the final water quality score noticeably without valid justification. But, the most critical deficiency of these indices is the lack of dealing with uncertainty and subjectivity present in this complex environmental problem (Ocampo et al, 2006). During the last two decades, fuzzy logic has undergone an explosive development in application in almost all the areas of research and has been easily accepted by both researchers and decision makers due to its ability to handle the uncertainties in Geosciences, water resources and particularly in water quality management. Consequently, great attention has been paid to develop the environmental indices using fuzzy logic (Gharibi et al, 2012).

Sadiq and Rodriguezz 2004), using fuzzy synthetic evaluation, have proposed a new indexing method of water quality. This method has been applied by (Ocampo-Duque et al. 2006, Lermontov et al, 2009) to identify river water quality. (Moreover, Liou et al, 2003) applied twostage fuzzy set theory to river quality evaluation. (Gharibi et al. 2012) used it to assess water quality in Mamloo dam for drinking purposes.

Method of study

In order to study the quality of surface water sources in villages of Meshkinshahr region located in northwestern Iran in Ardabil Province (Fig. 1), the stations were selected based on location of the pollutant sources, entrance of secondary branch to main branch, and availability of station; and sampling was done during the two low and high rainfall seasons and analysis was run on the samples in order to determine amounts of the heavy metals such as cadmium, chrome and lead.

Sterilized polyethylene containers were used for sampling. After rinsed by nitric acid 10%, the containers were washed by detergent and then rinsed by distilled water. During the sampling, the place was also washed by water and sampling was done based on standard method 2008. The samples were consolidated by using nitric acid. More specifically, 0.05cc concentrated nitric acid was added for every 250cc of the samples. In order to prepare the samples,



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they were poured into sterilized glass containers and put on Hot Plat and heated to the point of evaporating, yet not boiling, while evaporation continued until their volume reduced to 20cc. Again, as much as 2cc nitric acid was added to each of the samples and they were evaporated so much that their volume reduced to 10cc. The samples then were filtered and Atomic Absorption Device (Model Perkin Elmer 2380) was used to measure amounts of the heavy metals. Results from measuring the amounts of heavy metals for the two high and low rainfall seasons were compared based on the standard values by using one-way and two-way t-tests through SPSS-16 software. Standards used in this study included standards of Institute of Standards and Industrial Research of Iran, EPA and WHO.

RESULTS AND DISCUSSION

Results from one-way t-test for comparison of the values measured for the heavy metals during each low and high rainfall seasons in waters of Khiav-chay, Ghareh-su, Tazeh-kand, Kangarlou and Ghasabeh rivers, which have agricultural use, are shown in the table below.

High rainfall

Mean values for lead and chrome were lower than limits set by WHO and EPA and Iranian standard value; whereas mean value for cadmium was higher than limits set by WHO and EPA and lower than Iranian standard value.

Low rainfall

Mean values for lead and chrome were lower than limits set by WHO and EPA and Iranian standard value; whereas mean value for cadmium was higher than limits set by WHO and EPA and lower than Iranian standard value.

Moreover, single sample t-test was used to study the statistical difference between the values measured for the heavy metals based on the national and international standards.

High rainfall

Studies showed that mean value for lead was significantly lower than limits set by WHO and EPA and Iranian standard value (sig < 0.05).

Based on the results, mean value for cadmium was not significantly different from limits set by WHO and EPA (sig > 0.05); however, it was significantly lower than the Iranian standard value (sig < 0.05).

Likewise, mean value for chrome was significantly lower than limits set by WHO and EPA and Iranian standard value (sig < 0.05).

Low rainfall

Results from the studies showed that mean value for lead was significantly lower than limits set by WHO and EPA and Iranian standard value (sig < 0.05).

Contrarily, the results showed that mean value for cadmium was significantly higher than limits set by WHO and EPA (sig < 0.05); whereas it was not significantly different from Iranian standard value (sig > 0.05).



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Finally, based on the results mean value for chrome was significantly lower than limits set by WHO and EPA and Iranian standard value ($\text{sig} < 0.01$).

Results from paired samples t-test indicated that the two high and low rainfall seasons differed significantly for amount of lead ($\text{sig} < 0.05$), which was higher in low rainfall period than in high rainfall period.

Contrarily, difference between the two high and low rainfall periods was not found to be significant for amount of cadmium in surface waters of Meshkinshahr; whereas the same was true for the chrome content of the waters ($\text{sig} > 0.05$).

CONCLUSION

Results from mean comparison accomplished by using single sample t-test on amounts of the heavy metals in the surface waters during low and high rainfall seasons showed that mean values for lead and chrome were higher than limits set by WHO and EPA. In contrast, mean value for cadmium was higher than limits set by WHO and EPA; but, lower than Iranian standard value.

Results from paired samples t-test showed that amounts of lead in the surface waters during the two sampling periods were lower than limits set by WHO and EPA and Iranian standard value ($\text{sig} < 0.05$).

Moreover, the two high and low rainfall seasons did not differ significantly for amount of cadmium; while the same was true for chrome ($\text{sig} > 0.05$).

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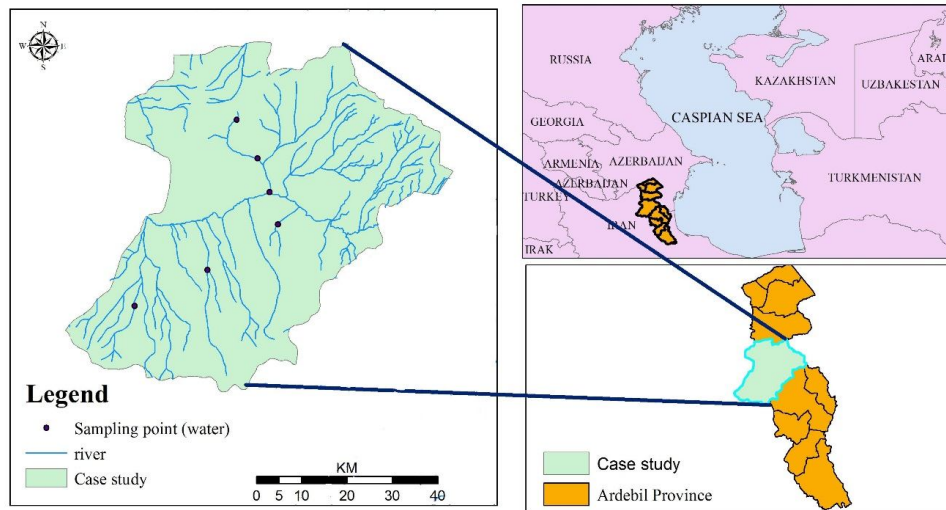


Fig. 1. Location of the study area in Meshkinshar, Ardabil, Iran

Table 1. mean comparison on amounts of heavy metals in surface waters of villages of Meshkinshahr region during high and low rainfall seasons, based on national and international standard values

iran	EPA	WHO		
b 1	b 0/5	b 0/5	standard	Lead feather rain
a 0/039	a 0/039	a 0/039	Average	
a 0/1676	a 0/1676	a 0/1676	Average	Lead less rain
a 0/05	a 0/001	a 0/001	standard	Cadmium feather rain
a 0/013	a 0/013	a 0/013	Average	
a 0/0372	a 0/0372	a 0/0372	Average	Cadmium
a 1	a 0/1	a 0/1	standard	Chromium feather rain
b 0/022	b 0/022	b 0/022	Average	
b 0/0218	b 0/0218	b 0/0218	Average	Chromium less rain





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Table 2. Results from mean comparison on amounts of heavy metals in surface waters of Meshkinshahr during high and low rainfall seasons based on the national and international standards by using single sample t-test (*significant at 5% level - **significant at 1% level – ns not significant)

Iran	EPA	WHO		
-50/322	-24/140	-24/140	Level t	Lead feather rain
0/000**	0/000**	0/000**	Significant level	
14/269	-5/698	-5/698	Level t	Lead less rain
-	0/000**	0/005**	Significant level	
-4/548	1/475	1/475	Level t	Cadmium feather rain
0/010*	0/241 ns	0/241 ns	Significant level	
-1/217	3/442	3/442	Level t	Cadmium less rain
0/291ns	0/026*	0/026*	Significant level	
-	-9/682	-9/682	Level t	Chromium feather rain
121/399	0/000**	0/001**	Significant level	
-	-63/015	-63/015	Level t	Chromium less rain
788/256	0/000**	0/000**	Significant level	

Table 3. paired samples (dependent) t-test for mean comparison of amounts of heavy metals in the surface waters during low and high rainfall seasons

Summer chromium - chromium spring	Summer Cadmium - Cadmium spring	Summer Lead - Lead Spring		
-1/771	0/025	-3/008	Level t	T-test
0/151ns	0/981ns	0/040*	Significant level	





Determining the Best Environmental Suitable Scenario for Municipal Solid Waste Disposal of Ardabil City by Life Cycle Assessment

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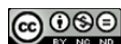
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ABSTRACT

With population increase in past decades, the issue of waste and the study of administrative management have become more complicated than past. Different measures have been gradually created to study and evaluate management system of waste that among the important ones is life cycle assessment. In this study that was conducted for the management of burying city waste, two scenarios of sanitary burial and sanitary burial and energy production, have been used in order to study and determine the best optimum system for burying city waste. Relevant system data was extracted from basic available data in the region and inserted into the simapro program. Model inventory was studied in two sections of emission into the air and water and six categories of effect including Depletion of abiotic resources, Climate change, Human toxicity, acidifying Acidification, Eutrophication, and photochemical oxidation were studied. The results showed that the scenario of energy production causes less decrease in effects and environmental burden than the scenario of burying in the region (that is already being conducted in the region).

Key words: Management of city waste, MSW landfilling, life cycle assessment, energy production, environmental effects.

INTRODUCTION

In twentieth century, waste management technology has had a remarkable growth. Until 1950, city waste was generally being dumped in open puddles in most parts of the world (Hickman, 2000), but today management of city waste includes advanced technology providing more health for society and biological environment (Diaz and Warith,



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2005). In comprehensive management of waste, in addition to sanitary burying and waste burning other means are used as well such as compost and recycling (Abdoli, 2006).

Waste is a complex system and management of waste is discussed as one of the key issues of biological environment and that is why there is an increasing demand for analyzing and comparing the effectiveness and impacts of biological and technical environment of various approaches of management of waste. Such issues can be accomplished by Environmental Assessment Tools. There are different tools to evaluate management system for waste including Environmental Audit, Environmental Impact Assessment, Risk Assessment, Substance/Material Flow Analysis and life cycle assessment (Ludwig et al, 2003).

One of the main approaches that are capable of estimating environmental impacts of ISWM is life cycle assessment (LCA). This approach as an effective approach, involves determining and assessment of the impact of used energy, material and waste inserted into the environment as well as assessment of environmental capacities (Curran, 2004). At first, Life cycle assessment is represented by "pure energy analysis" in 1972 which only was studied the amount of energy during the life cycle of a product or a process (Hannon, 1972, Boustead, 1972). Afterwards, waste and greenhouse gas production also included in model (Lundolm,1985, Boustead,1989). In addition, LCA was completed and represented as iso14040-3 standard in 1990 by poison study and environmental chemistry assembly in international standards organization.

The purpose of an assessment project by LCA is to mention ways that can help to the decision-making and policy making of authorities in this field and its advantageous is that it immediately provides acceptable results for such decision-makings (Guinée, 2001).

(Abdoli and et al. 2006) Studied life cycle with regard to different strategies for Tehran city waste disposal and the combination of four approaches of waste disposal including sanitary burying, recycling, compost and waste burning has been compared in a five scenario fashion in terms of environmental impacts, needed land, used energy. Finally, the fourth scenario (recycling associated with compost and sanitary disposal) with the most positive effects, the least area of daily needed land and the highest energy recycling was selected as the best option. After studying city waste flow and recent way of its disposal in one of the oil islands in south part of the country (siry Island), (Ghanbarzadehlak and Saboor 2010) have compared three scenarios of waste burning associated with energy production and ash burying, sanitary burying, collecting from burying center in order to produce energy and sanitary burying without gathering the gas of burying center, in terms of production and emission of greenhouse gases and energy usage using the life cycle assessment approach. Created results indicate a prominence of waste burning scenario to sanitary burying (without gathering the gas of the burying center).

(Jinglan et al. 2010) conducted the life cycle assessment to estimate environmental impact of city solid waste in china. In this study, four commonest scenarios in china that have assessed the effect of different technologies on environment were studied: 1) burying waste 2) burning 3) compost associated with burying waste 4) compost together with burying waste. Study results showed that increased use of methane gas for recycling electricity in order to decrease the negative effect of burying waste sites on environment would be useful. (Koroneos and Nanaki 2012) studied different environmental strategies assessment to solve the city solid waste problem for Tesaloneki province in Greece as well as methodology framework of life cycle assessment and management strategy of waste mass solid material considering social-environmental and economic effects. Results showed that recycling from the origin of waste and non-aerobic digestion of food waste are better than burying waste.





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METHODOLOGY

Today, life cycle assessment method (LCA) as an international standard method that is able to analyze inputs and output emissions from a waste management system in proportion to life cycle of products or processes, has been in the central attention of environmental experts (Saboor and Ghanbarzadehlak, 2009; Arena, et al., 2003; Cherubini, et al. 2008). In assessments based on LCA, the whole life cycle of a product from raw material exploitation to production stages, usage and finally its disposal have been considered and its potential negative effects regarding these stages are presented quantitatively according to ISO 14001-3 standard (Liamsanguan and Gheewala, 2007).

Life cycle assessment is a method by which environmental aspects with regard to a product or a process or services are studied during the whole Life cycle. Life cycle approach is an everlasting approach (SETAC/1998), that is, different stages of conducting a process (such as City management system) or manufacturing of a product (such as TV), from primary material exploitation to final disposal are studied (Powell, 2000).

LCA assessment in the field of waste management is composed of four stages of objectives definition and study area, life cycle inventory (LCI), life cycle impact assessment (LCIA) and results interpretation with regard to the objective (Rieradevall, et al., 1997, Weitz, et al., 1999; White, et al., 1995). In the first stage of life cycle list, input and output flow of the system is divided into three categories of direct factors (factors that are directly related to waste disposal establishments), indirect factors (cases with which energy and needed material of waste disposal establishments are produced and provided), reducer (activities which result in reduction of negative environmental effects of the system through energy production or materials) and all output emissions, energy and material usage and generally input and output flow of the system were determined. Second stage is drafting and inventory that life cycle drafting includes data collecting and estimation methods for quantifying inputs (resources) and outputs (pollutants) in the system (ISO 14042). In the study of this inventory taking processes such as Waste production, energy resources, different kinds of waste, prevalence of pollution from burying site to the environment, transportation and so on have covered all entities. Transportation (distance from origin to the destination as a presupposition for each section is 25 km.), pollution as its result, production of different kinds of gases, and emulsion have been calculated for each section. Background data (out of the system bound) have been measured from Ecoinvent database and others. The third stage includes impact assessment that in life cycle impact assessment, produced results from life cycle inventory transforms into physical units from which management methods are acquired. Till now, no equal and standard methodology with global acceptance has been represented for life cycle effects assessment (Hofstetter et al, 2000). Among environmental effects used as an index in the third stage of LCA are: Climate change effect, acidification, acid rains, eutrophication, decrease in unrenovable resources and energy, ecological effects, photochemical oxidation and toxic impacts on human (Arena et al, 2003, Banar et al, 2008 ; Cherubini, et al., 2008).

At the last stage of life cycle assessment method, produced results are also interpreted with regard to the objective and management strategies are represented. As discussed before, LCA study includes four stages. The relations between stages are shown in figure1.

In recent study, simapro 8.01 version has been used for assessment and interpretation. The program has many projects. A project includes all information that user inserts during different stages such as data collecting, stages of product manufacturing and information related to impact assessment. Projects data are produces based on different countries considering their own publications.



**Zahra sameenezhad and Ebrahim Fataei****RESULTS****Determining objective**

In recent study, life cycle assessment method was used to evaluate the best suitable method for city waste disposal for sanitary burying scenarios as well as energy production scenario from burying sites based on ISO standard. The purpose of life cycle assessment in Ardabil city was to study environmental effects of possible scenarios to determine the best waste disposal system. In ISO 14040 standard, operation unit is defined as reference unit in studying life cycle assessment.

Life cycle inventory

Life cycle inventory which is a time consuming process is conducted in waste disposal based on objective quality and study area with different tools and methods. In this regard, some of the databases such as ecoinvent, US LCI database, US IO dbase, Danish IO dbase, Dutch IO dbase, LCA food dbase, Industry data, Japanese IO dbase are used in inventory process using simapro program and following analyses are conducted on them. It needs to be noted that in many cases using these databanks causes an expansion in time scale and as a result increases the quality (Ayer and Tyedmers, 2009, Bosma et al., 2011; Cao et al., 2011, d'Orbcastel et al., 2009, Hospido and Tyedmers, 2005).

In this study, operational unit of average produced waste in Ardabil city is selected for one day. As a result, daily production of waste in Ardabil city has been considered as an input. Amount and composition of dry waste of Ardabil city is shown in Table 1.

Present data on city waste disposal was used as much as it was available. This data was collected using a direct observation, calculation and present internal resources related to waste disposal. Background and supplementary data are collected using Europe database which is the same as ecoinvent and includes issues of infrastructure, raw material, chemical material, and energy production. This data is revised in simapro program according to geographical properties of Ardabil city and results are obtained based on that revision. Annual average and inventory of administrative process of waste disposal (including energy consumption and raw material, fuel, emissions to soil and water) were extracted based on available data concerning Ardabil city waste disposal system. Inventory for two studied scenarios is presented in figure 2.

In table 2, the value of each category of sanitary waste disposal system is shown in terms of their specified unit.

Life cycle impact assessment

In this study, 6 categories of effect have been studied that exist in CLM 2000 method, that is:

- Depletion of abiotic resources
- Climate change
- Human toxicity
- Acidification
- Eutrophication
- Photochemical oxidation

As it follows, we study and evaluate scenarios in six categories of effect.

Scenario 1: sanitary burying without energy production

Scenario 1 in which all the waste produced is buried sanitary. From now on we call this scenario, scenario 1. There is no exploitation in this waste disposal.



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Figure 2 is about subsets collaborated in sanitary waste disposal in Ardabil city during 2013 and has illustrated potential environmental effects.

As seen in figure 2, the effect of processes used for sanitary waste disposal has had great impacts on effect categories except for environmental resources exhaustion. This case is not true for used energy. So that it has collaborated in all effect categories except for human toxicity and has not had great impacts on effect categories of Climate change, Depletion of abiotic resources and human toxicity. Waste transportation impact on effect categories of Depletion of abiotic resources is of second priority. However this entity collaborates in other effect categories. It should be noted that although all entities collaborates in effect categories, according to bound determination and omission of those entities with the least impact on effects category, we have generally come to a point of four entities with highest impact on creating Environmental effect.

Scenario 2: sanitary burial with energy production from created biogas

In this scenario, some electricity energy is produced from waste before sanitary burial and then sanitary burial occurs that from now on we call it scenario 2. In this scenario some of the produced gas from sanitary burial is collected and controlled by an energy recycling system in order to create electricity. In this scenario, it is supposed that electricity production system works full time and its efficiency is 50 percent for collecting gas and 80 percent producing energy. So, 50 percent of pollutants spread into the air and the rest is controlled and gathered. In figure 4, the values of each effect category of sanitary waste burial system is shown in terms of its specified unit. Previous obtained values for each category is shown in bold.

Figure 3 shows the subsets collaborated in sanitary burial process. This effect has reached above 90% in Climate change, photochemical oxidation and Eutrophication effect category. After that the effect categories of acidification and human toxicity have acquired highest values. It is surprising that this process does not have a great effect (less than 1 percent) on Depletion of abiotic resources. This little contribution to effect categories can be attributed to little use of fossil energies in burial process in this system. What is noteworthy in this system is the electricity production resulted from it so that in effect category of Depletion of abiotic resources resulted in 85% negative impact on environmental effect (it should be noted that negative impact means a decrease in environmental effect of usual electricity production that here environmental effects of usual electricity production has been prevented by electricity production from waste which is a positive point for every waste disposal system). This production entity from waste disposal system has the most negative impact on human toxicity and acidification, respectively. This production entity has had a relatively good negative contribution to other effect categories. This issue has resulted in a decrease of effect categories values and generally in a decrease in system environmental impacts compared to the basic scenario. After the process of sanitary waste disposal, it is the environmental effect of transportation system that has proved its impacts on effect category of Depletion of abiotic resources compared to other entities. This high contribution can be attributed to electricity production system that contributes to electricity production process so that an amount around 11% of its used electricity is consumed to produce electricity from waste.

DISCUSSION

The first objective of this study is to determine and assess environmental impacts of city sanitary waste burial systems in Ardabil city during 2013 as well as to choose the optimum scenario from among studied scenarios. Contribution of each part in each system for each effect category is shown in figure 5.



**Zahra sameenezhad and Ebrahim Fataei****Depletion of abiotic resources**

This category shows the energy-consuming impact on a system. In other words, it shows that how much a system contributes to energy consumption. As seen in figure 4, disposal scenario together with electricity production have had the best function in decreasing the environmental impact and waste burial scenario, as the basic scenario in Ardabil city, is known as a scenario with environmental impacts. But in general it can be said that in this effect category results of recent study corresponds with those of other studies (Liamsanguan and Gheewala, 2007; Zaman, 2010).

Climate change

As seen in figure, from Climate change viewpoint all of the scenarios have an environmental impact. Waste burial and energy production scenarios have almost the same environmental function from the Climate change viewpoint that corresponds with studies of other researchers (Banar et al., 2009; Cherubini et al., 2008, 2009; Liamsanguan and Gheewala, 2007; Zaman, 2010).

Human Toxicity

As seen in figure 6, all of the scenarios have negative environmental impact, but waste burial have more effect from energy production, waste burial with the highest impact in terms of Human Toxicity is in correspondence with studies of other researchers (Banar et al., 2009; Cherubini et al., 2008; Zaman, 2010).

Photochemical oxidation

As seen in figure 7, waste burial with the highest impact in terms of photochemical oxidation is in correspondence with studies of other researchers (Banar et al., 2009; Cherubini et al., 2009).

Acidification

As seen if figure 8, effects resulted from two scenarios in waste management of Ardabil city concerning acidification is the same as effect category of photochemical oxidation and is in line with other studies (Banar et al., 2009; Cherubini et al., 2009; Liamsanguan and Gheewala, 2007; Zaman, 2010). As seen in figure 9, the effects of Eutrophication caused by waste burial scenario are higher than those in burial scenario together with electricity production which is in line with other studies (Banar et al., 2009; Cherubini et al., 2009; Liamsanguan and Gheewala, 2007; Zaman, 2010).

CONCLUSION

Ardabil city owns a high value by virtue of geographical location from an environmental viewpoint. Waste disposal management malfunction in Ardabil city has created problems in environment pollution. In this study two scenarios were defined based on the conducted studies in this region as well as analyses on city waste in order to improve recent condition of city waste burial. Assessment of these options considering 6 effect categories were studied and interpreted using life cycle assessment of Ardabil city waste management. In this regard, two scenarios of sanitary burial by itself and sanitary burial together with energy production were studied in order to manage waste burial of Ardabil city. According to obtained results, waste burial scenario and electricity production have less environmental impacts (climate change with 862/87, depletion of abiotic resources with -1724/92, eutrophication with 3/20, acidification with 3/13, photochemical oxidation with 0/31, and human toxicity with 64/49) than burial scenario (climate change with 1609/32, depletion of abiotic resources with -413/13, eutrophication with 3/68, acidification with





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8/45, photochemical oxidation with 0/65, and human toxicity with 114/31). Environmental effects were calculated using Simapro program and its environmental effects were compared together according to CLM 2000 instruction which is a method for life cycle assessment. Final results of this study showed that sanitary waste burial even with electricity production has environmental impacts which have to be amended.

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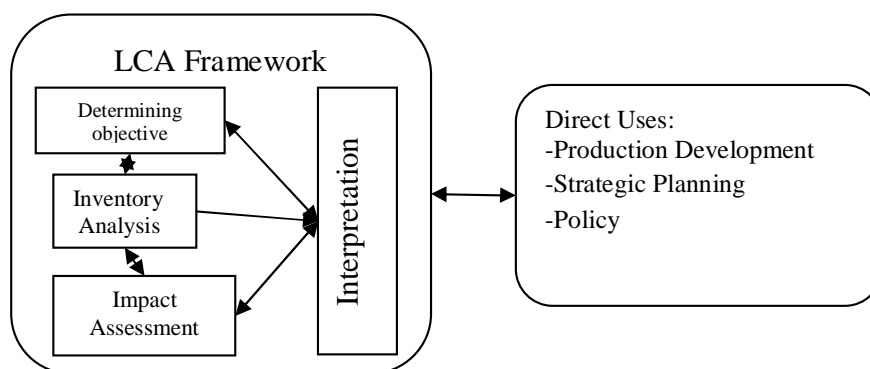


Figure 1: stages for performing life cycle assessment





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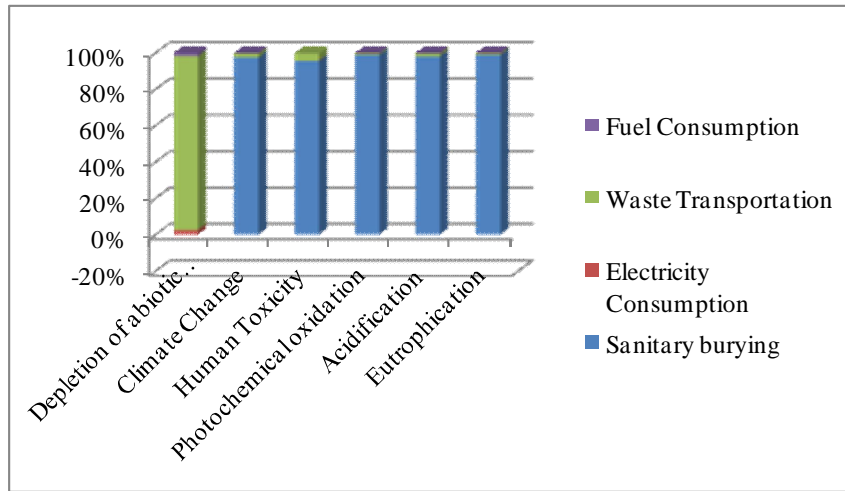


Figure 2: relative collaboration of sanitary waste disposal system components in Ardabil city in different effect categories

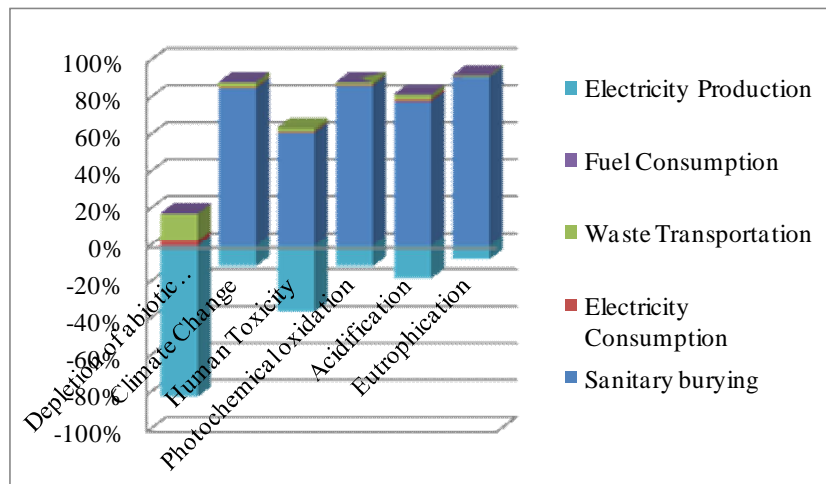


Figure 3: relative collaboration of system components of sanitary waste disposal together with electricity production in Ardabil city in different effect categories





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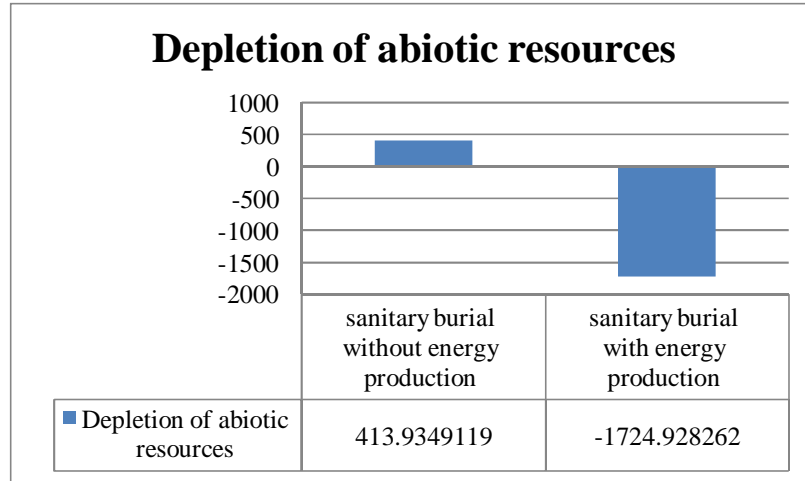


Figure 4: scenarios contribution to Depletion of abiotic resources

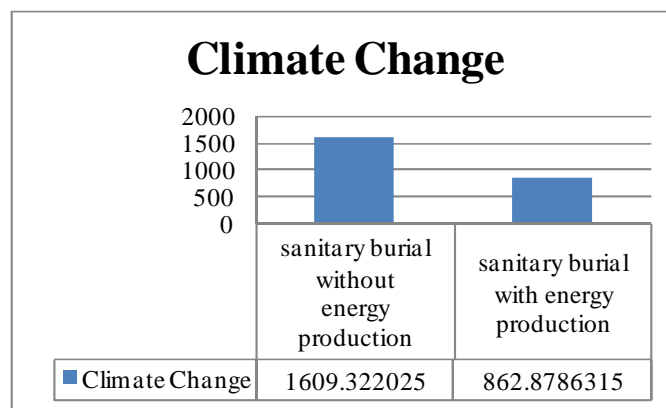
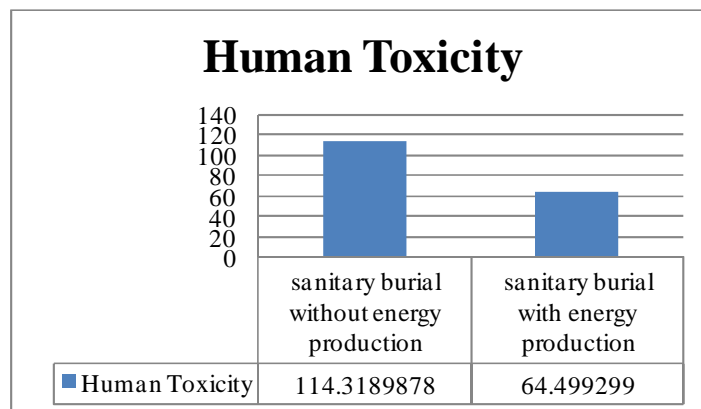


Figure 5: scenarios contribution to effect category of Climate change





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Figure 6: scenarios contribution to human toxicity

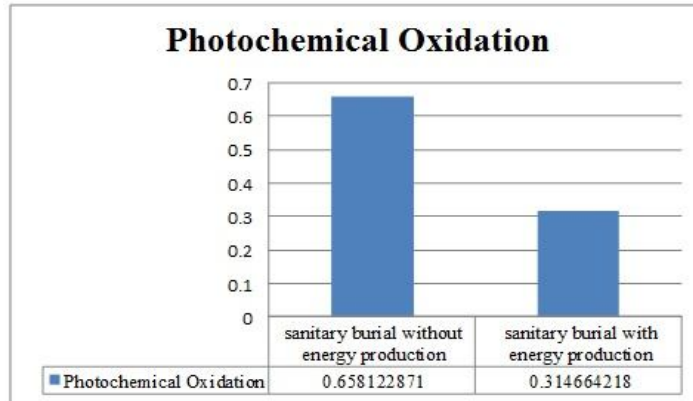


Figure 7: scenarios contribution to photochemical oxidation

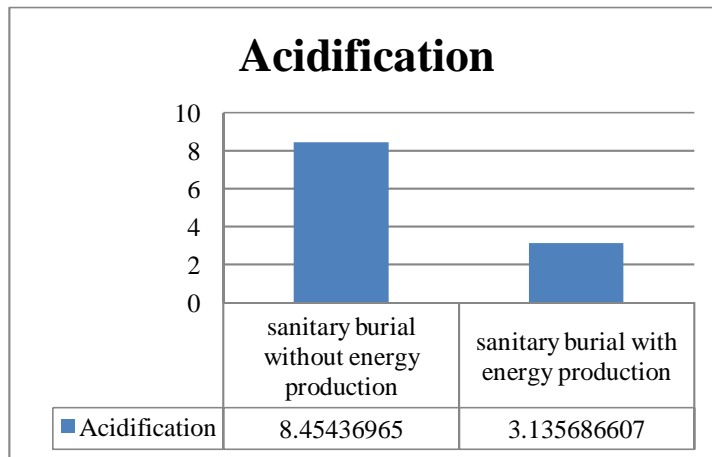


Figure 8: scenarios contribution to acidification





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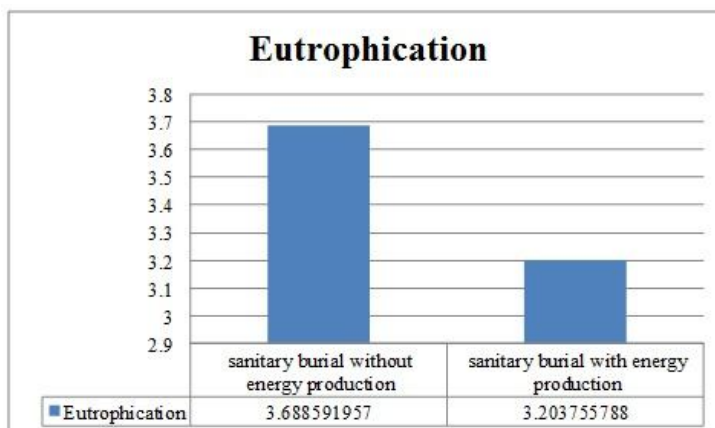


Figure 9: scenarios contribution to acidification

Table 1: Amount and composition of dry waste of Ardabil city

Raw	Title	Weight(ton)	Raw	Title	Weight(ton)
1	Carton	89.24	10	Aluminum	0.129
2	Waste paper	145.457	11	Style	
3	Nylon	1.93	12	Bread	19.88
4	Plastics	7.8	13	Mixed Waste	26.16
5	Plastic Laky		14	Fruit Baskets	0.81
6	Plastic sacks	0.18	15	Plicae tube	0.31
7	Iron style	3.94	16	Iron laky	0.38
8	Heavy Iron	2.78	17	Crystal	0.57
9	Zinc	0.38	18	Total	300

Table 2: Inventory of scenario 1 and scenario 2 based on one ton of waste in performance stage

	Consumption Material and emissions	Amount		Consumption Material and emissions	Amount	unit
Scenario 1: sanitary burying without energy production	Fuel	4.5	Scenario 2: sanitary burial with energy production	Fuel	3	kg
	Electricity Consumption	1		Electricity Consumption	6	MJ
	Electricity Production	-		Electricity Production	501	MJ
	Land use	0.5		Water	300	M2





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	Water	300		Landuse	0.5	kg
Emission to Air	CH4	58	Emission to Air	CH4	35	kg
	Nox	2		Nox	0.06	kg
	VOC	6.3		VOC	3.2	g
	Sox	6.1		Sox	6	g
	Metals	0.0009		Metals	0.0009	g
	Hg	0.0001		Hg	0.0001	g
	Co2	77		Co2	78	kg
	HCFC	0.5		HCFC	0.5	g
	SPM	2.67		SPM	2.67	g
Emission to Water	COD	1.767	Emission to Water	COD	1.690	kg
	T-N	4.8		T-N	4.8	g
	T-P	6.72		T-P	6.72	g
	Cu	0.06		Cu	0.06	g
	Cr	0.14		Cr	0.14	g
	Zn	0.34		Zn	0.34	g
	Pb	0.42		Pb	0.42	g
	Cd	0.01		Cd	0.01	g

Table 3: calculated values of different calculated effect categories for sanitary waste disposal (scenario 1) for one ton of waste in Ardabil city

Effect Category	Eutrophication	Acidification	Photochemical oxidation	Human Toxicity	Climate Change	Depletion of abiotic resources
Unit	kg PO4--- eq	kg SO2 eq	kg C2H4 eq	kg 1,4-DB eq	kg CO2 eq	MJ
Sanitary burying	3.659	8.320	0.641	109.650	1527	x
Electricity Consumption	0.000	0.009	0.000	0.269	0.814	12.469
Waste Transportation	0.029	0.123	0.005	4.407	31.140	396.014
Fuel Consumption	0.001	0.002	0.000	-0.006	0.368	5.452
Total	3.689	8.454	0.646	114.319	1559.322	413.935

Table 4: calculated values of different calculated effect categories for sanitary waste disposal (scenario 2) as well as electricity production for one ton of waste in Ardabil city





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Effect Category	calculated effect categories					
	Eutrophication	Acidification	Photochemical Oxidation	Human Toxicity	Climate Change	Depletion of abiotic resources
	kg PO4 ⁻⁻⁻ eq	kg SO2 eq	kg C2H4 eq	kg 1,4-DB eq	kg CO2 eq	MJ
Sanitary Burying	3.462	3.850	0.354	143.600	953.000	X
Electricity Consumption	0.002	0.054	0.002	1.612	4.883	74.815
Waste Transportation	0.029	0.123	0.005	4.407	31.140	396.014
Fuel Consumption	0.001	0.002	0.000	-0.006	0.368	5.452
Electricity Production	-0.290	-0.894	-0.047	-85.111	-126.635	-2203.026
Total	3.204	3.135	0.315	64.501	862.756	-1726.745

Table 5: comparison of environmental effects of scenarios for one ton of waste

Effect Category	sanitary burial with energy production	sanitary burial without energy production
Depletion of abiotic resources	-0.00174	1.28E-05
Climate Change	-1724.93	413.9349
Human Toxicity	862.8786	1609.322
Photochemical Oxidation	-0.00015	1.92E-06
Acidification	64.4993	114.319
Eutrophication	97.52673	129.6213





RESEARCH ARTICLE

Assessment Impact of Environmental Risk on Ramin Thermal Power Plant of Ahvaz with FMEA, AHP, DELPHI Methods

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ABSTRACT

Energy consumption in the world is growing exponentially. A large share of energy consumption is by the industrial countries and the more industrialized countries and economically more prosperous more energy will be consumed. Relevant countries to provide energy to the construction use power plants that development growth there imposes many effects to the environment. The purpose of this study was to evaluate the risk of environmental Ramin thermal power plant. In this study, a Delphi approach was used to identify risks of Ramin thermal power plant. To do this a group of well qualified specialists that are familiar with plant operations made up And drawing up a list of plant activities and their effects on the environment, physicochemical, biological, in the form of questionnaires and surveys of members of the Expert Group, 88 aspects of environmental risk in the operation and maintenance phase, 8 risk factors were identified as risk factors. Then, using Analytical Hierarchy Process (AHP) and software analysis conducted by Expert software, the probability of risks was estimated. And the failure modes and effects analysis (FMEA) of two factors of the severity of the impact and likelihood of risk factors were calculated. And risks were prioritized based on the number of risk. In this study, the largest risk (RPN) related to the loss of plants (density) that is loaded into the arena of the plant (18/19), which was identified as the most significant risk. That measurement of gases and malfunctions of system was evaluated.

Key words: environmental risks, plants, methods of Delphi, AHP, FMEA.



**Ghodratollah Siahpour and Neda Urak****INTRODUCTION**

There is often a negative attitude among the population in the society about the risk concept. They have considered it as a sign of damage, danger and negative effects as well as fail probability toward achieving the predefined goals of the considered project [1]. Britain Standards Institute knows risk as combination of occurrence and results of a hazardous event [2]. Risk assessment determines the qualitative analysis of risk potential regarding the sensitivity or vulnerability of the surrounding environment [3]. In general, there are currently more than 70 risk assessment methods in the world, which are divided into two qualitative and quantitative groups [4]. Among research studies conducted around the world regarding risk assessment of power plants, a study carried out in the Harvard Center can be mentioned. In this research, air emissions data (antimony, arsenic, barium, chromium, and so on), geographic information of the area, plant profile, speed and direction of dominant wind were used as the input of mathematical models to calculate the pollutant concentration in 50 km radius of the power plant [5]. In 1999, Akash et al. used the analytical hierarchy process to select an optimal system for electricity generation. In this study, a cost and benefit hierarchical structure was separately designed for various plants. Afterward, by comparison of different cost and benefit analysis results, it was concluded that solar and aquatic power plants are the most suitable ones for energy generation in Jordan [6]. In 2002, Twardowska and Szczepanska conducted a study regarding environmental risk assessment of solid waste in a power plant fly ash. Results indicated that waste should not be treated as the same way as a natural raw material, even those considered non-hazardous [7]. In 2009, Vaurio showed how risk assessment could be used to control errors and enhance human factors [8]. Dai et al. (2007) examined spatial distribution of radionuclide existing in soils around a coal-fired power plant, in Baoji, a city of China. They presented the obtained results using a map demonstrated the concentration of radionuclide through the area [9]. In general, as regards, power plant risk assessment is a global issue, so a lot of research has been carried out by scientists all over the world [10–14]. In recent decades, much attention has been focused by researchers on multi-criteria models in complex decision-making situation. Through such decisions, instead of using a measure of optimality, multiple measurement criteria are applied [15]. Analytical hierarchy process (AHP) is one of the most important multi-criteria methods [16]. A study carried out by (Shryvastava Vpatl, 2014) called the identification of hazards and risk assessment in thermal power plants in India. In this study the thermal power plants introduced as one of the major industries and power plants that supply their fuel needed from coal were discussed that this type of thermal power plant has its own risks and dangers, such as the process of rail transit from coal to power plants. The purpose of this study is to identify the potential risks and dangers in the areas of chemical, physical and biological which were carried out in five stages as follows: 1.system Definition 2. Definition and Description of risk 3. Risks analysis 4. Select risks from the screening table and determining the value of risk or hazard class. 5. The decision to risk that corrective action is recommended at this stage. As is clear from the research stage, after identifying risks, taking corrective actions is necessary to reduce the risks presented. A study carried out by (Tian and Yan, 2013) in China in Beijing, to identify risks in power plants using Analytical Hierarchy Process (AHP). Based on data from the satellite, according to the method described in this study, risks have been identified and weighting And the analysis of data obtained showed that the process of power plants and energy production in power plants makes the most risks and dangers all over. It also proves that by combining satellite data we can assess and manage risks of power plants.

METHODS

Due objectives of this study a research was performed in order to obtain reliable results for 9 months, from first of June 2014 till February 2014.





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Data collection methods

Step One: Library research related to subject

The required information includes identification the location of Ramin thermal power plant, identifying activities related to plant, gathering previous data related to the subject, were gathered from the following steps. To collect background and library information, literature and articles and internal and external studies were used. And in different parts study has been done by detailed supplier and data and information from Ramin power plant were used in research.

The second step: Refer to the experts

In order to collect information from various sources, experts, scholars, teachers and environmental experts of Ramin thermal power plant with interview sessions gathered the required information.

Introduction to the methods used

So far several methods have been proposed in the review process risk, but in this study with respect to the subject of study and conditions (lack of information and reports similar) techniques, AHP, Delphi and FMEA were used.

The Delphi method applied in this study:

The establishment of a panel to monitor the activities of Delphi the members of the group were selected from experts in Ramin thermal power plant, as well as technical experts of Khuzestan Environmental Protection Office and prominent scholars Environment Group of universities.

- Set questionnaire
- Check the written questionnaires (removing ambiguities deduction)
- The distribution of questionnaires

Questionnaire provided were distributed among Ramin thermal power plant experts and students in the Master of Natural Resources Engineering environment assessment and land use planning and environmental protection experts from the General Administration of Khuzestan province.

- Analysis of the responses received
- Numbering

Method of determining sample

The next step is determining the sampling methods and to determine the sample size the most logic and best method is formula Cochran. Because it is one of the most widely used statistical methods to calculate and for determining sample size in other studies different methods were used. . Two common methods for this purpose are Charles Cochran formula and Morgan's table. Using a Delphi questionnaire 88 environmental criteria was identified. As long as we don't have any information about variance in the community, and probability of success or failure, and we cannot use variable statistical formulas to estimate the sample size so we use Morgan table. This table shows the maximum number of samples. N: size criteria (a measure of risk), S: the sample size, because there are not 88 criteria





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in the above table and are between 85 and 90 so we must do central finding by applicable methods (try and error), related to thermodynamic debates:

As a result, after determining the sample size, and statistical requirement equal to 72 questionnaire is calculated as equal to: $S = 71.086 \sim 72$. The 72 questionnaire at three examples of FMEA, AHP, DELPHI prepared and distributed between 24 member team of experts due to Figure (1)

As can be seen in the diagram above the most questionnaires with 37% are distributed in operation (control room). Because the control room is the brain of a power plant and pollution from fuel combustion, and wastewater is exported into the environment.

RESULTS

According to the Delphi Questionnaire distributed among a group of experts and reviews the questions and hypotheses, including tables that represents the expertise ideas to identify the activities and important risks of Ramin thermal power plant, As well as the possibilities used from the " comparing the couple Questionnaire analysis " in the Analytical Hierarchy Process (AHP) using Expert choice software, the severity and likelihood of risk determined by experts at the end of the risk value for each of the identified effects are obtained. However, in this study, according to the choice of Analytical Hierarchy process (AHP), in order to identify environmental aspects in both the physicochemical, biological parts And anticipated standards and substandard of each section were examined separately and later likely hierarchical structure of environmental risk in unit are displayed in Figure 2.

Determined possibilities for risks

To determine the likelihood of each risk, comparing the pair Analytical Hierarchy Process (AHP) is used. . For this purpose, hierarchical structure was drawn and according to that hierarchical analysis was prepared and distributed and scores were given by experts in order to calculate risks, enter the Expert choice software to achieve occurrence of any of the risks. Tables (1 to 2) and figures (3 to 4) and given and obtained weight on the basis of the operation phase, shows repairs in 2 parts of physicochemical, biological.

According to the comparison test conducted by expertise ideas in Expert choice software, results suggests that the most likely risks in the physicochemical environment, were identified as water pollution (A1) and the lowest likelihood of risk of noise pollution (A4). In biological sector, it is calculated like this therefore due to the limited number of each paper, mentioning the content of results is enough.

In the biological environment, According to the paired comparisons conducted by expertise ideas in Expert choice software the results suggests that most probability of risk is the loss of plants in the environment (reduce the density) (A1) and the lowest probability of risk, is creating the phenomenon of subsidence (A4).

Determining the severity and likelihood of risk

After determining the likelihood of any effect (weight effect) in the previous step, then using FMEA method determining the severity and likelihood of risks will be discussed with the help of expert opinions. For this purpose, a questionnaire containing the risks identified was distributed among experts Delphi. Table 2 shows points used to determine severity and likelihood of each risk.





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Numerical values of risks

After determining the probability of occurrence (through AHP) and severity and likelihood of impact (through FMEA) using the following formula: number of risks (RPN) was calculated.

Probability number (RPN) = the likelihood of discovery * the severity of effect * the likelihood of occurrence.

The results of the calculation of the index RPN or the degree of risk taking FMEA, in physicochemical environment

For each risk, a score was considered by questionnaire distributed and experts and specialists ideas. Then risks were identified as descending from the most high-risk priority number 6.14, to the lowest risk priority number 525/0 and the degree of risk-taking could be determined in two ways (about risks)

1. Calculate the average standard deviation using Excel software
2. Using the arithmetic mean formula and standard deviation

In this study, calculating mean and standard deviation using Excel software is enough First average is obtained. Then standard deviation is obtained

However, according to the mean, obtained standard deviation, table (4) was determined for risk analysis.

As a result of the above calculations

High-risk venture, with equal numbers RPN more than 12.33 are recognized as high risk (critical) that need stronger corrective actions. Equal numbers below 0.6075 are known as low risk (negligible). And numbers between these two are known as medium risk (middle). With regards to the values in Table 4, they were interviewed as table (5).

The results of calculating RPN Index or the degree of risk taking FMEA in biological environment

Potential failure modes (aspect) of any risk distributed by questionnaire one score were considered by experts and specialists. Then risks identified was arranged as Descending as the highest risk priority number 18/19 to low risk priority number 51/0. The degree of risk taking (risk limits) in two ways were mentioned (which are fully described physicochemical environment), calculated and determined. According to the calculation results indicate that the highest risk is RPN = 16.17, and more levels than that, can be considered as high risk (critical). And the lowest level of risk is RPN = 0.54, lower than this level is known as low risk (negligible) and items between them is known as medium risk (moderate, tolerable). For high-risk venture (critical), with RPN, number equal to or higher than (16.17), are risks than need more corrective actions and stronger controls.

CONCLUSION

Now we are going to discuss determining the probability of each risk, calculate risk number (RPN), identify and rank risks and conclusion of the results of the research. At first important results of the study will be referred and finally will be concluded.





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Risk factors and their effects, as well as the origin in the physicochemical environment: The most distinctive risks identified in physicochemical environment were risk of water pollution, with the number of risk (016/14). Water pollution is the first risk factors identified in Ramin thermal power plant at physicochemical environment. Most important source of water pollution, is industrial waste water containing pollutants from the entire oil and fat industries, from Karun cultivation and industry to Ramin and Zergan power plants ... as well as sewage that containing risks of contaminants TSS "CO" BOD5, chloroform.

Risk factors and their effects as well as their most important source of biological environment:

As a result most prominent risks identified at a biological environment, the risk of loss of plants (reduce the density (18/19), is presented as the most prominent risk and this recognition depends on the quality reduction and contamination of water resources in the region, and because of that the density of vegetation in the area has fallen sharply and is one of the major reasons for the Reducing the quality of water resources in the region. The main source of chemical risks in the physicochemical environment is also mentioned in this context applies.

Conclusion on the determining the most prominent risks in two cases:

The most distinctive risk identified in the study, is the risk of loss of plants (reduce the density) with the numerical value risk (18/19) the second risk is that achieved the highest value is the risk of water pollution (016/14). The risk of subsidence phenomenon in the ranking of risks in the studied environment compared with the lowest numerical value risk (51/0) obtained the last rank among the risks identified in activities. In table (6) all risks identified in two areas of study are prioritized according to the value of risk.

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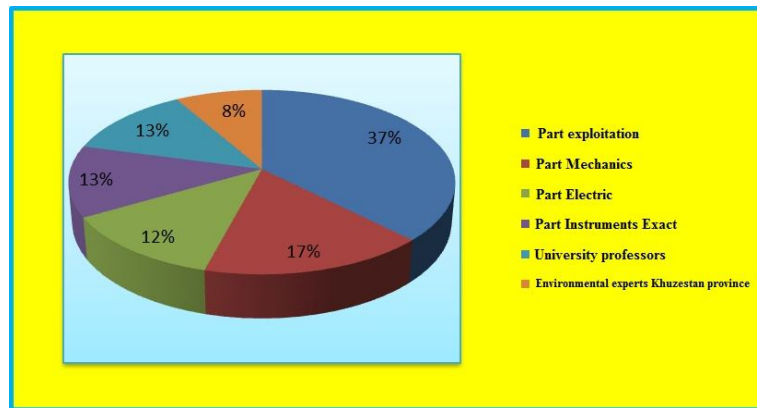


Figure 1: Distribution of the questionnaire in different parts

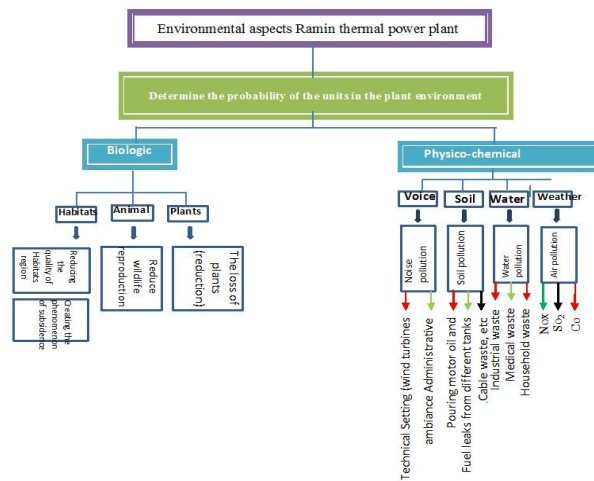


Figure 2: hierarchical structure of environmental aspects Ramin thermal power plant





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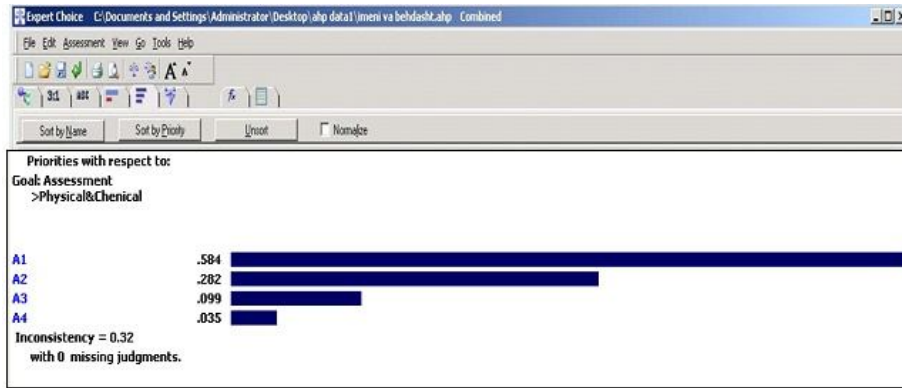


Figure 3: View paired Comparison of physicochemical risks in the Expert choice software

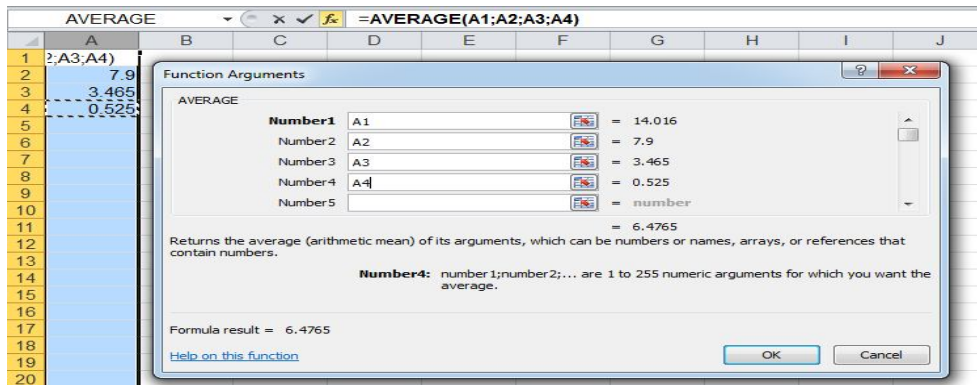


Figure 4: Show calculate average data, physicochemical environment in the Excel software.

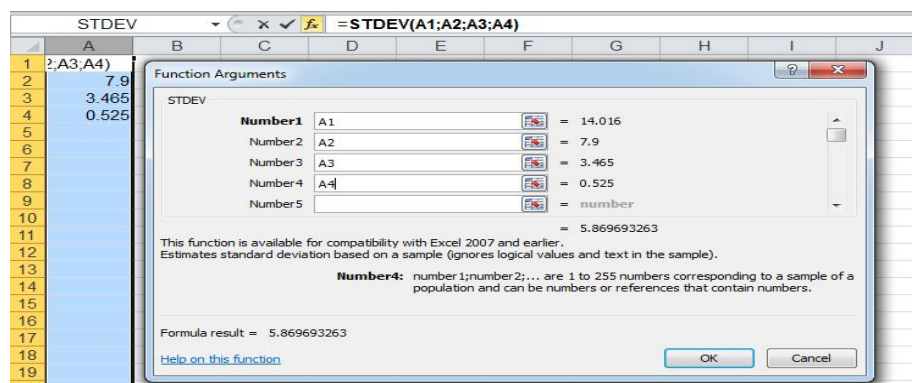


Figure 5: Show calculate average data, physicochemical environment in the Excel software





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Table 1: Comparison test on the exploitation phase, Repair - physicochemical environment

physicochemical environment	water pollution	Air pollution	Soil pollution	Noise pollution
water pollution(A1)	1	5	6	7
(A2) Air pollution		1	7	8
(A3) Soil pollution			1	7
(A4) Noise pollution				1

Table 2: Determine the severity and likelihood of danger to the risks of exploitation phase, repairs

environment	Risk aspects	The severity of occurrence	The chance of discovery
physicochemical	Water pollution	6	4
	Air pollution	7	4
	Soil pollution	7	5
	Noise pollution	5	3
Biological environment	(decrease in intensity)Loss of plants	7	5
	Reduce wildlife reproduction	7	4
	Reducing the quality of ecosystems	9	5
	Creating the phenomenon of subsidence	2	5

Table 3: Number of risks Identified

row	Identified risk	severty	Likelihood of discovery	Likelihood of occurrence	Risk number (RPN)
1	Water pollution	6	4	0/584	14/06
2	Air pollution	7	4	./282	7/90
3	Soil pollution	7	5	0/99	3/465
4	Noise pollution	5	3	0/035	0/525

Table (4) amounts required for the risk analysis in FMEA method, chemical and physical environment

Average (risk factors)	6.4765
Standard deviation	5.869
Total numbers	25.95
High levels of risk	12. 339
Low levels of risk	0.6075





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Table 5: Determine the level of environmental risk, physicochemical environment

Classification of risk	Risk level	row
$0.60 \geq RPN$	low	1
$0.60 < RPN < 12.33$	Average accepted	2
$RPN \geq 12.33$	high	3

* In Biological section, it is calculated just the same but because of limitation in number of pages we only presented the results.

Table (6): prioritizing risks identified in the study, According to the a number of risk

Row	Identified risks	Risk number
1	loss of plants (reduce the density)	19/18
2	Water pollution	14/016
3	Air pollution	7/90
4	Reduce in wildlife reproduction	7/056
5	Reducing the quality of habitat area	6/705
6	Soil pollution	3/465
7	Noise pollution	0/525
8	subsidence phenomenon	0/510





RESEARCH ARTICLE

Environmental Impact Assessment of Second Zone of Zanzan with the Approach of Urban Land Recycling

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ABSTRACT

Recycling unused and vacant lots within the city in order to achieve sustainable development and environmental protection has a great place in urban planning. Various studies show that the average urban land about 15 to 20 percent of land in most towns is empty and by recycling these lands we can preserve the environment. Zanzan city is one of the cities that by recycling urban land we can prevent the indiscriminate expansion of city limits. The present study aims to identify and prioritize the utilization of land in two cities of Zanzan city. For the purposes of research, library resources and field studies were reviewed. Using Multi Criteria Decision Making (MCDM) methods, plots in terms of recycling potential were divided into three categories of non-recyclability, recyclability first-rate rate and recoverability second- rate. Results show that about 14 acres of land in the region have recyclability. Of this amount, the surface of over 33,671 square meters plot of 107 lands has fist rate recyclability and mainly include arid, empty and dilapidated. And has the greatest potential for sustainable urban land use and building level. Next are second-rate recyclable lands that has allocated land surface of 105,274 square meters to it. The land mainly consists of non-maintenance buildings, lacking the necessary strength and old which need renovation and refurbishment.

Key words: land recycling, environment protection, methods of MCDM, Zanzan city





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INTRODUCTION

Urban land are scarce, non-renewable, expensive, irreplaceable and needs significant investment to convert raw land into urban land, is a very valuable commodity (Etemad, 1999: 15; Majed, 1999: 423) and have close relationship with the environment and sustainable urban development. The contrast between the area occupied and the ecological footprint of cities is very obvious. Although urban zones occupy a small space at ground level, but the extent of their ecological footprint is too high (J. Bone and Madres, 2009: 96; Hosseinzade Dalir and Sasan Pour, 2006: 83 101). According to the United Nations Centre for Human Settlements (Habitat) the shortage and high cost of urban land in the cities of the Third World is one of the main obstacles in urban development (Mahdizadeh, 2000: 74). All this has become a proven reality and undeniable that trends in the development of Iranian cities, including large cities, medium and small were like that of the use of physical development resources, especially land, is wasting and is in contrast to the optimal management of environment. As the density of persons per hectare in Iran is very low and is between 60 to 70 a person. Especially amount of index within the old context and the central cities is significant. As population density in compare with the density of the gross population in major cities around the world such as Calcutta (303 ha), Tokyo and Cairo (284 ha), Paris (208 ha) looks so small (Abraham, 2007: 2). In addition to the low density of persons per hectare, type of lands use in the center of the great cities of Iran, unlike the big cities of the world, the focus of activities and better jobs, capital-intensive, dense and consistent with the environmental rules are not proportionate to the performance and status of the center of large cities and even opposite of this trend is going on that the activities and jobs are moving out of the area. So policy of inner urban development and strategy (look into) which is forgotten policy in the development of Iranian cities, should be highly regarded by urban planners. However, in the period before the revolution and after the revolution, several programs under different names, including "mental part," "improving," and so on were made for the different cities of the country (Zia Khah, 2003: 487); but recycling of urban land and the allocation of the recyclable land to other land uses and avoid environmental construction in pristine areas have less attention and investigated. Also, big cities in inner developed as well as an increase in the spatial domain (peripheral development), do not follows a planning system a lot and have high ecological footprints and provide instability in the cities of their country, so some of the features can have a positive impact on the development of the city, reduce the ecological footprints of cities provide stability contexts in cities, have not been identified well. Some of these capabilities, recyclable urban areas, especially urban areas are empty and unused. So that lack of attention to this kind of development (internal development) forced the city to the surrounding development and this kind of development destroy consolidation of the city and makes parts of the city discontinue and in this case city experiences ugly growth .The result of this is a city with discrete and without visual beauty, rising costs of infrastructure and services, imposing exorbitant costs on urban management and conversion of agricultural and arable land to unusable land in the environment. Due to periphery development, the city will be rot and decay will be added to it. In general, the development of a broad and continuous increase in the city is out of the conventional standards that brings problem such as lack of economies of scale and severe destruction of agricultural land around cities and environmental challenges associated with the city and urban management. The results of the previous trend of population changes on one hand shows rapid population growth and on the other hand shows increasing urban population and change in living pattern. Based on the results of population and housing censuses during 2006-1956, the total population of the country in the last fifty years increased from 704742231 to 18956038 people in 2006, with annual growth rate of 55/2 percent and the urban population increased from 6002621 in 1335 to 48,245,075 in 2006, with a growth rate of 1.4 per cent annual growth increased, which suggests the sharp rise in the urban population (Table 1).

In addition, during the years 2006- 2021, the city with this trend, will experience a severe increase in population that urban surface for above population will be higher than the entire surfaces (Sarawani, 2006: 5). By observing this trend the first question that comes to mind is that whether to expand the growing settlements and urban services, are there suitable and adequate land? Urban land because of being scarce, non-renewable, expensive and requiring substantial investment to convert raw land into urban land is considered a very valuable commodity; On the other



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hand the need for land for housing and other land uses is necessary and inevitable for all urban households have access to land for housing and other land uses is essential (world bank, 1992: 2); therefore, the use of this product and the use of their own is important the more people use this product it shows more optimal use. The question is that due to the non0producing nature of land and the limited availability of land in time and space on one hand and the growing need of it in urban areas on the other hand and close relationship of these immovable goods with the environment, how can we recycle this land to provide needs? And what role can the Urban Distressed Areas have in the productivity of urban land (land recycling)? Due to the above issues, this study is to evaluate the dimension of this problem and provide suitable solutions to recycle and reduce the negative impact of humans on the environment, providing land as general wealth of old tissue areas to meet the most basic human needs (housing) in two of Zanjan city's old.

MATERIALS AND METHODS

In the present study two survey descriptive and analytical methods has been applied. Therefore, despite the observations and interviews from the field, information is collected through the study of literature. Existing resources provides important information in the study area provided that most of the information are not accessed from field studies. The data for this study were collected with direct reference to the statistical and information centers such as the National Land and Housing Authority, the Housing and Urban Development of Zanjan Province, Department of urban land of Zanjan province, statistics of the Statistical Center of Iran and former organization of Management and Planning of Zanjan province and cultural heritage, as well as Internet sites and databases and academic libraries. In the analysis of data and information after preparing information and comprehensive design maps and statistical Block 1385 in Zanjan city using software such as Arcview, ArcGis production of maps and pictures has been carried out. And using multivariate analysis, decision-making methods, and old areas in Zone 2 of Zanjan city in terms of recyclability, has been prioritize and determined. Since the AHP method is a multi-level approach, first surfaces analysis is introduced so that it is first level of goal; the overall objective of this research is prioritizing area in terms of recyclability. To achieve this goal has standards been setting that can be seen in Figure 1. It should be noted that the tree issue, is also considered as analytical model (Figure 1).

The theoretical framework

Urban recycling concept: Recycling urban land means the reuse of inadequate use land and arid land and abandoned that is endangered the visual appearance and the dynamics and quality of the environment is (Falamaky, 2007: 86). Recycling also refers to that measure that with minimal cost and minimal interventions leads to improve living conditions in urban areas. In fact, recycling refers to a set of measures that makes condition of survival and the survival of urban space in the surrounding environment more. . Recycling is trying to solve its immediate thing that has disrupted life in urban areas in other words, recycling is meant to meet the risk and return life in the short time to urban space, using the vital force in space or urban sprawl (Habibi, Maghsoudi, 2003: 5; Meshkini et al., 2007: 48). Recycled urban areas, including the areas of rehabilitation and reconstruction of old urban textures, inefficient use of urban land with (military barracks, etc.) and peripheral textures (Eftekharu Rad and Skandari Dorobati, 2000: 24). Abandoned land, are located in villages, cities and towns with populations of less than one hundred thousand people, and land use and old textures and improper use, mostly in medium and large cities. By studying maps of the cities and Statistics uses of land in the cities, in average about 15 to 20 percent of land in the city is empty. Cities with higher population growth due to the urban development have outside development mode and have more vacant lots (Fakhr Ahmad, 2008: 60). Although unused land and some land and sometimes recovered lands in large cities, will bring negative images such as destruction, environmental hazards and lack of security in fact, this type of land can be an opportunity for development and prosperity in urban areas of a city.



**Mohammad Hasan Yazdani et al.****The geographical location of the area under study**

Zanjan city is the capital of Zanjan province and is located in 36.40 degrees latitude and 48.31 over 1663 meters above sea level and a population of over 349,713 people in the 6763 square kilometers of desert in the North West was (Tafakori, 2007: 180). Among the factors affecting the development of Zanjan city we can mention connecting ways to the central plateau of Iran to Azerbaijan in the region, the ruling of the topographical conditions, existence of flat land with a slope of 2% in the mountainous region and the need for the mutual exchange of agricultural products and presenting services to rural hinterland. Zanjan city is among the central cities of the country and is considered as undisputed center of the political and economic center in province. In works of Islamic geographers name of this city with Abhar city is named, as the towns of Jebal Province. In various works sometimes name of Zanjan, a part of Azerbaijan, and Deylam. . . are also mentioned (Rastegar, 2009: 57). Now the city is 6169 hectares. The city of Zanjan with an area of 111443068 square meters (11,144 acres) of total tissue from the north and northwest of the central belt (22 February), from the south and south-west to the railroad tracks and from the East is limited to the streets of the Shohada, Sarbaze Gomnam (North Saadi) and 15 May. In this area in 2006, over 19,867 people were living (Figure 2 and 3).

Analysis

In the study area lands were divided into three categories in terms of recyclability, lacks of capacity, first-class and second-class capabilities. Hence, the degree of lands in the view of 4-fold criteria (type of operation, age, build quality and materials) got 1 to 3 points. For example, if the in a land there is a building which dates back more than 20 years, this means that the building has the lowest chance, or one point for recycling. In other words, the land and its buildings from dating index are like that it can be optimally used and has no need for recycling and reconstruction. Unless in terms of other criteria such as the quality of construction and materials. . . is in situations where can get two or more points. Table 2 shows the range of four rating criteria. In fact, at this stage there will be a relation between the choices (land) and measures that in next step by multiplying to the weighting of criteria, it will help in recognition of the potential recycle of these lands.

Table (3) that results from overlaps and integration of the lands recovered criteria using the AHP in GIS. As the table above shows, an area of about 33,671 square meters with 107 have first class recycle potential. 574 parts also has second class recycle ability, which is an area of over 105,274 square meters. A total of around 138,945 square meters of the 681 pieces has recycle condition and given that the existing buildings (land which are in recyclable group), have poor quality conditions. In this case it is essential that for the needs and shortcomings of the region, the relevant work be done towards recycle, reconstruction and the allocation of suitable use. In Figure 4 priority of land recycle in two cities of Zanjan is shown.

Use and the status quo of Renewable land: The recycle lands in the two regions of Zanjan in the status quo of have the residential user. So that from 681 pieces of recyclable tissue, 581 pieces equal to 86688 square meters are occupied by the user. In The next level of vacant lots, run-down building with the 109 block of 34,017 square meters of surface are dedicated to this application. There is a significant level of vacant lots, run-down and under construction, which is an opportunity to meet needs in the region. And also two middle schools and an elementary school due to poor quality and non-maintenance need demolition and reconstruction. The rest of the recyclable land is dedicated to commercial applications, transportation and warehousing, residential, mixed residential and special deals (Figure 5) that the number of parts and the area is inserted in table (4).





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CONCLUSION

To achieve sustainable development, especially in fragile environments such as desert and semi-desert country like Iran, dense tissue and develop from inside is inevitable (Kasmaee, 1991: 161- 168). The weakness of urban development plans should be sought in disregarding to the development philosophy in the city. The development in the city reduces infrastructure and construction costs and provides proportionate and equitable distribution of facilities and urban equipment and leads to development of sustainable (Shamaei and Pourahmad, 2005: 22 and 23). In order to achieve sustainable development and environmental protection in urban development, urban land recycling issue was raised. Zone 2 of Zanjan was chosen as sample in case study. And by using four criteria in prioritizing land plots in terms of recycling (standards, quality materials, quality of construction, age and the type of operation) were analyzed within the framework of multi-criteria decision making (MCDM). Studies showed that 107 plots of land, totaling 33,671 square meters surface is occupied with first class recycling capabilities. The land is mainly arid, empty and dilapidated that have greatest potential for sustainable urban land use. In the next degree renewable land has second grade that has allocated area of about 105,247 square meters. The land consists mainly of non-maintained buildings that lack the necessary strength and are old which need reconstruction and modernization. In the study about 14 acres of land in this area has identified that can be recycled. Also in this area there are deficiencies in the per capita land uses of recycled land that should be allocated to the applications. By utilization and allocation of the land to the uses required we can prevent the spread of uncontrolled urban landscape and economic costs of providing infrastructure and additional facilities and provide sustainable development and environmental protection in the region. However, by using the results we can have accurate picture of the status of the renewable land, which due to needs and shortages in the second zone of Zanjan city we should recycle and allocate appropriate urban User.

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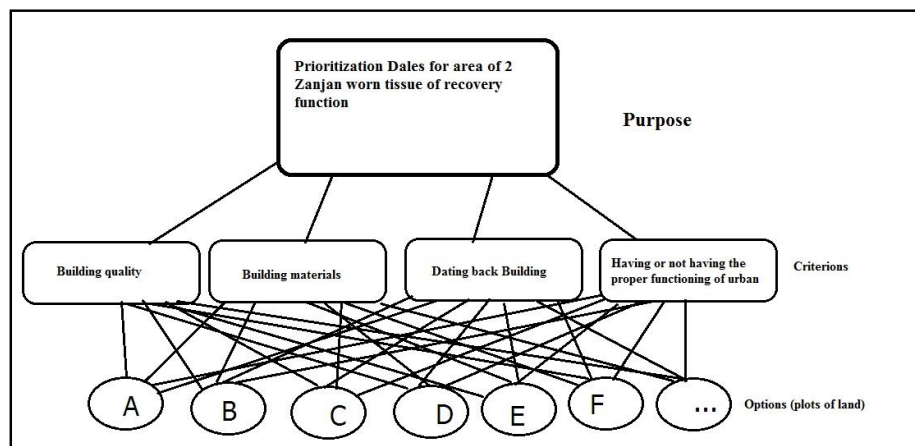


Figure 1: chart of hierarchy of decision-making, to set priorities for the utilization of land in zone 2 Zanjan city





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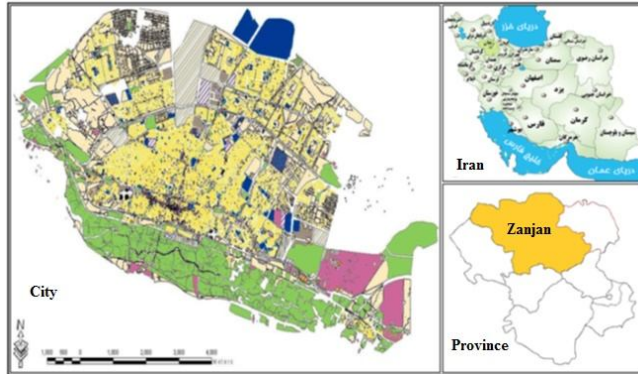


Figure 2: maps of the geographical location of the city

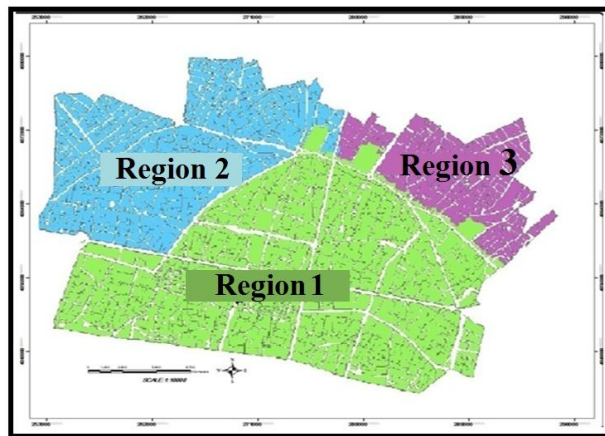


Figure 3: Map of the municipality location of Zanjan city

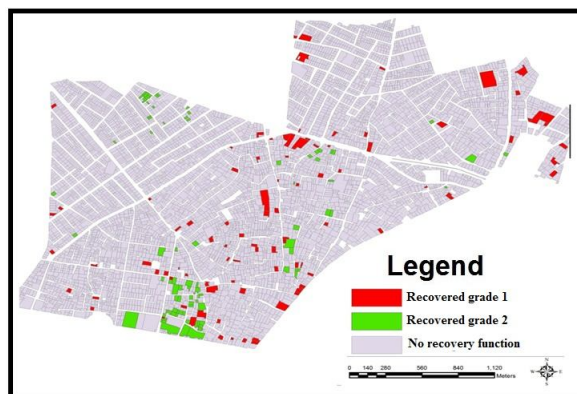


Figure 4: prioritize recycle land within the two area of the city





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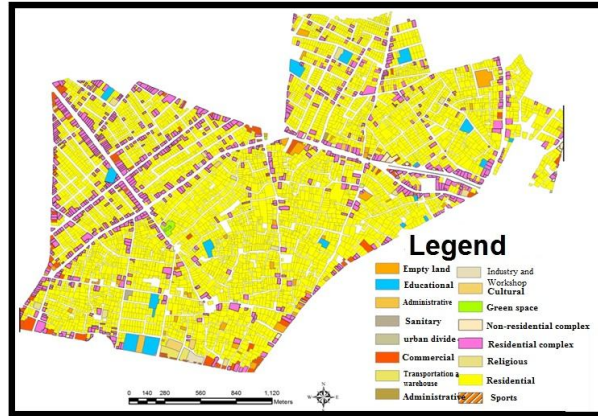


Figure 5: map of the status quo Renewable land use

Table 1: trend of urbanization in Iran from 1335 to 1385

year	Total population	annual population growth(%)	Urban population	Percent of urbanization	Average annual urban growth (%)
1335	18956038	-	6002621	32	-
1355	33710099	2.71	15854680	47	4.93
1365	49446375	3.91	26844561	54	5.41
1370	55838533	2.46	31836598	57	3.47
1375	60056863	1.47	36817789	61	2.95
1385	70474231	1.61	48245075	68	2.74
Average annual growth in 50 years		2.55	Average annual growth in 50 years		4.1

Source: General Population and Housing Census extraction of detailed results from 1956 to 2006 and calculated by the authors

Table 2: Groups of four rating criteria (old building, quality of building materials, Functionality of the land)

Antiquity	Range of Rating
Less than 20 years	1
Between 20 to 30 years	2
More than 30 years	3
Building quality	Range of Rating
New and under construction and maintenance	1
Restoration	2





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Destructive ruins	3
Type of material	Range of Rating
Concrete, brick and steel structure	1
brick and wood	2
Mud brick	3
Functionality of the land	Range of Rating
The proper functioning of the city	1
Lack of proper functioning of the city (vacant land, wasteland, military sites and...)	3

Source: Field study of authors

Table 3: number and area of recycling land in two regions of Zanjan

Area (m)	The number of recycled parts	descript
973800	6614	Land without recyclability
105274	574	Land with recyclability grade 2
33671	107	Land with recyclability grade 1
138945	681	Total land recyclable

Source: Field study of authors

Table 4: User status quo of Renewable land area of Zanjan

Renewable land		User type pieces		raw
Area(m ²)	Number of parts			
86688	518	Residential	Residential	1
2089	3	Special Residential		
6756	39	Residential complex		
1600	1	elementary	Education	2
5450	2	guidence		
513	8	Business		3
1830	1	Transportation and warehousing		4
34017	109	Vacant land, under construction and ruins		5
138943	681	total		





Tourism Situation Study in the City of Hamedan towards Sustainable Development using the SWOT Technique

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ABSTRACT

With the onset of the industrial revolution and urbanization incentive travel and entertainment to meet the needs of the human spirit became necessary, this global phenomenon in recent decades, the tourism industry to create the so-called theories. Login tourists can be a place of economic, social and cultural importance in the area to leave and the development of the region. In this study, to analyze the strengths, weaknesses, opportunities and threats in advance and weighting factors in order to determine the appropriate strategy for tourism SWOT model and strategies for the development of tourism in this province is presented. Results of this study indicate that the situation and the effects of Hamadan many outstanding historical, cultural, artistic and literary positions aggressive / competitive is the capacity to become one of the largest centers of international tourism is. The biggest obstacles to achieving this goal, disability management, financial and urban equipment, non-specialized and inefficient management, poor infrastructure and advertising. Solutions and strategies for planning tourism development in Hamedan, this study can be useful and effective.

Key words: S.W.O.T urban tourism, constant development, guideline factor, Hamedan



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INTRODUCTION

In recent decades, development of tourism industry of its assumption as one of the main economic activities from developed and developing countries plus competing with the main tourism destination for attracting tourist, planners pay special attention on two important categories for increasing incomes of tourism activities: First, increasing the content of tourists and increasing the quality of tourism experience. Second, the preservation of host society's revenue [1]. To all the countries, tourism is one of the important issue and all of the countries do their best to achieve advantages and revenues. Today's, one of the important tourism places is city places. The urban tourism has twofold characteristics; on the one side, this means that the city is one of the main tourism places. On the other side, the city is one of the main tourism destinations. The related subject to urban tourism is the second one; this means that the city is one of the main tourism destinations. In fact, the aim of tourist is visiting the attractive places of destination [2]. Cities including a lot of attractive places and tourism installation play an important role on their development. Nowadays, Tourism is viewed as an important economic issue which requires evaluation of competing scale, definition and appointment of the goals, decision about different choices in logistics, investment and creating appropriate structure and commercial products of urban tourism [3]. In order to make proper decision about planners of urban tourism attractive, all the best options and factors which effects on this decision should be chosen [4]. Now according to attractive places, the most important point in planning is how to decide about their preferences on development and how to develop them. For evaluating and making decision about preferences of attractive places, usually different criteria regarded such as: economic, social-cultural, substructure, existence-environment, natural, legal and geographical which can make proper decision about different attractive places [5]. When different criterion are not the same, the decision should be made on polyhedral space. In this condition, the multicriteria evaluation techniques can be regarded as separate condition which its final goal is the constant development, balance seeking and equal administering of sources which have strong relation with different sciences such as environment, economic, sociology and etc. [6]. Tourism is one of the sciences that have increased according to the logistic and the urban planning. Regarding the deeply neurotic compulsion resulting from air pollution, traffic, living in small houses and busy places in metropolis and also increasing the relative income of its residents, tendency to tourism has been increased in the country regions which include fine weather. Because people can spend their pleasure time in these places. It can be predicted that its growth will be increased in future. In recent decades, tourism industry development and it is assumption as one of the major economic activities of developing and developed countries for attracting the tourists who have caused the planners to make decision about two important categories for increasing the incomes of tourism activities: first, increasing the contact of tourists and increasing the pleasure and quality of tourism experience. Second, preserving the host societies revenues.

METHODOLOGY

Collecting the systematic data and logical analysis for achieving the standard goal is called methodology. Methodology is analytical-descriptive in this research and the method of data-collecting is of two kinds: library and interview. The analytical swot tool is one of the major techniques for clarity among the strategic issues. Besides, it is one of the best techniques for analysis and environment guidance. Regarding the questions and research goals, the swot goal is used as recognizing and classifying the factors of internal and external environment. Data analysis has been applied by matrix evaluation of external factors (ife) and external factors (efe). The process of matrixes is:

Appointing the strong and weakness points of tourism in this region, assigning the scale coefficient between zero (unimportant) and one (much important) which total scores of scale coefficient should be equal one through the normalizing the normalizing the scale coefficient. Appointing the concession between 1 and 5 according to this criterion:

1=weak, 2=lower than medium, 3=medium, 4=higher than medium, 5=very well





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Calculating the weighted concession through the concession coefficient of every rank of factors in normalized weight and writing them in new column. Calculating the weighted concession which is at least one and at most five and it means three. If the final score is lower than three, it means that the area has weakness internal factors and if the final score (ife) is over than three, it means that the area has strong internal factors. This method is a public tool which is both for internal environment analysis (strong and weakness points) and external environment analysis (threats and opportunities). Besides, the systematic approach helps on decision about this kind of situation.

Case study region

Hamadān is one of the western provinces of Persia, situated to the southwest of Tehran between latitudes 33°59' and 35°48' north and longitudes 47°34' and 49°36' east. The city of Hamadān (the capital of the province) is located at 37°47' N and 48°30' E, at an altitude of 1,645 m on the eastern slope of the Alvand massif (q.v.; alt. 3,571 m; the Mount Orontes of the Classical sources). In the National Physical Plan (Āar-e kālbodi-e melli), which divides the country into 10 regions, it is identified as a part of the central Zagros sub-region (Moassasa-ye āli-e pažuheš, p. 1). The province of Hamadān is bounded, clockwise, by the provinces of Zanjān and Qazvin to the north, the Markazi (Central) Province to the east, the province of Lorestān to the south, and the provinces of Kermānšāh and Kordestān to the west. According to the last national census (1996), Hamadān Province covers an area of 19,493 km², constituting about 1.2 percent of the country's total area, with a population of 1,672,957 (Markaz-e āmār-e Irān).

FINDINGS

The analysis method of research findings is one of the main processes of research. There are different methods which are related to the research findings. Analysis method has been used in this study which included four key words named: (strong points), (weakness points), (opportunities), (threats). The aim of using this method in tourism planning is to show how the available managing and planning system is working and which method should be continued in the future. This method is useful and applicable for political aims and special guidelines of urban tourism industry. The major use of this method is available which it is mentioned by four parameter matrix and then the importance coefficient of every parameter and measuring their concessions helps the analysis of measuring the possibility of tourism area. As it is obvious in chart (2 and 3), all of these factors (internal and external) have been marked. Furthermore, as it is obvious in chart (2 and 3), twelve strong points versus eleven weakness points as internal factors and ten opportunities versus eleven threats as external factors have been considered in this region. As a whole, there are twenty three cases as strong and weakness points and twenty one opportunities and external threats in the development process of tourism in Hamedan.

Rivalry-aggressive strategic (so) of main guideline

The increase of journey motivation especially in burges class, furthermore, the increase of attractive places and tourist products in order to make occupation and income for the residents of Hamedan. Recognizing and exploitation of attractive places and other relative advantage of the tourism area such as (citrus fruit and high antiquity of historical places in order to contest with other tourist areas. Coordination between private and governmental organizations in order to unify the constant tourism in the area. Supporting and encouraging private part in order to invest in tourism part.

Variety strategic (st)

Variety in tourist services in order to satisfy the tourists

Varieties in advertisement program in order to introduce the area and tourism attractive places.

Varieties in historical places through different display rooms and student camps in these areas.





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Varieties in local Bazaar and handmade industry.
Varieties in programs through the national networks of Hamedan.

Review strategic (WO)

- reviewing the governmental and private plan.
- reviewing the government planning in order to develop the substructures and different facilities of tourism.
- reviewing the services distribution in order to attract the tourist in the area.
- reviewing the notification process.

Defensive strategic

- holding the meeting and seminar in order to develop the tourism investment by cultural inheritance organization with the cooperation of other authorities and organizations
- Establishing the cheap tourism agency in the provinces and even in the whole of Iran.
- Establishing the rest places and playground around the tourism area with the aim of developing the tourism industry.
- Giving especial concession to the investors in tourism areas.
- Equipping the tourism roads for tourists welfare
- Sign installation in tourism roads
- Dispensing the guide booklet and notebook among the tourists.
- Teaching and notification of people especially villagers who live near the tourism places.
- Teaching and notification of tourists in order to notify them the protocols of area.
- Encouraging people to cooperate in the development of tourism industry and investment in tourism for earning money

CONCLUSION

In this study, in order to provide guidelines and strategies for tourism development in the city of Hamedan, strengths, weaknesses, opportunities and threats to tourism in this province by way of advance swot studied and strategies were developed to improve the development of tourism. Hamedan, due to the role, status and experience their cultural and literary history as one of the most tourism centers of Iran has always been in this position is a privileged and strategic Which can Hamedan position as one of the most important international tourism boost. Results of this study indicate that the Hamedan despite having a high potential in tourism for various reasons failed to optimum use of this gift in order to use their development. Most notably the inability of management, financial and investment in the necessary equipment in order to expand tourism services. Benefit from the tourism industry and management requires careful planning and attention to all sectors related to tourism and coordinate it with the industry.

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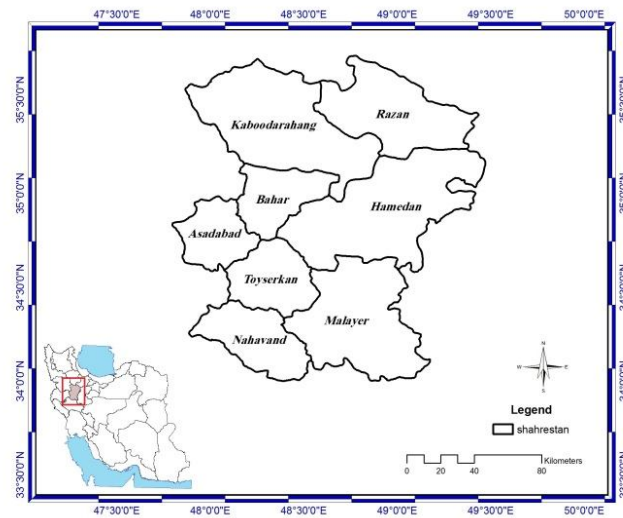


Figure 1: Case study region

Table 1: preferencing, internal factors in order to recognize the strong and weakness point of tourism development in Hamedan.

	Analysis model of swot (strong and weakness points analysis, opportunities and threats)			
Row	Chart 1: the matrix of considering internal factors (if, strong points) (strength)	weight	available status	weighted revenues
1	The existence of cultural attractive places like Baba Taher	0/09	5	0/45
2	The archaic of historical structure and architectural value of structure like Hamedan Bazaar	0/05	3	0/15
3	The existence of homes and primal village	0/07	3	0/21
4	The existence of historical mosques such as Jame mosque and Grand Mosque	0/04	2	0/08
5	The existence of cultural places such as playing polo and native music	0/03	1	0/03
6	The existence of protocol plus traditional and native culture	0/04	1	0/04
7	The existence advantage of Gharsoo Lake	0/03	2	0/06
8	The existence of natural landscape such as Ganjnameh	0/08	4	0/32





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	height			
9	The existence of handmade industry such as carpet, short-napped coarse carpet , coarse loosely-woven woven cloth	0/04	2	0/08
10	The existence of cold regions fruits such as nut and medlar	0/03	3	0/09
11	The existence of rare pharmaceutical plants in this region	0/05	2	0/10
12	The existence of different religious minorities, the weakness points	0/03	3	0/09
13	The lack of preservative and Guardian in order to prevent the destruction of valuable tourism locations.	0/03	3	0/09
14	The lack of communion of people in consideration of place status	0/03	2	0/06
15	The lack of guides in tourism places	0/02	2	0/04
16	The lack of guide Tableau and light in tourism locations	0/02	1	0/02
17	The lack of residence and entertainment	0/05	2	0/10
18	The unsuitable sanitary and services facilities	0/04	1	0/04
19	The lack of comprehensive and precise notification of tourism locations	0/04	1	0/04
20	The lack of residents' tendency of the region in order to invest in tourism part for different reason.	0/06	2	0/12
21	The lack of physical, social and cultural communications for valuable tourism places	0/04	2	0/08
22	The lack of governmental investing and planning in the region	0/05	3	0/15
23	The draughty problem in recent years	0/04	2	0/08
Σ	total revenues	1	-	2/52

Table 2: Preferecing, the external factors in order to recognize the opportunities and threats , tourist development of Hamedan

Row	chart (2): the matrix of considering the external factors (efe) (opportunities)	Normal weight	The available concession	the weighted concession
1	The tendency for tourism development of city by private and governmental part.	0/08	2	0/16
2	The New Stone lion statues Hamedan.	0/06	2	0/12
3	The notification by governmental parts.	0/04	2	0/08
4	The increase of more motivation for traveling and entertainment among the all people.	0/06	2	0/12
5	The increase of motivation in private part for investing in Hamedan.	0/06	1	0/06
6	The experienced forces at the environs of Hamedan.	0/02	1	0/02





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7	The natural landscape for environment enthusiastic.	0/04	2	0/08
8	The governmental and non-governmental organizations in order to support and present the different facilities and services.	0/03	1	0/03
9	The increase of the authorities' attention for constant developing of tourism with the investing approach	0/07	1	0/07
10	To last the value of traditional and local culture (such as language, local protocol, architectural ...) or increasing tourism.	0/05	2	0/10
	(Threats)			
11	Not presenting the justification and facilities to develop services and equipment of tourism	0/06	1	0/06
12	The lack of enough teaching by government in order to notify the local residents and guide them in order to develop tourism.	0/06	2	0/12
13	The increase of land price and exchange, furthermore the increase of financial cost of expensive equipment and facilities of tourism.	0/04	2	0/08
14	The increase of more social violations then before because of tourist entrance in the region.	0/02	1	0/02
15	The increase of tourists' tendency to travel to the other cultural areas.	0/04	2	0/08
16	Not having enough budgets in order to organize the historical structures and their environment.	0/07	1	0/07
17	Environment pollution by the tourists.	0/03	2	0/06
18	The lack of tourist attention because of tourist attention, because they destruct the historical buildings.	0/05	2	0/10
19	The lack of authorities attention because they don't repair the historical buildings.	0/04	2	0/08
20	Paying not enough attention to the economics of the region	0/05	1	0/05
21	The increase of services in the region.	0/03	2	0/06
Σ	the total concession	1	-	22/2





The Role of Urban Furniture in the Vitality of Historical Texture SideWalks (Case study: Shahrdari Street and Hafeziyeh Street, Shiraz, Iran)

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ABSTRACT

In architecture and urban design, taking into consideration the ideas of citizens is one of the most important factors for designing. That is to say, what features the space and surrounding environment should have in order to attract people. One of these urban elements that cause this attractiveness is urban furniture. Urban furniture is an element is very important in terms of creating identity, beauty and readability of the city. From the perspective of a western theorist, if city intelligence should be identified, its urban furniture has to be considered. According to this perspective one we realize the importance of urban furniture. The present study was done with the aim of investigating the role of urban furniture in the vitality of historical texture sidewalks. To conduct this research, the sidewalks of Shahrdari and Hafezieh streets in Shiraz were selected as samples. The study is a combined research and the data collection was done through library and indirect observation methods. In the indirect method, two types of questionnaires related to two historical places were provided and randomly distributed among 118 pedestrians (58 people on Shahrdari Street and 58 ones on Hafeziyeh Street in Shiraz). The collected data was investigated by correlation coefficient test (Spearman correlation) and Single-sample T-test and was evaluated using the 5-point Likert scale. Reliability of the questionnaires was assessed using Cronbach's alpha and it was seen to be 0.870. Results of the present study indicate that create vitality by using appropriate urban furniture in historical places may reduce the depreciation of those places. Investigating



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other factors effective on these sidewalks, we can say that factors such as environmental comfort as well as the monuments themselves are some other factors that make these historical places lively. It is implied that the factors effective on vitality including urban space have an effective relationship with urban space and attracting tourists.

Key words: attracting tourists, vitality, beauty, urban furniture, urban space.

INTRODUCTION

A city is a great work of art that has creators equal to its size and the number of its population. The ultimate goal of a city is to create a creative, educative environment for people who live there. Such a very diverse environment gives freedom of choice to the individuals and provides the situation for their creativity (Bekrizadeh, Abdul Hosseini and Almasi, 2010: pp.37). In the spaces between the buildings of this work of art, additional elements are needed to organize it; equipments that make it possible to live in the enclosed spaces between these buildings. These components regulate the movement, rest, recreation and anxiety in the city and give spirit to it. Urban furniture, equipments or street furniture are the common terms referring to these facilities (Bekrizadeh, Abdul Hosseini and Almasi, 2010: pp.38). These facilities are capable of playing an important role in urban spaces and if they appear, they will provide appropriate capabilities to improve urban spaces and make them beautiful. This element shows itself more in historical textures of a city and has caused the social life in these networks and has improving the quality these textures and renewed their memories (Jahanshah, 2000:pp 13). Nowadays, historical textures in our cities do not have live urban spaces. Vitality in historical textures is achieved through people's interactions in the city. If sidewalks provide safe and desirable spaces and if urban furniture and activities are provided in an organized way and in accordance with the values and needs of the society, active participation of the people and, consequently, vitality and livability will increase. Historical textures can be revived and vitalized by identifying and strengthening the factors effective on the vitality of historical sidewalks and creating lively spaces (Golkar, 2007: Safeh Magazine, pp.44). The necessity and importance of this research is that Shiraz as a historical center with many tourism potentials is of great importance and visiting the historical collections and monuments and enjoying the urban spaces of the city is the main reason for domestic and foreign tourists to go to Shiraz. Among these sites and monuments are Hafeziyeh and Karim Khan Zand monuments where many visitors from around the world go every year (Shiraz Municipality district 7). Given the importance and characteristics of Shiraz city, this research aims at investigating whether urban furniture is effective on vitality of sidewalks of Shahrdari and Hafeziyeh streets of Shiraz. If so, to what extent can it be effective in reviving and revitalizing these textures and sites and reduces the depreciation of them and also attracts tourists and makes the city beautiful. To conduct the present research, a combined "descriptive – analytical" method based on experimental observations and completing the questionnaires on sidewalks of the two historical places (sidewalks of Shahrdari and Hafeziyeh Streets) was used. Two main hypotheses presented in this study are as follows: 1) Successful urban furniture is effective on vitality of historical textures. 2) Vitality is effective on attracting tourists. To investigate these hypotheses, the data from questionnaires was analyzed using statistical methods by applying SPSS software.

REVIEW OF LITERATURE

There are many people inside and outside the country who have specifically dealt with the issue of vitality. Jane Jacobs and Kevin Lynch, Salzanv, Cyrus Golkar and many research groups are among those people. Each of them has looked at this concept with a specific approach which, though valuable, has been criticized. In her book named "Life and death of large American cities" published in 1961, Jane Jacobs described the street vitality as the possibility of making useful attitudes and actions among people and watching others (Jacobs, 1961: pp: 63). In addition, according to Salzanv's idea which was published in 1997 as "Seven Aims for the Livable City", vitality refers to having identity,



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the existence of social life in the city, prosperity and social progress, people and ecological sustainability. In his book "Theory of City Form", Kevin Lynch investigated vitality, mainly in a macro scale. He believes that vitality along with five other factors including meaning, relevance, access, control and authority, efficiency and justice make operational areas of a good city form (Lynch, 2003: pp 155-166). In an article titled as "Vancouver Working Group Discussions" prepared in 2005, a vibrant city is a thorough metropolitan system with social, economic, cultural and environmental dimensions, and vitality is defined as "Quality of life" experienced by the residents of a city or region that has accessibility, equality, and participation dimensions. Hence, vitality has been considered as having interrelated social and economic components. In "Public Places for People" guidelines (2007), the quality of vitality for successful urban spaces has been defined as dynamics, being active, safety and tranquility, variety, entertaining capability (Dadpour, 2004: pp 35-36). Moreover, in the book "the creation of an active urban center", Pamir described the factors effective on a successful and vibrant place to be the size, planning and design of that place as well as taking it into consideration (Pamir, 2007: pp 69). In a study done in the country by Kurosh Golkar (2007) on urban vitality, the terms "liveliness" and/or "livability" have been known as equivalents of urban vitality and it has been defined as one of the components making the quality of urban design. In other words, he believes that vitality along with sixteen other qualities including readability, visual personality, good time, sensory richness, personalization, learning, infiltration and movement, mixed use and form, inclusiveness, quality public realm, climatic comfort, safety and security, flexibility, harmony with nature, energy - efficiency and environmental cleanliness create a phenomenon named urban design quality (Golkar, 2007: pp3). By reviewing the above definitions, it seems that vitality can be broadly defined as the capability of a place for a variety of activities and users with the aim of diversity, experiences and social interactions, so that security, equality and comfort are provided for all users.

Theoretical Fundamentals and Concepts**Urban Furniture**

In Islamic architecture of the Safavid Era, Iranian houses always had a private platform on the street so that each house had a specific platform to sit on and landlords watched the street public spaces from there without flawing the home privacy. All houses had such a platform and pedestrians used them, too. This had caused the streets and passages to be lively in some ways (Specter, 1974: pp69). Urban furniture is one of the elements creating urban spaces and its quantity and quality, beauty, comfort, durability and location play a major role in achieving a beautiful and healthy city (Zangiabadi and Tabrizi, 2004: pp 3). This element is an important part of our city and environment and is in direct or indirect interaction with other urban facilities (with various applications) (Maurer, Jean-Pierre, 1994). Accordingly, creating visual consistency between the components of urban furniture and other urban elements in order to intensify and complement the beauty of the city is inevitable. If it remains hidden from the eyes of officials and designers, we will face a strong visual disturbance in the appearance of the city (Masdud and Hashemi, 2010: Perspective magazine, no. 7). Eliminating urban furniture from the body of a city or having inappropriate urban furniture can be grounds for inefficiency and dysfunction of the urban system and numerous needs of the city would remain unanswered (Agashteh, 2000: Municipal magazine, no. 13).

Vitality and Livability

In Robert Cowan's dictionary of urban development, vitality and livability have come together and have been translated as "Vitality and Viability" which are the characteristics of successful town and city centers. Vitality is reflected in the level of crowding at different times of the day and in different parts of the city; but viability is a measure of evaluating its capacity to raise funds for survival, recovery and compliance with various requirements (Cowan, 2005). Charles Landry has investigated the concept of vitality in a different way; he has defined vitality and viability separately and with four major approaches (table 1). He has dealt with the issue objectively (Landry, 2000). Lynch (1981, pp.118-19) identifies vitality as one of the performance dimension of urban design and describes it





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as the degree to which the form of places supports the functions, biological requirements and capabilities of human beings. Vitality deals to the degree with which an urban space is socially successful. In Montgomery's definition (1998), it refers to the number of people in and around the street (pedestrian flows) across different times of the day and night, the uptake of facilities, the number of cultural events and celebrations over the year, the presence of an active street life, and generally the extent to which a place feels alive or lively. Vitality in the urban realm is an important quality because it reduces crime, makes commercial interests more viable, increases passive enjoyment of streetscape – people watching, encourages social. According to the abovementioned approach, it can be concluded that two important qualities that lead to the vitality of sidewalks are diversity and permeability between spaces. The more various the events on sidewalks are, the wider the variety of activities at different times can be because the citizens go on these routes on foot and more details are comprehensible for them. Besides, creating the accessibility from different parts of the routes makes it more penetrable and gives a choice to the citizens to pass some parts of their routes on the sidewalks without dealing directly with them. The sidewalk paths are also very effective. If the penetration points to the routes are selected and designed based on major activity centers around, they can receive some part of the pedestrian traffic which are the interfaces between these points. Therefore, the sidewalks would attract another group of citizens (Pakzad, 2005: pp285).

Sidewalks part of the public space and urban interaction perspective

Francis Tibbalds (1992: pp1) describes the public realm as, "all parts of the urban fabric to which the public have physical and visual access". Public space is the space we share with strangers, people who are not our relatives, friends, or work associates (Walzer, 1986: pp470). People's public life occurs in urban public spaces in a complex set of forms and functions; accordingly, these spaces must be capable to contain diverse behaviour, uses and activities such as shopping, walking, conversation, using the facilities to entertain, relax or even passing the time as daily activities, and also periodic festivities and events (Oktay & Jalaladdini, 2012, pp 664 – 674). As Montgomery (1998) emphasizes, "it is the public realm and associated semi-public spaces which provide the terrain for social interaction and a significant part of a city's transaction base, i.e. the market square, the street vendor, the shop frontage and the sidewalk".

Francis Tibald (1992) explains federal territory as all the parts of urban tissues that are available physically and visually for public. Public space is a space that we share it with foreigners, people who are our. (Carolineh and others 2007). In modern programming, they pay attention to car more than pedestrian. Nevertheless, the pedestrian is more important than vehicles in vitality for urban areas. Oktay (2002), Siksna (1995-1998), Jacobs (1994), Joe (1998) and Montgomery (1998) also emphasize on the importance of pedestrian in urban exhilaration and criticize paying attention to vehicle traffic. (Oktay & Jalaladdini, 2012, pp 664 – 674). Therefore, sidewalks are parts of urban public spaces and a place for doing urban interactions between citizens (Poursartip, 2010: pp 29-35). In addition, studies have shown that the presence of green spaces is a way of increasing social communications and creating social vitality and interactions in district spaces (Sullivan et al. W.C.F.E and Tzoulas k. and P. James, 2003). In addition to social interactions, other important advantages of sidewalks can be 1-communication, 2-flexibility, 3-comfort, 4- joyfulness, and 5- clarity (Waldock, 2012: pp 64).

Case investigation

Hafeziyeh Street

Hafeziyeh Street is one of the historical streets in Shiraz that attracts many tourists every year and thereby, raises the economy of Fars Province. This street is located in district 7 and the area of the district is 1744 hectares which is 14% of the entire city with an approximate population of 191405 people which is about 130 people per hectare. As a main



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street in this district, Hafeziyeh Street has an area of 56 hectares and the population of 2145. It has a sidewalk of 4000 square meter area (www.eshiraz.ir/zone3).

Shahrdari Street

This street has been important since the Zand period in terms of tourism and visiting historical monuments. It is located in district 8 of Shiraz and has an area of about 3000 square meter which is approximately 21% of the entire city area. Having a population of 162000 people, district 8 has accommodated about 14% of the whole population of Shiraz and its population density is 54 people per square hectare (www.eshiraz.ir/zone8).

Questionnaire data analysis

The present questionnaires were prepared and distributed for two historical places: Hafeziyeh and Shahrdari streets in Shiraz. In both questionnaires, the factors affecting vitality and social interactions as well as the role of urban furniture and its effect on vitality of historical textures have been investigated. Among the pedestrians in these two historical places, 118 ones (59 people on Shahrdari street and 59 people on Hafeziyeh street) were randomly selected as the population of this research. The following table shows the number and gender of the pedestrians who answered the questionnaires.

The questionnaires were distributed among the pedestrians with different educational degrees, ages and genders. The table and the diagram above show that the most pedestrians passing these sidewalks were women (61% Arg and 57/6% Hafeziyeh). According to the studies done, most of them were residents of Shiraz and came to these places for sightseeing and visiting the monuments.

Analyzing the data related to the role of urban furniture in sidewalks:

This part of the study shows the average weight of urban furniture (the use of urban furniture by people compared to other factors in these sidewalks) in sidewalks of these two historical places. The average weight of urban furniture in Hafeziyeh and Shahrdari sidewalks were 3/5109 and 3/8942, respectively. These results have been obtained based on 5-choice Likert range (5= very much, 4= very, 3= average, 2= little, 1= very little)

To find out the role of urban furniture in Hafeziyeh and Arg sidewalks, the single-sample T-test was used (a test that is the average of a community based on T distribution and deals with the issues that to what extent the average of a community is more or less than a fixed amount) and number 3 was selected as the theoretical mean of the role of urban furniture in sidewalks. The test results suggest that the mean urban furniture in sidewalks of Shiraz historical textures (Hafeziyeh street: 3/5109, Shahrdari street: 3/8947) was greater than this amount and it shows the significant effect of urban furniture in sidewalks of historical textures.

The main objective of this research was to investigate the role of urban furniture in vitality of Hafeziyeh and Shahrdari sidewalks. Applying the research analytical model, the present questionnaire investigated the factors affecting the vitality and social interactions as well as the effect of urban furniture in these historical textures.

Table 7 shows how the use of urban furniture in these sidewalks causes the vitality of these historical textures. So, it is concluded that urban furniture in Shahrdari Street has caused the attraction of more pedestrians in this historical texture while it has caused more comfort and tranquility for pedestrians in Hafeziyeh Street. All these factors might bring about vitality.



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The present study indicates that the abovementioned factors have a significant relationship with urban furniture design, and the most effective factors in Hafeziyeh Street sidewalk is color while in Shahr-dari Street sidewalk the urban furniture material is the most effective. To understand this, the single-sample T-test was used and number 3 was selected as the theoretical mean of the factors affecting urban furniture design. The calculations indicate that the average of each factor affecting urban design furniture has been greater than 3.

statistical analysis, Chi-square test

To prove the research hypotheses according to the questionnaire based on Chi-square test results, some significant relationship between the role of urban furniture and the two concepts vitality and tourist attraction had to be found. Results of the test between the two variables urban furniture and vitality showed that among 118 participants, the correlation coefficients 0.518 and 0.667 in Shahr-dari and Hafeziyeh streets, respectively, with the significance level 0.000 were calculated. As this significance level is smaller than 0.05, there is enough document to reject the null hypothesis and it can be concluded that there is a positive significant relationship between urban furniture and vitality. In fact, the more appropriate and successful the urban furniture, the more increase in vitality will be seen. In addition, regarding the role of urban furniture in attracting tourists it can be said that results of the questionnaire suggest among 118 participants, the correlation coefficients 0.663 and 0.427 in Shahr-dari and Hafeziyeh streets, respectively, with the significance levels 0.000 in Shahr-dari and 0.001 in Hafeziyeh streets were calculated. As the significance levels are smaller than 0.05, there is enough document to reject the null hypothesis and it can be concluded that there is a positive significant relationship between urban furniture and attracting tourists.

By evaluating and comparing the above factors, we conclude that the most effective factors on vitality of monuments in Hafeziyeh sidewalk is the environmental tranquility and the second important factor refers to the colors used in urban furniture and sidewalks of Hafeziyeh street. Visual perspective in this sidewalk has the least effect on this factor. However, the most effective factors on vitality of the historical places in Shahr-dari street is the existence of monuments there (Karim Khan Arg, Vakil Mosque, etc.) and the second important factor is the environmental tranquility. Green spaces located in Shahr-dari sidewalk have the least effect on this factor.

When the correlation coefficient is between 0.50 and 1.00, the correlation is strong. Therefore, according to the above tables and the investigation of correlations, an effective relationship between these factors and vitality is seen.

Results of the questionnaire evaluation showed that among 118 participants, the correlation coefficients 0.509 and 0.413 in Shahr-dari and Hafeziyeh streets, respectively, with the significance levels 0.000 in Shahr-dari Street and 0.001 in Hafeziyeh Street were calculated. As this significance level is smaller than 0.05, it is concluded that there is a positive significant relationship between these factors and vitality.

DISCUSSION

According to the obtained results and analyses, it may be concluded that urban furniture has the most effects on vitality of Shahr-dari and Hafeziyeh streets compared to other factors (appropriate visual perspective, people's social interactions, monuments, environmental tranquility and comfort, green spaces, and color) and it can be a very important factor in historical texture sidewalks for people's interactions, attracting tourists and reduction of historical texture depreciation. The factors that have caused this vitality using urban furniture in the sidewalks are the use of the colors appropriate to the historical texture in the urban furniture of Hafeziyeh Street and the urban furniture material used in Shahr-dari Street with regard to the climate and local materials of that zone. This has lead to attracting more people to the sidewalks of this historical texture and has caused greater comfort and tranquility of pedestrians in Hafeziyeh sidewalks. All these factors would bring about vitality.





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CONCLUSION

According to the obtained information in the present study, it is concluded that urban furniture is one of the important factors of creating vitality and all its elements suggest that appropriate urban furniture in historical textures (using the colors appropriate to the historical texture as well as the materials appropriate to the climate of the intended zone in urban furniture design) increases the space vitality. Consequently, the citizens have more desire to use these spaces. The vitality created in these textures by urban furniture not only brings about social interactions, it reduces the depreciation of the historical places, attracts many tourists, increases the number of visitors to the monuments, and increases the beauty and legibility of the city. In addition to urban furniture, other factors including the monuments themselves, environmental comfort and tranquility, visual perspective, presence of people, colors, and green spaces in the sidewalks create the vitality in historical textures. Following that, social interactions that have decreased nowadays due to daily commotion would increase in the historical textures and bring about the pedestrians' happiness and joy as well as peace and security in the historical sidewalks. Furthermore, according to the evaluation and analysis of the questionnaire, it can be stated that the two main research hypotheses that have been confirmed are as follows: 1) successful urban furniture is effective on vitality of historical textures. 2) Vitality is effective on attracting tourists. Hence, it is implied that urban furniture is important in these two historical textures.

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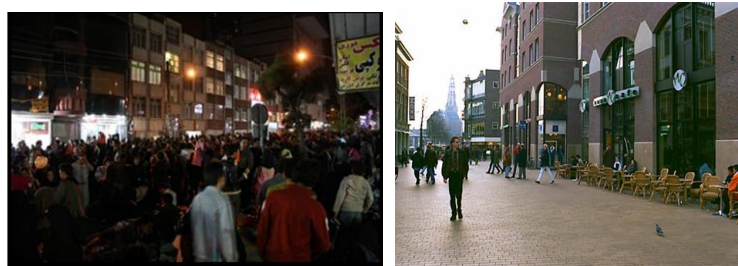


Figure 1. Social interactions in sidewalks Source: Pakzad, 2005

4



Figure 2: Hafeziyeh sidewalk Source: the author, 201

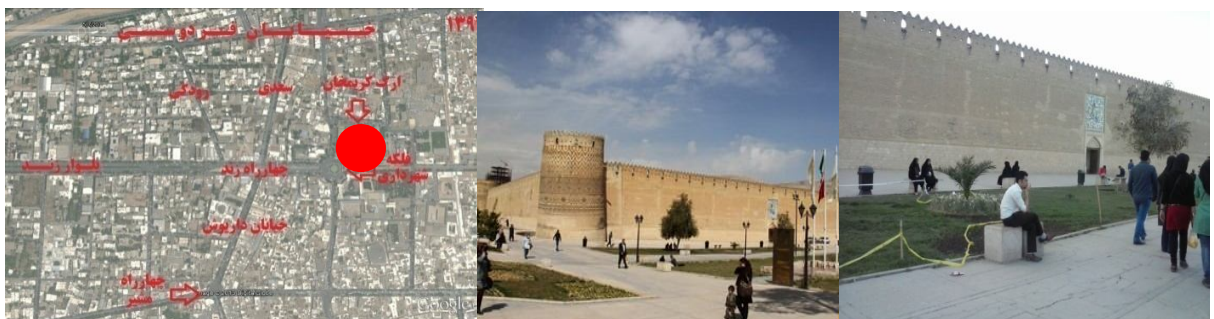


Figure 3: Shahr-dari Street sidewalk Source: the author, 2014





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Diagram2: Gender in the Shahrdari Street

Diagram1: Gender in the Hafeziyeh Street

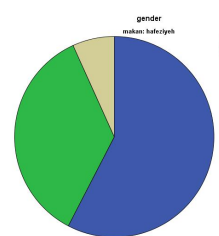
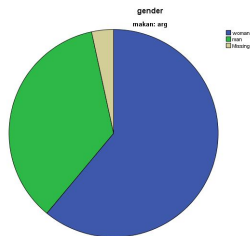


Table 1. Different types of vitality and viability (Landry 2000)

Different types of vitality and viability	Definitions and explanations
1.economic vitality	Developing employment levels, net income and life standards of the people living in the area under investigation, the annual number of tourists, retaining performance, the value of land and properties are assessed.
2.social vitality	It is measured by levels of activities and social interactions, as well as the nature of social communications. A vibrant a viable city can be socially described with regard to low levels of deprivation , strong social cohesion, good communications and the dynamics of the social layers, community spirit and civic pride , a wide range of lifestyles , harmonious relationships and a refreshed urban society.
3.environmental vitality and viability	It has two aspects. The first one is ecological sustainability related to variables such as air and noise pollution, waste disposal and sewage, heavy traffic and large green spaces, and the second one is the design that includes variables such as readability, sense of place, architectural distinction, connection of different parts of the city, the quality of light and the extent to which the urban environment is friendly, safe and psychologically approachable.
4.cultural vitality and viability	Including survival, honor and celebrate the city and its people , identity, memories , traditions , social celebrations , production, distribution and consumption of human-made goods and the signs that indicate the distinct nature of the city





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Table 2: Gender

place	Gender	Number of persons	Percent
Shahrdari Street	Woman	36	61
	Man	21	35.6
	No response	2	3.4
Hafeziyeh Street	Woman	34	57.6
	Man	21	35.6
	No response	4	6.8

Table 3: Lodging

place	Lodging in shiraz	Number of persons	Percent
Shahrdari Street	Yes	42	71.2
	No	15	25.4
	No response	2	3.4
Hafeziyeh Street	Yes	39	66.1
	No	17	28.8
	No response	3	5.1

Table 4: The purpose of coming to the Pedestrian

place	The purpose of coming to the Pedestrian	Number of persons	Percent
Shahrdari Street	Buy	8	13.6
	Recreation	11	18.6
	Visit the Historic building	40	67.8
	Other		
Hafeziyeh Street	Buy	2	3.4
	Recreation	20	33.9
	Visit the Historic building	36	61.0
	other	1	1.7

Table 5: the quantitative table of the role of furniture in these sidewalks

place	Number of persons	Mean	standard deviation
Shahrdari Street	59	3.8947	.29876
Hafeziyeh Street	59	3.5109	.39365





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Table 6: the single-sample T-test of the role of furniture in these sidewalks

place	T	df	Sig	Std.Erorr Mean	95% confidence interval of the difference	
					Lower	Upper
Shahrdari Street	23.004	58	.000	.89475	.8196	.9726
Hafeziyeh Street	9.969	58	.000	.51088	.4083	.6135

Table 7: the effects of using urban furniture in sidewalks

place	Factors	Mean	standard deviation
Shahrdari Street	1- attracting people	4.1525	.84718
	2- pedestrians' comfort in the historical texture	4.1356	.81912
		4.0000	.85096
	3- reducing historical texture depreciation	3.9661	.92785
		3.9322	.84821
	4- visiting the monuments by people		
	5- effective relationship between people and urban furniture		
Hafeziyeh Street	1- attracting people	3.6271	1.04878
	2- pedestrians' comfort in the historical texture	3.5593	1.02168
		3.7119	1.14547
	3- reducing historical texture depreciation	3.4915	1.04011
		3.3559	1.17095
	4- visiting the monuments by people		
	5- effective relationship between people and urban furniture		





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Table 8: the factors affecting urban furniture design

place	Factors	Mean	standard deviation
Shahrdari Street	1- citizens' mind and imaginations	3.8644	.99060
	2- color	3.9322	.80653
	3- people's use of urban furniture	3.8322	.80653
	4- urban furniture material	3.9492	.83921
	5- creativity in urban furniture	3.4407	.79375
	6- location of urban furniture	3.7966	.82587
Hafeziyeh Street	1- citizens' mind and imaginations	3.3559	.96065
	2- color	3.6102	1.06701
	3- people's use of urban furniture	3.5254	1.25060
	4- urban furniture material	3.5593	1.02168
	5- creativity in urban furniture	3.5085	1.04011
	6- location of urban furniture	3.1017	1.26892

Table 9: the single-sample T-test of the factors affecting urban furniture design in Hafeziyeh and Shahrdari streets

Row	T	Df	Sig	Std.Errorr Mean	95% confidence interval of the difference	
Shahrdari Street	-----	-----	-----	-----	Lower	Upper
6	10.450	58	.000	.8644	.9318	1.3733
7	8.442	58	.000	.9322	.6063	1.1226
8	6.703	58	.000	.9422	.7112	1.1532
9	6.367	58	.000	.9492	.5462	1.0470
10	4.264	58	.000	4.264	.2338	.6475
11	7.409	58	.000	7.409	.5814	1.0118
Hafeziyeh Street	-----	-----	-----	-----	Lower	Upper
6	10.649	58	.000	.3559	.931	1.3733
7	4.392	58	.000	.6102	.60631	.1226
8	3.227	58	.000	.5254	.71121	.1532
9	4.205	58	.000	5593	.5462	.8256
10	3.755	58	.000	.5085	.7795	.2338
11	.616	58	.000	1017	.2290	.4324





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Table 10. The relationship between the effects of urban furniture and vitality and attracting tourists in Shiraz

place	Factors	Correlation Coefficient	Sig
Shahrdari Street	The relationship between the effects of urban furniture and vitality	.663	.000
Hafeziyeh Street	The relationship between the effects of urban furniture and vitality	.427	.000
Shahrdari Street	The relationship between the effects of urban furniture and attracting tourists	.518	.000
Hafeziyeh Street	The relationship between the effects of urban furniture and attracting tourists	.667	.000

Table 11. the factors affecting vitality in Shiraz Shahrdari Street

Row	Factors	standard deviation	Mean
1	appropriate visual perspective	1.05045	4.0000
2	People's social interactions	.88066	3.9831
3	monuments	.87266	4.1186
4	Environmental comfort and tranquility	.86493	4.1017
5	Green spaces	.81123	3.8814
6	color	.80653	3.9322

Table 12. the factors affecting vitality in Hafeziyeh Street

Row	Factors	standard deviation	Mean
1	appropriate visual perspective	1.05240	3.4068
2	People's social interactions	1.13445	3.4576
3	monuments	1.02657	3.5862
4	Environmental comfort and tranquility	1.14572	3.7797
5	Green spaces	1.34364	3.4746
6	color	1.14547	3.7119

Table 13. the relationship between the factors affecting street vitality

place	Factors	Correlation Coefficient	Sig
Shahrdari Street	the relationship between the factors affecting street vitality	.509	.000
Hafeziyeh Street	the relationship between the factors affecting street vitality	.413	.001





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Table 14. The prominent characteristics of urban furniture in Shahrdari and Hafeziyeh

<p>The use of urban furniture by people</p> 	<p>urban furniture material</p> 	<p>Appropriate color of urban furniture</p> 	<p>The prominent characteristics of urban furniture in Hafeziyeh street</p>
<p>The citizens' mind and imaginations regarding the historical texture</p> 	<p>The colors appropriate to the historical texture</p> 	<p>urban furniture material appropriate to local materials</p> 	<p>The prominent characteristics of urban furniture in Shahrdari street</p>





Environmental Effects of Heavy Metals in Determining the Quality of Surface Water for Agricultural Purposes in Meshginshahr

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ABSTRACT

This study was conducted in 2013 to compare the amounts of heavy metals cadmium, lead and chromium in surface water sources of Meshkin Shahr with EPA, WHO and Iran environmental standards. Sampling and measurement of samples according to the standard method and measuring the amounts of heavy metals was performed by atomic absorption model perkin elmer 2380. For comparing the measured values with standard one-sided and two-sided t-test was used. T-test results in the rainy seasons showed that the lead and chromium average were higher than from WHO, EPA and Iran standards, but the average cadmium was lower than Iran standard and higher than standards of WHO and EPA. While in periods of low rainfall the amount of chromium and lead were lower than standards and amount of cadmium was higher than WHO and EPA and lower than Iran standards. The results of the two-sample t-test in low fall and rainy season showed that the amount of lead in low rainfall was less than rainy period.

Key words: water pollution, heavy metals, standard agricultural irrigation, Meshgin shahr, Iran

INTRODUCTION

Rapid urbanization and industrial development during last decade have provoked some serious concerns for the environment. Heavy metals contamination in river is one of the major quality issues in many fast growing cities,



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because maintenance of water quality and sanitation infrastructure did not increased along with population and urbanization growth especially for the developing countries (Sundaray et al., 2006; Karbassi et al., 2007). Trace metals enter in river from variety of sources; it be can be either natural or anthropogenic (Bem et al., 2003). Usually in unaffected environments, the concentration of most of the metals is very low and is mostly derived from the mineralogy and the weathering (Karbassi et al., 2008). Main anthropogenic sources of heavy metal contamination are mining, disposal of untreated and partially treated effluents contain toxic metals, as well as metal chelates from different industries and indiscriminate use of heavy metal-containing fertilizer and pesticides in agricultural fields (Amman et al., 2002; Nouri et al., 2006; Nouri et al., 2008). Metals enter into river water from mining areas through various ways such as mine discharge, run-off, chemical weathering of rocks and soils, wet and dry fallout of atmospheric particulate matter (Bird et al., 2003). The mine water, runoff from abandoned watersheds and associated industrial discharges are the major source of heavy metal contamination, total dissolved solid (TDS) and low pH of streams in mining area (Cravotta, 2008). Rivers in urban areas have also been associated with water quality problems because of the practice of discharging of untreated domestic and small scale industries into the water bodies which leads to the increase in the level of metals concentration in river water (Sekabira et al., 2010). Trace metal contaminations are important due to their potential toxicity for the environment and human beings (Adams et al., 2008).

MATERIAL AND METHODS

To estimate the quality of surface water resources in the countryside of Meshginshahr in Ardabil province that is located in the northwest of Iran (Figure 1) according to the sources of pollutants, the entrance to the main branch, and access to water at stations was selected and was implemented in two low water and high water seasons.

For sampling sterile polyethylene containers were used. So that after washing with 10% nitric acid, first with detergent and then rinsed with distilled water. At the time of sampling is washed with water and sampling is performed based on the standard 2008 method. To stabilize the samples nitric acid was used. So as for 250cc of water 0.5/0 cc concentrated nitric acid was added. To prepare the samples they are poured into sterile glass containers and put on a Hot Plat so that the water is not boiling and volatilization was carried out and the amount of water is reached to 20 cc. Again 2cc nitric acid was added in each sample and heated so that sample content is reached to 10cc, then, samples are filtered through filter and to measure heavy metals cadmium, lead and chromium, atomic absorption model perkin elmer 2380 was used. To compare the measurement results, the amounts of heavy metals in the low water and high water season, one-sided and double-sided standard T-test was used by 16 SPSS software. Standards include standard organization and Industrial Research of Iran, EPA and WHO.

RESULTS AND DISCUSSION

The results of one-sided t-test for comparing measured values in each of the low and high rainfall seasons of studied rivers Khiyav chay, Gharehsou, Tazekand, Kangarlou and Ghasabeh with agricultural standards are shown in Table 1.

High rainfall

The results for average comparison of surface water heavy metals with standards indicates that (Table 1), average of lead and chromium is lower than WHO, EPA and Iran's standards, but the average of cadmium is more than WHO and EPA and lower than Iran standards.



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Low rainfall The results showed that the average of lead and chromium in surface water of Meshginshahr region is lower than WHO, EPA and Iran's standards the amount of cadmium content is more than WHO and EPA and lower than Iran standard. To evaluate the difference between values for heavy metals and national and international a single-sample t-test was used.

The results in high rainfall period showed that the average lead levels is significantly lower than the normal standards of WHO and EPA and Iran (sig <0/05). The results showed that the average cadmium levels were not significantly different from standards of WHO and EPA (sig> 0/05), but were significantly lower than the standard of Iran (sig <0/05). Also the results indicate (Table 2) that the average chromium is significantly lower than the normal standards of WHO and EPA and Iran (sig <0/05). The results of the sampling in low rainfall period shows that lead levels is significantly lower than the standards of WHO and EPA and Iran is (sig <0/05). The results showed that the average cadmium is significantly higher than the standards of WHO and EPA (sig <0/05) and has no significant difference with Iran's standard (sig> 0/05). The results are stating a significant difference in the average chromium values from WHO, EPA and Iran's standards at 1% level (sig <0/01). The results of dependent paired sample t test (paired samples test) showed (Table 3) that the amount of lead in the sample time comes and the least rain are significant differences (sig <0/05). And the amount of lead for low rainfall period is higher than high rainfall period. But there was no significant difference between the amounts of cadmium and chromium in low and high rainfall period in surface water of Meshginshahr (sig> 0/05).

CONCLUSION

The results of the one-sample t-test (paired samples test) surface water in low and high rainfall season showed that the average lead and chromium of surface water is higher than WHO, EPA and Iran's standards. Average cadmium levels are higher than standards of WHO and EPA and lower than standards of Iran. The results of the two-sample paired t test (paired samples test) showed that in surface waters in low and high rainfall seasons, lead levels in two times of sampling is lower than standards of WHO, EPA and Iran (sig <0/05). Also between the cadmium and chromium values in both low and high rainfall periods, there was no significant difference in surface waters (sig> 0/05).

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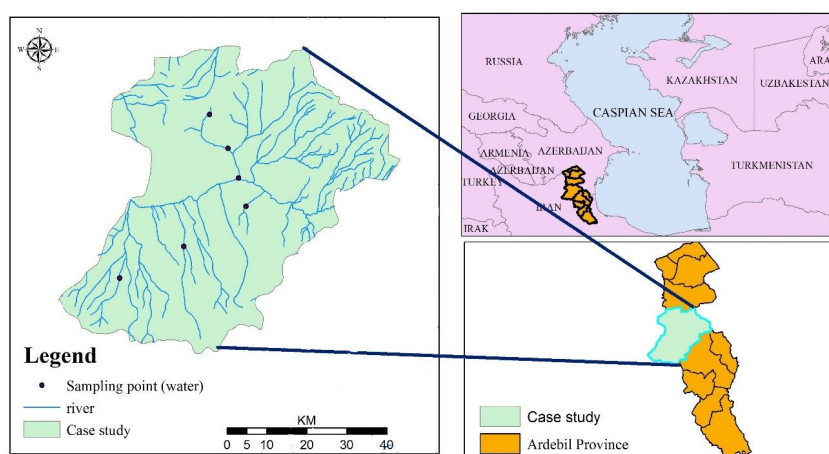


Figure 1. Location of the study area Meshginshahr, Ardabil, Iran

Table 1. Comparison of heavy metals in surface waters in the villages of Meshkin Shahr with national and international standards in low high rainfall season.

		WHO	EPA	Iran
High rainfall lead	standard	b 0/5	b 0/5	b 1
	average	a 0/039	a 0/039	a 0/039
Low rainfall lead	average	a 0/1676	a 0/1676	a 0/1676
High rainfall cadmium	standard	a 0/001	a 0/001	a 0/05
	average	a 0/013	a 0/013	a 0/013
cadmium	average	a 0/0372	a 0/0372	a 0/0372
High rainfall chromium	standard	a 0/1	a 0/1	a 1
	average	b 0/022	b 0/022	b 0/022
Low rainfall chromium	average	b 0/0218	b 0/0218	b 0/0218





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Table 2. The results of the single-sample t test for comparison of heavy metals in surface waters of Meshginshahr with national and international standards in high rainfall and low rainfall seasons

		WHO	EPA	Iran
High rainfall lead	t	- 24/140	- 24/140	-50/322
	Significant level.	**0/000	**0/000	**0/000
Low rainfall lead	t	- 5/698	- 5/698	- 14/269
	Significant level.	**0/005	**0/005	**0/000
High rainfall cadmium	t	1/475	1/475	- 4/548
	Significant level.	ns0/241	ns0/241	*0/010
Low rainfall cadmium	t	3/442	3/442	- 1/217
	Significant level.	*0/026	*0/026	ns0/291
High rainfall cadmium	t	- 9/682	- 9/682	-121/399
	Significant level.	**0/001	**0/001	**0/000
Low rainfall cadmium	t	- 63/015	- 63/015	- 788/256
	Significant level.	**0/000	**0/000	**0/000

*significant at 5% **significant at 1% ns: not

Table 3. paired t-test (paired) for the comparison of metals in surface water in low and high rainfall seasons.

Summer chromium - spring chromium	Summer cadmium - spring cadmium	Summer lead - spring lead		
- 1/771	0/025	- 3/008	t	paired t-test
ns0/151	ns0/981	0/040*	Significant level	





The Role of Climate in Architectural Design by using Baker Model (Acase Study: Kermanshah City)

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ABSTRACT

One of the effective factors on architecture design in every zone is its climate. Since, using of climate can be made appropriate or inappropriate conditions for living ,settlement ,working . the resident of this area had focused on appropriate use ing of climate in making building for a long times. Now by increasing of air pollution , climatic design as a suitable option is taken account, because of making desirable place for living and working . In this area understanding of reason sand climatic factors are very important for designing of technological park. Kermanshah city is situated in moderate , cold area with cold winters and dry and moderate summer. Since special situation of topography , weather conditions , have rather same and desirable conditions .in different parts of city. The goal of article is the studying and understanding of thermal comfort index value and it's adjustment with climatic factors in Kermanshah city. In this article we need climatic statistics during a ten years climatic cycle (2001-2013). That the goal of article is trying to present new and up to date climatic statistics which is personally derived from meteorology organization of Kermanshah province. Research method is analytical- descriptive which is made by field study and then using method of Bicker thermal index survey, architectural condition adaptable to climate for Kermanshah city is prepared and the hypotheses evaluated and finally suggestions are presented for residential space design including skeleton form for placing building , windows location.

Key words: climate, architecture , thermal comfort indexes , Kermanshah .





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INTRODUCTION

(Gulyas et al, 2005, 1713 & Hwang et al, 2011, 5) was pointed to using bioclimatic information for architecture and urban design. For the first time a commission including meteorologist, health specialist, architects, engineers, urban designers for studying building climatology is formed in Geneva in 1986, that its goal was understanding of urban air impacts to choose the best result on urban climate. Also Huvar, Gee, Koichilerd (1979) point to choosing of building place and they insist on local micro climatic conditions in comfort; and explain radiation, wind factors and placing building. Guiney (1989) in a book called urban design in different climate is considered to weather conditions in micro and macro scale; and first consider urban climatologist and then consider his design in making building. Sam and Chang (in Hong-Kong 1997) consider important survey for using of climatic elements on architectural design and building energy. Bowden and Grobe (2005) considered the survey of thermal comfort in 2 climatic areas in 5 cities in Tunisia. Toy and colleagues (2007) consider the studying and determining Bioclimatic comfort in Erzurum city and 3 rural, urban and urban-sylvan areas in Turkey and concluded that sylvan-urban area has more adaptable to used thermal in Turkey. Kefa (2004) to prepare general and suitable information for optimal using of passive solar energy in urban planning and building design, by using of monthly table, analyze 25 year cycles of climatic elements for Nicosia in Cyprus and post design strategies is measured and presented. Johansson (2006) studied influence of urban geometry of city on outdoor thermal comfort in hot and dry climate in Morocco and concluded that the city design should be compressed in hot and dry climate (to prepare more thermal comfort condition in city).

Area situation

Kermanshah city is situated in the east of Kermanshah province from 23° and 47' to 24° and 47' northern latitude and 46° and 40' to 47° eastern longitude from Greenwich meridian. Kermanshah city has a big city called Kermanshah which is center of province. This city is situated in mountainous area between Iran plateau and Mesopotamia plain. And its lowest altitude is 1400 m. 2 ranges, Perav in the north and Kooh sefid in the south is surrounded city; and are important heights for influencing on climate. In Kermanshah city the impact of latitude factor is less than height, and the difference between northern and southern is not caused a large and noticeable difference in parameters related to Sun radiation such as sunny hours. Weather conditions are systems of less pressure Mediterranean. By using climatic grouping, the amberegeh of cold, dry, moderate semi cold, cold semi dry, and semi humid cold climates is seen in city, Kermanshah is generally located in semi dry steppes cool climate.

Research method

Climate sign and climatic indexes by evaluating of meteorological parameters in long term cycles, are determined climatic condition of each zone. Then the first step in this research is the preparing statistics and long term and effective parameters in climatic and meteorological conditions in meteorology stations. Meteorological parameters are studied including daily – monthly fall rain, min and max, absolute min, absolute max, daily and monthly averages in ten years (2001-2013); And also radiation, direction and speed wind, wind humidity, main wind and compass card and then ambrotermic graph is prepared. The method is analytical, descriptive and compound. That done by field study. The most research method is personally done in meteorology organization and information and statistics center. There are different methods for studying of thermal comfort indexes. It is necessary to determine long term statistics of meteorology and its statistical analysis. So by using Bicker bioclimatic index, the results of its analysis can explain climate influence on human comfort in building.



**Reza Kakvan et al.****Fall rain situation**

According to statistics, the nearest synoptic station to Kermanshah city has the average raining 404mm in every year. That most raining was in the winter season and the summer season is rather dry. Also the average of icy days in this station was 72.9 days, that is mainly happened in 3 month of winter . in table 1 the information related to this noted station is presented.

Radiation situation

The average of yearly sunny hours according to 13 years statistics in Kermanshah synoptic station (2001-2013) is 2930 hours. According to this statistics the average of icy days is 72.9 days during year. One of the important issue in architectural design is radiation situation or radiation angles in every time, that is determiner of shade value , which is made in the back of each barrier. Also these angles are determiner of thermal energy which is radiated to horizontal and upright level s in different geographical directions . if sun radiation angle is smaller, the derived energy in upright levels toward sun will be larger and shade in the back of them is longer. The results showed that , in the coldest months t, the most solar energy is radiated to southward upright level .whereas the value of radiated solar energy on this wall is very little in Tir month or the warmest month of year . The radiated energy value on the eastern and western walls in the warmest month is 2 times of it in the coldest month. South ward Upright level with southward walls is generally getting less solar energy during years only in the summer season .

The direction of blowing wind and main wind

According to 13 years statistics (2001-2013), in Kermanshah synoptic station , wind direction is in the second half of fall and rather in all winter is toward south eastern direction and the rest of years is in the west direction . the average of main wind speed during the year is 6.7 knot(each knot is equal to 853.1 km in hour) and is generally formed 0.16 of the observations. The average of wind speed is between 4-7 knot and about 6.5 knot .the slow wind is 4.27 and the mildest month for blowing wind are fall and early winter. The speed of sever wind is varied from 30-50 knot , that is seldom reach to 60 knot and it blows in different directions.

Temperature

According to Kermanshah station information, yearly average temperature is 4.13°C that Day and Bahman have the lowest monthly average temperature and are the coldest months of year. Tir and Mordad months ,respectively have the max of monthly average temperature . also the max yearly temperature average is 5.21°C and the highest station temperature (5.42) happened in Mordad and the lowest temperature (4.22°C) was in Bahman month.

Weather classifying in Kermanshah

A weather formula is a function from 2 or more weather parameters, which is determined weather kind, in one area based on numerical values that is derived by formula. In this research using of statistics and information , some weather elements is measured ,such as temperature , fall rain, relative humidity. In this station also by using some experimental methods of weather classifying or weather software(Eqlim) is considered to weather classifying of area station and it's results are presented in table1.



**Reza Kakvan et al.****Ambrotermic curves**

Ambrotermic pictures are prepared for understanding of dry months in the studied weather station. The months which temperature and fall rain axes cross each other, are considered dry months. It is based on the relationship between temperature and monthly fall rain. On the right side vertical axis, falling rain index is presented with two times and on the left side is presented monthly temperature. Time cycles based on presented variants are classified into dry (lack of water) and wet (extra water). The months which falling rain curve are below temperature curve, from Ordibehesht to Mehr months is dry cycle. Indeed temperature from Ordibehesht to middle of Aban is advanced to falling rain curve and is considered hot and dry months. Humid cycle in the studied station is related to cold months from middle of fall to end of winter and Farvardin. So Kermanshah station in the winter or the cold cycle of year has wet and cold weather and from end of winter to early fall has dry weather. Generally according to fig, dry and wet cycle is recognizable and as it seen, dry month cycles in the zone are long and are formed most of months in year. Ambrotermic picture in the studied station is presented in.

Climatic strategies

In the cold and mountainous climate area, the buildings have plan and compressed texture. The building form should be decreased its contact level with outside cold air that less heat is transformed from inside to outside. So it is used volumes such as cubic or rectangle cubic, that is decreased outside level of building to its inside volumes and keep it at the min level. The buildings between 20° to the west and 45° to the east are located in the wind direction of each other and out of sun direction of each other in the northern – southern axis.

The climate impact in direction and placing buildings

Studying of weather condition in Kermanshah shows that in this area, coldness weather and sun radiation range can be caused max use sun heat. Choosing of appropriate direction in placing building for max use of sun thermal energy during cold seasons and using appropriate building materials and architectural models adaptable to climate are very important. 4 months (Khordad to Mehr) should be getting cool during the year. But it isn't necessary to get cool the environment in 7 months, which is more from the middle of Mehr to middle of Ordibehesht. The north west and south west directions are rather suitable directions for Kermanshah climate.

Small rooms with low height

In cold and snowy areas it should be avoided from making rooms and inside big places, because by increasing of its contact level with outside cold space, making heat of this spacious space is very difficult. So in this area the ceiling rooms are lower than same rooms in the other climatic areas that is decreased room volume and minimized the outside level to building volume. The low height ceiling in the corridor, main and vaulted rooms, market chambers is very noticeable.

Small slidings

In this area, it is used little small slidings to prevent from thermal exchange between inside and outside of buildings. If windows is big, shade use is necessary. The sliding shouldn't be used in cold wind direction. And 2 walls window for minimizing thermal exchange is more suitable. Meanwhile to prevent from cold air current to inside and going out inside heat, it should be minimized inside air exchange and natural exchange. In comparison to hot and dry climate sliding dimensions in this climatic area are increased for using of thermal energy resulting from sun radiation.





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Rather thick walls

The large thick walls prevent from thermal exchange between inside space and out side environment of building. Architectural criteria mountainous and hot and dry climate are rather the same and only difference between them is heating sources, Which in hot and dry climate this source is from out side direction and in cold climate is from inside direction. So in this climate by using of building material the thickness of walls should be increased until this walls can be acted as a saving source of inside heat of building. Thick walls. keep heat resulting from daily sun radiation during night and help to balance inside heat of building. In local architecture of this area is trying to heat building by natural forms or using of fire place and the heats resulting from persons cooking or animals.

Flat roofs

Traditional buildings in the northern foot hills of Alborz ranges have sloping roofs and in mountainous area mainly have flat roofs. Sloping roofs with its suitable roofing are more better than flat roofs, because it can be easily flowed from such a roof but if the roofing is made of clay and straw, its resistance to humidity, rain and specially snow will be weakened. because water of gradual melting of snow is penetrated into clay and straw roof and the building is getting wet. so, snow is Shoveled and roof with heavy and stone roller is again rolled u till clay and straw roofing is again compressed and holes which is made by water penetration is closed. Choosing of Flat roofs in cold climate is n't caused problem. Because by keeping snow on roof, it is used as a thermal insulation to out side cold weather which several degrees is less than snow temperature degree and also the space below truss skeleton which is used as a store room will be a Suitable insulation between out side and inside space of building. So 2 walls roof in this climate is very important for keeping heat in building.

Building materials

Used building materials in traditional buildings in cold and mountainous areas like other materials are based on climatic area, of its place. Building materials should have good thermal resistance and power, that building heat is kept in the inside space. So facade of buildings is made of stone (wood, clay and straw plaster, mud brick, brick) and roofing is made of wooden beams and clay and straw plaster. stone and heavy and resisting materials are used for foundation. And in some other areas china ? with heavy materials used to prevent from humidity. Although, buildings of this area are generally located on ground but we can mention javanrood city and its suburban villages which are located on the western side of zagroos and in 95 km of north west of Kermanshah. In this area stone building make homogenous landscape in all city texture and also villages texture.

There is a lot of stone in mountainous area which is used as scree or rock face in thick walls of building. in this cold area and rather with lot of fall rain, buildings roof is flat and is covered with wooden beam and clay and straw plaster. Although new buildings ceiling in javanrood often have wooden truss and house top roofing. Urban and rural texture frame in cold and mountainous climate: Urban and rural texture in cold and mountainous climate are formed to resist to sever coldness.

Urban and rural texture features are

Compressed and compacted texture

Small and enclosed places

To use sun and ground directions(as a determiner factors for placing and developing of city and village and its landscape), the side walks are level to ground according to climatic conditions of cold and mountainous area in Iran





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and to prevent from wasting energy and coldness weather, the building is built compressed, compacted and connected to each others; that contact level of residential heat places are decreased with out side cold weather. also the buildings are connected to each other so that surrounded each other and city spaces make smaller so that decrease cold wind current to outside urban places and radiation from outside level of building heat walls to small and enclosed urban places adjust it's cold weather. Another noticeable point in these cities is small and narrow side walks design to use better heat and prevent from cold and hot exchange.

In this climate the living complexes are usually located in the middle of heights and southward and in side ground or on it to rise thermal capacity of northern facade walls and increase of inside volume to out side level. Indeed at first placing village in valley down, result in destroying of village. and flood Second, heavy cold weather current to valleys result in increasing of coldness during night. Third, northern side of mountain is always located in shade and is very cold. While the city and villages to use max sun radiation should be located toward valley and in sunny places. Fours, because ground roughness and sever wind at the top of mountain and accessibility to water sources and rivers which are flowed at the low height is increased, placing urban and rural buildings on the top of the mountain is not suitable.

Bicker index analysis for Kermanshah city

According to bicker method in farvardin month in Kermanshah, days have B index, it means that the days are in normal and desirable conditions and have pleasant mild weather which is located in bioclimatic comfort range and at nights have D index, which is undesirable cold and the weather is cold and little bothering. in ordibehesht month because the weather temperature is increased specially during day, we have E index which is desirable comfort condition and the weather is pleasant mild. But during this month at nights because of high weather temperature, we have C index; which is undesirable and cold condition and the weather is cool. In Khordad month days have A index which weather is hot but have undesirable condition; but during night is seen C index which is undesirable and cold condition but the weather is cool. In Tir month we see A index, which weather is hot and sunny and undesirable and we have bioclimatic pressure and undesirable and hot condition but during night we have C index, which weather is cool and mild. We see A index during day in Mordad month which is undesirable and hot condition and the weather is hot and pleasant; and at nights the weather is cool and mild, we have C index. In Shahrivar month in days we have A index, which is hot and undesirable condition but at night we have C index which is undesirable and cold condition and the weather is cool and mild. In Mehr month we have B index in days which is normal desirable condition and at night we have D index which is very cold and undesirable conditions and the weather is cold and little bothering; and human bioclimatic condition is at average level and sever. In Aban month we have B index, which is normal desirable condition but at night we have D index, which is very cold and undesirable condition. Human bioclimatic condition is mild, but we have D index at night, which is very cold and very undesirable condition and the weather is very cold, and human bioclimatic condition is at average cycle and a little bothering.

CONCLUSION

According to information and climatic statistics dry cycle is from middle of Farvardin to middle of Aban. and other months Azar, Day, Bahman, Esfand of winter and fall season are considered wet cycle, because of coldness weather, even in the warmest hours of day during winter season, we can not make suitable condition in out side places by using of solar thermal energy. Hot weather in this climate result in leaving of thermal condition from comfort area. but hot weather is so that we can make suitable thermal condition by making shade in outside spaces, and using of weather current. In Kermanshah climate if the outside walls materials have large thermal capacity and prevented from sun light to inside place, thermal condition in the hottest days during year will be natural in comfort zone. In Kermanshah climate because we are under thermal comfort index in half of a year, solar energy absorption in these





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months , is very important to us. It is seem that using of materials such as marble stone, which absorbed heat, is very useful and saved solar energy. It should be used thermal insulations in outside of walls in this climate. by studying of Climatic factors in Kermanshah city ,following results are derived:

-the lowest altitude of place in this city from sea level is 1400m, and the highest place is perva mountain , which is about 3357m. so altitude from sea level make cold weather in winter and temperate weather in summer.

-Kermanshah city is located in mountainous area ,so latitude between northern and southern of it's place isn't caused large and noticeable different in parameters related to sun radiation.

-weather diet is Mediterranean in this city . yearly average fall rain is 404mm, and the number of icy days during year are 72.9 , and the number of sunny hours are 2930h.

-main wind during year is blown from west to east and fall wind in winter is blown from southeast to north west. The slowest winds are winter wind. Yearly average temperature is 4.13°C.

-it is seem that main winds which are usually desirable and blown during spring, winter and summer are used as a priority in climatic parameters. Max use of sun radiation to prevent from coldness of fall, winter and early spring is necessary.

-suitable placing building in Kermanshah climate is on the southeast side , it should be noted west light can be used in parts such as office places or meeting halls.

Suggestions for climatic design based on Kermanshah climate

- using heavy building materials
- using compressed and compacted plans
- predicting of small slidings
- predicting of outside spaces which are used in summer
- minimizing of outside level of building
- placing buildings in minimum distance to each other
- for separate buildings (buildings which aren't connected to other buildings) cubic form with square plan in one or two floors is very important
- using of common walls and making connected and compressed texture in building
- placing of connected buildings in the middle places of southward slopes
- keeping away from making building in curve slopes and dents
- predicting of warm places in the center of plan
- keeping away from big windows specially in the northern views
- minimizing of entrance doors and making main entrance in back front of wind
- increasing of southern view level and de creasing northern side
- heighten of yard level and lower of yard level to street level
- making green place and pool and planting in yard
- having central divided place

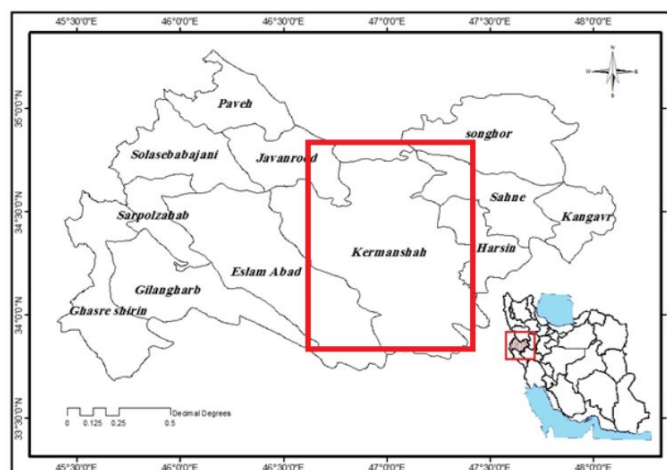




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Fig(1): studied area





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Table(1): statistical feature of yearly fall rain in chosen station level during statistical cycle (2001-2013)

Station	Fall rain average(mm)	maximum	minimum	Standard deviation
Kermanshah	404	651	227	96

Table(2): average of monthly sunny hours and yearly sum of area

Month station	farvardin	ordibehesht	khordad	tir	mordad	shahrivar	mehr	ababn	azar	day	Bahman	esfand
	Kermanshah	215	247	337	351	340	323	265	201	163	151	156





Evaluation of the Role of the ICT in Tourism Development

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ABSTRACT

Tourism industry and tourism as one of the industry's largest and most diverse in the world is many countries in this dynamic industry as well as the wealth of valuable oil and mineral resources are considered order of their positive effects on income, employment, growth and development use. Our country is one of the countries that have a high potential for tourism and the place of this our country can not be found the diverse tourism attractions is empty. Since the development of tourism and the technology are highly dependent on each other in recent years, IT has brought changes in the tourism industry and the has developed a new concept. At the present time, the explosion of information and the communication development changes in geographic and political boundaries have created the dimensions of this phenomenon is so widespread that all facets of human life in various fields of science, technology, culture, society, politics, economy and the tourism is affected. tourism industry as the largest and the most diverse in the 21st century is one component of a comprehensive and economically effective, and the as a phenomenon cultural and social establish relationship, connection, peace and the reduction of global and regional conflicts and shape the kind of convergence. The main objective of this article is IT governance in tourism development. Research method documentation and analysis. The results suggest that the role of the IT in tourism development to introduce the tourism potentials of the country is the whole world. As well as solidarity and the social integration, economic and political influence across all countries.

Key words: tourism, ICT, Iran.



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INTRODUCTION

The use of ICTs is a relevant opportunity for growing and strengthening a local tourism industry, and for the development of destinations economies overall. Specifically ICTs have the potential to increase destination incomes for financing economic and social development in [1], [2]. developing and reinforcing local tourism and tourism-related entrepreneurship and activities; developing genuine tourism offerings that rely on local productions and traditions (forex. food, furniture, handicrafts and constructions).

Enabling direct promotion and commercialization of local tourism offerings in international markets reducing dependence on big foreign intermediaries. Basically ICTs allow destinations to improve online presence (i.e. visibility and participation to Internet market) and offline connectivity (i.e. collaboration, clustering as well as intersectoral linkages among local public and private tourism and tourism-related actors) required to compete in nowadays global tourism market. More specifically the beneficial effects of ICTs are to be found in the opportunity to reduce the traditional disadvantages of small operators. First ICTs provide direct, cheap and effective access to (actual and potential) customers. At the same time ICTs make profitable to use multiple distribution channels and target niche markets [3], [4], [5]. before almost impossible for SMEs to reach, serve and even to identify. But for this to happen we already know from experience that a mere improvement of ICT infrastructures is not enough. Even an appropriate endowment of e-skills, as advocated by international organizations is by now a necessary but not sufficient condition. As for every new technology, the introduction ICTs cannot produce the promised benefits if it is not accompanied by complementary changes in organizational settings and structures to fit them with its distinctive characteristics [6].

Analyzing ICT functioning in different industries such as tourism seem to be of out most importance in a way that, this effect since 1980 has revolutionized tourism's industry [7] and has effected all sections of this industry [8] number of researchers believe that ICT is one of the criteria's for identifying sustainable development [9] and needless to note that sustainable development in tourism industry is a case of conflict and as a management guide in tourism industry is revealed for protection and adding up opportunities in future of industry [10].

In an overall definition sustainable development can be identify as strategic development that will manage all properties, natural and human resources such as economical and physical properties for long time [11] and will include economic and biologic processes towards improving life systems [10], cities are able to attract tourists from different areas such as historical, cultural, business, sport, entertainment, shopping and etc. That can provide, many inside stakeholders groups like jobs holder, employees and citizens. Urban tourism's sustainable development creates possibility of increase in economical, social and environmental benefits, plus reduction in negative effects of tourism's in an urban, in such a way that affects qualitatively in local people's life as one of the stakeholders.

Thus, as concepts of ICT has the able to publicize meaning of urban tourism sustainable development through creating job holder's more economic benefits, better cultural introduction, better evolution of society plus tourism and etc., therefore it is closely tied with quality criteria's of people and host society. So in this article, the search will be towards identifying ICT capacities in urban sustainable development with regard to its effects on host society life.

Using information and communication technology in tourism industry has a long history in a way that, [13] had recognized computerized ticket reservation in aviation industry, the first internationally usage of information technology (65) Sirirak et al, in their research had discovered a very strong positive relation between ICT usage in tourism industry, functional productivity and customer satisfaction. Berton & Altintas had come to this conclusion that managers in hotel sections, restaurants, and hospitality for improving excitable processes should increase their usages of information and communication technology.





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MATERIALS AND METHODS

In this study to investigate the role of information technology in tourism development of Methods descriptive - anatomical is used. Method has been used Deductive as a qualitative nature, which in real space, system information tourism has also been established to collect and theoretical structure. In fact, for review and analysis of the tourism system, first of all the parts and components tourism (supply side), including attractions, transportation, Aqamty-units catering, business services and tourism, organizations and unions, advertising, information and deals and then describe the impact and nature of functions system, eventually leading to the prediction of components and elements of the tourism system and provide control strategies to achieve the desired future tourism system is discussed. Based on the theoretical framework of this study is based on systems theory tourism as a system as a whole contains various components and structures, and special functions.

RESULTS AND DISCUSSION

ICT and tourism

Four major features can be given as the reason for expanding the use of ICT, the booming tourism industry discussed.

The first feature, the low average capital needed to create any jobs in areas related to information technology in the industry. Especially given the severe shortage of investment in one hand and a large number of applicants for employment on the other hand, this feature is very important. In fact, the development of Internet-related jobs, so no need to make large investments, a significant number of new jobs could be created in the industry and such an issue, particularly for countries with limited financial resources to invest in this sector are facing, can be considered very important. The second feature is the fastest growing worldwide demand for ICT-related services such as advertising, marketing, programming, network security services and content for Web sites of tourism, development of information and communication technology in this area is necessary.

Another important feature that makes a positive impact on the tourism industry and the development of ICT, as follows

ICT plays an important role in reducing the cost by a large number of enterprises and government agencies in providing services to tourists; for example through e-services, the average time required to decrease their presence in the workplace. Such a process leads to additional cost savings resulting from their presence in the workplace. Last channel impact of ICT on the development of the tourism industry, the impact of ICT in attracting tourism. Today, most of the time and cost spent many tourists because of the traditional system would flow through internet search to locate them.

The effective implementation of the development of tourism infrastructure

1. To provide accommodations for tourists (hotels, restaurants Park shopping center, etc.).
2. The coordination of tourism-related organizations
3. The security for tourists.
4. The development of road transport, air and rail
5. Preparation of various tourist places for tourists to visit.
6. publicize it at different levels of society.





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Each of the administrative process to be accurate according to their usefulness for the purposes specified in order to complement each other. If one of the factors to be executed accurately and with good quality, a gap in achieving planned objectives and provides a lot of time and cost involved. thinking and practical foundation for any purpose and goals are small, the main purpose of the strict implementation of the infrastructure will be achieved.

Information and communication technology

ICT in our society to the extent not considered adequate, but not as much time to practice it. Lack of adequate training facilities in the world may be other factors shortcomings. Recognition technology helps people in the field, for with the heart of the technology solutions that can be used to track your activity levels of society gave upgrade. In developed countries and developing IT committees and organizations in order to analyze the development and system integration municipal executive and the next step, all the challenges that the future will be to review the progress of technology and administrative measures implemented to date and future plans are presented. Recognition for IT managers who are influential in their planning, organization is essential. It has the ring of a chain in the development of any country. Successful managers in the world of pretenders and experts in the field of information technology, and managed with the help of this technology, the best services to their customers and develop your organization quickly and strongly support the consolidation. Accurate and adequate information use it at the right time and place with the purpose to meet anticipated this is what the main purpose of ICT is a simple definition.

ICT and Tourism

Tourism and travel agencies as well as other organizations closely with modern technology, including information and communication technology, which is perhaps one of the few agencies the use of this type of technology has had a significant impact on it. In developing nations, with innovative and appropriate solutions have been able to attract tourists to the the tourism potential of the region to raise an unimaginable way. In many of these countries are much lower than our country's natural and historical monuments but with the right information and knowledge they need to meet the high percentage of tourists and tourist attraction in its own right, have stabilized. However, our ability to attract tourists from all over the world is capable.

The use of information and communication technologies in tourism

The use of ICT in the field of tourism should any of the categories of ICT used in the place of use. The information technology complete, accurate and up to date on the most important issues, because if they did not have sufficient information to issue the desired day and sometimes inefficient in case of untimely and improper use of them would be too damaging. Identification and preparation of database applications for more efficient use of existing resources of the main tools in an organization is to achieve the target.

The advancement of information and communication technologies in tourism

The first step in creating a database of ICT is a powerful and easy to use. The Bank of goals, products and facilities in this area. There is a database of the tools and technology and using it regular programming can be done with high speed wide activities. Consumer spending to create the database in the form of a bank failure and move towards the development and promotion of it can cause very high costs.

The first step is to recognize tourism related government agencies, NGO's and companies in general tourism, recreational tourism in the country, student tours, parties interested in tourism, and a detailed record of the information in the database is the first step.





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The second step is to identify the tourist attractions and collecting and recording information in the database is accurate. This attraction can be divided as follows: Historic, natural, recreational, pilgrimage, industrial, scientific, research, sport, health fairs and other natural factors such as climate, soil, minerals, etc., can be named.

The third step is to gather all the available information such as hotels, restaurants, camps, street, medical center, bank, and the ground around ATM machines

Recognition technology tools

Understanding of the technology tools and means to increase the efficiency, accuracy and cost savings will be. In this technology, knowledge of modern tools and technology is essential. Computer systems in modern societies are to increase the accuracy and efficiency, to the extent that one of the most important and effective tools in information technology and information. These systems using various communication tools have been able to establish communications world. So this is a great contribution in changing societies will have. The World Wide Web is a product of ICT. It has good environment for the development of the cause. There are various websites, blogs, e-mail, chat rooms, exchange of information on a wide scale, reducing the cost of communications products throughout the world. Commodity exchanges, including activities that are done on the Internet. After recognition tools in the field of communication and use them in the right place and time will cause long-term goals. These technologies use various tools in establishing a relationship is very important perhaps worst because improper use of the means of communication and feedback disconnection cause. On top of that the differences between generations, and the differences are far from the current generation of communication tools should be appropriate to introduce the community to exert their influence. After identification of a society, needs and appropriate communication tools to get the best out of a relationship.

Using the tools of information and communication technologies in tourism

In the new century demands the removal of restrictions and easy access to the minimum possible time is a reality. Facilities and anything for tourists or non-arrival and during their stay there, they need to acquire. This is in addition to the recognition of tourism, will be safe for tourists. Even the number of virtual cities, full of tourist centers in the form of videos, photos and documents is presented. The regional authorities did not have to worry about the decline of tourists after this introduction, because the solutions and services that not only reduce the tourists were not removed but were also able to increase and stabilize their presence. There is innovation and creativity in the field of tourism during the visit, depending on the climate of the region, along with celebrations and exhibitions that are of interest to tourists, appropriate strategies to attract and increase the value of domestic and foreign tourists. After a virtual space for all the potential to be proprietary, with centralized management and cooperation with all organizations of the main things is. This will be the shortest possible time to fully introduce to the world. The design of the space and support strong and update the database for every visitor creates a feeling of assurance that refer to virtual (web site) before the trip can recognize and fulfill all your needs at the best time to choose. Each tourist can be satisfied hundreds of other tourists to the city and driven by the growth of the industry in the shortest time possible. Either in whole these types of spaces are available for all people in every corner of the globe. This space can be designed with minimal cost and enable it to maintain, although the spread of the Internet among different communities Group who are interested in establishing access to this technology due to generational differences are so using other approaches to these groups with specific scientific management policies and the tourist.

CONCLUSIONS

Impact of ICT in different sectors is inevitable, and this is evident in the tourism industry. The present article is to evaluate the governance of information technology in tourism development and the effects of ICT in attracting





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tourism. In today's world, using various advertising methods such as radio, television or the Internet can be guided into the minds of people and how best to exploit them according to predefined targets achieved. Having regard to the actual and potential fairs, conferences, events (science, art, sports) and comprehensive information in order to identify and attract tourists and In addition to creating virtual exhibitions and conferences worldwide awareness of the potential of individuals, issues and events of the day can be very effective. With the development of science and technology in every field according to modern technologies and Potential and favorite tourist attractions besides the best opportunities for growth and competition provides. This forward thinking ideas and solutions that we want our communities to progress, it is futile and doomed to lag. The IT skill progression, time and priorities are first classified information, because the speed of progress, wait meaningless and has no acceptable justification. Committee formed a government with the support of all organs of the city and the transition to a management unit for the program And implementation of tourism development, as well as officials work with NGOs to achieve the goal of developing tourism in the shortest time necessary. Escape from the problems and delays in administrative costs reflects the weakness of purpose and the high cost in time and money will follow. The results suggest that the role of information technology in industry tourism to introduce the tourism potentials of the country is the whole world. As well as solidarity and social integration, economic and political influence across all countries.

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Estimating and Comparing the Efficiency of Hotel Industry at the Provincial Level

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ABSTRACT

This study is ranked 14 provinces of Iran with structure and function of tourism, by taking the 8 criteria in tourism fields and Compromise Programming model. Then, the performance of hotel activities in the provinces is calculated using data envelopment analysis models and SE-CRS, SE-VRS and SBM techniques in four models. The results showed that in the first model Ardabil, Kermanshah, Gilan, in the second model Ardabil, Mashhad, Kermanshah, Gilan, in the third model Ardabil, Tehran, Gilan, Ardabil and Hamadan, and in the fourth model Tehran, Razavi Khorasan, Gilan and Hamadan have efficient hotel industry. We used Pearson's coefficient of correlation and the standard deviation to determine which model is more reliable and efficient. The coefficient of correlation indicates that between the ranking of provinces in the first, second, third and fourth models, there is not significant different, but respectively, according to the standard deviation, the efficiency evaluation have greater accuracy and less error in the fourth, third, second and first models.

Kew words: super efficiency, compromise programming, Fixed and variable returns to scale, hotel, and province of tourism





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INTRODUCTION

Tourism, by having 10.2 percent of the global GDP, has presented the largest industry in the world in 2011. The tourism industry for the first time was recorded in the world with 983 million people inbound and 1.030 trillion dollar earnings, in 2011. This industry, with rapid growth from 25 million people in 1950 reached to 983 million people in 2011, which represents 2.6 percent an annual growth (Highlights, 2012). The tourism industry, has created jobs for 240 million people in 2011. Also, this industry accounted 10.6 percent of the total workplace in the world, in other words, from 9 of every employee, one person is employed in the tourism sector. This industry made to 655 billion dollar tax revenue, and 10.9 percent total payments of the world in 2011. On average, about 6.9 percent of the payments to the states and 10.7 percent of the world's total investments were accounted to the tourism industry (Rahimpour, 2013). Due to a variety of historical and natural attractions of Iran, it is one of the tourist areas in the world. The exchange revenues of international tourist arrivals in Iran increased from 1963 to 1978, which the most foreign tourist exchange revenues with 235 million dollars, was for the before revolution in 1978 in Iran. The foreign tourist exchange revenues nearly was fixed and faced with minor changes from 1978 to 1988, and it was growing for the respect to the relative calm political and social conditions of the country from 1988 to 2008, but, it has taken a downward trend since 2009 until now.

Each country should have two important characteristics to attract and generate income through tourism, firstly, having the potential to attract tourists, secondly, Ability to provide services and tourism products. Although, Iran is very rich in the potential of absorption, but is poor in terms of providing services and products to tourists. One of the pillars of the tourism industry are hotels that offer an abundance of services, so development of the hotel industry could have a significant role in the tourism development (Khataei and et al., 2008). Considering the limited resources, the development of the hotel industry without increasing the physical facilities and the use of inputs, it is not possible except through increased efficiency.

Many countries in order to strengthen the economic infrastructures for better allocation of resources and achieve sustainable development, requires the identification of their own resources. Also, in this study, using the data envelopment analysis and with the two assumptions of constant returns to scale and increasing returns to scale, survey the efficiency of hotel industry in different provinces in the country. The aim of this study was to increase the efficiency and optimal use of existing facilities in the hotel industry, which increased revenues for this industry, with increasing the quality and quantity of services in the hotels and restores. In connection with the performance of activities related to tourism have been several studies, which are mentioned below: Najafi et al. (2014) introduced the perceived service quality index (PSQI) as a single measure for evaluating the multiple-item service quality construct based on the SERVQUAL model. slack-based measure (SBM) of efficiency with constant inputs is used to calculate the PSQI. In addition, a nonlinear programming model based on the SBM is proposed to delineate an improvement guideline and improve service quality. An empirical study is conducted to assess the applicability of the method proposed in this study. The DEA models proposed were designed to evaluate and improve service quality within a comprehensive framework and without any dependency on external data.

Zargham Boroujeni et al. (2013) to evaluate the performance of the services offered at hotels with a fuzzy balanced scorecard approach presented in Yazd province. The results showed that the performance of services in hotels is desirable in terms of customer and internal processes in Yazd province, while hotels have underperforming in the financial perspectives and the perspective of growth and learning. Zargham Boroujeni and Mir Fakhr (2012) were ranked the performance evaluation index of the hotel services with an approach to balanced scorecard (BSC) and fuzzy Topsis methods. According to the results, 38 indexes as an indicator have been identified a ranked for assessing the performance of hotels. In this way, return on investment in terms of financial indicator, satisfaction of customers in terms of customers, security of employees and customers in term of internal business perspective and training programs, and, Staff development in terms of growth and learning, had the first rating importance in assessing the





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performance of services in hotels. Oliveira et al. (2013) in their studied uses non-parametric techniques to investigate and compare the efficiency of Portuguese hotels in the Algarve, the comparison being made between those hotels possessing golf courses and those that do not. By using data envelopment analysis (DEA) this study investigates the influence of star ratings, golf courses and location on hotel efficiency. Additionally the study uses the test devised by Carvalho and Marques that takes into account the equality of the entire efficiency distribution. They conclude that the star rating is not a significant determinant of efficiency, but the location and the existence of golf courses may have some relevance.

A major finding is that it is those hotels that do not possess golf courses that are the more efficient. Oliveira et al (2013) discussed the efficiency of hotel companies in the Algarve (Portugal), a tourist destination of excellence in southwest Europe. In particular, they intend to assess the efficiency of the hotels in terms of star rating (four and five-star hotels), their location (Windward and Leeward), owning or not golf courses and owning just a single hotel or more than one. This analysis was based on the parametric method of stochastic frontier approach using a revenue function. They found relevant levels of inefficiency. The results also point out the important role of the operational environment, particularly the hotel location and the existence of golf facilities. Star rating and owning multiple hotels do not seem to be so relevant. Yang and Lu (2006) propose an alternative data envelopment analysis for assessing the operational performance of 46 international tourist hotels (ITHs) in Taiwan over the period 1997-2002. This is the first research that combines the discriminant power of a slack-based measure and the dynamic view of window analysis in applying DEA. It is shown that the trend of mean managerial efficiency is increasing, whereas the variation converges. Most ITHs operate at decreasing returns to scale, indicating that ITHs are facing a highly competitive environment. Results also indicate that differences in management style do have a very significant influence upon ITHs' performance over time (1997-2002).

METHODOLOGY

At first, this study has been ranked the various provinces of Iran in terms of having a tourism structure by using the Multiple Attribute Decision-making (MADM) method, and by taking different criteria in the field of tourism. Then, given the importance of hotel industry in tourism is calculated the performance values of hoteling in 14 provinces in Iran with having structure and tourism potential, using data envelopment analysis (DEA) and Super efficiency techniques (SE) with two assumptions, constant and variable returns to scale, and the slack-based measure (SBM) model. In this study, the inputs includes the energy consumption (water, electricity and fuel), gross capital formation, employee compensation, the number of full-time employees and special payments and outputs includes value added tax (VAT) and per person- per night Accommodation in Hotels. Also, four models have been considered to the selection of inputs and outputs.

Compromise Programming

CP is one of the approaches that take a paradigm different from the utility theory. The basic idea in CP is the identification of an ideal solution as a point where each attribute under consideration achieves its optimum value and seek a solution that is as close as possible to the ideal point (Chen et al., 1998). This model was proposed by Zeleny. It consists of minimizing the distance between the achievement levels f_k and the utopia values (f_k^{\max} or f_k^{\min}) associated with each objective k . In the case that the more of the objective is better, the utopia values f_k^{\max} can be obtained as follows (Amiri et al., 2011):

$$F_k^{\max} = \max f_k \quad k=1,2,\dots,k$$

$$\text{Subject to: } g_i(x) \leq b_i, i=1,2,\dots,m \quad (1)$$





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$$x \in S$$

And the final model of CP by considering preference weights of objectives (w_k) can be formulated as follows

$$\begin{aligned} \text{Min} \quad & \left\{ \sum_{k=1}^k w_k (\delta_k^-)^p \right\}^{\frac{1}{p}} \\ \text{Subject to:} \quad & f_k + \delta_k = f_k^{\max}, \quad k=1,2,\dots,k, \\ & g_i(x) \leq b_i, \quad i=1,2,\dots,m, \quad (2) \\ & x \in S, \\ & \delta_k \geq 0, \quad k=1,2,\dots,k. \end{aligned}$$

The variable δ_k^- is deviational variable of slack for constraint related to k th objective. Also if the case that less of the objective is better, the utopia values f_k^{\min} can be obtained as follows:

$$\begin{aligned} F_k^{\min} = \min \quad & f_k \quad k=1,2,\dots,k \\ \text{Subject to:} \quad & g_i(x) \leq b_i, i=1,2,\dots,m \quad (3) \\ & x \in S \end{aligned}$$

And the final model of CP by considering preference weights of objectives (w_k) can be formulated as follows:

$$\begin{aligned} \text{Min} \quad & \left\{ \sum_{k=1}^k w_k (\delta_k^+)^p \right\}^{\frac{1}{p}} \\ \text{Subject to:} \quad & f_k - \delta_k = f_k^{\min}, \quad k=1,2,\dots,k, \\ & g_i(x) \leq b_i, \quad i=1,2,\dots,m, \quad (4) \\ & x \in S, \\ & \delta_k^+ \geq 0, \quad k=1,2,\dots,k. \end{aligned}$$

The variable δ_k^+ is deviational variable of surplus for constraint related to k th objective.





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Super Efficiency model

The use of the super efficiency model can contribute to provide the more detailed list of functional units. The Super efficiency name used to refer the DEA modified model which units can have efficiency values greater than one. The reason is that, the firms to evaluate the efficiency do not have any restriction for the placement itself as a reference ahead. This method is presented by Anderson and Peterson for the first time, its main purpose is to provide a system for ranking the firms that can distinguish between firms on the frontier.

In this case, to calculate the performance of the firm I, the data will be removed from the matrix. Thus, in a linear programming model which runs for the firm I, the firm is not exist as a part of border basis, and, if the firm is quite efficient in the basic standard DEA model, in the current model would have efficiency more than one. Several applications are listed for the super efficiency model which includes: a) ranking efficient units, b) classification of decision making units, extreme efficient and extreme efficient noun, c) Sensitivity of efficiency classifications, d) double-performance ratio games, e) calculate and analyze the Malmquist index efficiency (Chen et al.2010).

Algebraic equation of a super-efficient model to calculate the efficiency of O decision-making as follows

$$\text{Min } \theta$$

Subject to

$$\sum_{j=1, j \neq 0}^n \lambda_j X_{ij} \leq \theta X_{i0} \quad i = 1, 2, \dots, m$$

$$\sum_{j=1, j \neq 0}^n \lambda_j Y_{rj} \geq Y_{r0} \quad r = 1, 2, \dots, t$$

$$\sum_{j=1}^n \lambda_j = 1$$

$$u_r, v_i \geq s \quad \forall \quad r \text{ and } i$$

SBM model

Tone (2001) has proposed a slacks-based measure (SBM), which is non-radial and deals with input/ output slacks directly. The SBM returns an efficiency measure between 0 and 1, and gives unity if and only if the DMU concerned is on the frontiers of the production possibility set without input/output slacks. In order to estimate the efficiency of a DMU (x_0, y_0), we formulate the following fractional program in λ, s^- , and s^+ :

$$\text{Min } \rho = \frac{1 - \frac{1}{m} \sum_{i=1}^m s_i^- / x_{i0}}{1 + \frac{1}{t} \sum_{r=1}^t s_r^+ / y_{r0}}$$





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$$s.t. x_0 = x\lambda + s^-$$

$$y_0 = Y\lambda + s^+$$

$$\lambda \geq 0, s^- \geq 0, s^+ \geq 0$$

In this model, we assume that $X \geq 0$. If $x_{i0} = 0$, then we delete the term s^-/s_{i0} in the objective function. If $y_{r0} \leq 0$, then we replace it with a very small positive number so that the terms s^+/y_{r0} plays the role of a penalty (Kao et al, 2011).

RESULTS AND DISCUSSION

The results of ranking the provinces in terms of tourism function

In this study, at first, 14 provinces with tourism structures were selected to analyze the efficient of hotel industry, using metrics related to the field of tourism and Compromise Programming. These metrics are included: The number of resorts, air carriers (The number of domestic and foreign flights), rail transportation (rail length into the area), road transportation (along main roads to the area), The number of travel agencies, The government budget in the tourism sector, types of tourism functions (natural, historical, religious, recreational, health, commercial, sports,....) and The number of historical and cultural sites.

Based on table (1) and considering the different potentials related to tourism industry in each of the provinces, in order Tehran, RazaviKhorasan, Gilan, Fars, Isfahan, East Azerbaijan, Mazandaran, Ardabil, Hormozgan, Hamadan, Khuzestan, Kurdistan, Kermanshah and Yazd provinces have the highest potential for tourism development.

The hotel industry efficiency in the provinces with tourism potential and structure

At this stage, the efficiency of hotel industry in 14 provinces were estimated by four models. In the first and second models, the output was per person per night Accommodation, and in the third and fourth models the output was the value added. Also, in the first and third models the labor force input was the number of full-time employees, and, in the second and fourth models was employee compensation. Other inputs are included the energy consumption (water, electricity and fuel), gross capital formation and special payments. The value of special payments are included payments for used weak accessories and instruments and dishes and resorts appliances alternative costs, Meat products, cereals, rice, Edible oils, fruits and vegetables, dairy products, drinks and beverages and disposable containers.

In this study, the efficiency of hotel industry was evaluated by data envelopment analysis, super efficiency and the slack-based measure models (with the assumption of constant and variable returns to scale), in 14 provinces of Iran in 2011. To measure technical performance, we can use two different approaches. First, by considering the constant output level, technical inefficiency of the economic units is measured by decline in consumer inputs. This is the Farrell technic in measuring technical efficiency which is known the input-based approach. Another way is the output-based approach, which is estimated the technical inefficiency by considering the constant level of used inputs and increasing in output. Although, in technical efficiency of economic units, The use of both methods is the same when the process of production in a unit has the constant returns to scale, but, in terms of variable returns to scale, the computed technical efficiency values are not similar necessarily in both approaches. In selection the type of input and output based models should specify managers have more control on outputs or inputs. According to the fact that



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hotels and Resorts are always looking to minimizing their costs, therefore, the input approach has been used to estimate the values of performance. The results presented in Tables 3 and 4.

The results showed that in first model Ardabil, Kermanshah and Gilan provinces, in second model Ardabil, RazaviKhorasan, Kermanshah and Gilan provinces, in third model Ardabil, Tehran, Giland Hamadan provinces and in fourth model Ardabil, Tehran, RazaviKhorasan, Gilan and Hamadan have efficiency hotel industry.

To determine which model and efficiency estimated is more reliable, Pearson's coefficient of correlation was used. The results presented in tables 5, 6, 7, 8 and 9. comparison of different methods to estimate the efficiency in each model showed that SE-VRS method is less accurate compared with SE-CRS and SBM methods. Because showed impossible amounts for RazaviKhorasan province in the first and second models, and for Tehran province for the third and fourth models. Also in the first and second models, coefficient of correlation between all three efficiency methods is close to one and completely significant, which indicates, there is no significant difference between rankings of units by various methods. But, in the third and fourth models, there is no significant difference just between SE-CRS and SBM methods.

The coefficient of correlation in the first and second models and the third and fourth models are close to one and completely significant. In the other words, there is no significant difference in the first and second models and the third and fourth models between provinces. According to the standard deviation of efficiency evaluation, in order the forth model (0.32), the third model (0.34), the second model (0.54) and the first model (0.55) have greater accuracy and less error. Also, the forth model is analyzed.

Based on the results of the fourth model, hotel activities respectively in Ardabil, Tehran, Hamadan, Gilan and RazaviKhorasan provinces have technical efficiency in terms of constant returns to scale, and Kermanshah, Hamadan, Ardabil, Gilan, RazaviKhorasan provinces have technical efficiency in terms of variable returns to scale. Therefore, Ardabil, RazaviKhorasan, Gilan and Hamadan have fixed technical efficiency in both fixed and variable returns to scale. In fact, the provinces have performance and scale efficiency; which they can be suggested as reference set for the hotel industry of other provinces to improve their efficiency. On the other hand, the inefficiency of Hamadan which indicates the efficiency less than one, in the constant returns to scale, just is for inactivity in optimal scale. Therefore, there is the potential to expand the scope of its activities to improve the performance, adjustment costs and improve the efficiency.

Also, the results showed that East Azarbyjan, Isfahan, Khozestan, Fars, Kordestan, Mazandaran, Hormozgan and yazd have the efficiency less than one, on the other hand, have distance from the efficient frontier. Indeed, the efficiency estimated for Mazandaran (0.46) is less than other provinces. This means that the hotel industry in this province, as least, can reduce 54 percent the inputs, without any reduction in the outputs.

Based on the table 4, the average of technical efficiency is 0.84 in Constant returns to scale, in the data envelopment analysis method. This means that on average, the provinces were studied, should save 16 percent of their inputs to achieve both technical and the efficiency of scale in their hotel activities. Thus, the hotel industry in different provinces of Iran, have empty spaces (assuming the other conditions are constant), in both scale and management. And, the situation should be arranged to efficiently use the resources. When the technical efficiency is 0.84, this means that in different provinces, in the constant return to scale, from 1000 units of capacity of hotel industry, just 840 units are used. In other words, the hotel industry will increased the output by 16 percent, without increasing the capacity. Thus, on the basis of a scientific process can be explained that hotel industry in provinces of Iran, by tourism structure and potential is active by 16 percent under the capacity.





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Suggestions

In hotel activity of inefficient provinces, the average of technical efficiency is 0.68. This indicates that the majority of issues in the resorts related to the management in this field. Therefore, it is necessary to strengthening the management system including training, absorption of employees systems, etc.

Because the hotel activity in most provinces due to seasonal activity has the inefficient situation in the use of human resources, creating the flexible employment system can be economical. In order to comply inefficient provinces in hotel activities from efficient, and improve their efficiencies is recommended that continually monitor the resorts performance and create the necessary motivations, such as, transferring the knowledge of provinces directly and indirectly with hotel activity, holding the classes and training courses, etc.

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Table (1): Ranking the provinces of Iran Based on tourism development potential

The province	Tehran	RazaviKhorasan	Gilan	Fars	Isfahan	East Azarbayjan	Mazandaran
coefficient	0,562145	0,568217	0,764403	0,767629	0,801288	0,844676	0,85325
The province	Ardabil	Hormozgan	Hamadan	Khozestan	Kurdistan	Kermanshah	Yazd
coefficient	0,861022	0,87157	0,87683	0,88064	0,883698	0,918197	0,927407

Table (2): DEA inputs and outputs in four different modes

Model1	Model2	Model3	Model4
Inputs: -energy(water, electricity and fuel) - gross capital formation - special payments - number of full-time employees	Inputs: -energy(water, electricity and fuel) - gross capital formation - special payments - employee compensation	Inputs: -energy(water, electricity and fuel) - gross capital formation - special payments - number of full-time employees	Inputs: -energy(water, electricity and fuel) - gross capital formation - special payments - employee compensation
Outputs: per person- per night Accommodation	Outputs: per person- per night Accommodation	Outputs: value added	Outputs: value added





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Table 3: The hotel industry efficiency levels in tourism provinces by different models-2011

Provinces	Model1			Model2			Model3			Model4		
	SE-CRS	SE-VRS	SBM	SE-CRS	SE-VRS	SBM	SE-CRS	SE-VRS	SBM	SE-CRS	SE-VRS	SBM
East Azarbayjan	0.64	0.75	0.58	0.64	0.66	0.57	0.63	0.70	0.43	0.63	0.69	0.47
Ardabil	2.02	2.29	1.00	2.02	2.29	1.00	1.49	1.51	1.00	1.49	1.51	1.00
Isfahan	0.38	0.38	0.33	0.38	0.38	0.31	0.81	0.82	0.55	0.81	0.82	0.56
Tehran	0.48	0.70	0.38	0.48	0.70	0.35	1.37	Infeasible	1.00	1.29	Infeasible	1.00
RazaviKhorasan	0.92	Infeasible	0.84	1.03	Infeasible	1.00	0.83	0.92	0.61	1.07	1.07	1.00
Khozestan	0.37	0.38	0.28	0.37	0.38	0.27	0.56	0.60	0.52	0.56	0.60	0.53
Fars	0.41	0.43	0.34	0.41	0.42	0.32	0.56	0.57	0.38	0.56	0.57	0.40
Kurdistan	0.81	1.04	0.63	0.81	0.87	0.60	0.63	1.00	0.50	0.74	0.96	0.53
Kermanshah	1.06	4.71	1.00	1.06	4.71	1.00	0.83	4.71	0.56	0.83	4.71	0.62
Gilan	2.27	2.29	1.00	2.27	2.29	1.00	1.09	1.11	1.00	1.09	1.11	1.00
Mazandaran	0.45	0.47	0.35	0.43	0.43	0.35	0.35	0.37	0.27	0.44	0.46	0.31
Hormozgan	0.71	0.81	0.47	0.71	0.81	0.47	0.85	0.88	0.52	0.85	0.88	0.56
Hamadan	0.60	0.80	0.41	0.60	0.80	0.39	1.11	1.60	1.00	1.11	1.60	1.00
Yazd	0.51	0.54	0.39	0.51	0.53	0.38	0.30	0.42	0.25	0.39	0.48	0.27

Table 4: A summary of efficiency indicators in hotel industry of studied provinces

Indicators	Model1			Model2		
	SE-CRS	SE-VRS	SBM	SE-CRS	SE-VRS	SBM
AverageEfficiencytotal provinces	0.83	1.19	0.57	0.83	1.17	0.57
AverageEfficiencyinefficientprovinces	0.57	0.54	0.45	0.53	0.60	0.40
Min	0.37	0.38	0.28	0.37	0.38	0.27
Max	2.27	4.71	1	2.27	4.71	1
Total efficient provinces	3	4	3	4	4	4
Total inefficient provinces	11	10	11	10	10	13
Indicators	Model3			Model4		
	SE-CRS	SE-VRS	SBM	SE-CRS	SE-VRS	SBM
AverageEfficiencytotal provinces	0.81	1.17	0.61	0.85	1.19	0.66
AverageEfficiencyinefficientprovinces	0.63	0.66	0.46	0.64	0.68	0.47
Min	0.3	0.37	0.25	0.39	0.46	0.27
Max	1.49	1.51	1	1.49	1.51	1
Total efficient provinces	4	4	4	4	4	4
Total inefficient provinces	10	10	10	10	10	10





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Table 5: Different methods of estimating the hotel industry efficiency of tourism provinces in the first model

	SE-CRS	SE-VRS	SBM
SE-CRS	1		
SE-VRS	0.628 (0.009)	1	
SBM	0.874 (0.000)	0.870 (0.000)	1

Table 6: The coefficient of correlation in Different methods of estimating the hotel industry efficiency of tourism provinces in the second model

	SE-CRS	SE-VRS	SBM
SE-CRS	1		
SE-VRS	0.631 (0.009)	1	
SBM	0.856 (0.000)	0.866 (0.000)	1

Table 7: The coefficient of correlation in Different methods of estimating the hotel industry efficiency of tourism provinces in the third model

	SE-CRS	SE-VRS	SBM
SE-CRS	1		
SE-VRS	0.399 (0.126)	1	
SBM	0.949 (0.000)	0.331 (0.211)	1

Table 8: The coefficient of correlation in Different methods of estimating the hotel industry efficiency of tourism provinces in the fourth model

	SE-CRS	SE-VRS	SBM
SE-CRS	1		
SE-VRS	0.374 (0.153)	1	
SBM	0.946 (0.000)	0.335 (0.205)	1





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Table 9: The coefficient of correlation in Different methods of estimating the hotel industry efficiency of tourism provinces

	First model	Second model	Third model	Fourth model
First model	1			
Second model	0.999 (0.000)	1		
Third model	0.588 (0.013)	0.592 (0.012)	1	
Fourth model	0.618 (0.008)	0.630 (0.007)	0.980 (0.000)	1





RESEARCH ARTICLE

Clarifying Environmental and Behavioral Factors' Role in Developing Citizens' Mental Image of City Spaces (Case Study- Karim Khan Zand Street, Shiraz, Iran)

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ABSTRACT

Cities are settlements consisting of buildings, tracks and a set of different textures next to each other. Human living in a place requires interaction with environment, experience and recognition of existing and occurring phenomena. Citizens' interpretation of a great city and their references to its constituent elements, have a direct relationship with their objective and subjective needs. In addition to physical structure of a place, people memories are effective in places identification. For this reason, people experiences of places are recorded as different pi and memories in their minds and are always with them. this study began examining physical manifestation of city based on city physical factors, in its most profound mode of historical elements and parts, and analyzed environmental and behavioral factors relationships in developing users' mental image of this space. The purpose of this study was to find these characteristics in representation of cities manifestation reality. Research method of this study is a combining one that uses analysis and survey method. Data collection instruments are observation, interview and questionnaire. Based on data obtained, there is a significant relationship between environmental and behavioral elements and citizens' mental image. This relationship is 0.882 based on Pearson coefficient. This coefficient is 0.613 between non-physical factors and mental image. Standardized regression coefficient is 0.544 for non-physical factors and is more than that of other factors.



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The value of the coefficient has been reported 0.449 for functional factors, 0.47 for behavioral factors and 0.27 for form factors.

Key words: environment, behavior, mental image.

INTRODUCTION

Every day new buildings are built. These physical locations impose some behavioral patterns and modern social roles on their settlers, or they improve some behavioral patterns and criteria and weaken some others. In sum, they give new directions and dimensions to their settlers (Mortezaei 2002, 2).

One of designers and architects' missions is to create a proportionate relationship between human beings and the buildings surrounding them. Designers should have a good understanding of human being within different settings, in a way that they strengthen the relationship between humans and the place (Behzadfar, Ghazizade 2012, 16). Except from many behavioral levels that become compatible with each other, other environmental features should also be kept in mind. Willems (1974) has put an emphasis on the issue that any change in any part of environmental systems can have serious unpredictable effects on parts of the system (Altman 2004, 268).

Human beings change the environment according to their needs, values and goals; and in return they are affected by the altered environment. Western psychologists put emphasis on environment as an important factor with which the individual has an interchangeable relationship, a factor which affects human and is affected by him and such effectiveness and influence form his mental imaginations (Chapman 2007, 21). Human beings keep different images in their minds from a fixed place. Human's emotions can influence his perception of the environment and his mental image he has from a place (Partoee 2004, 42). These mental images bring about differentiation and separation of places and thus give him identity. In fact, environmental systems can be designed in which environment and various behaviors combine together as a general framework (Altman 2004, 260). Theoretically, first environment and its dimensions, and then, the relationship between mental image and behavior or environment and behavior have been discussed. The purpose of the present research is to distinguish citizens' mental image from urban space. Therefore, Zand Street has been analyzed as the case.

METHODOLOGY

Behavioral and perceptual differences have great impacts on individual decisions. People's behavior is affected by their perception of the world and their perception of the environment, which are determined by factors such as culture, age, education, and prior experience. Therefore, gathering data from people of different ages, cultures, genders, education, etc. through questionnaire can be a useful method. This study is practical in terms of purpose and is considered as a survey in terms of methodology (Hafeznia 2012, 131). To collect data, field research (observation, interview and questionnaire) is used. The data was analyzed using SPSS 2.0. The statistical society of the study is the users of Zand Street within the physical areas of A, B, and C (Figure 5).

In order to gather data, questionnaires were designed and used after their validity and reliability were confirmed. To compute reliability, Cronbach Alpha was used ($=0.76$) and to assess validity, opinions of professors and sociologists were kept into consideration. The purpose of the study is to distinguish those factors which influence the mental image of the space users. In this regard, the research questions are as follow.



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What factors have a role in users' mental image? Can structural and no-structural features of urban arteries create different mental images for individuals?

On this basis, research hypotheses consider the effects of environmental and behavioral effects on citizens' mental images.

LITERATURE REVIEW

Environmental perception approach which was formulated by Lang as an ecological study, focuses on practical theories resulted from systematic and organized studies. This approach refers back to Chicago School (of sociology) and the great attention it pays to the impact of environment on perception and behavior. Here, not only are structural features important but also citizens' perception and environment users and the way they perceive the world determine their weak and strong points.

To study collaborative interactions in a place, Edward Hall (1982) considers concepts such as sociability. He believes that depending on its norms and its ongoing behavioral events, each space needs a special treatment. In his study, environment is divided into two parts: welcoming environment and non-welcoming environment. Welcoming environments bring about collaborative interactions and non-welcoming environments decrease collaborative interactions (Hall, 1982). Therefore, the investigation of undertaken studies by photos and sketches reveal that many environmental experts have used sketches and manual drawings to objectify the relationship between individual and city. As an example, in his book called "summary of city landscape" Gordon Kallen (1968) has provided a good collection of aesthetics and photos of city environments. Kevin Lynch (1960) discovered five factors making up mental image of the city by citizens' unprofessional sketches and by comparing them in three American cities. Francis Tibalds (2001) refers to the features of a good city through the technique of reading the minds of settlers in a city. Regarding landscape architecture, Collins (1965) could investigate and analyze important features of city landscape in the past by the use of written literature and pictures of landscapes taken by citizens. Ueda et al. (2012) found out the various patterns of Russian and Japanese peoples' minds by investigating manual sketches drawn by participants from the two countries.

Theoretical Literature**Urban Space: the Arena for Appearance of Behaviors**

Urban space is somewhere we live in. Most of us spend not only part of our day but sometimes all of it in urban spaces. Therefore, it can be said that urban spaces or public places are somewhere citizens live in and are the foundation of the knowledge-profession of urban design. Thus, they are of great significance for environmental dynamism and civil life in a city. (Mirshahzadeh 2007, 103) From the viewpoint of theorists in this area, urban spaces are defined differently, all of which have something in common and that is the role of these spaces in creating and enhancing the relationship between humans and the environment and between humans themselves at different levels of sensation. It is clear that urban public spaces get their meanings from humans' presence and their activities, and more than their physical role, they are of importance because they create social interaction among citizens. (negintaji 2010, 85)

Features of physical environment are important factors in humans' lives. However, in spite of the close relationship between environment, form of the land, and culture, such features cannot determine human behavior. Although physical environment is the source of cultural and behavioral differences, it is not the only source affecting humans' social behavior (Lang 2005, 115).





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Environment-Behavior

Moen Persian Dictionary defines environment as surrounding and somewhere human lives in (Moen 1997, 3929). We have two kinds of environment. The first one is a potential environment for human behavior and the second one is the effective environment which the individual pays attention to and uses it. In all classifications, the existence of a potential environment for behavior and the effective environment that an individual pays attention to and uses is necessary (Lang 2005, 88).

An environment includes those geographical features that have internal relationship with each other and provide some behaviors in the same way. A collection of environmental abilities in a special situation creates a good condition for human being to live (Lang 2005, 117). Thus, "environmental assessment" is not a simple and one-dimensional issue.

Assessment is defined as: 1) the description of how people use adjustable techniques to monitor interactions, 2) the representation of the effects of environmental designs on these techniques, 3) the recognition of long-term, short-term and direct effects (Altman 2004, 268). The exchange between structural features of the environment on the one hand and patterns and cultural codes and mental abilities on the other, models such predominant quality. Four different human patterns are put forward here in encountering the environment which are among the most important factors for recognition of this relationship.(Nejadsattari 2011, 91)

The machine-assumption pattern

States that human is for the most part a task-oriented and performance-oriented creature. This pattern puts emphasis on individual's ability to sense, process and interpret environmental data, and also on human's assessment and selection skills. And since it sees him as part of a machine, the performance-oriented abilities of the human gets special significance. Another feature of this pattern is its focus on environmental design and shaping physical environments.

The conceptual-cognitive pattern

Represents perceptual, emotional and cognitive reactions of human and of the environment which regards human as an internal processor. It mostly deals with psychological and mental procedures.

The behavioral pattern

In this view, human is always a behavior-oriented creature. This proactive approach focuses on environmental dependencies as the determinant factors of behavior and tries to recognize them and include them in environmental design.

The ecological or social systems pattern

In this pattern, behavior and environment are so intertwined that it is difficult to distinguish them from each other. Behavior is defined within the context of environment and the environment is considered as a great part of one's personality. Individuals are the main factor in the definition and change of emotional aspect of space and they are not only the receivers of environmental effects.



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According to Gehl (1987), people's activities in public spaces are divided into three groups; each one needs different features in physical environment. The three are essential, selective, and social activities. Obligatory activities receive the least amount of influence from physical environment and public space, because they are performed in all days of the year and under any circumstances. If the external environment is of low quality, people only do necessary activities; and where the spatial quality is high, in addition to essential activities, they also tend to become present in space and they prefer to walk rather than drive by.

Optional activities other social activities are being done if a good condition is provided, and doing social activities depends on the presence of other individuals in the space (Gehl, 1987).

Mental-behavior Image

To perceive environment, board research has been carried out. To do this the main method is to create a mental image, i.e. creating a mental image of environment which is shaped by individuals and are used as their behavior in the city (Madanipour 2001, 98). The mental image of the city is that part of the city which appears physically and structurally; a part which will be observable and kept in memory. What give value to such mental image are criteria, systems, orders, proportions, shapes, forms, methods and elements that are combined together to differentiate the constructed elements from other societies and make them more attractive, more memorable and better (Ardeshiri 2012, 56).

In cognition or recognition of physical context of the cities, it is important to consider the role and the effect of mental image of the city. Since in all social settings the mental image of the surrounding area plays an important role in shaping people's attitude towards the place they live in and therefore, in explaining the urban identity. Philosophers of urban sciences recognize a "good, strong, and efficient mental image" as one of the positive and key features for any individual city. The understanding of the personality and character of a building is a mental process that occurs through the relationship between human and environment. The human receives sensory messages from the environment and creates an image of the environment in his mind (Mirmoghtadaei 2010, 7).

With the increase of such elements and familiar images, the sense of establishing a more simple relationship, peace and attachment increases within the individual. In contrast, with the change and the transformation or the destruction of space and familiar elements, the human being feels diminution, alienation and ambiguity. The concepts of "familiarity" with and memory of urban spaces are accompanied by a sense of attachment and identify. History is part of the memories of the cities and thus, historic buildings in every city are piles of memories indicating the habitation history of each city (Habibi 2005, 14-18). Each of these historic sections gives shape to part of a work's, here a building's, personality or character. In this sense, personality means collection of features by which cities are described. Therefore, it is related both to observer and to what is observed. On the other hand, personality refers to differences which make it different from others.

Lack of memory is one of the features of general or generic city, a term which was first used by Ram Colehouse. Colehouse recognizes these cities as lacking specific memories; cities which have taken and completed their history and are free of identity (Koolhaas 2001, 65-81). Here, Koolhaas honestly refers to the issues of history and memories of the settlers, and introduces the lack of them as a sign of the city's rootlessness in terms of shape.

Therefore, character-making factors in urban space are in most part formed by the different characteristics of the buildings. These characteristics can be studied under the two following fields: Physical: size, orientation, conflict, scale, proportion, human scale, construction material, color, maximum forms

Non-physical: identity, history (historical period) or antiquity, mystery



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Also, one's presence in an urban space or location does not only lead to his physical perception of an urban space, but generally it creates a relationship between individual and the space or spatial body which situates in his mind and sets the round for his perception of the surrounding environment (Khatibi 2014, 65).

Environment-Behavior

In his book called "urban landscape," Gordon Cullen writes in favor of the significance and the role of visual appearance: "we consider visual issues because it is almost in this way that we recognize the environment. Visual perception is not only a useful tool, but is also the reminder of all tangible feelings that are left in our minds".

The investigation of five senses of environmental knowledge, ethology, and environmental motivations in studies by "Rapaport" and "Lang" has made clear the operational capabilities of this approach in making urban spaces and the architecture acceptable in relation to the needs and potentials of human beings. The behavioral-environmental studies have focused on the bilateral interaction and relationship between human and his surroundings. Considering that city and urban spaces are the arena for memories and emotional events, and individuals' actions and reactions to the environment, they remind citizens of a number of concepts which affect the structure and dimensions of the citizens' characteristics (Pakzad 1997, 102). In urban life, positive behavioral stimuli such as numerous collections of cultural, entertaining, economical, and political resources exist which can enrich the life (Altman 2004, 182).

Urban spaces are defined by their internal activities, and these activities cause mental images in the relationship between people and also lead to creation of urban memories. Social identity and collaborative memory are kept in a place in which the individual, when being there, finds it different from other places (Khosro khavar 2005, 13).

Case Study

Since the aim of this study is to identify a conceptual and structural model of standards and variables shaping citizens' mental image of factors and macro and micro components of the portrait of urban spaces, this research has considered an urban space from Shiraz city as its case study, Karim Khan Zand Street. Shiraz had been one of the most important cities during the Islamic middle ages, and was the capital of Zand Dynasty (1747-1779). Today, Shiraz has developed widely and now is divided into two modern and traditional zones. The traditional zone includes gates and neighborhoods from different historical periods. The modern zone, mainly, surrounds the traditional zone and is located in suburbs.

Like other cities of Iran, Shiraz has undergone massive street constructions and physical changes. One of the instances is the construction of Zand Street, a wide street in downtown, which was extended first in Safavid period and then in Zand period by Karim Khan Zand. The street is one the oldest and main streets of the city which connects to all sights and monuments. In the period of Pahlavi I, between 1921 to 1941, tremendous changes occurred in the street structure, and new spaces, parts and components were added to it.

Nowadays, Zand Street is not only the main passage for Shiraz citizens but also is the main route for domestic and international tourists. Therefore, regarding the effective and importance role it plays for creation of the mental image and perception of urban spaces of Shiraz, it has been selected as the subject of our case study considering its environmental-behavioral effects. In case of this research, the street has been physically divided into three general parts including: first part: Namazi Square up to Setad Square, second part: Setad Square up to Zand Crossroads, and third part: Shahr-dari Square up to Taleghani Street. Physical and non-physical elements and characteristics of each part has then been evaluated separately (Figure 5).



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Also, the amount of role each element or environmental factor plays and its efficacy in each part have been examined and compared through a questionnaire; its results will be analyzed in the following parts. The questionnaire was provided on the basis of components of mental image in the form of two environmental and behavioral variables and its results are shown in the Table 1.

In order to evaluate mental image of the authors, first, the environmental components of the three parts of the street were compared and then the users were questioned on their mental image using the questionnaires. Study of the environmental factors which influence users' behavior in Zand Street was performed separately in the three distinct parts of this street based on Likert scoring system (Table 1) they were divided into two general physical and non-physical areas, and then were evaluated. The results are as follow:

In the physical area, the first part of Zand Street, according to the modified indices, has gained more scores. The scores for the third part of the street are close to that of the first part; which indicates that in the first part of the street, the functional indices – index elements and building scales –, accessibility and functional coordination have acted more stronger (and have more influence in shaping the citizens' mental images of Zand Street which guide their behavior in part 1). Meanwhile, in part 2, the indices of performance role and proximity of the buildings have acted strongly. In part 3 of the street, index elements of horizon, form and coordination are known as the strongest factors.

In the non-physical area, the results from the table show that the third part of the street has higher scores and that all indices except for security, supervision, and religious meaning are evaluated as strong. The second and the third parts also had the same scores. The information obtained from the questionnaires, for the evaluation of mental image, show that 43.9% percent of the respondents were male and 56.1% were female. The respondents were between 20-30 years of age with the frequency of 56.4%, 30-40 years of age with the frequency of 30.8%, and over the age of 40 with the frequency of 12.8%. 32.5% of the respondents had educational degrees less than high school diplomas, 60% had degrees over high school diploma or bachelor's degree, and 7.5% had degrees over bachelor's degrees.

According to analyses, the environmental and behavioral factors result in the following data

Hypotheses Testing and Description**RESULTS**

The research paradigm or pattern which includes the hypotheses and research mental works is the starting point of any special research which aims at the researcher's individual hypotheses on the nature of the subject and way of understanding its variables. In this research, the physical reality of objects is considered in a way that their characteristics are clearly determinable. Their efficiencies are measurable using instruments of measurement and the results are quantitatively comparable. In other words, the subject of the research is of "tangible" and understandable reality; therefore, the hypotheses of the research have been considered as follow:

Hypothesis environmental and behavioral elements are effective in citizens' mental image.

Null Hypothesis: There is no meaningful relationship between environmental and behavioral elements and the citizens' mental image. Alternative Hypothesis: There is a meaningful relationship between environmental and behavioral elements and the citizens' mental image.

As for this hypothesis, the present research seeks to come to the fact that the more environmental and behavioral elements exhibit different environmental indices, the more powerful mental image will be created in the citizens'



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minds. Therefore, the amount of each physical, non-physical, and behavioral factor was examined for Zand Street as the case study. To this end, first, we calculated the meaningful test among different variables by Pearson coefficient test, results of which are as follow

Pearson Coefficient index for the correlation of mental image and environmental factors is 0.882 which is meaningful at the level of 0.01. This amount of correlation coefficient shows that the relationship between environmental factors and mental image is strong. In other words, we can say with a certainty of 99% that in accordance with the increase (decrease) of environmental factors, people's mental images also increase (decrease). (Pearson) coefficient has been also calculated for minor environmental factors such as physical elements which include secondary and functional factors, as well as the non-physical elements. Pearson coefficient for physical factors by mental image is 0.55 which is meaningful at the level of 0.01. The coefficient is 0.41 for functional factors by mental image which is again meaningful at the level of 0.01. The coefficient for formal factors is 0.45 which is meaningful at the level of 0.01. Also, Pearson coefficient for non-physical factors by mental image is 0.72. The amount of correlation between mental image and behavioral factors is 0.613 according to the given table, which is meaningful at the level of 0.01. All of these coefficients show the correlation between the above factors and mental image. That is, an increase (decrease) in any of the above factors leads to the strengthening (weakening) of the citizens' mental image while being present at Zand Street.

General Evaluation of the Influence of Independent Variables on the Dependent Variable

According to the previous data and correlation amounts, the factor of non-physical elements in Zand Street, Shiraz has the most correlation with mental image and then with formal, behavioral, and functional elements.

Multivariate Data Analysis

Performing Multiple Regression by Wise-step Method

For the last part of data analysis, we performed data regression analysis in order to have a general sketch of the factors explaining the amount of mental image and the amount of meaningful relationship between the effective elements. Regression analysis is one of the most applicable methods in socio-economic studies which provides the researcher with the opportunity to predict the changes of dependent variable via independent variables and to determine the contribution of each independent variable in explaining the dependent variable.

According to the Table 4 $F=157.49$ which is meaningful at the level of 0.01 which is of good value and signifies the ability to become generalized. Standardized regression coefficient of non-physical factors, functional factors, and behavioral factors are respectively reported as 0.544, 0.47, and 0.27.

According to t index which shows the relative importance of each independent variable for the model, the amount fluctuates from the most to the least for behavioral elements, functional elements, and form elements respectively.

These quantities show the contribution and the role of each independent variable in determining the dependent variable and provide the possibility of comparison and determination of relative contribution of each variable. In other words, although the amount of B is equal for all variables, their contribution and role is different in explaining the dependent variable. In other words, the amount of standardized regression coefficient (β) shows that for one unit of change in deviation of physical factors, 0.544 units of change happen in deviation of the dependent variable (mental image).





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CONCLUSION

In order to recognize physical texture of the cities, the role and influence of the city's mental image should be considered; because the mental image of the environment in any social context has an important role in shaping people's attitude toward their places of living and consequently in explaining the urban identity. Scholars of urban science believe that having "a good, powerful, and efficient mental image" is one of the positive and necessary characteristics of each city. Therefore, we can say that the mental image of the city is part of the city's identity which appears physically and structurally and then will be seen through and committed to memory. What gives value to this image and differentiates the mental image of one city from that of another city are standards, systems, orders, proportions, shapes, methods, and elements combined together to make the constructed elements more beautiful, memorable, better, and superior than the neighboring communities. In other words, a good and powerful mental image of an urban space or even of the whole city leads to the following consequences:

Citizens' satisfaction

Visitors' happiness

Uniqueness of the city and urban space

Increase of national and international fame of the city

Creation of emotional and powerful connections between the city and its citizens

Strengthening more public participation of the citizens in city affairs

Thriving tourism industry to the city

The results of this research show that the presence of a person in an urban space or place not only leads to his physical perception but also connects the person to the area or physical space that is situated in his mind and underlies his perception of the environment. These results can be divided into three groups:

Non-physical factors such as history, identity, special happenings, etc. are known as the first and most powerful factors in shaping people's mental images of urban spaces, changes of which (strengthening or weakening) result in direct influences on the individual's mental image.

Behavioral factors are considered the second in shaping individuals' mental images.

Functional factors are the third factor in shaping individuals' mental images.

Karim Khan Zand Street, as an example which throughout a historical process has undergone many changes, has different historical and contemporary buildings and urban spaces with various functions and scales, and is a ground for various behaviors resulted from individuals' mental images. It is a general image and vision along with significant elements and characteristics which help people in identification and mental recall. The study of Zand Street, as a case study, shows that correlation between formal factors and mental image is more than its correlation with other factors. That is formal factors play more powerful role in creation of people's mental image. Standardized regression coefficient shows that among the environmental factors, non-physical factor most probably explains the dependent variable, and its changes lead to most of the change in the variable of mental image. Contrary to what was thought, functional factor does not fill out the first but the third place; which indicates that regarding urban spaces, people keep in their minds the places which have obvious formal characteristics more easily, and perceive more lasting mental images of it.





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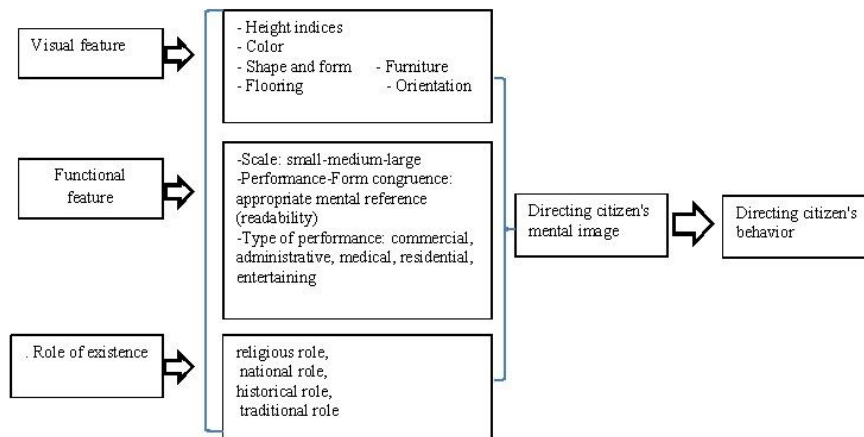


Figure 1. The relationship between mental image and behavior; by the authors

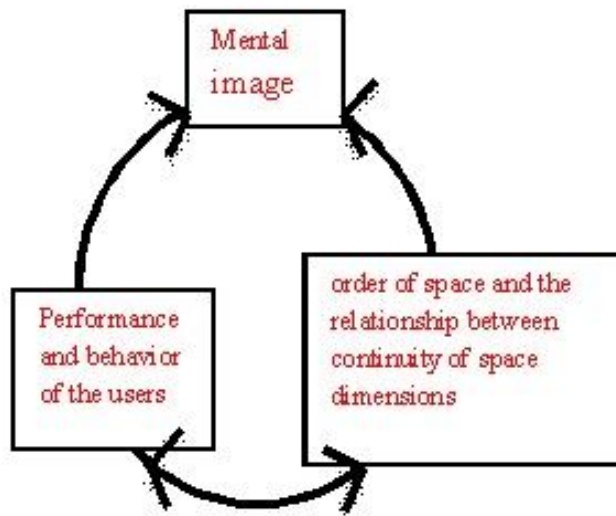


Figure 2. The relationship between mental image and behavior and environment; by the authors





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Figure 3: Zand street in different times, (authors)



Figure 4: The location of Zand street in historical zone in Shiraz



Figure 5. Aerial image of Zand Street at the location under study





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Figure 6- Shahr-dari Sq. in the third part of the street with important buildings such as municipality and Justice Administration buildings and proximity to Karim Khan Castle



Figure 7- a view of the first part of Zand Street with important buildings including Shiraz Medical Sciences building (in front of the picture) and Pars Hotel at the end of the picture.

Figure 8- Zand Street, Part 3 Important Building of Management of Bank Sadra Source: authors

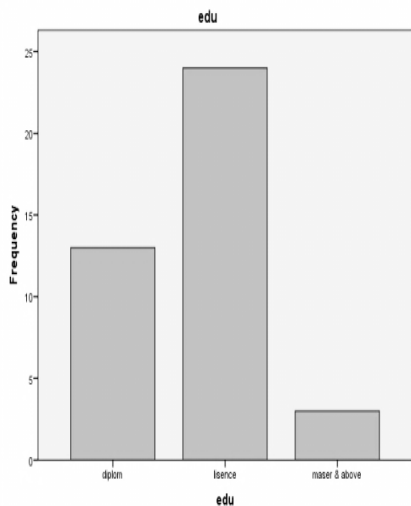


Figure 9- Education Frequency

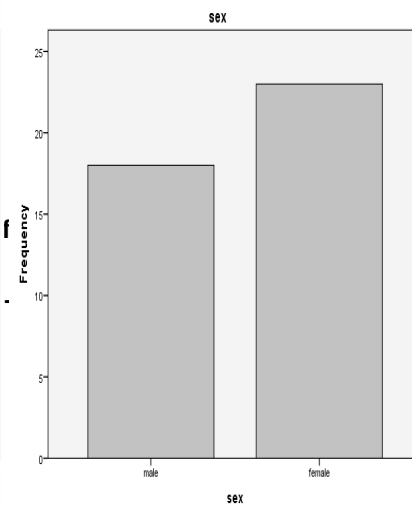


Figure 10- Sex Frequency

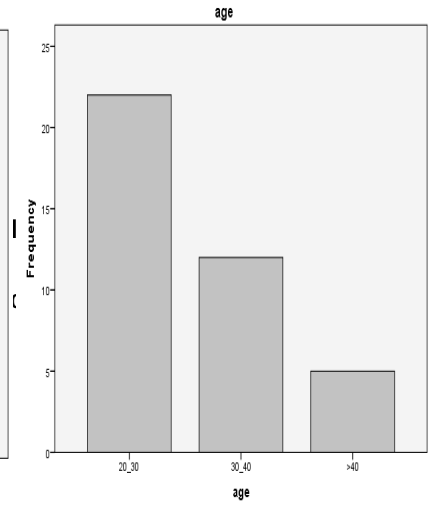


Figure 11- Ages





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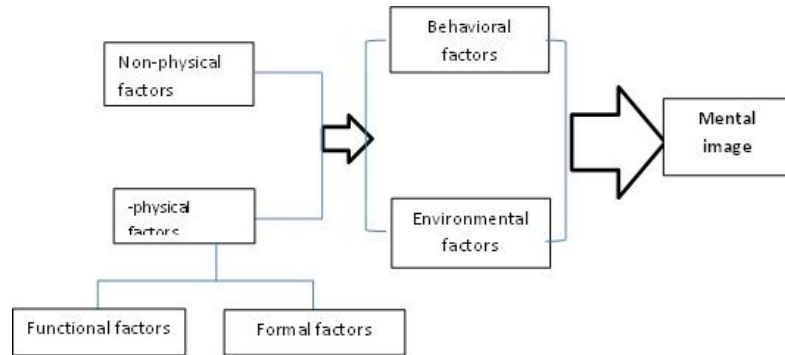


Figure 12. The factors can describe Mental Image in Zand street (According authors research)

Table 1- Evaluation of environmental components in the three parts of Zand Street

Component	Studied Factors	Part 1	Part 2	Part 3
Physical	Operational Role	5	4	1
	Index Element	5	3	5
	Buildings Scale	5	3	2
	Horizon	2	3	4
	Accessibility	5	3	2
	Buildings Quality	4	1	3
	Proximity **	1	4	2
	Buildings Architecture	5	1	2
	Form	2	1	4
	Color	1	1	3
	Color	1	1	3
	Urban Furniture	1	1	3
	Coordination	5	1	4
	Form	4	2	4
Total		40	27	37
Non-physical	Security & Supervision	4	3	3
	Memory	3	3	4
	Sense of Place	2	3	4
	Identification	3	2	4
	Liveliness	4	2	4
	Maintenance & Social Protection	3	2	4
	Sense of Belonging	2	3	4
	Visual Attraction	3	2	4
	Meaning	2	2	2
		Historical	1	3





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	National	1	4	4
	Develop a Sense of Discovery	1	2	4
	Participation & Interaction	3	1	4
	Total	32	32	48

1-Very little, 2- little, 3- middle, 4- much, 5- very much,

Part 1: Namazi Square to Emam hossein Square

Part 2: Emam hossein Square to Zand Crossroads

Part 3: Zand Crossroads to Taleghani Street

Table 2- descriptive data of elements related to the mental image

Statistics						
	Functional	Form	Behavioral	Non-functional	Physical	Environmental
Mean	3.07	3.12	3.97	3.36	2.80	3.29
Mode	3.00	4.00	4.00	4.00	3.00	3.00
Std. Deviation	1.23	1.12	1.01	1.17	1.10	0.87
Variance	1.52	1.26	1.02	1.38	1.21	0.76
Skewness	-0.23	-0.14	-0.25	-0.19	0.05	-0.38
Kurtosis	-0.77	-0.78	-0.80	-0.92	-0.28	0.36
Range	4.00	4.00	4.00	4.00	4.00	4.00
Minimum	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00
Sum	126.00	128.00	122.00	138.00	115.00	135.00

Table3: Correlation between factors describe mental Image.(authors)

Correlations								
Examined Standards		Functional	Form	Behavioral	Non-physical	Physical	Environmental Factors	Mental Image
Functional	Pearson Correlation	1	0.129	-0.98	-0.51	0.869**	0.570**	0.410*
	Sig. (2-tailed)		0.423	0.542	0.752	0.000	0.000	0.008
Form	Pearson Correlation	0.129	1	0.20	0.1990	0.602**	0.554**	0.454*
	Sig. (2-tailed)	0.423		0.899	0.212	0.000	0.000	0.003
Behavioral	Pearson Correlation	-0.98	0.20	1	0.319	-0.69	0.168	0.613*





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	n							
	Sig. (2-tailed)	0.542	0.899		0.042	0.669	0.293	0.000
Non-physical	Pearson Correlation	-0.51	0.199	0.319*	1	0.058	0.719**	0.739*
	Sig. (2-tailed)	0.752	0.212	0.042		0.718	0.000	0.000
Physical	Pearson Correlation	0.869**	0.602**	-0.069	0.058	1	0.735**	0.557*
	Sig. (2-tailed)	0.000	0.000	0.669	0.718		0.000	0.000
Environmental Factors	Pearson Correlation	0.570**	0.554**	0.168	0.719**	0.735**	1	0.882*
	Sig. (2-tailed)	0.000	0.000	0.293	0.000	0.000		0.000
Mental Image	Pearson Correlation	0.410**	0.454**	0.613**	0.729**	0.557**	0.882**	1
	Sig. (2-tailed)	0.000	0.003	0.000	0.000	0.000	0.000	
**correlation is significant at the 0.01 level (2-tailed)								
*correlation is significant at the 0.05 level (2-tailed)								

Table 4- main elements of multivariate regression analysis for prediction of dependent variables

Regression Elements & Variables	Model 1		Model 2		Model 3		Model 4	
	B	β	B	β	B	β	B	β
constant	43.42	–	18.08	–	4.78	–	-3.21	–
Non-physical Elements	1.34	0.729	1.38	0.752	1.11	0.604	1	0.544
Functional Factors	–	–	0.99	0.44	1.08	0.48	1	0.449
Behavioral Factors	–	–	–	–	0.97	0.46	1	0.478
Form Factors	–	–	–	–	–	–	1	0.278



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R	0.729	0.855	0.963	1
R ²	0.531	0.732	0.927	1
Adjusted R ²	0.519	0.718	0.921	1
F	44.17	51.84	157.49	0.000
sig F	0.000	0.000	0.000	0.000

According to this table, non-physical elements have the highest coefficient of determination ($R^2=0.531$) . The lowest coefficient is that of minor factors ($R^2=0.07$) which explains the amount of influence by these factors on the dependent variable.





The Lost Function of House Entrances in Contemporary Architecture (From the Qajar Dynasty till after the 1979 Revolution)

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ABSTRACT

Entrances are the first and most important part in Iranian traditional architecture. Values and concepts of the traditional architecture are inherited from the past to the next generation like a continuous chain; but westernization and cultural disorientation in the contemporary era have caused the rings in this chain to be discrete. Safeguarding the sanctum has been one of the most valuable basics of architecture in the past but in the contemporary time, it is becoming inconspicuous or completely ignored. Safeguarding the sanctum of residential spaces is something that the peace of a family relies upon. In this study, we are trying to discuss the necessity of the architectures' attention to this matter through the analysis of the gradual process of the elision of sanctums and its effects from the Qajar dynasty till present day with an attributive and bibliotheca method and reach to this conclusion of how important and notable is paying attention to the sanctum and how architects can achieve this goal through proper designs.

Key words: entrance, confidentiality, traditional architecture, contemporary architecture.



**Sadjad Bashiri and Pedram Eslami Moghaddam****INTRODUCTION**

Iran has a reach culture and historical record in architecture and the art of architecture has always been the most prolific art among Iranians. Its basics have very close bonds with culture that has been transmitted to next generations. This transmission of basics and concepts has continued until the contemporary era but with a more accurate look at the contemporary architecture, we will find out that a great number of these basics have either changed or completely forgotten because of various reasons such as the infiltration of the western culture in Iran.

The expansive multi-dimensional connection between human and his environment has caused the establishment of a somewhat spiritual relationship between human beings and his living environment. Therefore, in architectural or urban spaces, it is relative indication of cultural-tribal characteristics that show some of his thoughts and beliefs, wishes and personal and social behaviors. Therefore, it can be said that entrances are often formed in a correlative with the environmental life circumstances of the society and they reflect some of the bonds and behavioral and social patterns and also the way to use space. In the traditional society of Iran, family is considered as one of the basic units of the society and houses are the bases for the unity of families. So houses are designed so that they are excluded from the world outside and in their design, the basic values of a family are to be more in attention. In fact, a house is a holy sanctum and therefore, the inhabitants of this sanctum must be kept safe from any uninsured looks and unwanted interventions. The most important part, playing this role (safeguarding this sanctum), is the entrance of the house. In this study, we will first discuss the definitions and try to give a clear meaning of sanctity and sanctum, and then analyze the entrances and its effects and the effective factors in the gradual elision of sanctum from residential buildings from the Qajar dynasty until after the 1979 Revolution, and in the end we will analyze the effects of the elision of entrances on the members of the society in contemporary times.

MATERIALS AND METHODS

This study belongs to the quintal researches and was done in a scaling descriptive method. The method of this research is bibliotheca and is based on available documents.

Basics and concepts of traditional Iranian architecture

Traditional societies lived in a spiritual environment which from both of the standpoints of quality and quantity seeks equality and harmony. Seyyed Hassan Nasr, in the introduction of the book "Sense of Unity, Determination of Tradition" states that "... the traditions' words are that of the inalterability basics with a divine source and that of using them in different periods of time and in different places, and also that of the continuity of special teachings and holy forms that are bases for transcending teachings to human beings and the realization of the teachings of tradition in mans' thoughts." Islamic civilization is a prominent example of a traditional civilization that cannot be formed without the presence of some of the basics that are dominant and unalterable.

In traditional Iranian architecture, there are basics that are devised by the artist architecture that are rooted into his orientation toward the universe. "Talking about the roots is the same as talking about basics. To understand a basic concept is to understand the meaning of what gives an orientation to all the art and civilization of a group of humans with a common culture and costume." for instance the sanctity was considered as one of the basics that was seen in Iran from very long time ago but its peak was during the Islamic era. In Islamic architecture, the sanctity and not having a view over the neighboring house was one of the designing criteria in constructing Islamic cities. In the Islamic era and to reach this goal, houses were built in an introverted form and had a hierarchical base and they did not have a view over other houses. Some of the most important bases of Islamic architecture in traditional houses are these:





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Introversion :Introversion in traditional houses was either formed because of regional conditions or adjunct beliefs. It was in a way that buildings were built around a center that was called the courtyard and they had no connection with the world outside except for one door.

Hierarchy :Also in entering the house, we had to reach to the hall by passing through a hierarchical set of places from the entrance door to the vestibule to the corridor and then to the courtyard to reach the door of the hall. It may be said that introversion is the most sensible characteristic of observing hierarchy or it can be the result of the sanctity belief.

View: It is the view from outside the building through which the inside is visible. In the architecture of the past when there was more correlation with Islamic criteria, there was no view from a building over the other and buildings did not trouble one another because it is against the law and keeping the Islamic sanctity.

Entrance and its goals

The entrance is like a bridge between the sanctum of the house and the street and the neighborhood. It is place where the inhabitants, through decorating, show their personal taste and their importance and class in the society. This characteristic gives the building a deep sense of architectural identity.

The importance of the entrances of the houses in the past was so much that this small space also had its own special characteristics that played a role far more functional than what it was meant for in the house. Some of the basics that should have been considered in designing entrances for traditional buildings are these:

- The sanctity of the house is to be kept.
- The permission for entrance is given in a gradual process.
- Controlling the entrance must be indirect.
- The look of the house must be exceptional in the neighborhood.

In the past, entering and exiting the house followed a ritual that had religious and cultural significance. Often an inscription of a verse from Qur'an was put at the entrance and people would naturally read special prayers when leaving the house. Entrances were affected by various factors such as material and technical facilities, lifestyle, culture, needs and wishes of the users or constructors. As all houses are made of different parts, the entrance also consists of different parts and it consists of seven particles: forecourt, fore arch, port, vestibule, corridor, patio, and sunshade.

The main goals that are effective in the way the parts of the entrance are structured are first to create a connection between the interior spaces of a building with the outside space and creating a type of observation and control in the way of the connection for keeping the safety and territory of the interior spaces. It is obvious that each or sometimes both of the mentioned goals are considered in designing all or some of the examples related to a certain type of entrance. In other words, in designing entrances, all the examples from some buildings considered only one purpose. However, in designing some other types of buildings, all the examples were not designed with regard to one specific goal .





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Functions of entrance spaces

Providing between among the interior and exterior spaces

One of the most important functions for any entrance space is to provide a connection between the interior and exterior spaces of a building or a complex; because entering and exiting a confounded closed building is only possible through the entrance space. Therefore, the entrance space, from its practical use, is a connective space. Added to that, the entrance space is also a bonding space; because a lot of buildings, especially the old introverted houses that are located in the textures that are chained from the skeletal, functional and visual aspect, are often actively connected to the street or the public space only through the entrance space because most of these buildings lack a designed exterior visage. So the entrance space is a connective bonding space to its surroundings.

Supervising the connection

In the past, creating a connection between confounded spaces with its surroundings followed a specific set of various functional and social considerations. At first, the functional features of a building must be considered, especially its functional-social hierarchy.

The way the connection between any of the public, semi-public, semi-private and private spaces and their neighboring space should be in a specific way so that the activities inside that space will be done properly; in other words, for every kind of entrance space with regard to the aim of its design and set, a type of supervision must be considered.

The entrance door for every building was known as the most important factor of supervision over connection. In the most general simple form, with the closure of the door, the connection was cut and then whenever the owners or users of that space wanted, they could reestablish that connection as they wished (in different times and for different people). The presence of two warning devices (the knocker and the ring) on the entrance doors for men and women, and also the existence of separate entrance for the exterior and interior parts of some houses are some of the examples for connection controlling methods.

Supervision over the connection was done through various methods. Another method was the way the interior was designed in a way that it would realize the purpose or purposes needed in the way the connection between a space and its surrounding spaces is provided. In houses whose inhabitants did not want an uninsured person to have a view to the interior part of the house from outside and also to provide the utmost amount of sanctity and in some cities and periods to provide the highest amount of security they tried to lengthen the path inside the entrance as much as possible. Added to that, there were also other ways and methods to supervise the connection.

Gathering

Some of the parts of the entrance such as forecourt hall, fore arch and vestibule were places where people used to sit and gather in small and big gatherings. One of the important functions of the forecourt hall in a lot of buildings was to create a primary space for access and connection and gathering in regular times and also for holding some rituals at special times. Added to that, in each of the sides of the foreparts of most of the types of traditional buildings, a bench was built for people to sit on. Sitting on these benches and talking about the things to be done or to pass the time was one of the behavioral patterns of the past.





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Escorting and receiving

The entrance is always a proper place for escorting and receiving the guests and newcomers as they come and go. This tradition is also considered to be a virtue inside the religion and it also has been advised. It has been said from Prophet Mohammad that: "It is the right of the person who enters a house to have the people walk with him for some time when he enters and exits."

Effective factors in the elision of the sanctum from the architecture of the Qajar dynasty until after the 1979 Revolution

Qajar dynasty

In the historical path of the Iranian civilization, after the two important events of the outbreak of Islam and the prolonged attack and ruling of Moguls over Iranians, tendency to the west is the third event and probably the most important event that took place in the era of the Qajar dynasty; as in this era, basic changes, not only in architecture but all the parts of the country took place.

In general, the Iranian architecture except for the architecture of the mosques and their belongings because of the lack of security and the need to keep the men and women away from each other, was an introverted architecture and it did not have a showing form and as a result it did not experience any big development in the exteriors of the buildings. But in this era, with the start of the Qajar kings' travels to the west and being affected by them, the architecture gradually changed form from introverted to extroverted. But the changes in the buildings and especially their entrances started in the official buildings from which Shams-ol-Emareh can be named. This official building was built in the time of Naser-el-Din Shah and added to the clock tower which was put at the top of the building. The entrance form was also different, in a way that the staircase led directly to the main space (hall), whereas in the past the entrance was from the sides of the building. The effect of this change was so in contradiction with the traditional Iranian culture that in the Pahlavi dynasty they had to omit the staircase and carry on with entrance only from the sides of the building. Another example of these types of buildings is the Ghavaam-ol-Saltane house (late Qajar era) which is correlative with the culture that has been infiltrated in Iran from the west. In this house, the interior and the exterior are blended.

Pahlavi dynasty

Before pontificating on the transformations of art, especially architecture in this period, we will have a glimpse on the cultural and social evolutions in this era, because without talking about them, our discussion will lead to no conclusions. Changes whose result was the modernism-like era that was programmed and carried on by the government. Reza Shah's long term goal was to rebuild Iran according to a western pattern. Weakening the culture and religion were ways through which he could have realized his dream. Therefore, a lot of his actions conflicted completely with the religious sector; actions like revealing the hijab, eliminating the authority and supervision of clergymen from the judicial system and limiting the religious rituals.

With regard to the above descriptions, we first will reach to this conclusion that primarily, intellectuality must have entered the Iranian culture and then the architecture was affected by it. "The extroversion phenomenon was first formed in ideas." Then buildings were affected and the needs of extroversion were realized through the changes in architecture and the construction of modern urban building.

Vartaan Havanesian, in his notes and articles, saw the modern architecture as the revealing of hijab and he was of the belief that as Reza Shah took away the black veil off the women's heads and set them free of the limits of hijab,





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modern architecture did the same thing with the buildings of the Qajar dynasty and took away their mud wall. Still and glass did the same thing as revealing hijab in the extroversion of the buildings from the first Shah of Pahlavi dynasty.

In fact, it was from these times that the sanctum of entrances lost its significance and the entrances were opened to the street with less turns and smaller spaces than before Entrance.

After the 1979 Revolution

After the 1979 Revolution, with the increasing rate of population in Iran and the shortage of empty lands for making residential areas, the government started constructing taller buildings and this resulted in the following issues:

The elision of hierarchy

Hierarchy in old houses was a type of preparing people to reside in the peaceful atmosphere of the house when he or she comes from the crowded environment of the outside. Ali Akbar Saaremi has stated in his book "Values of Stability in Iran's Architecture": "In Iran's houses, entering from a street into a vestibule is very effective as it changes the spirits of people from the social life atmosphere to the private space environment. In other words, the vestibule clears the private house from the hustle and bustle of the outside world and makes the person ready for accepting the conditions of the inside. Here, there is a similarity between the role of the vestibule as a connection between the interior and the exterior and the porch as a connection between the courtyard and the inside of the house. The porch is used for creating a space for entering into the coolness and peace of the room from the environment of the courtyard which is full of light and noises. Both of the spaces of vestibule and the porch are in between spaces they connect the outside with the inside." With the shrinking space of the houses, the hierarchy is eliminated and the limit between the outside and the inside is shortened. With the elision of hierarchy in the contemporary times, the person enters the peaceful space of the house from the staircase which is considered as a dead end without a mental preparation with all of his or her thoughts and the contaminations of the public space and disturbs its peaceful state.

The lack of historical and traditional correlation of culture and house

In the present times, the historical and traditional correlation of the culture and the house is omitted. As we can see clearly, Iranian Moslem families prefer the open kitchen, disregarding the religious beliefs and there are no more interior and exterior spaces in the houses and it is hard to tell the religious beliefs of people from their houses.

Dr. Naghi Zade in his book, "The Islamic City and Architecture" writes that: "The most prominent sanctums are those of the residential buildings and their open spaces. The placing of different spaces of a house in relation with other houses and the public spaces was the least in terms of height, distance, visual contact and even olfaction and hearing ranges, in a way that there was the least possibility for connection between the outside and the inside. Therefore, not only a sense of security was given to the inhabitants but also others were kept safe from the ability to sin or error or an aggression of other's personal rights and freedoms."

CONCLUSION

From the past until now, the entrances have been considered as the most crowded space of the house; but unfortunately, today because of the shortage of space, they have the least amount. The width of the new entrances is about 2 to 3 meters and in very rare instances in big houses it reaches about 5 to 6 meters. The new entrances, unlike the old ones are not consisted of many parts. But only through the use of appliance some parts are added; coat





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hanger, shoe closet, mirror, etc. Unfortunately, today the entrances have lost their main significance which is to keep the sanctum of the family. The reason for this is either the weakness in planning or the shortage of space. As we mentioned in the part of basics and concepts of traditional Iranian architecture, traditional architecture have had unalterable basics without whose presence the Islamic civilization would not have been formed. It can be said that the confusion of today's architects is derived from their forgetfulness of these very basics. To help end this problem we should reconstruct our today's architecture with a look at our forgotten basics. According to the above mentioned statements we will understand that we are living in an age where our dear country, Iran, is suffering from an identity crisis. On one hand, there is the continuous attack of the western culture which has us under its control and on the other hand, we have not been able to forget our previous identity. We are like the same crow that wanted to learn the way peacocks walk but forgot that of its own. In Iran, without understanding the dominating modernist beliefs of the European society, its culture was publically accepted. Art which is also a result of culture has not been safe from this crisis. A simple glance over the Iranian metropolitans like Tehran is a clear indication of that notion as it has no color of the Iranian rich art. Reflecting on the past does not mean to a mere copying act but is to return to the truth which has been forgotten by today's human. This forgotten past caused the outbreak of several problems for the society. The lack of a sanctum and a connective space is one of these issues; because Iranians from the past have considered the private sanctum of the house as a place for security and peace. The first effect is the lack of peace for the inhabitants of the house. By regarding the staircase as a dead end and with the entering of the person inside the house without the hierarchy, the outside space have entered the safe sanctum of the house and the person without forgetting the problems of the outside have entered the atmosphere of the house and contaminated the house and the family with this tension. On the other hand, the lack of a connective space has given the permission to any stranger to enter the most private spaces of the family. The growing number of social disorders like family problems, murder, etc. can be attributed to this lack of peace and security of the contemporary houses which lack the sanctum.

Suggestions

The necessity of prioritizing this basis in designing

Proper planning of residential spaces with regard to the regional culture

The immunity of the interior spaces from the eyes of the strangers

Providing the peace of the inhabitants by designing the entrance based on their culture and belief

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Figure1: First floor plan of the Broujerdiha house, Qajar dynasty



Figure 2: An example of a house plan in the 50s and 60s

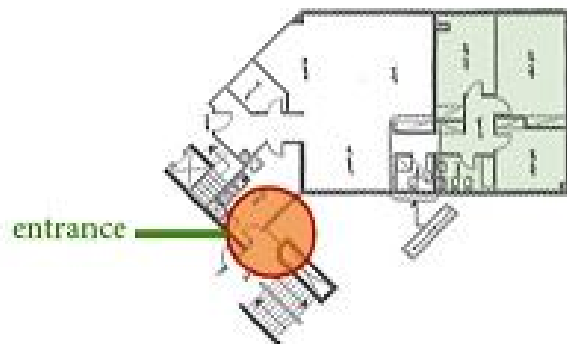


Figure 3: An example of contemporary plan (Ekbatan Residential Complex)





Evaluating Effective Factors for the Formation of City Image of Mashhad from the Viewpoint of Stakeholders

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ABSTRACT

City image in modern urban planning is considered one of the most important constructive factors of cities. A desirable city image can be the most effective factor in attracting people to cities. Hence, identifying the effective factors in the formation of a city image in today's highly competitive world seems to be inevitable. This analytical-applied research attempts to identify and evaluate the effective factors in the formation of city image of Mashhad from the viewpoint of different stakeholders including city managers, citizens, and pilgrims in 7 dimensions of culture-history, economy, social issues, architecture and urban planning, transportation and communications, range of services, and environment. To reach this purpose, three questionnaires were developed for three stakeholder groups and presented to 604 statistical samples (50 city managers, 384 citizens, and 170 pilgrims). One sample t-test was used to measure the desirability of the current situation of dimensions and structural equations to evaluate the kind of relationship and impact intensity of city image dimensions of Mashhad in SPSS and Smart PLS software. The results showed that, in general, the current situation of dimensions in all the three research models was relatively desirable. Based on the structural equations modeling, all the dimensions in all the three models were related to the city image and the effects of dimension of architecture and urban planning in the models of city managers and pilgrims as well as culture-history dimension in the model of citizens were of priority.

Key words: City image, Mashhad City, Stakeholders, Structural Equation Modeling (SEM)



**Negin Eghbali and Omid Ali Kharazmi****INTRODUCTION**

Human is the most important factor that makes places meaningful. There is a kind of relationship between human and place, which is called spirit of place by Ralph and considered a factor that causes spiritual state by Schultz (Carmona, 2006). Developing a desirable city image on the minds of residents of cities as well as those who are outside can attract more people to them. Since today cities attempt to have a desirable image on the minds of investors and immigrants, leaders of most cities believe that undesirable images and clichés that are tied with the names of cities are an impediment for their bright future (Avraham, 2004). To create healthy communities and have proper understanding of the costs and benefits of different development models, city managers require accurate and appropriate diagnosis; i.e. they must first recognize the city image in the current situation and then start planning to achieve a desirable city image. On the other hand, it is necessary to note that city image should be called the directing factor of development strategy (Martinez, et al., 2007). City image plays an important role in the issues related to selecting destination and its final purpose is to influence the decisions concerning tourists' trip and selection through the possible marketing activities (Sonnleitner, 2011). Most studies which have been done on city image are related to city image from the viewpoint of tourists (Qolipour, et al., 2011: 39). For example, studies conducted by Pierce, Woodside, Lysonski, and Goodrich have shown a clear relationship between the positive perception from a tourist spot and positive decisions on traveling to that place. Similarly, a negative image (even if unnecessary and wrong) warns tourists about visiting the place (Selby & Morgan, 1996).

Baloglou and McCleary (1999) in an article entitled "Place Imaging Model" showed that image plays an important role in selecting a tourist spot. In this article, a model consisting of important factors for place imaging was presented based on the previous studies. The results showed that a place image is formed under the influence of stimulus factors and characteristics of tourists (Gallarza, et al., 2002).

Jatla (2000) conducted a research in Shimla city in India and identified two separate images for the city: the city image from the viewpoint of tourists and the other one from the viewpoint of residents. The image of tourists from this city was based on its natural and cultural spaces, while the image of its residents was based on their familiarity with the city.

Smith (2005) published an article entitled "Conceptualizing City Image Change: the Re-Imaging of Barcelona" in order to present a conceptual framework from the way current imaging activities affect the images of tourists from a place. This study showed that defined mechanisms in this conceptual framework were useful methods for describing the point that how city images are modified.

Martinez et al. (2007) in the article entitled "Modelling a City's Image: The Case of Granada" described that the concept of city image as a multi-dimensional issue, which is not limited to one of the urban aspects, but also includes many dimensions that may identify some consequences for the formation of city image.

Mashhad metropolis as the second metropolis of Iran after Tehran and owing to the holy shrine of Imam Reza (PBUH) has become the spiritual capital city of Iran. For this reason, this city welcomes a huge number of pilgrims throughout the year that visit this city with pilgrimage and tourism purposes. Therefore, it is very important for it to have a desirable and eligible image on the minds of its audience. Obviously, the audience of Mashhad is not limited to its citizens, but also the pilgrims and tourists who visit this city are equally important. The city image on the minds of managers is also important, since they are executors, decision-makers, and sometimes decision-developers. Therefore, identifying the dimensions constituting the city image of Mashhad from the viewpoint of stakeholders (city managers, citizens, and pilgrims) is among the most fundamental problems in Mashhad city, because the existence of a desirable city image (mental image) will certainly attract more audience to the city.



**Negin Eghbali and Omid Ali Kharazmi****Research hypotheses**

According to what was said above, the hypotheses of this study can be stated as follows:

It seems that the current situation of the seven dimensions forming city image of Mashhad from the viewpoint of all the stakeholders is appropriate.

It seems that the most important dimension in the formation of city image from the viewpoint of city managers is architecture and urban planning.

It seems that the most important dimension in the formation of city image from the viewpoint of citizens is architecture and urban planning.

It seems that the most important dimension in the formation of city image from the viewpoint of pilgrims is culture-history.

RESEARCH METHOD

The method of this research was analytical-applied. In this type of research, the general attempt is to study and analyze phenomena (cause and effect relation) by considering the relationship between them and thus detect the problem or its cause. Due to the multiplicity of meanings of city image, the cause and effect model would help better dimensional understanding involved in the formation of city image and allow for the investigation of the importance of each dimension in the process of city image formation using a quantitative approach (Martinez, et al., 2007). Data collection can be performed in two documentary and field methods. In the documentary method, different references related to the research including books, articles, national documents, etc. are referred to. In the field method, in addition to observation, a questionnaire is formulated separately for all the three groups of stakeholders (city managers, citizens, and pilgrims) according to the knowledge, approach, and perception of people from the research problem. For evaluating the response of questions, a five-point Likert scale in two fields of measuring the effect of dimensions and variables in desirable and current situations (with very high/desirable, high/desirable, average, low/undesirable, and very low/undesirable) was used. The statistical sample size was determined to be 604 people in total: 50 questionnaires were related to city management (estimated based on Morgan table), 170 questionnaires related to pilgrims/tourists (estimated based on Cochran's modified formula considering the uncertainty of the exact size of the statistical population and variance of the primary sample), and 384 questionnaires related to citizens (estimated by Cochran's formula). For the data analysis, one sample t-test and structural equation method were used in SPSS and Smart PLS software.

Introducing variables and indicators

City image includes the sum of beliefs, ideas, and emotions of people toward a place, which should be valid, acceptable, and appealing (Baker & Cameron, 2008). City image could be turned into a distinction, because it significantly affects the beliefs about tourism products (MacKay & Fesenmaier, 1997). The effective factors for the formation of city images have been mentioned in different studies, which could be categorized as follows: culture-history (Minghui, 2009; Hanna & Rowley, 2008; Minghui, 2009; Zhao, et al., 2009; Boisen, 2007; Helmy, 2008; Kavaratzis, 2008; Parkerson & Saunders, 2005), Economy (Gaggiotti, et al., 2008; Zhang & Zhao, 2009; Vary, 2011; Pfefferkorn, 2005), social issues (Qu, et al., 2011; Zhang & Zhao, 2009; Martinez, et al., 2007), architecture and urban planning (Boisen, 2007; Martinez, et al., 2007; Gaggiotti, et al., 2008 ; Vanolo, 2008), transportation and communications (Prilenska, 2012; Qu, et al., 2011; Jansson & Power, 2006; König, 2011), range of services (Jarvisalo, 2012; Vanolo, 2008; Sonnleitner, 2011; Karavazaki, 2013; Prilenska, 2012), and environment (Zhang & Zhao, 2009; Hanna & Rowley, 2008; Vanolo, 2008; Jarvisalo, 2012).

After studying different sources and forming the theoretical framework of the research, according to the characteristics of Mashhad city, the variables of 7 dimensions constituting the city image of Mashhad were localized,



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as shown in Table 1. Also, this table shows every variable in the questionnaire which was answered by each stakeholder group considering their perception from and familiarity with Mashhad and its problems. Accordingly, the conceptual model of this research was drawn based on the model presented by Martinez et al. (2007) about city of Granada and the relationship between Mashhad's city image and 7 dimensions is specified in Figure 1. It should be noted, as shown in Figure 1, the conceptual managers responded to all the questions in all the dimensions (including 7 dimensions and 58 variables), the conceptual model of citizens included all the dimensions, but did not account for all the questions (including 7 dimensions and 45 variables), and the conceptual model of pilgrims only included the culture-history, architecture and urban planning, transportation and communications, range of services, and environment and some questions (including 5 dimensions and 28 variables), as shown in Table 1.

Research scope

The research scope was Mashhad metropolis (Figure 2), the second metropolis after Tehran and the spiritual capital city of Iran. This city with the population of 2766285 in 2011 (Statistical Center of Iran in 2011) and area of 29580 ha (Farnahad 2009) is the capital of Khorasan Razavi Province. About the urban management of this city, Mashhad metropolis now is composed of 13 municipal areas and 42 districts of urban services. According to the current statistics, the population of domestic and foreign pilgrims/tourists of this city is about 16,604,000 and 378,000 people from April until September 2011 (Tash 2012, p. 28-29).

Concepts, perspectives, and theoretical bases

The term image is one of the concepts, which has found a pivotal role in the knowledge related to urban design (Pakzad, 2006: 20). City image means the mental perspective of the city and such mentality is created through perceiving and processing the perspective on human mind. In fact, the meaning and concept of city image on the minds of people could be different, because people look at the spaces through their own mentalities and have different perceptions about their surrounding space (Mahmoudi, 2006: 58). What should be noted is that some of the mental images (city image) are collective and shared within a group (Bromley, 2001).

Michael Tribe defines city image as follows: the images created on the visitors' mind from the environment that is the result of a two-way stream between the visitor and environment. Every environment manifests itself with its own expressions and a relation is emerged between visitors and their experiences on their minds (Pakzad, 2011: 136). In this definition, city image has a hierarchy which ranges from the image of the whole city (overall image) to componential images of the whole city (urban areas) and eventually mental images of space components (Tribe, 1974). Reynolds considers the image formation as a result of the expansion of mental structure based on emotions caused by flood of information. About the image of a place, this flood of information could have different sources. An image is the result of different, diverse, and often conflicting messages that are sent from a city and this image is separately formed on the mind of each recipient (Kavaratzis, 2004). Kotler et al. believe that image of a city could be positive and attractive, negative and weak, combinatory (simultaneously positive and negative), or contradictory (when the image of city is negative for a group and positive for another) (Avraham, 2004). Also, the image of a city is unique from the viewpoint of each person and depends on past experiences and demonstrations of that particular place. There are two types of images: the external image is the way through which the public or other communities outside the place understands it and the internal image is the way by which its residents see their place in relation to the society or their neighborhood. These two images influence each other. If a society has a negative image from a community, the community would have a low-quality image from itself as well (Karim & Cahana, 2007).



**Negin Eghbali and Omid Ali Kharazmi****Analysis of findings****Evaluating the current situation of dimensions**

The current situation of research dimensions was evaluated using one sample t-test. In this test, at the confidence level of 95%, the obtained significant level for the variables is compared with the value of 0.05; if it is lower than the error coefficient, the situation will be desirable. Accordingly, as shown in Table 2, in the model of city managers, the significant level of social issues, architecture and urban planning, transportation and communications, and range of services was greater than 0.05, which indicated the moderate situation of these variables. Also, considering that the significant level of culture-history and environment variables was less than 0.05 and the corresponding confidence interval was negative, the status of these variables was undesirable. In the model of citizens, the significant level of social issues as well as transportation and communication variables was more than 0.05, which indicated the moderate situation of these variables. Also, considering that the significant level of culture-history, economy, range of services, and environment variables was less than 0.05 and the confidence interval was also negative, the situation of these variables was undesirable. In the model of pilgrims, the significant level of culture-history, architecture and urban planning, transportation and communications, range of services, and environment was more than 0.05 and the corresponding confidence interval was positive, which indicated the desirable situation of these variables.

Structural equations modeling

For evaluating the structural model, several criteria are used, first and most essential of which is t significance coefficients or t-value that is the most primary criteria for evaluating the relationship between the variables in the model (structural part). If the value of these numbers exceeds 1.96, the validity of the relationship between the variables is established and, as a result, the research hypotheses are confirmed at the confidence level of 0.95. To measure the intensity of relationship between variables and specify the explanation amount of changes in the dependent variable by the independent variable, standardized coefficient of factor loading (path coefficient) was used. So, according to Table 3, in the structural model of city managers (Figure 3-a), the relationship of all the dimensions with the city image was confirmed and architecture and urban planning (path coefficient of 0.987) was specified as the most important factor. Afterwards, the dimensions of economy, transportation and communications (0.981), range of services (0.980), environment (0.979), culture-history (0.962), and social issues (0.950) were placed. In the model of citizens (Figure 3-b), the culture-history dimension (0.982) was the first priority and then were the dimensions of transportation and communications (0.980), economy (0.978), architecture and urban planning, range of services (0.975), social issues (0.974), and environment (0.973). In the model of pilgrims (Figure 3-c), the most important dimension was architecture and urban planning (0.976) and then the dimensions of range of services (0.966), culture-history (0.962), transportation and communications (0.941) and environment (0.903) were specified.

CONCLUSION

As mentioned before, the purpose of this research was to evaluate the importance of effective factors in the formation of city image of Mashhad from the viewpoint of pilgrims. For this purpose, at first, the related literature and bases were briefly examined. Then, the background of this issue in Iran and the world was briefly introduced and, relying on the theoretical framework of the study and considering the characteristics of Mashhad and the model of Granada city (Martinez, et al., 2007), the variables of this research were extracted and the conceptual model was drawn for all the three groups of stakeholders (city managers, citizens, and pilgrims). Finally, using one sample t-test, the current situation of city image dimensions for all the stakeholders was evaluated and then, using structural equation modeling for stakeholders, the accuracy and intensity of the relationships with significant coefficients and path were evaluated and the effectiveness of each dimension in the formation of city image from the viewpoint of different stakeholders (city managers, citizens, and pilgrims) in Mashhad was determined. On this basis, hypothesis 1 that



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implied the desirability of city image dimensions in all the models was confirmed for the dimensions of social issues, architecture and urban planning, transportation and communications, as well as range of services and rejected for culture-history, economy and environment in the model of city managers according to the results of one sample t-test (Table 2). In the model of citizens, this hypothesis was confirmed for the dimensions of social issues, architecture and urban planning, as well as transportation and communications and rejected for the dimension of culture-history, economy, range of services, as well as environment. Also, for all the dimensions of city image in the model of pilgrims, hypothesis 1 was confirmed. Hypothesis 2 stated that architecture and urban planning dimension was the most important one in the model of city managers and, according to structural equation modeling (Table 3 and Figure 3-A), architecture and urban planning dimension was the most important one with the path confidence of 0.987. Therefore, hypothesis 2 was confirmed. Hypothesis 3 introduced architecture and urban planning as the most important dimension in the model of citizens. According to the structural equation modeling of citizens (Table 3 and Figure 3-B), culture-history was the most important dimension with the path coefficient of 0.982. Thus, this hypothesis was rejected. Also, hypothesis 4 introduced culture-history as the most important dimension in the model of pilgrims. In this hypothesis, according to structural equations modeling of pilgrims' model (Table 3 and Figure 3-C), the most important dimension was architecture and urban planning with the path coefficient of 0.976. Therefore, hypothesis 4 was not confirmed.

Recommendations

Obviously, results of this research demonstrate the difference in the stakeholders' viewpoints about city image of Mashhad. Each of these stakeholders develops the mental image (city image) of Mashhad city based on their understanding and expectations of Mashhad. Therefore, the priority in terms of the factors making the city image is different for each one, which specifies the importance of paying attention to the ideas and perceptions of all the people who take advantage of the city (city managers, citizens, or pilgrims/tourists) for all the cities in order to achieve a desirable city image, because in the first instance, a desirable city image is the most important factor for attracting people to the city for the purposes of residence and recreation. Definitely, only later, a city can grow and be introduced as one of the best cities in the world, since this is the mental image of people that makes them return to a city or even recommend it to others. In this study, the supreme dimensions in all the three research models are somehow related to the most important competitive advantage of Mashhad: the holy shrine of Imam Reza (PBUH). This means that, in Mashhad, culture-history and architecture and urban planning dimensions are closely related to this holy and massive element and dramatically affected by this factor. In this regard, the results of this study could be compared with two international and national studies respectively conducted by Martinez et al. (2007) in Granada and Gholipour et al. (2011) in Tehran, both of which have sought to identify effective factors for city image from their own perspectives. Results of these studies and also those of the current study suggested that the first priority effective for the formation of city image in Granada city was architectural attractions (Martinez et al., 2007), while the factors "economy and business" (Gholipour et al., 2011) and "architecture and urban planning" and "culture-history" were the effective factors in Tehran and Mashhad cities, respectively. The most important point to note is that the most effective factor for every city has been identified based on the competitive advantage of that city: i.e. the factor that is regarded as the strength in that city. In other words, because of Imam Reza (AS) holy shrine, Mashhad city has greater varieties of Islamic architecture and urbanization (influenced by the holy shrine) compared with Tehran city (as a similar national example in this section of the study). Therefore, this factor was stronger in Mashhad than Tehran and, thus, the dimensions related to an Islamic-Iranian city were more evidently represented in Mashhad than Tehran. Furthermore, since Tehran is the capital of Iran and has benefits of such cities, it also had more favorable economic prosperity than Mashhad city. In this section, some recommendations are made to promote the quality level of Mashhad city image in each of the 7 dimensions associated with all the three models:





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To promote the level of culture-history dimension, functional and structural coordination, especially in the area surrounding the holy shrine could be developed to increase the religious-pilgrimage role of Mashhad. To improve the economic dimension, planning for the abandoning one-dimensional economy (economy based on pilgrimage role of Mashhad) could be mentioned. To improve the social issues, paying attention to culture-history values and spiritual heritage of Mashhad in order to increase social sustainability, in architecture and urban planning dimension, formulating special rules and regulations about improving city face of Mashhad, in transportation and communications dimension, paying serious attention by authorities to improving the public transportation system, in the range of services, planning to provide the needs of citizens and pilgrims at different levels and, at environment level, preserving and planning for proper use of ecological spaces in Mashhad could be mentioned.

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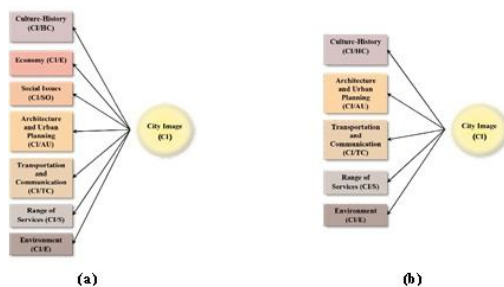


Figure 1. The conceptual model (a. Conceptual model of city managers and citizens; b. Conceptual model of pilgrims)





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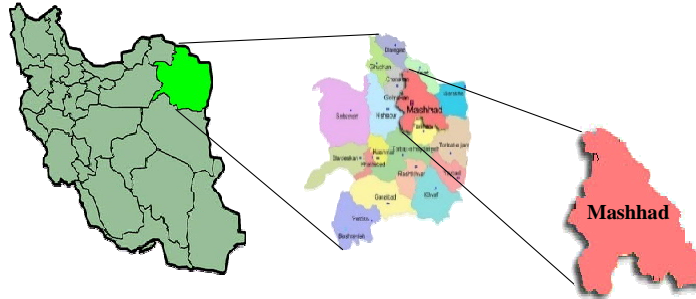


Figure 2. Geographical location of Mashhad

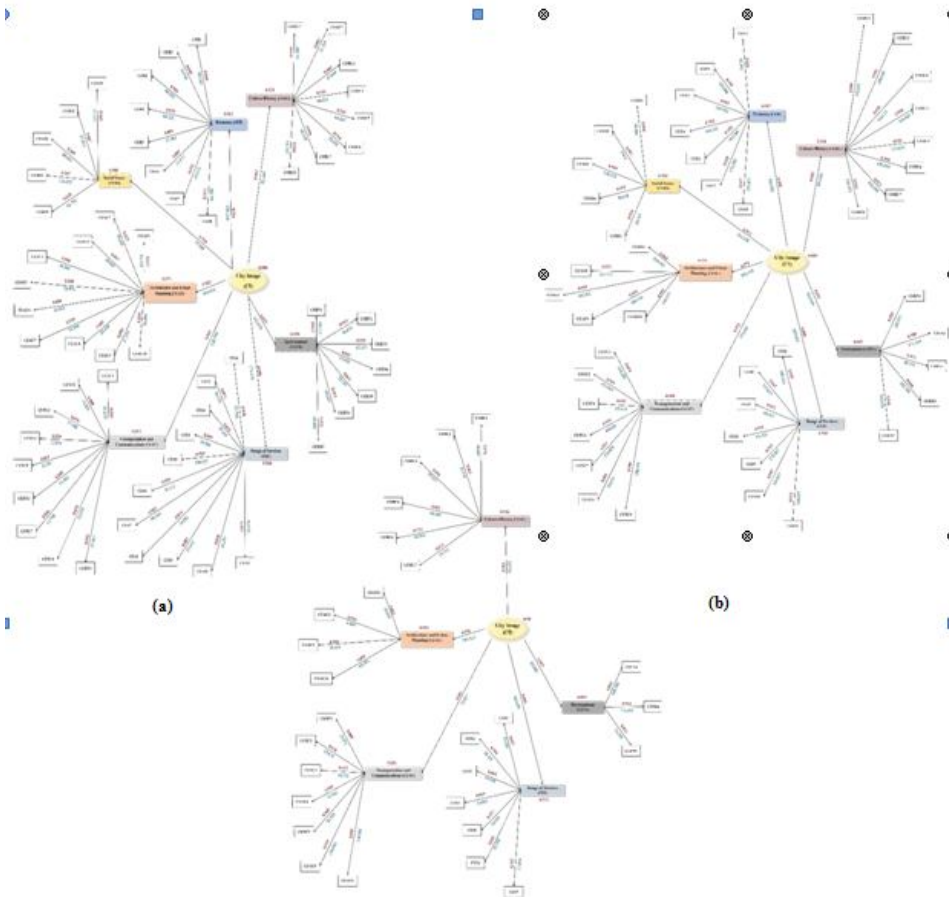


Figure 3. The structural model (a. structural model of city managers; b. structural model of citizens; c. structural model of pilgrims)





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Table 1. Dimensions and variables forming city image of Mashhad

Dimension (code)	Item (code)	Target group
Culture-history (CI/HC)	Improvement, renovation, and reconstruction of buildings in the city center and the area surrounding the holy shrine as well as enhancing qualities of urban spaces and public areas (CI/HC1)	Managers/Citizens/Pilgrims
	Physically improving the spatial area associated with the holy shrine and applying Iranian-Islamic architectural models and symbols (CI/HC2)	Managers/Citizens/Pilgrims
	Existence of appropriate public areas (streets, squares, parks, commercial complexes, etc.) for the interaction of tourists/pilgrims and strengthening national culture as well as ethnic unity (CI/HC3)	Managers/Citizens/Pilgrims
	Protecting the historically and culturally valuable monuments and regulating physical and activity development with respect to these monuments (CI/HC4)	Managers/Citizens/Pilgrims
	Existence of high quality libraries in Mashhad (CI/HC5)	Managers/Citizens/Pilgrims
	Existence of high quality amphitheatres in Mashhad (CI/HC6)	Managers/Citizens/Pilgrims
	Existence of high quality amphitheatres in Mashhad (CI/HC7)	Managers/Citizens/Pilgrims
	Existence of high quality training centers and appropriate facilities in Mashhad (CI/HC8)	Managers/Citizens
Economy (CI/E)	Facilitating foreign relations and exchange as well as transit services (CI/E1)	Managers/Citizens
	Facilitating the attraction of domestic tourists (CI/E2)	Managers/Citizens
	Facilitating the attraction of foreign tourists (CI/E3)	Managers/Citizens
	Existence of economic development infrastructures with global and high technology approach (CI/E4)	Managers/Citizens
	Supporting innovative groups, innovation centers, and research and development units with the goal of developing a knowledge-based economy and increasing productivity (CI/E5)	Managers/Citizens
	Effective support of private sector investment in clean and green industries and providing spatial capacity for expanding these industries within the city area (CI/E6)	Managers
	Creating appropriate socio-economic and spatial-physical grounds for the growth of local economy, particularly small businesses and handicrafts (CI/E7)	Managers/Citizens
	Controlling unemployment by creating new	Managers/Citizens





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	employment opportunities and promoting the level of professional skills (CI/E8)	
Social issues (CI/SO)	Enhancing capabilities of citizens and creating really equal opportunities through the creation of areas for participation and strengthening local management as well as council activities (CI/SO1)	Managers/Citizens
	Allocating sustainable resources and investment in deprived and under-developed areas in order to reduce centralized social and spatial deprivation (CI/SO2)	Managers/Citizens
	Equipping urban space network as a ground for social interaction and promoting the quality of urban spaces (CI/SO3)	Managers/Citizens
	Paying attention to social capital (trust, participation, etc.) in Mashhad city (CI/SO4)	Managers/Citizens
	Providing security in the city for all groups (CI/SO5)	Managers/Citizens
Architecture and urban planning (CI/AU)	Empowering and organizing informal settlements and regulating them within the framework of land development plan of Mashhad metropolis (CI/AU1)	Managers
	Developing and equipping network of sidewalks and bike paths in Mashhad metropolis (CI/AU2)	Managers/Citizens/Pilgrims
	Prioritizing spatial development and providing integrated and coordinated physical capacity for the city with the main focus on the holy shrine (CI/AU3)	
	Regulating and observing the maximum and minimum physical, activity, and population density in the urban areas (CI/AU4)	Managers/Citizens
	Promoting and improving old constructions and urban spaces with no activity, especially the urban buildings surrounding and related to the holy shrine (CI/AU5)	Managers/Citizens/Pilgrims
	Developing appropriate diversity and activity incorporation in urban spaces and preventing the development of single-function spaces (CI/AU6)	Managers
	Determining the role and position of lands with no activity in the framework of general structure of urban lands (CI/AU7)	Managers
	Providing capacity for promoting the quality of residential zones, adequate housing, and a variety of housing types in an appropriate combination with urban and ultra-urban functions (CI/AU8)	Managers/Citizens





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	Appropriateness in the existence of architectural and urban planning attractions (urban elements/symbols) (CI/AU9)	Managers/Citizens/Pilgrims
	Existence and appropriate distribution of urban furniture in pavements and sidewalks (CI/AU10)	Managers/Citizens/Pilgrims
Transportation and communications (CI/TC)	Sufficient security of public transportation services (CI/TC1)	Managers/Citizens/Pilgrims
	Satisfactory quality of interconnecting paths within the city (CI/TC2)	Managers/Citizens/Pilgrims
	Familiarity of drivers of urban public transportation with city roads (CI/TC3)	Managers/Citizens/Pilgrims
	Appropriate and consistent relationship and association between inter- and intra-urban transportation networks to facilitate the access of the public in Mashhad metropolis and other population centers in this city (CI/TC4)	Managers/Citizens/Pilgrims
	Consistency of development process with the existing and future capacities of urban and ultra-urban transportation network (CI/TC5)	Managers
	Improving and developing public transportation in Mashhad city by increasing local and national investments (CI/TC6)	Managers
	Sufficient parking spaces in Mashhad (CI/TC7)	Managers/Citizens/Pilgrims
	Sufficient traffic signs in Mashhad (CI/TC8)	Managers/Citizens/Pilgrims
	Appropriateness of legal and traffic disciplines in the driving of citizens (CI/TC9)	Managers/Citizens/Pilgrims
	Range of services (CI/S)	Existence of suitable infrastructures to provide superior services for pilgrimage and tourism at national and international levels (CI/S1)
Sufficient security in residential centers for tourists/pilgrims (CI/S2)		Managers/Pilgrims
Optimal access to residential centers (CI/S3)		Managers/Pilgrims
Appropriateness of accommodation costs charged from tourists/pilgrims (CI/S4)		Managers/Pilgrims
Appropriate introduction of historical heritage, tourist spots, and entertainment centers in Mashhad city (CI/S5)		Managers/Citizens/Pilgrims
Easy access to the brochures introducing Mashhad city (CI/S6)		Managers/Pilgrims
Sufficient number of tourism information centers (CI/S7)		Managers/Citizens/Pilgrims
Existence of sufficient sports facilities in Mashhad city		Managers/Citizens





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	(CI/S8)	
	Existence of sufficient health-medical facilities in Mashhad city (CI/S9)	Managers/Citizens
	Existence of appropriate social services in Mashhad city (CI/S10)	Managers/Citizens
	Existence of suitable public services in Mashhad city (CI/S11)	Managers/Citizens
Environment (CI/EN)	Changing methods and reforming the use of energy resources as well as modernizing and developing basic infrastructures in order to reduce different environmental pollutions (CI/EN1)	Managers/Citizens
	Existence of green space networks (CI/EN2)	Managers/Citizens/Pilgrims
	Active preservation and sustainable operation of the valuable natural resources located in the city (CI/EN3)	Managers
	Conducting programs to correct spatial and physical status of the city according to safety rules and reducing factors damaging the urban environment (CI/EN4)	Managers/Citizens/Pilgrims
	Optimally selecting and distributing locations for important activities and distributing population centers considering the areas affected by natural disasters (CI/EN5)	Managers
	Providing information and improving the community preparation against natural disasters and unexpected accidents (CI/EN6)	Managers/Citizens
	Citizens' commitment to environmental issues (CI/EN7)	Managers/Citizens/Pilgrims

Table 2. Evaluating the current situation of city image dimensions using one sample t-test in the research models

Description	Mean	Standard deviation	t-test statistic	Significance level	confidence interval 95%		
					Lower bound	Upper bound	
city managers model	Culture-History	2.72	0.73	-2.71	0.01	-0.49	-0.07
	Economy	2.54	0.69	-4.72	0.00	-0.66	-0.26
	Social Issues	2.81	0.68	-2.00	0.06	-0.39	0.02
	Architecture and Urban Planning	2.57	0.68	-1.32	0.19	-0.32	0.07
	Transportation and Communications	2.95	0.65	-0.49	0.63	-0.23	0.14





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	Range of Services	2.97	0.79	-0.24	0.81	-0.25	0.20
	Environment	2.71	0.71	-2.89	0.01	-0.49	0.09
Citizens model	Culture-History	2.87	0.840	-3.07	0.002	-0.22	-0.05
	Economy	2.73	0.838	-6.25	0.001	-0.35	-0.18
	Social Issues	2.91	0.924	-1.87	0.062	-0.18	0.004
	Architecture and Urban Planning	3.11	0.937	2.23	0.026	0.01	0.20
	Transportation and Communications	3.03	0.886	0.641	0.522	0.06	0.12
	Range of Services	3.39	0.824	-2.11	0.036	-0.17	-0.006
	Environment	2.76	0.866	-6.25	0.001	-0.36	-0.19
Pilgrims model	Culture-History	3.65	0.628	13.40	0.001	0.55	0.74
	Architecture and Urban Planning	3.48	0.964	6.518	0.001	0.34	0.63
	Transportation and Communications	3.85	0.878	12.55	0.001	0.71	0.98
	Range of Services	3.35	1.006	4.60	0.001	0.20	0.51
	Environment	3.65	0.981	8.69	0.001	0.51	0.80

Table 3. Significance coefficients and path of city image dimensions in Mashhad in the structural models

Mo del	Dimensi on	Signifi cance Coeffi cient	Path Coeffi cients	Accuracy of the relationshi p/priority of significant effect	Mo del	Dimensi on	Signifi cance Coeffi cient	Path Coeffi cients	Accuracy of the relationshi p/priority of significant effect
city managers model	Culture-History	82.446	0.962	significant / 5	Citizens model	Architect ure and Urban Planning	302.318	0.975	significant / 4
	Economy	150.338	0.981	significant / 2		Transpor tation and Commun ications	374.165	0.980	significant / 2
	Social Issues	77.709	0.950	significant / 6		Range of Services	297.082	0.975	significant / 4
	Architect	305.055	0.987	significant /		Environ	364.949	0.973	significant /





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	ure and Urban Planning			1		ment			6
	Transportation and Communications	228.799	0.981	significant / 2	Pilgrims model	Culture-History	88.698	0.962	significant / 3
	Range of Services	171.210	0.980	significant / 3		Architecture and Urban Planning	303.769	0.976	significant / 1
	Environment	152.674	0.979	significant / 4		Transportation and Communications	75.523	0.941	significant / 4
Citizens model	Culture-History	491.166	0.982	significant / 1		Range of Services	103.078	0.966	significant / 2
	Economy	395.970	0.978	significant / 3	Environment	29.880	0.903	significant / 5	
	Social Issues	266.328	0.974	significant / 5					





The Position Identity of the Human Works in Authentication of Society (Casestudy: Alighapoo Street, Ardabil)

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ABSTRACT

A city is the biggest symbol of human civilization which human being has constructed it for his security and comfort and is indicative of identity and spirits of individuals who live in it. one of fields and elements in authentication and especially collective , cultural , historical and civilization authenticity of a society and its sections is civilization and man-made works which it could be referred to cities and consequently civil spaces and elements as the most obvious expressions . these identity factors refer to public's attitude towards life and the relationship between human being and universe and also his role in the world which in addition to illustrating itself as an objective and apparent physical and identity element should be able to transfer emotional beauties , cultural values , mental principles , scientific capability , artistic skills , national unity and other clear issues of a civilization to an observer . Actually the important points are principles and values to which these identity making elements refer . According to this research is conducted aiming identification of these factors and their effect on forming identity of society using descriptive – analytical method which its results suggest that the identity of a culture with particular properties and characters form art and architecture and also town structures of that nation .the current physical structure which has been formed based on functional relationship according to mutual interaction becomes an element which makes identity among all residents and more in future generation , an identity – maker element from an identity processor human being .



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INTRODUCTION

Identity originated in Arabic means "individuation" which identify characters of individual and society and distinct them from the others and is so important due to its role in realizing people, things, communities and places. Urban identity is a collective identity which is expressed in body, content and implication of city and motivate the sense of belonging to a place through evoking collective memories and directs burghers towards citizenship (Changizi et al., 2013). Body and content properties of a city is formed influenced by geographical environment including cultural, historical and like that structures in that geographical region. Cultural structures including ideology and dominated policies on every geographical region influence extremely on city identity, thus it could be said that the identity of each town expresses the culture in the environment (Shamie and Pourahmad, 2006) which should be able to induce spiritual beauties, cultural values, intellectual principles, scientific power, artistic capabilities, national unity and other characters of a civilization to an observer in addition to illustrating itself as a physical element and objective identity (Naqizade, 2007). Therefore every work belongs to a person and every building has an identity (Hojjat, 2005). So it could be said that culture and environment make identity in human life, so that each of them has significant role in providing identity. On the other hand it can be observed that intersection of environment human identity and human identity constitute the identity of environment (Selseleh, 2009).

Thus it can be said that the identity of a culture forms art, architecture and physical structure of that society towns along particular features and properties. The current physical structure, itself, which has been formed according to a mutual interaction, becomes an element among all residents and more in future generations which makes identity, an identity – maker element from an identity – processor human being (Habib et al., 2008).

Structure and research method

The research method is descriptive – analytical which due to realizing identity nature, there is an attempt to draw a theoretical framework based on specialized literature of topic by a phenomenological approach and considering effective factors on forming and the effect of identity on urban and society audience. According to survey and field study, the identity factor has been investigated in Alghapoo street of Ardabil and the observed information and photographing and data collection in especial tables are as the most important devices for collecting data in this field.

Definition of identity

Identity means detailed fact, it means that when an identity is validated by individuation is called identity and is the goal of realization and it is sometimes inherent and sometimes is exhibited (Moien, 2005). In the field of psychology, one of personality characteristic is feeling identity and it includes a feeling that human being has towards continuity of mental life and the unity which feels against external frequent situation and mode (Qaraie et al., 2008). Among existing theories in the field personality and personal identity formation, the attitude of scholars such as Adler, Honai, and Morfy is more acceptable. According to these set of psychologists and anthropologists, personal identity is formed by mutual act with others in the life environment during mental development of child. Actually, in addition to man personal features, social and environment features are also important in identity formation (Changizi et al., 2013).

Human identity





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Sadrolmotalehin proposes that every creature identity includes his certain manner and unique identity in human being has various dignities. The individuals have characteristics by which they are separated and this personality remains in them until their life and it is called identity (Goudarzi , Soroush et al. 2013) .As it was mentioned literally , an identity is what distinguishes one thing from another and thus human identity is the thing which distinguishes him from other things . However if man is considered as a total concept among others , if he is considered to have a hierarchy of life , if he is compared as a whole with other wholes , if every human being is considered as part of many other wholes , if we consider a relation between his identity and the identity of all phenomena , concepts and attributed things to him or created by him and if we consider many conditions and other things like this , so it is realized that human identity is able to have various and different attributes and features which of course their collection constitute his actual identity (Naqizade, 2007) . As Yong says ,” the central point , itself is personality and identity around which other systems of identity circle and this helps to personality and identity to get to balance unity and consistence (Siasi, 2000) . Appropriate and favorable environment is able to provide a proper ground for growing individuals’ qualifications replying to a collection of biological needs (Changizi et al., 2013) . One of the most fundamental roles which identity plays in human’s life is explaining his relation with universe. Actually , knowing his identity , he not only identify his relationship with being but also tries to change , improve and develop the environment so that through them should introduce and reinforce his identity (Naqizade, 2007) . It could be said that some part of human internal personality which makes individual identity is a place by which he knows himself and introduce to others. Various attitudes have been proposed by scholars about identity of place and local identity. Marko Lali has described a more especial aspect of local identity in human being and has called it urban identity for urban people he believes that urban identity is caused by a deep link between a person and his urban environment. he believes that urban identity has a positive effect on capability and self esteem of citizens and distinguishes them from other citizens (Lali,1988 : 303) . Thus we conclude that location has a significant role in forming human identity that is developed by man. So the relationship between human identity and his works are explained.

The effect of human identity on his works

It is a fact that all people like and try to produce and create things based on their logic and beliefs , so that their work express their beliefs and help them to achieve to their goals , Because of this man is interested in his works Regarding his determinative role of human identity in defining human works’ identity and the close relationship between man identity and works’ identity , it is natural that identity implications which are described by every ideology and culture and a thought for human should be expressed in his physic , face and works as well and actually they should explain the identity of environment (Naqizade, 2007) . every especial place has some features which is distinguished by them from other places and accepts identity . Having an specified attribute with cultural , religious , economical and social beliefs could highlight distinction . the identity of place originate not only in establishment location , weak functions , its occupation by environment and people financial experiences , but also all of these factors form essentially the face and identity of place (Shekole, 1996) .

Human personal identity could be summarized in two levels : natural and acquired . in defining natural identity features , several factors have considerable roles such as parents , origin , race and physical properties of human being . these factors are typically ones in their providing and change man has no role , Acquired identity also is called to some features that generally are acquired by human and could be changed and selected . It is also notable in describing and defining personality identity that this level of identity explains intellectual and cultural dimensions of human being and mainly is definable for the relationship of people with other fellow groups which have common target and goals . Although personal identity could influence on his intellectual and spiritual character and also on his behaviors , what has the most effect on forming mental and intellectual identity is one which a person shows towards other social parts that is a segment form them . This identity which is called character identity of human being has several levels : cultural , social , family , national and religious identity which cause works arising from these factors (Naqizade, 2007)





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The identity of urban space and human works

Before studying urban spaces' identity and the style of projecting " identity" in the mind of citizens from every urban space , it is necessary to define related terms . Urban spaces are places which belong to all citizens , and are not unique to physical aspect .Actually are meaningful due to human presence and his activities . " Colon" defines the term urban term in two ways : social space and structured space (artificial and manmade) . social space : is spatial expression of social organizations which are studied by sociologists and geographers . On the other hand an artificial space is a physical space (Madanipour , 2008) . Every space and environment is as an identity source and gave identity to groups within it (Rabbani, 2002) . An space for its residents should have an identity and structure (Fialkov, 2003) . As a collection of cultural , social and known environments combined by human , a city in which inhabitants are centered (Shia, 2006) has an especial identity . An identity which distinguishes a city from other cities and makes its residents meaningful .This particular personality and identity is defined and described by different elements .Based on different forms , content and function , these elements typically constitute natural structure of a city and are different from a city to another one . If this fact is acceptable that human being is influenced by manmade phenomenon (external environment) , the cities leave various effects on social life of citizens with their identity variation (Kord Daroukoliaie et al., 2006) .On the other hand the identity of each phenomenon consists two main components : objective and subjective . The objective component includes urban structure , its economical function and public places , and so on ; and subjective element means settled social groups , their perception level and social awareness and their expectation an desires , synchronic groups and like them (Varesi et al, 2010) that here the objective component is considered . in John Panther model named sense of place model , an urban environment is as a place including three integrated dimensions : body , activity and imaginations (Golkar, 2006) . These three elements are raw material of local identity and the dialectic between them is the building block of this identity (Afrough, 1998) . Vagner believes that time and place , human and action build an inseparable identity ; Therefore meaning and act are combined elements which should be considered to understand local identity (Qasemi Isfahani, 2006) .

Local space identity could be investigated in three dimensions of city : form , semantic and social .

According to the topic of paper and the significance of physical identity of a town that other alternatives , this issue will be assessed in case study . Physical identity means attributes and properties that distinct the body of town from others and define the similarities these attributes should be in a form which the body of town ,while continuation , attempts to change and develop and eventually results in a whole emergence (Mirmoqtadaie , 2004) . Physical identity is equivalent with "personality" and "sense of place " terms (same source :29) . The values of urban face , streets space , is different from other physical elements of city . Having linear content and transmission performance, street space has especial condition for introducing itself ; on the other words the main part of street space is just observable from corner and since observer is in dynamic condition and the physical elements are integrated with sky line , various values are observed frequently . However in the intersections , the observer pause and different space conditions cause urban face values to change (Goudarzi Soroush et al., 2013).

Investigating the effect of human works identity on social identity

The environment is the most basic factors forming human identity which this effect is provided by understanding in the environment . Environment perception is a process which is the core of all environmental behaviors , since it is the source of all environmental information . The surroundings stimulate all senses and the person encounter with information more than his processing capability .Therefore , the perception is the result of refining and processing provided by person . in interpreting this phenomenon , Itelson proposed that actually the person himself is a part of perceptual system . Sometimes, separating the person form environment is difficult in perceptual process , since both are interacting and perception depend on what a person is doing in an environment (Bahreini , 2006) . The effect of culture or cultural environment on forming human identity is as high that it could be said that there are few people



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who is able to escape completely from the effects of his initial cultural, environmental and religious works. The identity and personality of individuals reflect highly the identity of a society to which this person depends on (Naqizade, 2007). In addition to define the relationship between human and life and its components, explaining and defining the identity and its features could underlie introducing other environments and collections to which human being depends on. One of the most basic issues in this field is society. Considering the role of society as unit and a whole which in many fields a common and single destiny is imagined for its members, obtaining a single identity which acceptable and respectable could play an important role in improving their individual identities and thus their pride and self esteem. In addition, the issue of personal and social goals and consequently defining goals and also explaining the properties of ideal identity or an identity which could illustrate goals, suggest the significance of the "identity" to human being (same source: 327). One of fields and factors for obtaining identity and especially authentication of a society and its parts, is civilization and manmade works which one of its obvious expressions is cities and consequently spaces and urban elements. Since cities express the beliefs and lifestyle of people and thus are their attitudes towards life, so they could emerge as an identity element in a civilization, nation and society. Not only whole body of town but also its components and elements also point to intellectual, historical, scientific and artistic identity of its provider society which is derived from their principles and beliefs. The relationship between a society and manmade works identity is an interaction which are related to each other all the time.

Thus culture (cultural values) and architecture /urbanism have mutual effect on each other and for several reasons, these effects, especially the effect of architecture and urbanism on culture is so complicate and significant. Totally, it could be said that first the culture of society has a direct effect on lifestyle and human activities and consequently on the procedure of space creation. Such that most of researchers and even people who try to change and permute the architecture / urbanism and the environment and life scope of nations emphasize on cultural evolution of society. Second, the architecture and urbanism have expanded effects on lifestyle and the human relationships with each other and consequently on culture of society. Nowadays, due to concealment the theoretical principles of architecture and urbanism and also due to occurred wrong discussions, considering the effect of architecture and urbanism on culture and permutation of society culture provided by especial styles of architecture and urbanism has found an especial position (Selseleh et al., 2010).

Case study : Alighapoo St.

Ardabil is considered as one of historical regions in Iran which dates back to 5000 years ago. Such that in muddy plates of Sumerians has recorded as Arta which shows 5000 years as city archaism. During the Umayyad and Baniabbas regimens, this city has been the center of Azerbaijan government and the center of B. Khorramdin uprising, respectively. In 618 A.H, this city was attacked by Mughals, however during Timurid and Safavid, Shia and political movements aroused from this city. Ardabil flourished at the time of Safavid and achieved to its top prestige and dignity, but after extinction of this dynasty in historical events and evolutions in Nader Shah era and early Qajar and especially entering Russia army to Iran and the events of constitutionalism, this city lost its prosperity and importance. Mausoleum of Sheikh Safi – which is one of unique constructs among religious buildings – includes some buildings from various eras which was set out as a single collection by Shah Tahmaseb. The high importance of this monument is expressed generally by its relationship with Safavid kings dynasty. This collection has high importance according to Islamic architecture. Individual buildings are unique (Municipality of Ardabil, 2013). Mausoleum of SheikhSafi Ardabili has been located in Alighapoo St. in Ardabil which is so important due to locating of this monument and is the first and most effective alternative in Ardabil people identity and visitor tourists. This street is the most important and crowded street of city which has an especial role in activity variation and availability. Encountering with Alighapoo St. sides, the architectural elements located in this path could be divided into two groups: 1) the elements with historical value, 2) elements without historical value.





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Whatever seems important in encountering first group elements is expressing some principles for designing and assigning function to these buildings which along respecting adjacent historical heritage , a fresh and active spirit should be blown to the old contexts bodies , without destroying historical value and identity of old contexts . Valuable elements in historical sides could be maintained by various methods including support , strengthening and repairmen

According to case study , we find that Alighapoo street has old historical background which this identity is expressed by special elements and spaces and by some functions that generally belong to the past and also by arts and works remained from past . The important point here is paying attention to some elements which have role in providing original, ideal and populated identity . the “ religion” factor may be introduced as the first and most important factor influencing culture and spiritual values . This factor not only plays a role in providing especial physical works such as religious elements and places and the environments for holding ceremonies and artistic works but also beyond that also is effective in providing values which perform as evaluation , determining spiritual and valuable level of phenomena and topics and concepts level criteria . Actually the religion and its values effect not only on forming religious and historical identity of human works but also beyond influence human identity as well by evaluating symbols and marks , natural and manmade elements , by shaping and defining culture and cultural values , by affecting social behaviors and manners and consequently by influencing on forming individual and collective spaces and some other effects (Naqizade, 2007) .

CONCLUSION

Using terms like “I , self , personality and like them states that there is an issue called “ identity “ for human being including individuals and community to which all belongings , dependencies and human activities depends on . Reviewing related concepts suggest that considering identity , has both spiritual –non material and physical-material aspects . various aspects of identity could not be proposed separately and independent from each other and each one affect the others . in addition , not only every thing needs an identity , but also this identity has some attributes which are resulted by that thing and suggest spiritual features of that identity which has been expressed in body and appearance (Naqizade , 2006) . On the other hand , environment is an important factor for obtaining an especial identity for human being . Due to physical expression of beliefs and cultural values of society , an environment could influence the feeling of identity or lacking identity (Habib et al, 2008) . the identity of a nation , community and land effects on everything which is a symbol of that nation and land and expresses itself as various aspects . Actually the identity is formed in a historical continuation and shows itself dynamically in the physical , artistic and architectural phases of a land . It should be noticed that after forming such a body that actually has been created by identity and natural elements of a land , the art work , city or architecture work , itself becomes a device for transferring concepts , customs and cultural effects of that land to future generations and also becomes a identity maker element for that identity processor human being . This suggests that interacting identity and urban body is an effective and constructive interaction which could be considered an identity maker element which has been formed one day by a hidden identity if there is no improper and wrong intervention . Actually a city is constructed by identity and after building the city , itself will play an important role in processing future identities .

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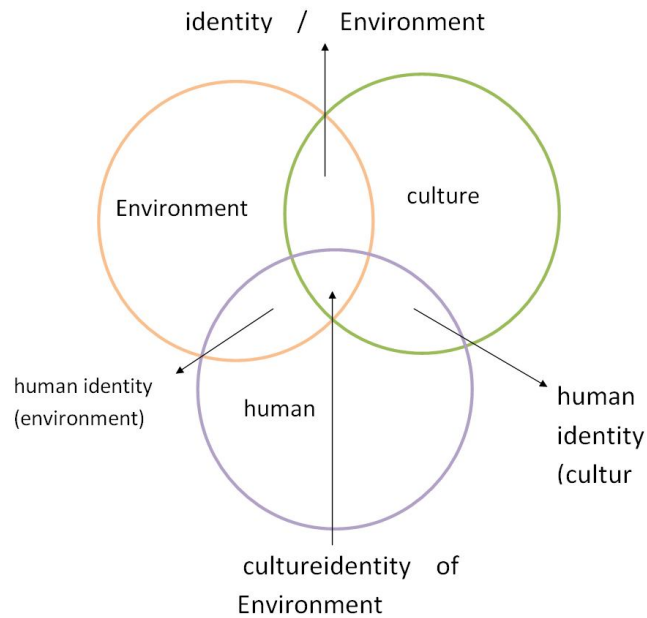


Figure. 1. The relationship among human, culture, environment and their relation with identity (Naqizade, 2007)

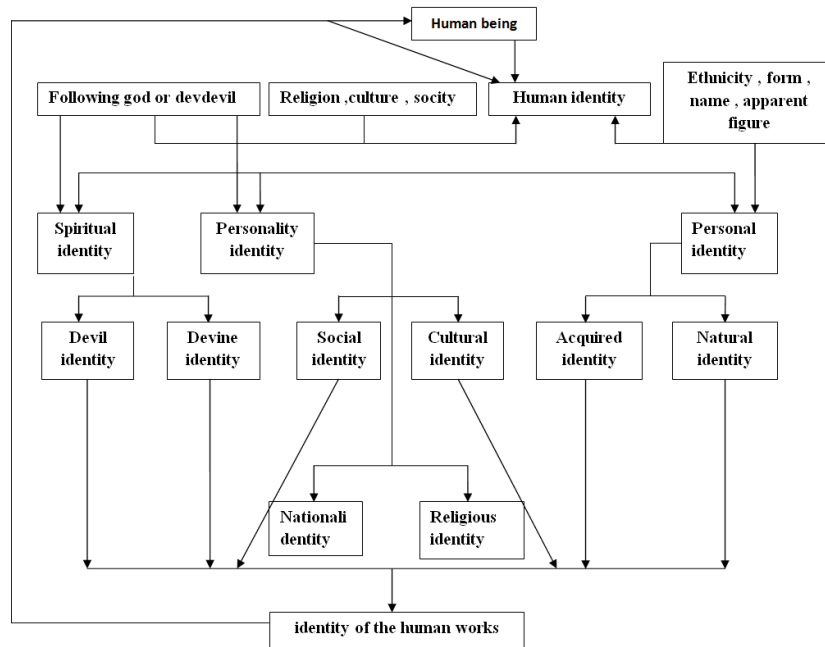


Figure 2.various facets of human identity and their relationship with his works (Naqizade, 2007)





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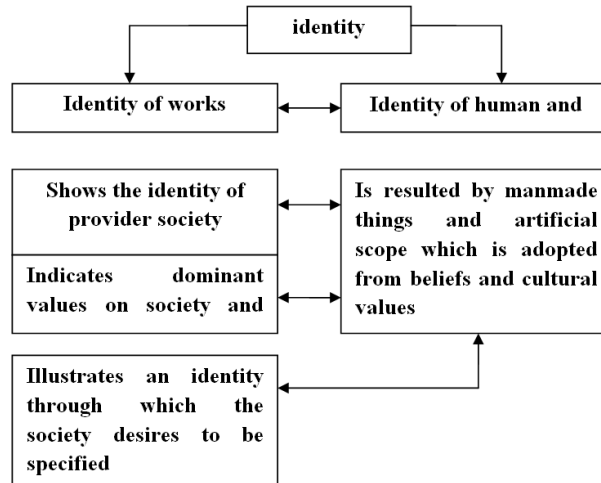



Figure 3. mutual relationship between human works and identity

Table 1. factors shaping the identity of Alighapoo St. in Ardabil according to human impacts (Source : authors)

row	Physical element (manmade)	Notes	image
1	Visual elements	Aesthetic values include scope quality and the possibility of perception , position and orientation . if a person enters to a city and be able to describe that after visiting various parts and the city diagram remains in his mind , this city will illustrate one with visual identity (Nofel et al. , 2010) . Sheikh Safi monument plays this role in Alighapoo street and surrounding historical environment	









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2	Cognitive elements	Suggests the quality and quantity of urban space and urban symbols and historical and cultural values which all of these items are observable in historical works : mausoleum of Sheikh Safi , museum m traditional bazaar and the most important , Allah dome .	
3	The sky line	-upper limit of building crown and common part of street body with sky . Sky line components : base line 0 combination line – the base line is upper limit of vertical wall of building and combine line is final line of back wall or observable roof boundary and the background of sky .	
4	wall	Defines the street scope and gives it environmental meaning .design elements in wall include context , rhythm , simulated rank , continuation , street architecture , corner , curve and symbol .	
5	Culture	Undoubtedly , the culture should be considered the most important identity source and in this regard people find identity relying on various cultural components and elements and on the other word the culture is both distinctive and integrative in the space (Behzadfar, 2007).in the terms of historical background it dates back to Safavid era and has especial cultural and social identity and most of its residents are Shias . the visibility of this monument could be considered as one its physical elements	





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		which distinct this street from its surroundings .	
6	Readability and emergence	The locations which are important physically and culturally and are public are so effective in identity improvement For example in Alighapoo street , separating ride and walking trails and their integration with natural elements and green space margins results in readability of area .	
7	Historical building and works	Sheikh Safi Ardabili monument which is the most important work in this street which has remaine from Safavid era and has given an especial effect to this region and its residents and indicates civilization and the identity of people in this area .	
8	Symbol and impact	The symbols are factors for defining various parts of city to which the observers have no way . these symbols are unique ones which have created especial points by their form and contrasting with around i.e. flooring path , Allah dome , Saqakhaneh , museum and historical environment	
9	Collective memories location	Urban environment has two physical and huan elements which have no meaning without eachother .the places of meetings and collective activities also are memorable factors which should be maintained and improved .	





Assess the Sustainability Characteristics of Traditional Houses Qajar Era Ardebil

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ABSTRACT

The energy crisis in the seventies AD, and subsequent environmental problems cast a shadow on many human activities and has faced architectural design and urban areas contributing to energy consumption and environmental pollution, a difficult challenge. Since one of the major polluters in the world and especially in our country's environment, fossil energy consumption in residential areas the necessity of paying this important becomes necessary. Iranian traditional architectural survey shows that architects have been able by considering principles of aesthetics and emphatic emphasis on the environment, climate meet needs of any area. The extent of the cold climate in the country, shows paying attention to the design of buildings and the body of cold and dry climate cities that are major consumers of fossil energy, very essential. The purpose of this study was to investigate determinants of sustainable architecture in the historic homes of Ardebil with an emphasis on Qajar era home using analytical methods and survey, To the recognition of sustainability principles in vernacular architecture and their compliance with the modern concepts of sustainability To achieve practical solutions and to design climate patterns in the region with the aim of saving energy and reducing air pollution.

Key words: sustainable architecture, in harmony with the climate, traditional houses, Ardebil.

INTRODUCTION

Traditional houses in Iran have a kind of beautiful interior structure that is based on beliefs and culture which have long been of interest to architects. Space flexibility, readability, introversion, spatial hierarchy and respect for family





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privacy have a special place in Persian houses' architecture, which is replaced by extravert architecture. Traditional houses and buildings, due to observation of climatic criteria have had a good performance in the face of inclement weather, and naturally have kept man from hot and cold weather conditions. But due to human technological development since the Industrial Revolution and access to fossil fuels, climate criteria in housing construction and building have been forgotten. However, the limited resources of fossil fuels and environmental problems since the mid-twentieth century caused the tendency of humans to observe nature and climatic criteria in building which was followed by development of various climate techniques (Aspany 2004). In the traditional buildings the use of natural resources and energies was one of the space construction principles. Old houses in the desert texture were typically directed to Mecca. This kind of orientation provided a climatic condition for summer spaces and winter chambers to reasonably surround the central courtyard (Tahbaz, 1995). The central courtyard has been the main environment in desert houses (Robinson, 1998). Water pond in the middle of the courtyard, which was in its maximum size, would store the energy of sun. Thereby a cool air conditioning for each residential unit was provided by guarding deep yards and providing the possibility for compressed house to breathe into the courtyard. Courtyards which are enclosed on all sides with indoor spaces absorb the cool night air such as a cool pit and use it on the hot day (Asad Pour, 2006). On the other hand the negative effects of modern architecture on the structural organizations of cities in Europe and spread of its consequences to other countries including Iran became a dilemma which is seen as space displacement. According to the expert views on morphology issues, such as the Carrier brothers, Christopher Alexander, Roger Trancik, the most appropriate solutions to avoid and confront the history gap is utilizing the experiences and values before Modernism (Edwards, 2008). Early examples of Iranian modernist architecture for the first time were emerged simultaneously with the extravagant movement and the focus to create urban spaces, and coincide with the appearance of the street on morphological and anatomical organization of Iranian cities (Zekavat, 2003). But according to the remains of ancient settlements since the sixth millennium BC in many parts of Iran, and the remains of some of the settlements in Mesopotamia, the home is typically made of two parts; one the enclosed space and the other the open space, because in the central and southern regions of Iran and Mesopotamia, during the year the weather was half of the year cold and the other half was mild and warm, and part of the house chores at the appropriate time were done outdoors. Although the role of environmental and geographic phenomena in the formation of open space or courtyard of houses is more or less obvious, some researchers named cultural factors as the main factor forming various types of courtyards in the traditional houses. Moreover, it seems that the current classification of outdoor spaces and its relationship with spaces built in Iran is very general and are not precise enough (Sultan Zadeh, 2011). Despite the mentioned descriptions, as Aspany says "climatic design techniques which are derived from climatic indices of traditional architecture were maximally efficient" (Aspany, 2004). Accordingly, this study sought to examine the status of courtyard in modern homes and the influence of Western architecture on the location and morphology of this part of the building.

MATERIALS AND METHODS

This study is descriptive-analytical and survey and by referring to reliable sources and publications and reference books on the subject of research material collected And comparison have been made.

The concept of sustainability and sustainable development

Sustainable development is concepts that consistently meet the needs and consider satisfaction with the quality of life of people. According to the World Commission on Environment and Development, development of basic issues including Population and development, food security, diversity of life forms and the environment, energy, industry and the urban challenges. Therefore, sustainable development, especially in urban structures and sustainable architecture, won't be possible but by improving the quality of urban life and welfare of citizens. (Barzegary, Ben Jawad Talebi, 2008: 97). The concept of sustainable development in various spheres of human life is important; that these various topics are classified in three comprehensive areas: Social development, economic development and





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environmental development. So if the concept of development is fulfilled in all three areas of social, economic and environmental, sustainable development will achieve its comprehensive meaning, In fact, it can be said that sustainable development is the common scope of development three areas.

Sustainable Architecture and Urban Development

Sustainable and ecological architecture pays attention to architecture as a live organ to provide a suitable environment for human life as a living organism and in terms of this gives value to the identity of the built environment Although in appearance is of the most advanced design techniques, it will also relate closely to the principles of traditional architecture. In this sense, to make a living and organic architecture, and begin to respond to the needs and mood of society today you can start a review and understanding of traditional architecture and after that, interpret the language of contemporary expression. (Amin Zadeh, 2003: 22). The objective of designing sustainable building is to reduce damage on the environment in terms of energy and the exploitation of natural resources (Figure 1), which includes the following rules

1. Reduce the consumption of non-renewable resources
2. The development of the natural environment
3. Remove or reduce the use of toxic or harmful to the environment in the construction industry (Singeri, 2007)

Principles of sustainable architecture

The principles that must be met to a building to be classified as sustainable buildings are as follows

The first principle - energy conservation: the building should be constructed in a way to make need for fossil fuels to minimum.

Second principle - coordination with the Climate: the building must be constructed in ways that coordinate with climate and energy resources and work.

The third principle-reducing the use of new resources: structures must be designed in such a way that the amount of new resources are reduced as much as possible And at the end of its useful life for the new building, to be used as a new source.

The fourth principle- meets the needs of residents: in sustainable architecture meet the spiritual and Physical needs of the residents are important.

The fifth Principle - sync with the site: The site should be gently placed on the ground and be compatible with the surrounding environment.

Sixth Principle - holism: all Principle of sustainable architecture must be embodied in a complete process that led to the creation of a healthy environment (Bonnie M., 2008).

History of sustainable architecture in the world

History of Sustainable architectural dates back to the nineteenth century. John Ruskin, William Morris and Richard Laby are the vanguard of sustainable architecture. Ruskin in "seven torches architecture," says that order to achieve growth and development harmonic found in nature can be as model. Morris recommends returning to the green countryside and restore self-sufficiency and local industry. Here are some of the projects are designed based on the principles of sustainable architecture in the world. (Table 1).

History of in sustainable architecture

Iran is one of the best examples of traditional architecture in sustainable architecture. The principles of Iranian architecture is derived from nature (light, water, air and soil), strongly oriented text and land-based and is an integral





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part of the environment. The architecture reflects the special attention of Iranians in the proper use and effectiveness of renewable energy in the ancient times that for doing this they used simple but effective way that in every climate these methods were different according to the climate, culture, etc. Integration and alignment of the principles of past sustainable architecture of Iran with design principles is not a coincidence, but also sustainability, continuation and maintenance of concepts and ideas of the perfect architecture of the past, suggesting the existence of such ideas in the past, Iranian architecture. (Table 2)

The concept of sustainability in traditional houses in Iran

When speaking of traditional houses, picturesque houses are pulsed in the traditional context, the role of religious life and other natural forces (sun, wind, etc.) and the efficiency of their coordinated by the technical foundation of a social nature, such as aqueducts, deflector and... lays highly complex Order that has basis in the nature of land. Traditional house orders in the horizontal and vertical surfaces. In the horizontal plane hierarchy access from the outside (very common area) and layering of light and darkness with respect to central courtyard and in the vertical direction and water direction is determined. Entrance, vestibule, corridor and courtyard-tier hierarchy of spaces that by maintaining privacy within the garden makes it possible to access the internal house. Layers around the yard in order to go straight to the room are where light, water, plants, air and generally are in contact with the inner garden. Synchronization of buildings and residential environment with climate so that as little as possible use natural value based on platform to provide comfort for the users, was a milestone in Iran's traditional architecture. Areas and elements such as summer, winter stay, cellar, basement, deflector and to coordinate with cold and warm season and optimal use of the wind, the sun and the heat capacity of the soil is noticeable in the Houses of this land. According to the above-mentioned, principles of sustainable architecture can be classified as shown in Table 3.

RESULTS AND DISCUSSION

To study the physical characteristics of the traditional houses in the city of Ardabil and adapt to the climate of the region, some traditional houses were Selected and studied and compared to the climate and sustainability were mentioned) Table 4 and 5). Finally, these results were obtained with that architecture of the old houses in Ardabil, is Iran native architecture that is consistent with regional climate. The purpose of creating these works by Iranian architect was not only to provide a beautiful effect, but also the beauty, the Heir principles and avoid idleness is one of the basic principles of Iranian architecture, Principle of Heir people, is pay attention to the needs and lifestyle of the people that was the principal of architecture in Iran. And avoiding the futility is a principal in Iran architecture and architects have always tried to work not in vain in building and they avoid the wastefulness that is one of the principles of sustainability.

CONCLUSION

Today, with the increase in construction and the growing process of architecture and building construction with use of new energies in building and construction consistent with the climate of each region can be saving energy and fossil fuels and subsequently to reduce environmental pollution. Construction that is currently confronting us is often contrary to what we would now call sustainable development. In this regard, the use of valuable patterns of Iranian traditional architecture that is typical of the traditional home of Ardebil was examined As well as other models and climate strategies are very important and useful. Climate tricks used in traditional Iranian architecture has been representing sustainability in the building design so that with fore fronting these teachings and incorporate these tricks with modern techniques, we can achieved new design methods. So to keep pace with modern architecture and new energy applications in building and construction, we can save energy consumption coordinated with the region that will be finished in the near future and has environmental pollution. . By reviewing the results of a study designed buildings in cold and dry climate and its extension to cities such as Ardabil it can be concluding that by a





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detailed study of traditional Iranian architecture, substantial points can be achieved by designing and the climate of the region because the maximum use of natural and clean energy for heating and cooling, have been considered. Thus compliance with the climate patterns in the region and the use of clean and unrestricted energy is normally used especially for heating of buildings and therefore limit the consumption of fossil fuels.

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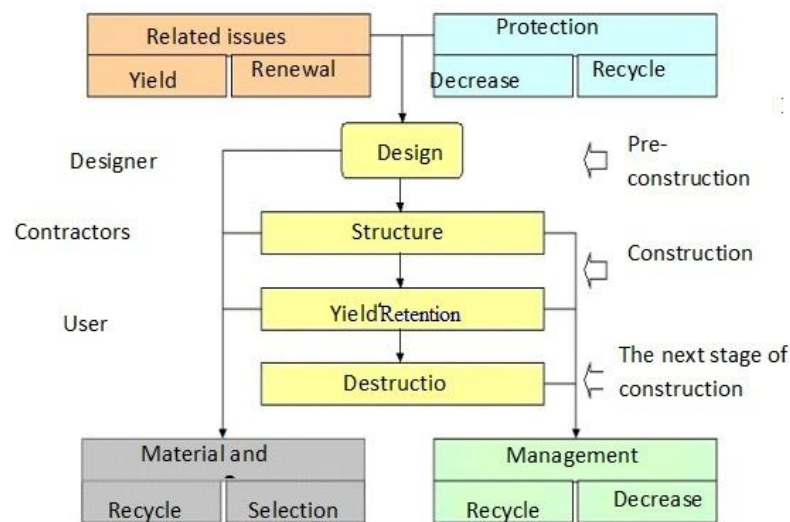





Figure 1: Diagram of sustainable building





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Table 1: Some of the projects designed on the principles of sustainable architecture (Source: Based on the investigation and processing of the author)

Row	Name of building	The construction date	principals	images
1	Hearst Tower Architect: Norman Foster	2006	<ul style="list-style-type: none"> - Use of recycled materials - View Dyagryd (intertwined) of triangular steel frame - Innovations to reduce energy consumption-Using motion and light sensors in Indoor and outdoor places to turn off the lights 	
2	Complex zero energy Bedington Architect: Bill Danstr and Arup group	1998-2002	<ul style="list-style-type: none"> - Zero carbon - Zero Waste - Sustainable transport - The use of sustainable materials and local - The use of sustainable and local food - A stable source of water - Natural habitats and wildlife - Heritage and Culture - Equality and fair trade - Health. 	
3	Reichstag Dome Architect Norman Foster	1995	<ul style="list-style-type: none"> - The use of natural light - Natural ventilation - Natural sight - Energy saving 	





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4	Cultural Center Jean-Marie Architect: Renzo Piano	1993-1998	<ul style="list-style-type: none"> - The use of local materials - Architecture in harmony with the climate and nature - The use of natural ventilation - Energy-efficient design using two shell 	
5	Europe Court of Human Rights Architect: Richard Rogers	1986	<ul style="list-style-type: none"> - The use of local materials and natural - Increasing the use of new materials To use renewables -Waste disposal system 	
6	Eden Complex Architect: Nicholas Grymshav	2001	<ul style="list-style-type: none"> - The dynamic relationship between the plants and cultures of different nations - The relationship between man and nature - Due to the topography of the land and certain species of plants - View the status of the plant in the United Thinking 	

Table 2: Comparative study of Persian architecture with the principles of sustainable Architecture and Urban Development (Source: author)

The principles of Iranian architecture	Principles of sustainable Architecture and Urban Development
Heir people	Improve the quality of life and physical and mental well-being of humans
Avoid Futility	Space design based on the needs and the use of multi-functional spaces and flexible space
Autarchy	Providing human needs without taking out future generations resource
Introspection	Harmony with nature and its energy use
Nyarsh	using the Modular system in design





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Table 3: Indicators of sustainability in architecture of traditional houses in Iran (Source: author)

row	Sustainability indexes	Description
1	Introversion	Using elements such as central courtyard and pool, and... serves as the pit.
2	Orientation	1. The establishment typically in the direction of the Qibla 2. Paying attention to the wind for a good wind or prevent annoying wind 3 leading to the formation of Summer and Winter spaces
3	Solar passive devices (vestibule)	Prevent wind entering directly into the building
4	dive in the soil	Using the thermal capacity of the soil in different seasons
5	The pool of house	1. using as the summer stay 2. The water cooled the atmosphere by passing water from pool 3. Create and provide needed moisture
6	Building material by sex (clay, brick, stone, wood, plaster)	The use of appropriate materials in the region has no reason, but the performance of these materials in any climate of the region. In addition, using materials available in each region to reduce the cost of transportation, which takes energy And the availability of it is also very important.
7	Building material according to the color	Select the appropriate color, in addition to materials and material thickness, is a whole insulation against the climate factors of the region.
8	House of Four Seasons	Summer stay: a room on the south side yard and back into that sun, Which was cooler and used in the summer. Winter stay: a room on the north side and the sunny courtyard that was warmer and used in the winter.
9	Vegetation	1.Providing shade 2. Landscape and visual beauty 3. Compensate for humidity 4. Prevent the absorption of radiation beams reflected radiation and the temperature rises again 5. carminative
10	wall	1. Create insulated with thick walls 2. No entry and exit of the cold and heat outside the building and vice versa
11	window	Latticed windows with colored glass are ways to control the depth and the amount of sunlight into the building in summer and winter, according to residents of the sun's energy requirements.
12	roof	The two cover of the flat roof, whether it's the curve or slopes in

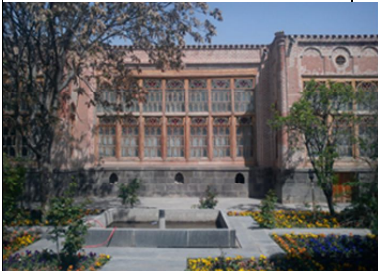
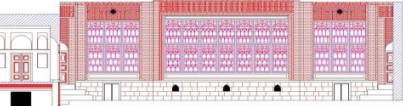
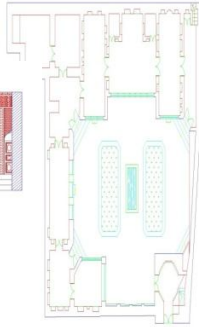

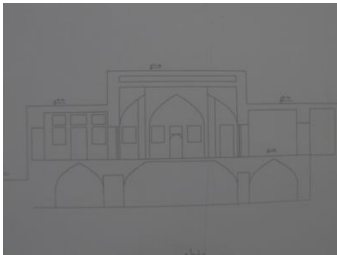





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		addition to light roof had help To control the heat received by the sun from the roof to create an insulating air trapped between the two shells.
13	Materials with appropriate heat capacity	Depending on the climate, materials with low thermal capacity and high thermal capacity of the materials are used.
14	Porch and canopy	1. Shading 2. The prohibition of direct solar radiation in the building
15	central courtyard	Being enclosed of central courtyard makes this open space for residents, such as internal fans and makes the warm air go out.


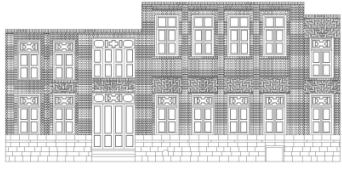



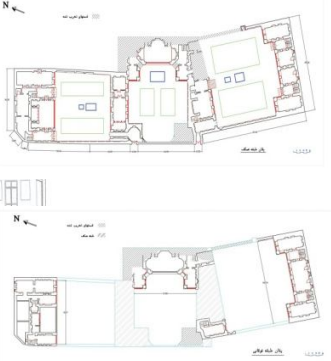


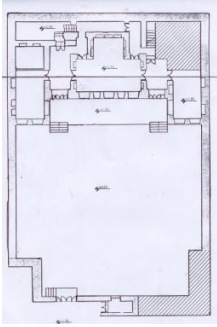


Table 4: Documentation of traditional houses in Ardebil

Three-dimensional Complex	View	plan	Building name
			Mirfat ahi house
			Ebrahimi house





Somayeh Ebrahimzadeh

			Khadembash house
			Sadeghi house
			Nozari house
			Asef house





Somayeh Ebrahimzadeh

Table 5: Evaluation of physical and climatic features of traditional houses in Ardabil (Source: author)

Climatic characteristics and indicators of sustainability	Characteristics of building	The physical properties	Period construction	Building name
<ul style="list-style-type: none"> • dive in the soil • The physical form • The role of water in providing comfort • Green space 	<ul style="list-style-type: none"> - Geometry yard Crusader - Floor below the level crossing - flat roof insulating for heat, cold, moisture in two covered - No balcony - A vestibule at the entrance 	<p>Located in the Taze meidan area of 878 square meters and 939 square meters aristocratic</p>	<p>Qajar 1250</p>	<p>Mirfatahi house</p>
<ul style="list-style-type: none"> • Completing building • Proper orientation • Sort spaces • dive in the soil • The role of water in providing comfort • Green space • The use of colored glass 	<ul style="list-style-type: none"> - Geometry yard half-cross - Floor below the level crossing - No balcony - A vestibule at the entrance <p>(Ground floor and basement of the main building consists of two large and beautiful hall</p> <p>The Hall that formed an important part of building has two porches and shahneshin</p> <p>And are decorated with fine mesh windows with colored glass with sash windows. Decorations used in the Hall include, Mogharnas plaster, paintings and valuable inscriptions.)</p>	<p>Sarcheshmeh square –Haji fakhr street – Ebrahimi house</p>	<p>Qajar period</p>	<p>Ebrahimi house</p>





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<ul style="list-style-type: none"> • dive in the soil • building physical form • The role of water in providing comfort • Green space • Completing building • The use of appropriate materials • Sort • For good measure spaces • 	<ul style="list-style-type: none"> - Thick walls, vault, arches and ceiling Tyrpvsh - building aesthetic elements (proportions, forms a rule, part of relationship whole relationship with the elements of repetitive elements, etc.) - Decorative painting and sash windows - Chinese brick and orders and Wicker Sleeping 	<p>Located in the old neighborhood of Ochadkan on Sartip Abad streets Total area of 2000 square meters</p>	<p>Qajar period</p>	<p>Khadembashi house</p>
<ul style="list-style-type: none"> • dive in the soil • building physical form (introversion) • The role of water in providing comfort • Green space • Completing building • The use of appropriate materials • Sort • good orientation of spaces • The use of colored glass • 	<ul style="list-style-type: none"> - Materials used: brick, stone, wood, brick, mortar, - Following the stone with lime mortar - Rocking cover and basement vault of the Azeri Klyl - A stone plinth with a height of 1.20 m - The brick facade, in various forms - Cover flat Dvpvsh - Three yard - Mogharnas and wall painting of shahneshin - Large sash windows with 7 door and colored glass 	<p>Located in the neighborhood of Ochedkan Area of 2028 square meters and 2176 square meters of Lords</p>	<p>Qajar period 1242</p>	<p>Sadeghi house</p>
<ul style="list-style-type: none"> • good orientation of spaces • Sort spaces • dive in the soil 	<p>Plaster decoration , brick decorations (The building is located in the southern part of the site and the other three is closed by a neighboring property.)</p>	<p>Sarcheshmeh square located in Masoomzadeh street</p>	<p>Qajar period 1274</p>	<p>Nozari house</p>





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<ul style="list-style-type: none"> • The role of water in providing comfort • Green space • Completing building • good orientation of spaces • Sort spaces • The use of colored glass • 	<p>Windows are decorated with beautiful sash windows and colored glass with motifs, the foundation of building is with stone and lime mortar and concrete, stone plinth, with a height of 1.10 meters, adobe bearing walls with 95 centimeters thick and brick view And Tyrpvsh wooden roof structure forms the building.</p>	<p>Imam Intersection - Memar street – Asef House</p>	<p>Qajar period</p>	<p>Asef house</p>
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Analysis of Sustainable Architecture in Traditional Houses in Ardebil

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ABSTRACT

Sustainable architecture is one of the issues raised in our country in modern times and has been of interest to the majority of architects. Take a look at the architecture of native cold and dry climate, shows identifying environmental characteristics of the story of our ancestor's clever remedy for using more natural resources and deal with climate - environment abnormalities. Vernacular Architecture of Ardebil accurately coincides with environmental conditions and cold and dry climate of the region and has a special climate identity of its own. So knowing this architecture in its own solutions, created areas valuable to use them in new spaces. The aim of this study is that after identifying and investigating the concept of sustainable architecture definition and understanding of the local architecture and traditional architecture parameters used, study traditional architecture of Iran in cold and dry climate. Given that indigenous and traditional architecture in cold and dry climate of Ardabil, is an example of a sustainable architecture In this regard, a number of traditional houses in the city in terms of orientation, the building, using local materials, space is analyzed in this study and is expected that by using these cases, reduce a major part of these biological pollution and consumption. The purpose of this paper is to examine how to place, construction and the development of sustainable architecture in traditional houses of Ardabil.

Key words: Sustainable architecture, architectural patterns, vernacular architecture, traditional houses of Ardebil

INTRODUCTION

It can be said that sustainable architecture is type of the architecture which utilizes maximum environmental capacities for comfort of the consumers and uses smart tools and strategies in this way which minimize adverse



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conditions resulting from construction (Ahmadi, 2003). The challenge which is faced by designers of new buildings is the way of relationship between the building and city and natural environment. To this end, such intellectual trend should be adopted which neither denies updated technology and novel scientific approaches in industry as traditionalists did, nor criticizes all concepts of traditional architecture and cultural past like modernists, nor steps toward a combined architecture like moderate groups (Mahdavejad, 2003). The formation of such an approach to address sustainable architecture and furniture design requires a deeper understanding of the goals and the recommendations are stable. Sustainable development is a concept that links between different aspects of development (economic, cultural, social and political) and pays special attention to environmental issues and environmental protection of the 80s decade that were widely discussed. (Heidari, M. Ali, Ice Storage new technology, energy storage, p 9) "from the perspective of the World Commission on environment and Development, sustainability, namely the needs of the present without compromising the ability of future generations to meet their own is " designed to sustainably find solutions to the living conditions. It designed for this purpose and should be based on three principles " resource Conserving " , " design based on life cycle " and " human design " takes place. (rayisi 2007) During the first two principal techniques and materials, construction methods and renewable energies periphery is considered to be a part of the life cycle is the biological system. (Mahmoudi 2005), But because of the traditional vernacular architecture, as architecture is always biased toward ecological sustainability and social trends is referred to more than a finished product (Willis, 2000). In this paper we introduce new approaches to sustainability and integration of these technologies with traditional vernacular architecture home environment and energy resources and maintain patterns of Vernacular Architecture of the lasting and traditional. Sustainability means consistency, coherence and continuity means of saving for the future. Architectural design as an activity, and the stabilizer settings that need to be stable. The new paradigm of human development based on harmony with nature on the part of man's nature is emphasized. He is only a small portion of human activity. Industrial nature of the actions, reactions and lifeless and inert huge shown is not included. In this context, the use of new energy and new meaning to the place of business. In the 80 years that the use of new energy and renewable up with very little pollution as a fundamental solution to the bio-economy was introduced. (Mahmudi et al, 2008) considering the fact that sustainability is a fundamental and universal rhetoric about protecting the Earth's resources to achieve solutions to take into consideration applicable to pragmatically should Local approaches. (Z.Zou et al, 2011), so it cannot blend sustainable architecture as well as the ready-made product to be transported from one place to another. (Norton, 1999), but it had the potential of processes, technologies and systems as possible so they can be considered was given a place to work, because sustainability is an underlying feature. Vernacular architecture of Ardebil city which is one of the salient regions in Iran' North West is exactly compatible to environmental and climatic conditions. According to the utilized principles and methods, it not only does not impose any destruction and harm on the environment, but also preserving natural resources, lack of environmental pollution, minimum fossil energy consumption and coexistence with natural and climatic conditions through architectural and urbanism measures are on its agenda, which are primary principles of sustainable and modern architecture. Thus, it seems that reviewing this attitude can provide new path in architecture of this land.

Statement of the problem

The study tried to answer the following five questions appropriately

1. What is the role of the material in the stability of historic homes of Ardebil?
2. What is the role of the openings to prevent loss of heat energy?
3. Due to climatic characteristics of Ardebil, how should we construct the facade and buildings orientation to use most of the sun's energy in different seasons?
4. What is the role of culture, customs and traditions of the region of Ardebil in assessing the needs of its residents?
5. What is the effect of form of historic homes in Ardebil on sustainable architecture?





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In the field of research hypotheses, given the issues raised by the research, hypotheses have been formulated as follows:-

Sustainability patterns of historic homes in the city of Ardabil are repeatable.

Patterns of traditional architecture in historic homes in the city of Ardabil is repeatable and adaptable

Research Objectives

The aim of this study is to identify and investigate the concept of sustainable architecture definition and understanding of the local architecture and traditional architecture parameters used in cold and dry climate especially in Ardebil. And finally they achieved to results that today if used proper planning and compliance and provide appropriate design due to patterns, minimal damage is for the environment.

MATERIALS AND METHODS

It is clear that scientific research has one or more appropriate Methods to the subject. Selection of appropriate Methods and its continuation in the direction of study is the strategic principles of scientific research. In this study the Method is analytical- descriptive. Methods and instruments used for study are library and reviewed documents methods. For this purpose, in the theoretical part, library and review written documents is used and in addition to use the references and sources available and discuss their different perspectives and analysis, we considered all aspects of the problem. In the case study based on the data obtained from theoretical studies that have been identified, these indicators have been evaluated. Mainly survey has been done through objective observation. The study was done based on a logical description and analysis methods, to achieve research objectives.

Sustainability literally

According to Dehkhoda encyclopedia the word Sustainability means a durable and lasting. (Dehkhoda Dictionary, 1952: p. 47). In Moein encyclopedia the word sustainable means, the resistance of the Sustainability. The verb Sustain is from the Latin root of sustinere the two components of sus formed from (which means a bottom-up) and Tinere (meant to keep, preserve) and since 1911 has been used in English, the verb is mixed with concepts such as "support and sustain". And sustainable adjective is to describe "situations, state or thing" and is supported or is continuing through livelihood (Asad Ali, Ali, 2006, p. 65).

The definition of sustainable architecture

The definition of sustainable architecture is dating back to the 19th century. John Ruskin, William Morris and Richard Letabiha are the vanguard of sustainable architecture. Ruskin in "seven torches architecture," says the in order to achieve growth and development we can model nature's harmony. The purpose of designing sustainable buildings to reduce damage on the environment in terms of energy and the exploitation of natural resources, including the following rules

Reduce the consumption of non-renewable resources

The development of the natural environment

Remove or reduce the use of toxic or harmful to the environment in the construction industry.





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In general a definition for sustainable architecture is as follows: "Building that has the least inconsistency and incompatibility with the natural environment around them and the wider area with the region and the world. »"Creating man-made environment and its commitment management is based on the principles of ecological compatibility and efficient resource.

These principles include minimizing consumption of non-renewable resources, upgrade and improve the natural environment and minimize ecological damage based on environment". "More balanced relationship between living and architectural environment on the conscious act of architectural interest in the environmental condition is established. »" Sustainable architecture involves a combination of values, aesthetic, environmental, social, political, and moral.

Principles of sustainable architecture

The principles that must be met to a building as sustainable buildings are classified as follows

First principle energyconservation

The second principle coordination with the climate

The third principle reduce the use of new resources

First principle energy conservation

Every building must be designed and constructed in such a way that it requires fossil fuels to a minimum reach. The need to accept this principle in the ages without any doubt with regard to the construction is undeniable and perhaps only because of the immense variety of materials and new technologies in modern times it has been forgotten in buildings.

The second principle coordination with the climate

Buildings should be designed to be able to use the local climate and energy sources. . Shape and location of the building and its interior spaces can be such that improve the level of comfort in the building and yet through proper insulation of buildings, thereby reducing fossil fuel consumption occurring. The processes will inevitably overlapping and abundant common areas.

The third principle reduce the use of new resources

Each building must be designed to minimize the use of new resources at the end of its useful life, create a resource for other structures.

Principle IV The needs of residents

Sustainable architecture respects all people who are living in building. The process of sustainability in architecture, including respect for all shared resources in the construction of a building is complete, does not leave a man of the series. All buildings are made by human beings. . In some structures the human presence is respected. While others try to deny the human dimension in the manufacturing process can be observed.





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The model of sustainable architecture

The buildings are part of the environment and make up a large part of environmental pollution. Sustainable architecture is one of the ideas in the planning and design for the construction of such buildings has been proposed to reduce pollution. In general, there are three main pillars of sustainability defined as follows:

- Improving the quality of life and human health
- Meet the everyday needs of people
- The preservation of ecological systems and energy sources

-The overall objective of sustainable design of a building is through proper utilization of energy and natural resources to reduce the adverse impact of buildings on the environment

Thus, following the model of sustainable architecture can be given:

To minimize the exploitation of non-renewable resources and the use of natural and renewable energy

Improve the quality of the environment and developing the natural environment
Eliminate or minimize pollutants and toxic
Promoting a healthy lifestyle

Wise use of land and buildings fit in with the environment
economically construction by use of efficient alternative technology
Avoid noise pollution and air

Therefore, sustainable architecture will help to create a healthy environment based on the efficiency of resources, conservation of renewable resources, reduce energy consumption and improve environmental quality.

Home

Home is one of the most important topics in our architecture, which is less considered. Unfortunately, this debate has not been studied in architecture schools. At this time need for home is felt so much and with the knowledge of the architecture and match it to modern architecture will meet this need. Word of house that is common now in the past has been referred to the room. Private rooms were called (Vestakh) or Gostakh or Vesaq. Word sara was used instead of the word house in the term today.

Sustainable architectural patterns of traditional houses in Ardebil

building orientation

The traditional buildings of the cold climate, use of natural resources and energy use are one of the principles of spatial organization and construction. For example, surveys show that orientation of historic homes of Ardebil for using optimal solar energy has Esfahani Ron (northwest - southeast). . The orientation of the climate has created conditions so that logically in summer and winter find their place in the design of living spaces. Right orientation, In addition to heating the space prevents entry of bad winds. (Qobadian, 2008: p. 86).





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The thickness of walls

In the Qajar era historic homes in Ardebil region due to the cold climate, the average thickness of the walls were considered between 60 cm to 70 cm which is usually made of clay and brick that due to their high thermal capacity, were considered the most widely used materials in construction materials as most of the houses.

Sink in the soil

Sink in the soil and building spaces in the basement are to use soil heat capacity in different seasons were design techniques in Ardebil's climate. Usually basements are under the hall and into the sun. And part of it a pond is seen with the well and hand pump. This work was because in winter of Ardebil, the pool of water freezes so it will facilitate for household to wash their hand and face and ablutions. . Basement, with a door to the courtyard was concerned, there was also another door to the kitchen in the basement and no one was forced to go through the yard but could go down a few stairs to reach the basement. (Fig. 10 -1) (Safari, 2003: p. 252)

Design of exterior and interior of building

Design of historical buildings of Ardebil that are Exterior and interior (eg home, of Sadeghi, Bashari, Khadem bashi, Eshadi and Shariaty) , usually done in such a way that the relationship between the outer courtyards of the King Street route, is provided to the market or the street and the courtyard has another separate way to street. Usually Gate (the back door or back door alley) connected the courtyard to the back street pass. This relationship, caused if household needed to go outdoors the go through back door and do not use exterior door attached to the king of the streets. In fact, the idea, kept people in the house comfortable and safe in every way because non-confidential lived out. And people of family could go out from another door so that not to meet non-confidential. In general, exterior and interior the building in addition to design of the spaces from the view of winter and summer stay due to the large and small modulus, their implementation were performed according to principles of anti-seismic retrofit. (Safari, 2003: p. 254).

Materials and constructions

Materials used in historic homes, often coordinated with cold climate. The choice of material depends on factors such as easy access to their homes Ardebil, strength and stability required, the employer financial ability, moisture resistance and good thermal capacity. In the construction of Structural elements houses different materials have been used. Materials of building facade wall stone were often plinth, handmade black basalt ax to a height of 2.1 meters and houses which belong to the upper class society were shaped of brick and bricklayer facade in various forms. Internal foundations were adobe and roof buildings in the interior were made of woody bar. In architectural house of Ardabil often a mixture of structural systems such as flat-arched and Kalyl Azeri is seen. And most of the lands in the shahneshin are from couches and usually within the walls horizontal coils with wood Materials are used. (Shk110-2) (Safari, 2003: p. 252).

In the most historic homes Ardabil at least one axis of symmetry can be felt. Existence of the axis of symmetry is fully understood in plan view and the size of the house. Center of symmetry is in the center of the main façade that different event occurs in compare to other façade. Coordinate of building axis of symmetry is evident on different views of the courtyard and in historic homes of Ardabil. And usually form and the posture of historic homes in Ardabil is horseshoe and rectangular. Based on field research carried out, 6/86 of historic homes in Ardabil have an axis of symmetry (Figure 10-3).





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Unity and harmony and diversity

In historic homes in Ardebil, always repeating elements with different sizes and features in common, around the central core create integration and coordination and unity, "total unit". In these houses, courtyard are usually as the core of the introvert view, the discipline of the diversity and the unity in the Inside view and elements of it.

Spatial structure of building

In Ardabil, interiors of houses are in North and South direction. And to protect the room from the cold of winter all windows are made double it means two windows that internal window opens into the room and another window opens to the outside.

Introversion

One of the common historical architectural of houses in Ardebil, is their introversion. Discussion of not working on appearance and instead working on the inside and internal conditions, is also drawn into this field by some professionals in architecture as far as in Iran architecture from the perspective of outside view, and maze passage nothing is seen but adobe and mud But inside, there are a lot of beauties is called introspective (Pirnia, Seventh Edition, 2003). So first of all we to introduce the features of an introverted house and these features are as follows:

The lack of direct visual of inside spaces relationship with outside urban spaces

Having unique spatial organization that elements such as the yard or indoor platforms have played a role in its formation So that pores and the openings are open to these elements.

The effect of window on air flow and sunlight

Formation of houses in cold area is like that they benefit from maximum heat in the winter and minimum heat in the summer. Thus, in the north and south facades, long walls and main opening are located that in order to retain heat in the winter, windows are double glazed. Because of the cold, air flow in the house is not necessary but to guide the sunlight to the North, large sash or windows are placed so that more light enters into the building. So that in these house sash windows and shahneshin are 100% double glazed. (Shkl10-4) (Memarian, 2008: p. 95).

Performance

Performance of houses, depending on their size varies. Yard gas formed Home's distribution and indoors space has provided multi-functional quality of comfort requirements for residents. In architectural of Ardebil houses like most old cities of Iran, depending on the multifunctional quality of different spaces of house, unlike the new architecture, naming parts of the house is based on the type of architectural space such as the vestibule, corridor, hall and Also Ardabil historic homes are often two floors (the basement and ground floor), generally with a flat roof. (Safari, 2003: p. 257).

Mix of spaces and volumes

The combination of different spaces, traditional houses and its Formative is done using the functional components required by traditional architectural concepts and common patterns. Combining elements of the house is achieved based on the exact geometry and applying the principle of introspection and linking all of these elements by creating





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a central courtyard. Placing the main hall and shahneshin and rooms of the house, in the yard and the use of very rich construction techniques in spaces covering of home has created meaning form of volume. (Kateb, 2011: p. 15). Ardabil historic homes are not an exception.

The role of culture and customs

Vernacular architecture of Ardebil was based on the views and values of conscience of Builders were only reflecting the culture and the customs and peoples values of thought in a community and architectural style defined common concepts and values in society. Single view of Traditional architects in building created favorable and homogenous buildings inside and outside as a result of urbanization, made them away and coordinated from the noise. Noble concepts such as discipline, moral values, humanism, God-centered were rooted identity in building unfortunately, at present, according to the same architecture and the use of new materials past values has also been abandoned.

CONCLUSION

In this study characteristics of sustainable architecture in traditional houses in Ardebil were evaluated and in traditional home study, it was found that the optimal use of renewable energy in buildings such as air and sunlight were fully respected... as well as construction were in coordination with regional cold climate and building had the least negative impact on the environment. Research and study building design procedures showed that one of the main goals to minimize energy consumption is the production of building materials and their use in the long term, Proper design and use of materials in different parts of the building, the proper use of double glazed windows And the establishment of appropriate building to the northwest and southeast were the main objectives of sustainable architecture in Ardabil. Thus it can be argued that the emphasis on sustainable architecture and using the tool design and construction practices and making appropriate relationship with the environment and the building the negative impact on the environment can be minimized and by creating a central courtyard (external and internal), meet the social and psychological needs of people like privacy. To keep pace with modern architecture and applications of new energy in building and construction in accordance with the climate you can save energy by using a minimum of fossil fuels and also reduce environmental pollution. In addition to these affairs, use of valuable patterns of vernacular architecture such as northwest and southeast direction of building and the unity and order volume, facade, plan and use of the thick walls and sink in the soil, can be very important and helpful. However, the cases cited as elements, spaces or Climate tricks of traditional houses were only a small sample of the measures used by the ancients of this land.

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Figure -1 use of the basement in house of Sadeghi



Figure 2 houses using brick facade in Sadeghi house in Ardabil





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Figure 3 symmetry view in Abraham Home in Ardabil



Figure -4 double glazing windows of Mojtabeh house in Ardabil





Determine the Physical Stability Indicators - Environmental Design of Residential Complexes (Case Study of Ardabil)

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ABSTRACT

This article expresses the concept of housing and residential properties, with a short overview of sustainability indicators to determine the quality of housing space, especially residential complexes and offering notions of physical stability and its components in the housing, and pay attention to the introduction of the concepts of environmental psychology such as of the nature of the issues - the role of behavioral sciences in the theoretical design - sort of environment – capabilities of built environment and human behavior approach for dealing with the environment, that can have important role for designers. This paper presents the debate about the relationship between human behavior and the physical environment and strategies to achieve sustainable residential spaces to meet the needs of beneficiaries and the importance of recognizing the association for design (especially architecture) to establish a general framework for analyzing the human relationship with the environment. The present study is an attempt to address the principles of sustainable housing design and development of effective criteria that by analyzing the results of field studies and the views of experts and the sample implementation and compliance, some solutions are presented in the design.

Keywords: housing, residential complex, sustainability, human needs, the physical environment.



**Motahare Karimpour and Bahram Gosily****INTRODUCTION**

The increasing population of cities and lack of open areas resulted in city landscape shifted to vertical landscape of complexes and apartments. As cities saturated with apartments and residential complexes and following psychological and critical explorations, designers understood that the vertical growth isn't just matter; innovative and creative designers experience materials and techniques in order to promote from the mere technology to a certain level of the art which meets other human needs including living in the nature. Initial residence in complexes and watching far landscapes and approximately two dimension pictures from behind of windows can be interesting, but getting away from touching animated and non- animated elements of nature, deprivation to smell them, having no walk on the land, seeing no close picture of creatures provokes an enthusiasm which have products including inclination to build and maintain artificial nature like dry and paper flowers, artificial home waterfalls, and even keeping dried animals (taxidermy) (Aimin, Z. C. L., 2012). In this study we tried to determine proper designing strategies in order to connect vertically and horizontally the external and internal landscapes of complex applying strategic planning and identifying Weakness and strength, opportunities and treats in complexes. Having connected the building to environment and indeed connecting external and internal landscapes of residential complexes through environmental and ecological designing would help us to protect the integration of landscape, the visual quality improvement through approaches of spatial and visual continuation, creating dynamic landscapes, connecting human to the nature, improving the environmental quality of complexes (Taleb and Sharples, 2011).

Due to its very diverse limited conditions in different seasons, in Iran, classical architecture has invented reasonable solutions and methods for providing a peaceful life for man. The Iranian classical architects through benefiting from their experience and conditions they were in have strived to approximate the environmental characteristics of buildings as much close as they could. Today's, using modern technologies have added to methods of designing buildings I a way that life without these technologies is hard to ignore. Reusing past methods is pretty impossible and the past lifestyle would be unable to support today's life. However, investigating in this regard seems necessary. It should be mentioned that benefiting from traditional architecture never means a duplication of the past but the logic behind traditional forms must be learned and used (Farifteh, 1987).

In most areas in the world there are regions that identical climate exists, though in spite of similarity some specific local conditions make many big differences, which are critical in architecture and an architect needs to consider them. Therefore, for designing in any region such points must be explored and the designing plan should be prepared that will be in accordance with the local climate. Considering these conditions, specific climate factors like temperature, relative humidity, intensity and rate of annual rainfall, intensity and angle of the sun, are among the most significant factors (Olgay, 1981). Wind speed and temperature in thermal exchange through transfer depends on each other. Continuous flow of air into indoors in contact with human's body causes evaporation of sweat and creates a sensible coolness on the skin surface (Badland and Schofield, 2005).

Lack of air flow in the environment, increases temperature and humidity and brings a stifling environment for the residents and temperature and humidity inside the building maximizes compared to outdoor. Therefore, direction and way the building is founded play a critical role (Moshiri, 1986). The used materials in side walls possess a considerable high thermal capacity and good thermal exchange. The other building elements matters in traditional typology is wind towers that wind contacts them in four directions and direct it into the building. As a result, the warm air is lighter than the outside air and the cold air goes downward and enters the room. Because of repetition of this process, a desired air stream flows that creates a relative comfort zone (Negro and Stafferi, 1984). intersecting points of formation of social capital. Queen observed that when configuration of local maximizes non-verbal communications by residents, rate of crime decreases. Children are under better surveillance and people show more inclination and satisfaction in interaction with their surrounding public environment (Queen, 1992). Also, Sullivan et al. (2004) indicated that presence of green spaces is one of approaches for increase of unofficial communications and



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social happiness in the locals. Moreover, points like architectural designing of landscapes, renovation and improving existing buildings around urban spaces and different urban planning and function, in addition to prevention and decrease of crime will be critical in increase of security of urban spaces. Therefore, environmental designing play an important role in providing safety and public health.

Research questions

What is Theoretical Foundations of housing based on physical principles of sustainability? How is the Relationship of notions of sustainable development and environmental capacity in residential complex? What are the indicators of sustainability in the residential environment? What are Strategies to improve the quality and functionality of residential space to achieve sustainable development? What are housing indicators based on physical sustainability from the perspective of residents?

The importance and necessity of research

The importance of and need for research is due to changes in society and population growth and as a result increased demand for housing and higher density urban construction and shortage of land to build houses, create problems such as rising land prices, The inability of low-income and middle strata of society in the provision of land for housing construction, as well as increasing the diversity of expectations and daily needs of beneficiaries of home spaces, It can somewhat decrease housing demand in the needs of beneficiaries in major cities and with properly design space houses we can use the most out of the minimum levels to give an acceptable respond to such needs. This research aims to investigate integration of the architectural optimization in using on levels and analyze samples of Iran. In the present study has tried by field studies and direct observation of residential complexes in the city of Ardabil and distributing questionnaires among the beneficiaries to compare and evaluated Residents satisfaction of how to design with the favorable situation, so that to provide background quality for sustainable housing.

Theoretical researches**concepts of sustainability and sustainable development**

Today, the term sustainability associated with the term sustainable is widely used in economic development issues, environmental and social. Dehkhoda encyclopedia has meant stability durable and lasting. The concept of sustainability is the present and future needs of the people and the distribution of resources. (Ahmad, 2004). From the perspective of the World Commission on Environment and Development, sustainability is to meet the needs of the present without compromising the ability of future generations to meet their own needs. (Dabydyan, 2003, p. 7). Investigate and explain the principles in architectural design has formed sustainable its basis and will be effective to expand and improve the quality of architectural design as well as the quality of space and responsive to the needs of the beneficiaries. (Chapman, 2007).

sustainable architecture

Sustainable architecture is as part of the proposed stability and sustainable development is a sub-category. Sustainability issues can be studied in two main areas that each provide mentioned goal and in some cases together, will overlap. First the physical stability, works on the stabilization of body of building and energy efficiency materials and strategies to empower the beneficiaries meet the diverse needs of its architectural space deals. Second, non-physical stability will be remembered as "social stability". Architectural design can play an important role in finding solutions for such operations in the architectural space. (Raesi, Abbaszadegan and Habibi, 2007). In Sustainable design we should care about physical stability, socio-economic and environmental impact of energy





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consumption in buildings and cities. So a good and decent home for social cohesion and personal well-being and independence is a fundamental need. No society can achieve sustainable development if the building process won't be stable. (Lang, 1383: page 91). Home is origin and destination of human life. People get out of it for work and social activities and after doing it and experiences return home. Home is where that we after experiencing the different aspects of the world, we go back to it. Home is so important to one that it can be called center of one's world (Norberg-Schulz, 2002).

nature of design problems

Designing spaces, buildings, construction sets and urban areas are heavy-duties. Because the spectrum of human activities and aesthetic needs are so vast that understanding of how responsive environment forms is difficult. Issues must be accurately known and best solution should be developed for a specific search. In most environments the needs of users and groups of stakeholders should be met simultaneously. These needs can hardly be recognized. Many needs are sorely unconscious. People are not able to categorize them properly. Design environment problem occurs when that there is a difference between composition of the current environment and composition that meet needs of individuals and groups. Creating an environment that will enhance human perception is the noblest goals of the design. . (Lang, 2004: page 26).

role of Behavioral Sciences in Theory of design

Behavioral sciences have roles in formulating the theoretical design from a variety of ways. These include: (1) theories and models, to understand the design process and the relationship between people and provides the physical environment, (2) research methods. (Haman., 2004: page 26).

various environmental categories

- 1- Physical (potential - potential)
2. Social
3. Psychological
4. behavior.

Built environment

Built environment is part of cultural, geographical or land environment. Architecture Environment is formed of the surfaces of materials with mixed color - texture - light and different degrees of transparency and the spaces between them. And these factors are essential design criteria. Environment is a set the adaptability the human makes between geographical and cultural environments. With a change in the built environment possibility of changing in abilities is created in the world. To provide new activities and new experiences by providing better aesthetic activities environment condition also changes. The cause of these changes is respond better to the geographical Environment, living - cultural to humanitarian purposes. (Haman., 2004: page 93).

Built environment and human behavior

About the relationship between the environment and human behavior four positions are detectable theoretically.

- Optional approach: that believe the Environment has no effect on human behavior



**Motahare Karimpour and Bahram Gosily****Ability-oriented approach:**

Ability-oriented knows environment as to provide human behavior more than it knows.

Algebraic approach: Algebraic body is that human behavior is determined by the nature of the geographical environment used by him. (Haman., 2004: page 78). In This study among the architectural approach, Ability-oriented has been based of work. The intersection of other approaches of architecture is paying attention to the face and body, although sometimes more qualitative issues are paid as well. In Ability-oriented approach, the researcher first familiar contact with the environment and space users of physical spaces and then introduces and analyzes the architecture. To achieve the desired results in a social perspective, the researcher utilizes existing methods in the social sciences to enter his own society and with specific tools will evaluate the environment's behavior and their relationships.

Environment capabilities

The psychological theory proposed in 1979 by the name of James Gysbnv that said: capabilities of anything, whether material or immaterial, are part of that thing that makes it usable for special being or a member of a species. Gibson had the desired physical configuration of an object or a place behavior that makes it usable for certain activities. Some demands are meet easier from other requirements by an object or the ground - alive or cultural environment. Some of the activities in the particular configuration of the built environment will meet the needs of some people, and do not meet others needs. The important thing is that Environment capabilities of a good - or bad thing are something that environment suggests with its configuration features and materials. Notion of capability in spite of simple meaning has strong conceptual and basic design environment theory. Different patterns of built environment have the ability to provide the behavior and different aesthetic experiences. Therefore capabilities built environment limited or expand, behavior and aesthetic choices, depending on the configuration of environment. People change the natural and artificial environment to transform and change ability and continue (Haman., 2004: page 91).

Concept of residence

Home and its architecture, as the most pervasive, yet most exclusive space in human life, has been considerable for everyone always in ideas, creating and manufacturing. Residence and comfort is one of the basic needs of humanity and of the first things that people always try to find a decent answer to it. Housing must be a place for comfort of residents in objective and subjective dimensions, and in fact a place where body and soul in comfort (Ghaemal, 1996, page 25). Norberg-Schultz views "residence represents a meaningful link between humans and the given environment. This link is originated from trying to find an identity, a sense of belonging to a place. Thus, when a person is aware of the settled and, therefore, its existence is recorded in the world." (Falihat, 2006: page 59). Design houses in its wake have many of the values and concepts associated with cultural influences. In English, there are two words in relation to home. The word «House» which means residence and «Home» has a personal concept. The word housing and residence is synonymous with Accommodation controversy and relax. Although the definition of home is shelter, but at there are factors that the value of human will be manifested there (granted, 1386, page 125). In Sura Nahl, verse 80 we read: "God for your residence gave you home to find peace." Martin Heidegger with qualitative approach believes that the real crisis is not the lack of housing but the real crisis is search of a man for residency (Brig. Gen., 2004: page 40).

Definition of housing

At the second meeting of human settlement in 1996, which was held in Istanbul affordable housing is defined as follows: "Adequate shelter does not mean just a roof over one's head but a suitable the shelter is proper,





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environment, physical access and good security, property security, stability and durability of structures. Lighting, ventilation, heating adequate basic infrastructure such as suitable water supply, health, education, waste disposal, environmental quality of suitable health, suitable and accessible location with regard to work and basic facilities to all will be provided with respect to affordability of people. "House is established as an architectural body in our identity and gives us security.

Types of social housing

Social housing is a specific type of apartment units with a common courtyard and open space and can enjoy the benefits of a semi-private home. In this type of housing can bring more variety and diversity in the field while providing facilities and open green space and parking in the area are equipped. A residential block with linear chain B: individual residential block C: multiple fin block D: residential block with internal courtyard E: a combination of residential blocks F: Miscellaneous residential block. (Zonouzi and Shepherd, 1995).

Housing at least

In the least housing there always has been discussed at low-income households and the type of housing available to them. The quantity has been mentioned before, but the quality is superior today, the least energy (water, electricity, gas, etc.) is wasted, the area is not high, maximum utilization is done and has maximum quality. (Ahari, Z., 1991, page 4).

Space quality

Observations of created spaces in Western countries have shown that necessarily paying attention to body does not create a good space. In order to make a good space to be considered as good Environment it is needed that space respond to the needs of the human. Maslow's hierarchy of human needs theory is the most complete in dealing with this issue, and most people behave according to the Maslow's hierarchy of needs. In translation for classification of Maslow's needs to design we approached Table 1.

Maslow acknowledges that many of the requirements are related to the built environment so that some of needs are based on physiological and psychosocial or combination of these factors. But in addition to meet the needs of humans in space, their rights must also be addressed in the control of space. One of the requirements of having good atmosphere is meaning and connection with people and these elements are known as readability of space. In the physical part Quality space can be examined. Spatial qualities are qualities of the topological space. Meaning that quality of space does not dependent on the geometry of space but the depends on the relationship that results from the geometric relationships. Such as the proximity of the elements, order, the separation, inscribed disruption and continuity. They are also considered in the layout of space and as noted earlier on the basis of is due to spaces communicate with each other. (Raesi, Abbaszadegan and Habibi, 2007).

MATERIALS AND METHODS

The study was descriptive, analytic survey that is collected by referring to reliable sources, publications and reference libraries, materials for the research topic and necessary comparison was carried out. And through observation and field studies and interviews, existing portfolio were examined and opinions of beneficiaries living in residential complexes of selected samples were analyzed by software Spss.





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RESULTS

Extracting stability factors in promoting quality of housing space

Flexibility

The idea of the flexible design of residential units from the beginning of the 20th century were made as part of the Modern Movement by architects such as Le Corbusie, Mies Vndrrvhh and Habrakn and burgers The idea of developments in technology that makes isolation of fixed structures from its elements possible, With the current methods and approaches such as folding furniture, furniture moving, overlap of functional spaces in internal composition of building were also provided. For designers there will be a tend to create space in the building for each of types of activities. Dedication often makes the pursuit of other activities in specialized space difficult; Users use of space should be able to modify it according to their needs so that its activities become easier. The concept from the view of psychologists called adaptation. Lang explains that when the Environment is suitable, it must change to answer it. If the Environment does not adapt to the activities of users it won't be used and the environment eventually becomes obsolete. Flexibility can be considered both micro and macro scale. Flexibility in the macro scale is the ability to change the use of the building as a whole unit or parts of the building. This kind of flexibility can enhance user's choice in the long run. . With increasing age of the building and lower their cost of funding, in order to accommodate more types of uses they become more considered. Flexibility of small scale will be considered the ability of certain spaces within the buildings in the order that can be treated using a wide range of practices. The scale of the Flexibility is compatible with lives mechanisms of mainly with the vast majority of ordinary users. The issue directly affects environmental quality and a choice of daily activities of majority of people. Therefore, they are very important and essential. Flexibility of macro scale, because it will deal with major changes to the user, blends with the requirements of the overall building and, therefore it should be paid attention to the first steps of designing should. Flexibility of small scale will conflict with smaller decisions, so it is vital for users and can be examined later in the final stages. . (Haman., 2007)

Forms of Flexibility of

The species flexibility is defined as diversity of (multi-functional space), versatile (seasonal and daily movement) and variability (segregation and aggregation).

Diversity (multi-functional space)

Diversity is the ability to provide a variety of different uses of space. Such flexibility deals with space and time variables. Space for multi-function units can simultaneously be used for different functions at different times.

Adaptation (seasonal and daily movement)

Adaptation is the ability to adapt to the new conditions of a space. In practice, it includes the implementation of all internal changes, such as changes in personality and the structure and composition of spaces and the elements small. In planning new residential complexes, the most effective way to achieve adaptability, is not being of internal components constant and the possibility of combining various together. For example, when the kitchen and service are considered fixed input, the remaining space can be adapted to other functions. The map of the traditional housing in Iran, due to following facades and public spaces of the house of a pattern formation and construction of fixed spaces daily and seasonally adjusted by adjusting the horizontal and vertical relations of Home, use of different areas at different times of day and in different seasons has been possible. Since the summer and winter stay, basement,



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balcony and roof of the house provides to conform to the different conditions of life. The flexibility institutor in the scale is the yard, central element of house.

Variability (segregation and aggregation)

The housing design flexibility, is called the ability to increase or decrease quantity or separation and aggregation areas and to return to the original plan to expand or reduce the area. In this case, flexibility means the ability to respond to the growing family at various stages of life. In other words this ability will make it possible to change the size of residential units in the smaller or larger. The concept of variability will be connected with changes in infrastructure, space needs, and the residential units. The variability is achievable both by adding to existing infrastructure home, and with spaces separating it (without the area). (SAREMI and Radmard, 1997: pages 53-68).

Flexible Housing

Flexibility In general terms is defined, the ability to bend, flexibility, sensitive not to modify or change a ready capacity to adapt to different purposes or conditions, freedom from stiffness or rigidity. One of the basic principles of designing flexible is avoiding the inflexibility. (Schneider & Till, 2005: 287)). This should be considered in two aspects: the number of spaces and places for social and cultural growth and meet the relevant requirements. Hence, first quantity of spaces that can meet the needs of the spiritual and social growth be investigated. In other words, spaces that are flexible (Habibi et al., 67: 82) flexible structures sought to respond to the changing conditions of use, performance, or place. The need for flexibility and adaptation to new conditions, not only originates from desirable and possible conditions, but also from the economy (Parent et al., 89: 6). The solutions expected to understand the relationship between needs and standard requirements, are the use of public participation and opinions of beneficiaries in the planning and design process. Public participation in this process will increase to accommodate their housing needs, and public satisfaction for housing rises. Providing changing ability and ability to accommodate space with needs and the living space according to the personal taste are the characteristics of an ideal home. Flexible housing is defined as housing for the user, that provides socio-economic stability through the life of the building. (Objective process, 82: Page 65).

Flexible approaches to at least housing

The main purpose of downsizing and mass housing, savings in materials, manpower, cost, space and urban services. In order to achieve this objective, one of the important indicators of housing is marginalized and lack of attention to them cause problems in the operation time of the houses Such as ignoring the architectural design of houses and the consequences of the reduction of the size mentioned. Reducing the net area of residential spaces is possible in two ways: considering the minimum area required for an application or delete a space. Remove means to remove a function of space or integration with other functions Since the space for other functions has been predicted, and therefore the problem of provide enough space to meet the minimum needs of users come up that resulting in a lack of physical and psychological welfare of the residents in these areas. Since at least housing, possibility of providing more space is not available for different functions; to increase the welfare of the inhabitants there should be appropriate solutions in order to make optimal use of existing spaces indoors. That provides a comprehensive response to the different needs of residents in the limited space. Flexibility is one of including options that can cause maximum efficiency by collision of multi-dimensional spaces with minimum spaces. A necessary prerequisite for the flexible space is using a multi functional; for this purpose same spaces must be classified and time limit should be identified for their use. With this action spaces behavior in specific time periods during the day was marked and the possibility to take advantage of them for same performance arises during non-interference functions. (Nikravan Monfared and Arfaei: 2004: 81).





CONCLUSION

To achieve physical stability factors in the design of residential complexes in the city of Ardabil, 6 residential complexes comprising a population of 170 randomly with 20 percent sample size was used. A closed questionnaire included 26 questions were prepared and provided to residents. After obtaining the opinion of population, data analysis was done in spss software. Reliability of test is according to Cronbach's alpha coefficient 876 /.

Determine the fine Factor

Questions were classified based on correlation and linear regression. Then the 5 factors affecting the sustainability of the social and physical sustainability was extracted from the perspective of residents. The parameters of each of the factors are listed in Exhibit 1 to 5.

The names chosen for agents

In this step for each factor corresponding with operating parameters an architecture title was selected. The first factor: the tangible, the second factor reliability, the third factor responsiveness, the fourth factor assurance and the fifth factor was named empathy.

Explain the factors that affect the physical and social sustainability in the design of residential complex

The tangible

Including factors that have specific aspects and are considered as the first factor of the assessment. It seems that the residents evaluate quality of a home based on decoration and equipment. For other evaluation criteria we can mention appropriate and proper design of residential areas.

Reliability

To assess the quality reliability, we can mention criteria such as resistance of house to disaster (Earthquake Bad-floods), animal attack and insects, the quality of materials used and so on.

Responsiveness

To assess the responsiveness we can mention the assessment criteria, such as social and cultural needs, psychological needs, and easy access to the required facilities and so on.

Assurance

For evaluation criteria of these factors we can mention to feel safe at home, feeling the heat and comfort, harmony with regional climate and housing structure's safety.

Empathy

To assess empathy we can mention criteria such as social empathy in the neighborhood, sense of belonging to place, relationships and interaction with neighbors and so on.





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Statistical analysis of the factors affecting the physical and social stability

The data from the survey of experts were analyzed. Inferential statistics has been made through correlation and linear regression with spss software. The effectiveness of factor from the perspective of statistical population in each compound separately is presented in Tables 2 to 6.

Housing quality gap

SERVQUAL model is a function of the challenge between expectations and performance and the purpose of this method is to identify and fix design flaws that can be done through the assessment. The main objective in the quality of housing is to reduce the gaps as possible. Therefore, designers should eliminate these gaps, or reduce it. The gap between expectations and performance are the most important challenge in the quality of housing and accommodate all five divisions in itself. The results of this study show that the overall quality of residential complexes in this study, especially the housing Mehr is less than the usual expectations. As Figure 6 shows, there is a significant difference between the expectations and performance of housing. The findings show that between expectations and performance in relation to each of five dimensions there is a significant difference indicating lack of satisfaction with the quality of housing. As we can see, the biggest gap is in the assurance dimension and lowest is in the empathy dimension. In Figure 7 expect performance gap is shown in each of five dimensions of housing quality.

Sustainability in architecture can be divided into two categories according to dealing subject. Physical stability, which is also referred to as climate stability and non-physical stability which here is called "social stability" studies to improve the quality and sustainability of the mentioned events in the architecture body. sustainable design can Socially be defined as follows: Designing a space to be suitable within the culture, attitudes and way of human life. And the life which includes these elements be able to be present for a longer period. According to the definition provided, for achieving space sustainability we can utilize three axes in designing. Consistency of physical and behavior patterns, raising quality space and making space flexible. Of the most efficient ways to find the connection between the physical patterns and the impact of these two models are used, is the method of "space layout" Which will help can to study the connection of current patterns and to test the efficiency of the proposed project prior to implementation. To enhance the quality of space, it will also increase the quality of life that it will contribute to sustainable space. Access to good quality space, requires in addition to considering physical items, human dimensions also need to be addressed. To increase the scope of the sustainability space, space flexible solution can be used. Thus one would expect mentioned atmosphere to be able to respond to behavior patterns changes in the future.

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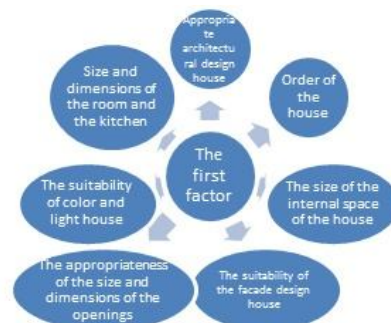


Figure 1: The first parameter (the author)





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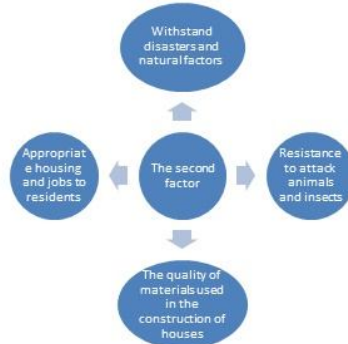


Figure 2: The second operating parameter (the author)



Figure 3: The third operating parameter (the author)



Figure 4: The fourth factor parameters (the author)





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Figure 5: The fifth operating parameters (the author)

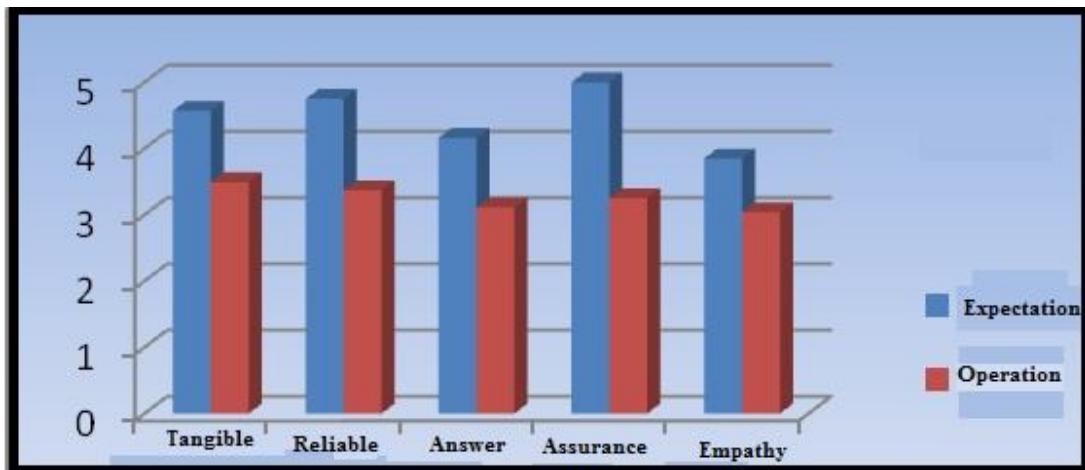


Figure 6: expect performance gap in each of five quality dimensions (source, author)

Table 1: Return Maslow design

Need Physiology	Haven
Takes security	Physical and psychological security
Attachment	A symbol of environmental activism
Self-actualization	Freedom of choice
The need for beauty	Beautification official





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Table 2: Results of tangible dimension in six studying complexes (source, author)

Too little	Low	Average	High	Too much	Question
21/25	30/16	29/1	15/83	3/75	Beast
26/91	30/41	20/32	18/32	8/33	Workers
9/75	27/65	10/7	32/26	20/31	Nir
11/88	20/98	14/17	30/46	19/03	Nastaran
6/11	25	15/9	43/9	10/01	Aftab
14/8	26/18	28/12	20/46	10/56	farhangyan

Table 3: Results of reliability dimension in six studying complexes (source, author)

Too little	Low	Average	High	Too much	Question
25/41	30/25	16/23	10	2/5	Beast
29/32	24/37	23/11	10/37	12/5	Workers
28/39	18/63	21/53	10/7	20/57	Nir
18/47	15	30/05	26/3	10/25	Nastaran
15/85	25	27/8	20/5	11/67	Aftab
23/15	34/36	15/62	20/52	6/7	farhangyan

Table 4: Results of responsiveness dimension in six studying complexes (source, author)

Too little	Low	Average	High	Too much	Question
33/75	36/25	16/87	10/87	4/16	Beast
48/05	28/12	25/1	20/62	16/87	Workers
4/87	23/15	28	23/2	20/75	Nir
5/95	19/62	25/2	20/07	25/37	Nastaran
10	20	20	26/7	23/3	Aftab
14/65	19/42	24/15	20	16/85	farhangyan

Table 5: Results of security dimension in six studying complexes (source, author)

Too little	Low	Average	High	Too much	Question
45/5	20	28	4/5	5	Beast
32/5	33/5	17	13	6/66	Workers
6/34	20/86	25/80	26/84	20/98	Nir
11/92	24/17	23/16	20/02	20/96	Nastaran
14/68	30/34	11/34	28	16	Aftab
19/52	36/1	30	12/18	12/22	farhangyan





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Table 6: Results of security dimension in six studying complexes (source, author)

Too little	Low	Average	High	Too much	Question
39/5	27	20	12/5	1	Beast
22	26/5	24/5	12/5	14	Workers
11/72	20/05	24/88	27/06	16/34	Nir
15/63	20/72	25/72	27/12	11/44	Nastaran
12/52	38/6	15/14	16/34	15	Aftab
23/02	19/52	20/16	21/26	16/12	farhangyan

Note :This article is extracted from a Master's thesis is Motahare Karimpour, Entitled "designed residential complex in the city of Ardabil with approach of optimum use of space" under the guidance of doctor Bahram sent in March 2014 at the Islamic Azad University of Ardabil Research offered and accepted.





RESEARCH ARTICLE

Gentrification of the Historic Urban Context an Approach toward Urban Sustainable Development: A Case Study in Ardabil, Iran

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ABSTRACT

The present paper is a case study on one of the old areas in the city of Ardabil with an approach of gentrification model to gentrify and rehabilitate the old urban context. Besides the library studies, this study includes local observations and questionnaires which deal with the opinions of residents on the problems and shortcomings. It also includes the ways of satisfying the residents to keep on living in the area. In this regard, the reason for main residents' decision to move away is studied through three specifications of old context (size of segments, quality of buildings and availability) in the first part of model based on an external map named real estate desirability in every part of the area, while the residents' tendency to move away is studied and analyzed through specified scales which have been given weights for each part. At the end, the state of area is observed in terms of gentrification and real estate desirability for the residents in order to specify the results by combining two output maps of each part of model (estate desirability map and the map of main residents' tendency to move away) in GIS and analyzing them with the application, then the results are acquired and some approaches are presented.

Key words: Gentrification, Cooperation, Rehabilitation of Old Context



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INTRODUCTION

The role of people is getting more and more significant in social and urban affairs, and it is now publicly accepted that people have the right to determine their own destiny as the human rights state. Urbanism is one of the important aspects of life in nowadays societies. The role of people has seriously been pointed out in urbanism since almost four decades ago. It has also been accepted in many countries, especially the developed ones (Alavitabar, 2000;14).

In our country, public cooperation has not been taken much seriously since urban development came into view, and urban plans were made without public cooperation. But with the emergence of civil society and in the current circumstances of our society in which public cooperation is discussed in social, cultural, economic, and political fields, it is undeniably necessary to analyze public cooperation in urbanism and to study main residents' tendency to continue living in the area. Therefore, it is essential to recognize social, cultural, economic, and environmental factors influencing the extent, type and level of public cooperation and also main residents' tendency to stay by applying public cooperation in urban affairs. As a result, it is specified that what trends a society which is supposed to take part in the urban planning has toward participation in urbanism and how its evaluation of cooperation should be in order to impose gentrification on the old context to prevent this invaluable legacy of the past turn into devastated context and finally to avoid its destruction.

In this regard, various theories have been tried out in different countries. Some of the main instances are economic planning theory (the relationship between the quality and availability of land and its applicability), real estate lifecycle theory and rent gap theory (analysis of investment and lack of investment in real estate) (Smith, 2008, Sciencedirect), residential localization theory (analysis of urban re-localization with family activities system), theories by Lewis Mumford, Kevin Lynch, and the theory of gentrification of old urban context (Habibi, Maghsoodi, 2002; 68)

Gentrification Theory

The main theory hypothesis is on the basis that the more capital is driven toward the suburbs, the lesser opportunities are provided for investment in urban areas; therefore, building maintenance expenses goes up, so the buildings will finally be deserted (Rahnama, 2009; 86). Apart from housing improvement and residential environment facilitation, gentrification refers to changes in the formation of area units and displacement of low-income groups with high-income ones. It means the re-localization of middle class in older urban area units. This action is called areare-station which is contrary to migration patterns from urban areas to the suburbs (Rahnama, 2009; 183).

Gentrification theory argues that western cities' area units near Central Business District (CBD) are populated with the working class, low-income groups, especially immigrants, and indigenous sedentary seniors due to dense population, exhaustion, unfavorable environment, redlining, private sector's unwillingness for investment, pollution, and so forth (Rahnama, 2009; 95). A Perspective Consistent with Renovation and Gentrification

Cities which were built by people brick by brick over centuries have civic and cultural value undoubtedly. They cannot be demolished by order while people are mere spectators. The ultimate objective of renovation plans is to satisfy people, and these plans are basically designed for their welfare. Therefore, their participation should be drawn with some strategies. Although people consider participation as their presence and intervention in determining their economic, social, political, and cultural destiny, different definitions could be presented in relation with the type of participation. If it means that people help the affairs which the government decides and does all alone, a certain definition of participation is thought of. But if it means that people are convinced to do the affairs which are accepted by both the government and people, the purpose of participation is different. If it means that people dismiss their ownership and give it to the government (so that it does whatever it desires), another definition can be considered. So





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it is clear that people are expected in certain ways in each city or district, and participation means their cooperation with local projects of interest(www.udro.org.ir)

Gentrification Model

Social sciences studies are challenged by a dichotomy between the individual and people. They should be well recognized in order to overcome environmental problems, case study challenges, and also difficulties in top-down or bottom-up adjustment.

The tool existing in the model can be useful to overcome some difficulties. Automation (model) has been successfully used to model a wide range of complex urban phenomena. Urban development, changes in land use, pedestrian dynamics, residential mobility, social and spatial segregation, traffic, and other problems are discussed by using the formulas presented in this model. In this research, the model is useful in bottom-up mode due to adaptability of complex adaptive systems.

Given the objectives, a model is made to gentrify downtown in accordance with the basic theory, and it studies the supply and demand of residents.

The structure of model is made up of types of entities, attributes and nesting.
Three major characteristics are considered for locational and behavioral analysis.
Market, Properties, and Assets
Capability, Assets, and Properties
Fixed Lands (Access Path and Access Point)

Two types of fixed lands are considered: roads and access points which are used to introduce influence and access to sites in residents' behaviors. Four access points have been considered: downtown, highway (input/output), mall, and grocery store.

At any point in time, some simulation processes are important. Some of them are the decisions made by current residents to move away or stay in site; influx of new residents to the area; housing selection; and updating variables of state (area).

Decision to Move away: According to this event, the current urban residents and the probability that they move away is studied. This event is the motivation for future movement dynamics.

Influx of New Residents: This process introduces new residents to urban context as the consumers of properties. They were previously stationed at the time of moving in and should be currently searching the market for housing (They should resolve the problem after moving in.). This search is successful if it is added to the current population to probably move current residents.

The search for private housing begins when the current resident who is willing to move away or the newcomer family that is a beneficiary of the market decides to search for real estate (Paul, Atsushi, 2007, Elsvier).

Real Estate Behavior

Real estate doesn't show any common type of behavior. Real estate owners do not put themselves in the market to move about. People propose to them for sale or transfer. Real estate dynamics is a minor result of population growth,





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consumption, evaluation and its values. Each behavior toward real estate is a reflection of human activity, and real estate is an agent for this activity. The activity within and around real estate is indicated in the model by considering the relationship between families and real estate in desirability mode. In summary, the exhaustion value of real estate is considered as a packet of its characteristics. For example, real estate accessibility can be a factor for location selection. The characteristics values determine the tendency toward desirability. Price or value pertaining to housing is determined by families in real life situation (Paul, Atsushi, 2007, Elsevier).

Model Formulation

Desirability Evaluation

A value is attributed to each unit in this stage, and it is used in a model named desirability evaluation. In this stage which is calculated through the following formula, three indices are considered for exhausted context. Each segment is valued by these three indices in order to see if the segments of this stage have high values or how much value they have in terms of exhaustion or non-exhaustion.

Variable states range from 0 to 1. Through the following formula, they turn into something between 0 and 1 from real value.

$$\frac{V_i - V_{\min}}{V_{\max} - V_{\min}}$$

V_i is the state value for state i .

V_{\min} is the minimum real value.

V_{\max} is the maximum real value.

These three indices are the size of segments, segments access, and the quality or age of buildings. There is one attribute for each index, and there is one value which is special for that attribute and segment. The value of each attribute is calculated through the above-mentioned formula.

Finally, the score of each attribute is multiplied by its value, and the sum of scores for these indices of each estate is its final score and value.

$$P_j = C + \sum_{k=1}^n V_k Q_k \quad (ii)$$

The Tendency to Move

The tendency to move is a main behavioral part of the model. Its probability is based on endogenous factors (dynamically based on cycle transmission) and exogenous ones in the model. They follow Clark's model in basic theory and Mac Fowden's model in characteristics method. The tendency to move and the probability that families move away are studied in this stage of model. The probability that a family leaves its residence is calculated through the following formula.





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$$P_{Lij} = 1 - P_{Cij} \tag{iii}$$

Nesting Space Selection

The space selection is formulated as follows:

$$P_{Cij} = \sum (b_{HE} \cdot H_E) + \sum (b_{NE} \cdot N_E) \tag{iv}$$

Pbcij is the probability that the family i selects estate j.

bHE is the estate weight.

bNE is the market weight.

HE is a set of estate characteristics.

NE is a set of market characteristics.

$$\begin{aligned} \sum (b_{HE} \cdot H_E) = & b_1(1 - |P_{ij} - E_{Si}|) + b_2(H_{Tsj} \cdot R_{PTSi} + H_{TCj} \cdot R_{PTCi}) \\ & + b_3(1 - |P_{Sj} - R_{PSi}|) + b_4 \sum (A_j \cdot R_{PAi}) \end{aligned} \tag{v}$$

$$\sum_1^6 b_m = 1.$$

The weights are explained in this way:

Coefficients for estate value proportion (b1), supremacy of estate type (b2), supremacy of estate size (b3), access priority (b4), area's economy in comparison with markets (b5), and areas'ethnics (b6).

$$\sum (b_{NE} \cdot N_E) = b_5(1 - |E_{SMj} - E_{Si}|) + b_6 \cdot E_{Ri} \tag{vii}$$

Pvi includes estate economy and characteristics.Esi includes the economic characteristics of family.Htsj is an artificial variable for the house.Htcj is an artificial variable for the house.Rptsi is the preferences of house size.Rptci is an artificial variable for the extent of participation and joint ownership.Psj is the size of estates.Rpsi is the preferences of house size.

In the next case in which area accessibility is investigated, the access to four points is targeted: access to downtown, access to the mall, access to the highway, and access to grocery stores.





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The accessibility formula which is of coefficient (b4) is defined as follows:

$$\sum (A_j \cdot R_{PA_j}) = (A_{DT_j} \cdot R_{PADT_j} + A_{HW_j} \cdot R_{PADHW_j} + A_{M_j} \cdot R_{PAM_j} + A_{G_j} \cdot R_{PAG_j}),$$

where $\sum R_{PA_j} = 1$ (vi)

ADTJ considers the access to downtown. AHWJ considers the nearest input/output to the highway. AMJ indicates the nearest mall. AGJ considers the nearest grocery store (Paul, Atsushi; 2007, Elsevier).

Map for Tendency to Move (Calculation of Values)

Case Study

The area of Ooch-Dokan is one of the six oldest areas in Ardebil. Some important and famous historical buildings including many old and historical houses of Ardebil are located in this area. The area of Ooch-Dokan has always been significant due to being near the Friday Market and the mosque and having influential individuals and social figures both in the past and now. It might be noteworthy to say that there were six main areas in Ardebil, and other areas were considered to be their environs. This classification is still accepted and applicable in doyen urban management system, and the area of Ooch-Dokan was one of the six main areas in Ardebil (Safari, 1994; 85).

Area Accesses

Due to having an old and traditional context, the area of Ooch-Dokan has winding access tracks and passages which are extended from four sides and connected to main and significant parts of the city like passages of Sartip-Abad Alley, Kabood Mosque, and so forth. Being extended from 2 meters or more, the width of these passages is not the same in different areas.

Given the applied model, people's tendency to move away has been specified. It fluctuates between 20% and 65%. This range has been divided into 4 equal segments with a distance of 10 in between, and it is observed that the biggest number of people who left the area was between 35% and 45%. Only 4 segments had the willingness of 55% to 65% to move away. 3 segments out of them are deserted buildings, and the respective questionnaires were provided somewhere else. The sons who are now the owners would be asked to fill out the questionnaire, in case the main owners were dead. The desirability evaluation has also been specified in this model. The combination of these two maps in GIS has shown us that most people who have more than 40% of tendency to leave are evaluated with a desirability evaluation of 35% to 45%. Since the indices we have chosen for evaluation are the same as the indices of context exhaustion, it can be concluded that families who live in the houses which are not in a very bad condition or both their accessibility and their segmentation along with quality are problematic are not very willing to move away. The only number of tendencies to move away which are over 40% can be found between 35% and 45% of desirability which is considered to be a moderate state, and their problems should be resolved so soon in order to prevent them from moving away in the future. The number of them is higher than that of other tendencies because the desirability of their current units is decreased by improving their economic states, a fact which causes them to move away.





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CONCLUSION

As it was mentioned in the beginning, this paper aims to introduce a model by which some approaches are presented for gentrification and rehabilitation of the old context. The results indicate that the requirements of people should be discussed with their participation. The problems should be resolved by using their suggestions so that the necessary circumstances are sorted out for them to continue their stay. Also, combining the desirability map with the map of tendency to move in GIS and analyzing the questionnaire, we have acquired some results showing that most residents of the area are deciding to move away; as a matter of fact, that people with high tendency have already left their residence. Other results are as follows.

Estates are mostly placed in mediocre desirability rankings.

Most segments are highly-intended to move away.

Most residents are not satisfied with public transportation accessibility.

The most important cause of people's dissatisfaction which hinders building is height restriction in construction.

Using the historical buildings of this area for applications which people want to transform there (like library, artistic creations foundation, traditional restaurant).

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Investigating the Effects of Urban Development on the Hydrological Behavior using HEC-HMS Model and Techniques of GIS (Case Study: Watershed of Ardabil)

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ABSTRACT

Changing land use in the watershed is one of the main factors in regime change in the flood basin. Urban development causes land use change and lead to an increase in impervious surfaces due to increased residential areas, and ultimately the flood. In this study, the combination of geographic information system (GIS) and hydrological model HEC-HMS, and impacts of development of Ardabil city on the hydrological behavior of the basin, is investigated. To this end, first the comprehensive information on watershed Ardabil, including land use, vegetation cover, soil hydrologic group information of rainfall flood hydrograph and physical characteristics of the basin, was collected and relevant maps have been prepared. Then, using maps of land use, vegetation and soil, maps of curve number (CN) of 74-80 years, 80-86 and 86-92 is extracted in the software Arc GIS. Using HEC-HMS software, basin hydrological model also for the city of Ardabil, has been implemented. The results suggest that the hydrological behavior of Ardabil basin, with the development of the city during the years of 74-80, 80-86 and 86-92, had significant changes in the level of 95% that its cause were, in addition to an increase in area, an increase in impermeable surfaces in the construction of residential, office, commercial and services on the one hand and increasing the level of covered streets and major and minor alleys on the other hand. In other words, increasing trend in urban flooding, due to the lack of significant





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changes in the amount and intensity of rainfall, is a function of changes in the permeability with loss of green space in the area because of land use change which show increasing trend of urban flood with the expansion of cities.

Key words: urban development, flood management, HEC-HMS, watershed of Ardabil, GIS

INTRODUCTION

One of the main factors in the torrential regime change in catchment areas, is Changing land use in the watershed. Land use changes, have significant impact on the quantity and quality of runoff from the catchment areas (Roghani et al, 2003). In urban watersheds, on smooth, impervious surfaces that are made by humans, high-speed flooding occurs; therefore, getting a city mode of natural catchment areas, have a negative impact on performance and the increase in volume and intensity of watershed runoff and cause flood the downstream regions (Borumand Nasab, 1381). In parallel with the development of cities, impermeable surfaces such as roofs, streets, sidewalks, parking lots and runways, replacing the natural and permeable land And precipitations which have been influential in the soil and cause vegetation growth, because of the expansion of impermeable surfaces, changed into urban floods, causing damage to buildings and facilities and Water logging in city pathways (Jens and McPherson, 1964). Blocking or redirecting streams without regard to principles of geomorphological at the intersection of the main and secondary streets with less width and height leads to water rejection (Giorgio Kamvrany et al., 2005). Based on previous research, we also can include Khalighi that in year (2004) evaluated the effect of land use change on hydrologic characteristics of surface waters, In West of Azerbaijan province in BarandozChay basin by using model number curve to change rainfall to runoff and change Masyngam in HEC-HMS software for routing After modeling process, calibration and Validation, to simulate the behavior of the basin hydrological modeling system was used. The results show that the because of the change occurred in the studied basins, flood peak flow increased more than of the flood volume and time focus and latency time reduced to the peak. Motiee in the year (1388) with research in the field of hydrological parameters with HEC-HMS model based on land use changes increased urban growth and development, and impermeable surfaces. In this regard, Karim Khodae et al (2010) using HEC-HMS software investigated the effects of land use changes on flood hydrograph and concluded that the by land use changes and increase in impervious surface, the flooding in the region has increased. On this basis Maryam Ashoori et al. (2007), in a study carried out in the catchment area of Darabad in Tehran By with assessment of satellite images of the area before and after of urban development, they calculated the amount and type of land use changes in the watershed and soil CN values in both cases. Then, using the HEC-GeoHMS extension and model HEC-HMS, rainfall-runoff phenomenon in the area for before and after of urban development simulated and flow peak of floods were achieved in each period with different return periods. For the results of this research we can mention to urban development by 8% and an increase of urban flood peak by 9 percent, Reduce the flood hydrograph base time of 10 minutes and increasing the amount of 10% of the development's flood also according to foreign experience of PIJANSHI (in 2007) they studied the impact of land use change on surface vegetation and runoff in the area in China. Their selected method for estimating runoff was SCS method, because the parameters used in the above were type of soil and land use in addition, it used potential adaptation as the input data for remote sensing studies. They showed that with increasing urbanization and loss of vegetation and land use change, discharge peak flow rate and runoff increases effectively. Also WENG in year (2010), with studying the growth and development of an urban area in southern China, has reported that the growth of the metropolitan area in two decades caused several problems in the management of water resources in practice, the height of surface runoff have increased at a rate of 1.8 mm. In this study, a combination of a distributed runoff model using remote sensing (Remote sensing) and geographic information system techniques (Geographic Information System) and utilizing three maps of the metropolitan area changes, land use and surface runoff during the years 1989 to 1997 was done. The aim of the present study was to investigate the effects of growth and development of the city of Ardebil in years 74-80, 80-86 and 86-92, on the hydrological behavior of the basin using HEC-HMS model and GIS techniques.





MATERIALS AND METHODS

Introduction to the study area

Ardebil city is capital of Ardabil province, with an area of 2516 square kilometers, in the range of geographic, 48 degrees and 15 minutes to 48 degrees 20 minutes east longitude and 38 degrees 12 minutes to 38 degrees 17 minutes north latitude, (Figure 1). This city, from the north is limited to the city of Meshginshahr, from the East to the city of Namin, from the south to the city of Kosar and the from the West is limited to the city of Nir. Major rivers of Ardebil are, Gharehsou and Balyqlychay that the most important is the river Balyqlychay that passes through the city center. Watershed average slope is less than 4 percent. Average, maximum and minimum height of the basin above sea level is, 1345, 1423 and 1337 meters respectively. Annual average rainfall of catchment is 350 mm and an average annual temperature of catchment is 11.1 ° C. basin Climate, according to Emberger, is semi-arid and cold.

Research Methodology

In this study, in order to simulate rainfall and runoff to determine the output flood hydrograph from basin, HEC-HMS model was used. Due to choice methods identifying the model inputs were done and to convert rainfall to runoff, curve number method or CN was used. For this purpose CN maps of the basin were prepared by combination of vegetation, soil hydrologic group and land use in GIS. Also the information required for computing hydrological watershed, including: Determine the basin and sub-basin, along the way of flow, length and cross slope of basin and the slope of the flow path, land use and vegetation, soil, runoff coefficient, the reaction time with response of basin to turning rainfall to runoff that Each of the above information was defined as a data layer in GIS environment. Finally, to assess the flood zone and preparing flood hydrograph of the years, the software HEC_HMS used.

HEC- HMS introduced models

HEC-HMS model is extended version of HEC-1 under Windows to simulate the response of surface runoff of a watershed toward specific rainfall. This model simulates watershed as an interconnected system one-way component of rainfall-runoff process in inside part of the basin which is usually considered as a sub-basin. In this study, SCS hydrologic simulation method was used to convert the rainfall-runoff relationship in the sub- basin and also for Routing main channels to extract the output flood hydrograph. To prioritize the area in terms of flooding and to determine the influence of each of the following sub-basin in flow of output flood for whole basin Using HEC-HMS model and calibration for parameters such as curve number (CN) and latency flow rate for each sub-basin was calculated and then prioritize. HEC-HMS for simulations of rainfall-runoff requires some observing events in order to calibrate the model. By using observational data and changing model parameters we can reach to a model with maximum accuracy and efficiency in studying area.

Basin model of Ardebil

In this study, Due to the watershed basin of Ardebil there are only two elements of sub-basin and connection (Figure 2). For each sub-basin amounts of CN, the initial losses, the percentage of impervious land and the delay time was defined.





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Casualties

This section includes a number of curves, initial Casualties and the percentage of impenetrable land. The mortality rate of rainfall in a given area for maximum power of plant maintenance is related to plant setting, Penetrate in the soil and surface storing. Number curve of the soil profile, the type of land use and soil previously humidity conditions are determined and are presented in standard curve table from organization of soil protection for moisture condition of soil in average mode.

Sensitivity analysis of the model compared to parameters

It is used to review and understand the relationships among the factors affecting the flood basin. So, after determining the flood hydrograph of output flood of basins with the participation of all sub-basins, considered factors, in each sub-basin is changed respectively. So that the impact of that factor is determined in peak output flow. Thus after each run of HEC-HMS model, the impact of the changes in peak output flow of the basin is reflected. With this method of identifying, sub-basin boundary factors that show greater sensitivity to these changes is also detected. . The extent of these changes is depicted by a curve. The greater the slope, a small change in the parameters, cause great change in model response that the model in compare to that is called sensitive parameter. Conversely, if the slope of the curve is low, a lot of changes in the value of the relevant parameter, will have little effect on the model response and model called insensitive. In this study the sensitivity of the output flood peak flow of basin were assessed than CN and latency. . To determine the sensitivity of the model to change the parameters, equation (1) was used.

$$SEN = 100 \frac{NEW - old}{old | pc|}$$

Where

SEN size of sensitivity of the objective function resulting from changes in the parameters size

NEW The new size of output model obtained from parameter

Old fist output model

pc : absolute of changes percent in the parameters.

Calibration or optimization of the HEC-HMS model

Hydraulic modeling system resulted in automatically calibrating (calibration) in the desired domain this change will continue until the best match simulation hydrograph is observed and to ensure the most appropriate parameter calibration values are provided. Like the rest of the hydrological model, HEC-HMS model calibration can be done both manually and automatically.

The first method (manually) Work by changing parameters such as initial estimates entered, by trial and error method, maximizes observation compliance and simulation.

The second method (automatically) The calibration model is done by internal planning and implement test parameters step by step so that to be automatically adjusted and set. Running the test program to obtain the best value of the parameter can be repeated. In this study, the combination of both manual and automatic method is used for calibrating model. So through trial and error and modulation parameters to set the approximate model is



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followed and then following up in the automated search procedure which is performed with greater precision, the best processing parameters obtained. The CN parameter was used to calibrate and validate the model. With a selection of parameters in each sub-basin in the optimization model reached the lowest values Function then various combinations of CN were compared and finally due to average parameters of above the final model were extracted. Automatic calibration, search of slope of one variable method was used. So that dimensions of all selected parameters in each repetition has changed to achieve the goal function stages.

RESULTS**Calculate the number of curves and initial losses of basin**

Curve Number (CN) watershed, a trait that defines the basin hydrological conditions. To get a number of curves of the basin, basin hydrological map with maps of vegetation, land use and former soil moisture of basin is overlapped. The results of curve numbers and preliminary of curve Basin is provided in Table 1 and Figure 3,

Simulating rainfall-runoff models

The rain and floods data seen in years 74-80, 80-86 and 86-92, in the relevant part of the calling basin models, meteorological and related control parameters, runoff was simulated The results of which are presented in Figure 4.

In Table 2, the results of the simulation of target function parameters, volume and peak flow rate and their difference are presented.

Sensitivity analysis of the model

For sensitivity analysis, the numbers of curves and delay time in each of the sub- basins, they become high and low and the results have been less studied in output basin. . Thus, the value of the parameter and its effect on peak flow is determined. In Table 3, the results of the sensitivity of the model are presented to two factors: the number of the curve and the time delay. As the table shows, the model is more sensitive to changes in the number of curves, so calibration of model has been done based on this parameter.

Calibration of model

In this study, the method of automatically searching for one variable slope of HEC-HMS model of parameter of curve number is used for calibration. Meaning that number curve of each studied basins to optimize obtained the amounts and composition of the curve numbers were compared. Eventually final values of (calibrated) curve number were derived and the results are presented in Table 4.

SCS unit hydrograph results

To determine the effects of urban development on the hydrological behavior change, we draw by SCS method and compared hydrographs related to 74-80 years, 80-86 and 86-92. The results in Figures 5 and 6 and Table 5, according to Ardabil sub-basins are presented. The results suggest that the rate of surface runoff in the sub-basins have been increased, that the largest change was related to sub-basin 2 and the smallest result was related to sub-basins 1

According to figures 5 and 6 and Table 5 in the statistical studied period, in basins 1, by increasing the amount of impermeable surface area of 71 percent, 110 percent of the peak flood level or by 1.2 times is increased. In basins 2



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also by increasing the amount of impermeable surface area of 38 percent, 110 percent of the peak flood level or by 1.2-times is increased.

CONCLUSION

As stated in the history because of the young urban watershed management topics, especially in Iran there are many aspects of the factors affecting the formation or development of surface runoff and flood urban and changes related to them because of growth of cities. Obviously, access to important points in this regard, including the factors affecting the hydrological behavior of urban catchments Especially in relation to their growth and development is an important aspect in order to achieve appropriate solutions to prevent surface runoff Such as water and urban flood and their control and the optimum utilization of urban runoff and floods, That study aimed to identify factors influencing the hydrological behavior of the watershed in urban catchment is trying to determine the appropriate strategies and According to the results it can be concluded That Ardabil hydrological basin behaviors had significant changes in the level of 95% with the development of the city during the years of 74-80, 80-86, 86-92 that its cause In addition, to the increase in area, were an increase in impermeable surfaces in the construction of residential, office, commercial and services on the one hand and increasing the level of major and minor covered streets and alleys on the other hand. Due to the growth of cities has a significant relationship with the hydrological behavior and contribution to the area of land covered by impenetrable in increase in floods is more than any other factor. That represents the change in land use on the hydrological behavior in the urban basin. USEPA (2008), in the urban watershed management has raised two important aspects as follows:

The flow of surface runoff (urban flooding) as the WWF (wet-weather Flow),

Urban infrastructure (clean urban infrastructure).

In light of these discussions and the results of simulation in the study basin and compare the simulated and observing hydrograph Hydrological model HEC-HMS can be used in the study basin to simulate rainfall-runoff. The results of model simulations in research Kafli et al. (2007) and Kamvrany et al (2005) in abroad, and Khaliqi (2004) and Mary Ashoori et al (2007) in country was satisfactory for match between observation and simulation hydrograph. According to the results of the sensitivity analysis that was conducted between parameter number of curves and time delay, Parameter of number curve with changes was determined as a sensitive parameter, and it was used for calibration. This result in comparison with Khalighi (2004) in Urmia basin of BarandozChay has obtained similar results. According to the results of recommendations including: increasing Permeable surface through making margin levels in the middle of streets that are considered as urban green spaces and direct surface runoff into the street, which in addition to penetrating into surface runoff, it supplies water needed by urban green space. The creation of absorption wells or storage tanks, is with the goals of artificial recharge of groundwater runoff and water storage for irrigation and water supply of green space Or other urban uses in the course of the streets and alleys of the city in order to reduce the size of the urban flood In other words, the increase in pothole storage that reduces the amount of surface runoff.

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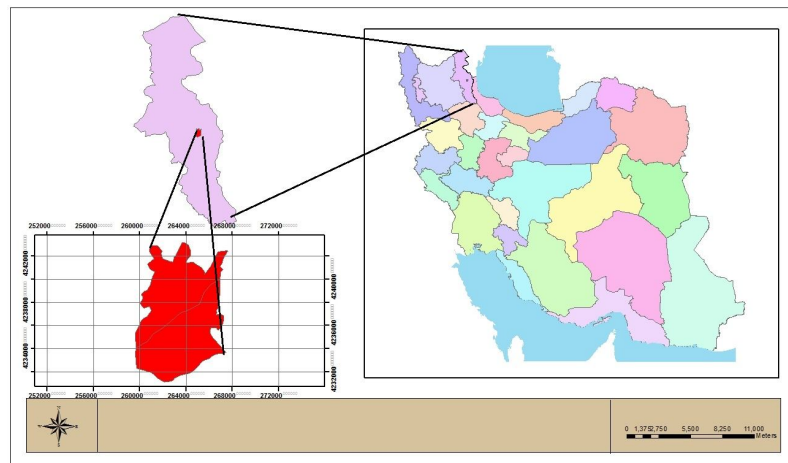


Figure 1. The position of the basin in the province of Ardabil city and country

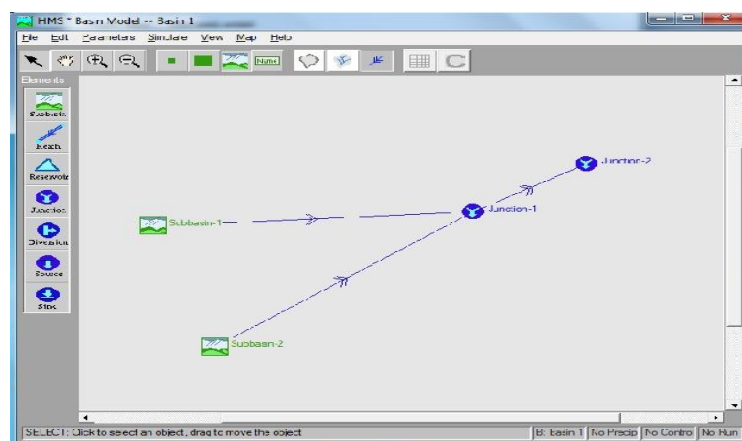


Figure 2. Basin model of Ardebil





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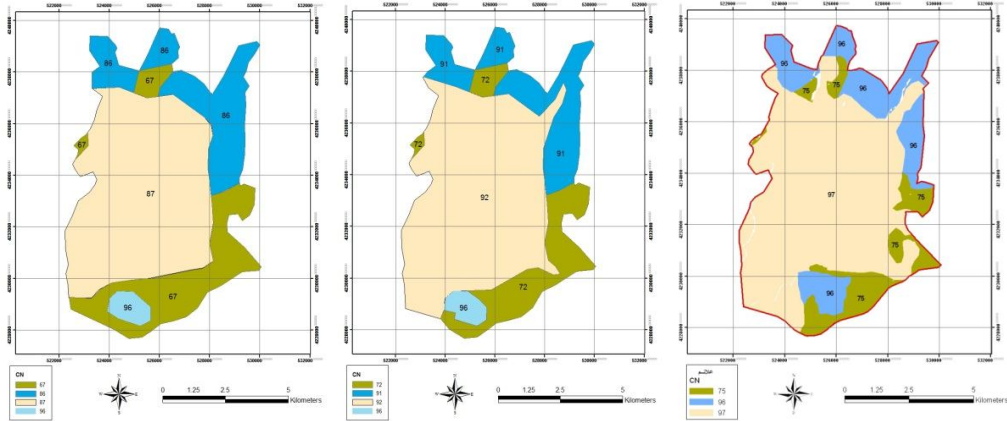
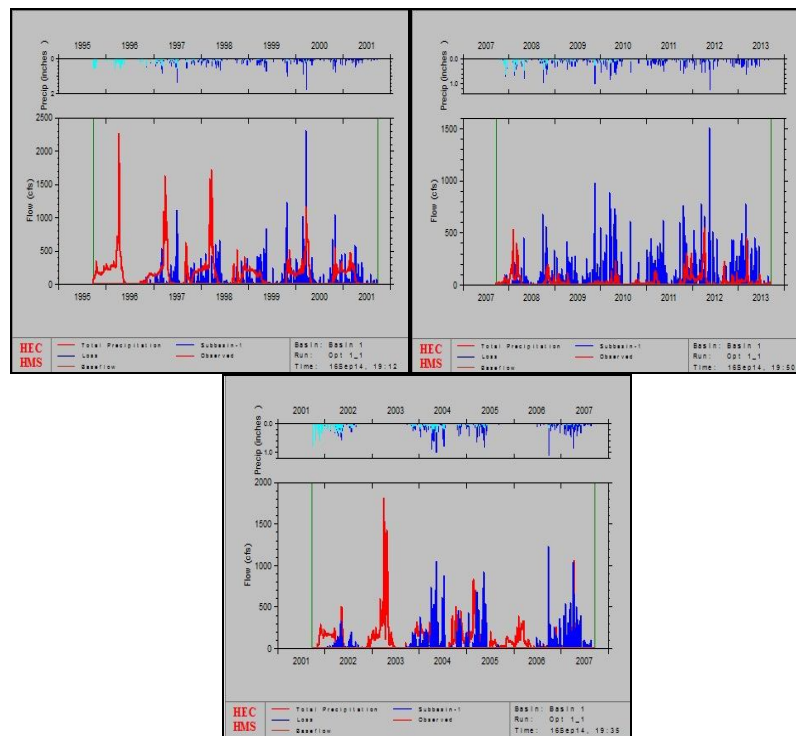


Figure 3. Map of curve Number for 74-80 years (A), 80-86 (b) and 86-92 (c)



C

B

A

Figure 4. Precipitations hydrograph observed in statistical years 74-80 (a), 80-86 (b) and 86-92 (c)





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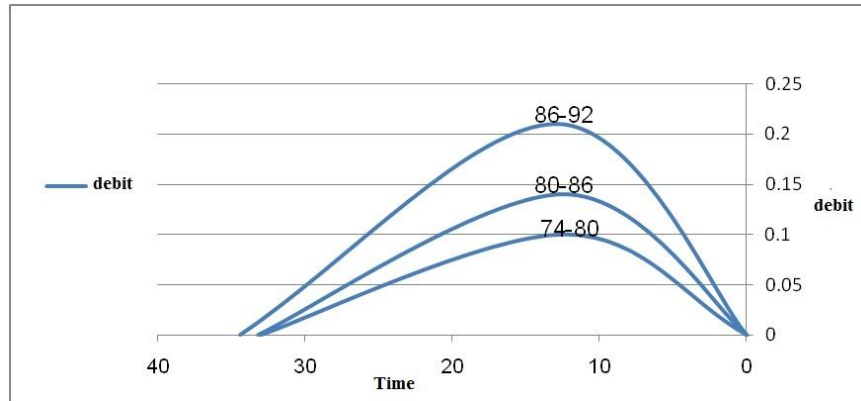


Figure 5 hydrograph of sub- basin one in three periods (74-80, 80-86 and 86-92)

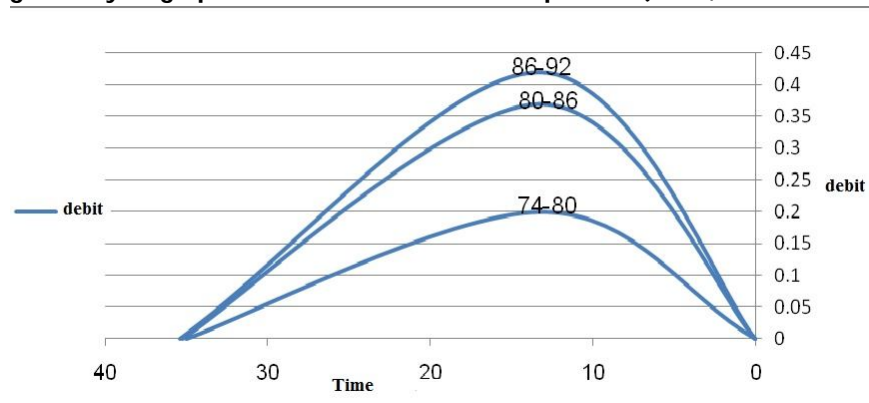


Figure 6 hydrograph of sub- basins 2 in three periods (74-80, 80-86 and 86-92)

Table 1 values of weighted curve number and the initial losses of basin

Statistical Year	80-74	86-80	92-86
Curve number	87	92	97
initial losses	7.59	4.41	1.57

Table 2 Summary of the results of the simulation

Statistical year		86-92	80-86	74-80
Target function		154.51	367.211	144.05
volume Mm	Calculation	41.30	28.62	34.80
	observation	38.32	116.48	5.05
Percent of volume difference		7.79	75.43	588.34
Peak flow CMS	calculation	1499.1	1221.2	2297.9
	observation	543.85	1804.6	2248.1
Percent of Difference peak flow		175.64	32.3	2.2





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Table 3. Sensitivity of curve parameters of delay time and number of curve to target function

92-86	86-80	80-74	Statistical year
97	92	87	Curve number
36.1	35.3	36.4	estimated amount
154.51	367.211	144.05	Amount of target function
157.32	157.32	157.32	delay time
157.32	157.32	157.32	Estimated amount
154.51	367.211	144.05	Amount of target function

Table 4. Results of parameter calibration of curve numbers

Statistical year	86-92	80-86	74-80
Initial Number curve	97	92	87
optimized Number curve	36.1	35.3	36.4

Table 5- Results of calculated hydrograph of SCS

year	Sub-basin	(hour) T_p	(hour) T_b	(Cubic meters per second) Q_p
80-74	1	12/36	33/1	0/1
	2	13/14	35	0/2
86-80	1	12/43	33/18	0/14
	2	13/2	35/24	0/37
92-86	1	12/9	34/4	0/21
	2	13/26	35/4	0/42





Citizen Purchase Geographical Behavior Analysis Using Structural Equation Models in the Quarters with and without Chain Shops

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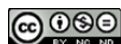
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ABSTRACT

Today, in order to success in the markets, realizing the costumer consumer values and their influence on the consumers is one of the vital issues. To collect questionnaire information , 384 of the ones who came to Rasht different chain shops selected by random method and adjusted to the society population and were tested through modeling the structural equations , hypothesis , research method is in terms of the explanation , measurement and coherence and in terms of the aim it is applicable. based on the research findings , local efficient indices , influential indices and place suitability and presence of the chain shops in the quarters have the positive and meaningful influence on the citizen purchase behaviors .Research results indicates that quarter citizens without the chain shops , to reach these places to go a long distance and loss much time and bear much expenses too, so presence of the chain shops in the quarters make less transport expenses and availability to the more thrust and the more vast shops and purchase the qualified goods.

Key words: Purchase behavior, Lisrel analysis, Quarters with chain shops, Rasht city.

INTRODUCTION

Chain shops account one of the important civil service centers that to provide daily needs of the people have much role , they do this by providing vast domain of the good select and other suitable lateral conditions(Aghayari Hir , et al, 2007:1) .These shops could dominate on the suppliers of the good and competitors and even legislators .





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Inevitably, in today world, the chain companies' role is very important and vital (Brokman, etal, 2001). Today the customers are in central company attentions and their satisfaction is the basic factor to gain organization competition priority. To satisfy customers it must meet their compel let needs and exact recognition of the their wants expectation ,tends, abilities and their limits in good purchase .having such information one can recognize the influenced factors on the consumer behaviors (salar, 2010). The first and the most basic default to provide and expand of the economic theory in the consumer behavior field is that a customer behave by wisdom (Tavana, 2008). Costumer behavior is a new course and Moven defines it: costumer behavior is study the purchase units and exchange processes include in purchase , consume and goods , services and ideas .throw off The consumer behavior is a controversial and challengeable subject and involves the people and what they buy why and how they buy and involves the market. Consumer behavior is an elegant phenomenon, because the people behavior is not clear, constantly and so their functions as consumers, is not predictable mostly (Naalchi kashi, 2012). Consumer behavior has many activities, all consumer have different in thoughts, sense, decision aspects with each other. Study of the consumer behavior is very important because we are consumer whether deliberate or undeliberate. (Musavi, 2009). Comfort and saving are the factors that the costumers seek them at the modern world. The costumer cognitions of the comfort rate and spend time expense, affected their satisfactions and loyalty amount. Today, all super retailer efforts to keep costumers and their tendency to purchase again, is providing the services at less time with highest comfort rate. (Jahandideh, et al, 2012: 74). The purpose of this article is analysis the citizen purchase behavior in the quarters with and without chain shops. Used analysis method in this study, is to analysis the structure equation model and path (SEM).in this research has been used of Lisrel 8/53 software to confirm function analysis and path analysis sample volume estimated based on Morgan formula equal with 380 ones. These people randomly were among consumers who referred to the different chain shops of Rasht city.

Research Theory Basis

Chain Shops

Chain shops as one of the distribution modern institute ,are mediator circle between the production and the consumption process .that form of several retailer under the focused and common property and all of its branches coordinate their activity under a central organization .(Saeedi, 2010). Chain shops after appearance , pass a path un monotone but evolutionary , current chain shops are compound of the new distribution method .(Samadi, et.al, 2006) .Basically , chain shops generate in 3 definition : civil , regional and local purchase center .and each has especial standard in the ground , parking , good kind and ,....aspect. Good kind and construction expense determining in terms of the economic and social situation of any region of the city. (Vafae, 2006).

Consumer Purchase Behavior

Consumer purchase behavior usually is as an important issue. Consumer behavior base is on the 5 following stages:

- 1- Recognize the problem
- 2-Search the information
- 3-Survey the option
- 4-Decision to purchase
- 5-Behavior after the purchase

The Important Of the Place and Distance of the Costumer Form the Chain Shops

The policy to find correct place to establish and generate the chain shops, interpret as an important strategy to stable and decline the price of the presented goods. In the market theory ,the subject of the good distribution and the



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consume with minimum price considered as an efficient element to stable the prices and to prevent from black market generation .(Ghareh nejad ,2006) .Also ,the selection at the place is the main problem in all work kinds including service and effort of production . Suitable selection of the work place is a vital component in the possible success or failure of a company, and also it can improve the market share, grow the costumer gain as a strategic instrument (Onut, 2001).

Research Background

Tai ,et ,al,(2012)research background ; in a research investigated the influenced factors on the consumer intent to take part to group purchase and their studies indicates that quality ,receivable price fair and relations have important influence on the purchase intent.Ying- ping Liang (2012). In a study investigated the relations between 3 variables: consumer participation, product knowledge and the purchase behavior. Erdogmus, (2011) et al in an article investigated online group purchase; what is for costumers? And their result shows that more costumer decisions are based on discount rate. Asadi (2006) Investigated Tehranian costumers behavior in the chain shops in an article ,and its results indicates that although the consumer behavior is affected by mental and cultural factors ,but the influence of this elements in Tehran chain shops is not meaningful and cannot confirm Katona theory based on sensitivity and un knowledge the costumers. Jahandideh and colleagues (2012); proceed to know and priority the determinant factors to continue Etca chain shop costumer purchases using nerve mesh algorithm, in a study. Mortazavi, et.al, (2012): Investigated the cultural trend influence on national root and its influence on the costumer purchase behavior and intention, in a study, their research result shows that it can be account the cultural trends an influenced factor to the costumer purchase behavior and intention. Ebrahimi , et.al (2012)investigated the ethical marketing role in the costumer purchase behavior in a research , the research results shows that maintain the social values by companies affected on the consumer purchase behavior of the food material as in conjunction these values with consumer values (society) ,pursued them to select the name and the brand of that companies .also it will be accessible for citizens to go the more valid and more expand shops and use of the qualified goods purchase material and methods.

MATERIALS AND METHODS**Geographical Features of the Studied Society**

Rash is a small component of Gilan plain this city is one of the big city of Iran center of Gilan province in the north of Iran and the center of Rasht, and also it is the biggest and the most popular of north of Iran among khazar sea marginal provinces (Mazandaran,Gilan, Golestan).Rasht city located in 49° and 36 min. east aptitude and 37° and 16 min North latitude (Ziari, et.al, 2011) and with 136 area km locates in the plain ground (Abbaszade shahri and other (4: 2010) and has over 639951 in 2011 (Rasht statistical calendar, 2011).

Research Methodology

This research , studies the relation between citizens purchase behavior in the quarters with and without the chain shops using structural equation models in Rasht city .research method is in terms of explanation and measurement and coherence method and in applicable in aim .to collect research literature used of used sources like the books , magazines, essays and physical and digital sources .to collect the statistical data , information gather method is in field and used of questionnaire instrument .used analysis method in this research , is the structure equation model and path analysis (SEM) in this research has been used of Lisrel 8/53 software to confirm factorial analysis and to analysis the path.



**Seyed Ali Hosseini et al.****Society and Statistical Statistic**

Present research has done in Rasht city. Sample volume estimated based on Morgan formula equal with 380. These people were among costumers randomly who referred to the different chain shops of RASH city. Generally, there are 16 chain shops in Rasht. The needed information has been collected by a questionnaire with 16 questions.

The Characteristics of the Respondents

In this research were asked 384 randomly that 194 means 51% are male and 188 means 49% are female .and also old ranges 25-45 are 243 means 63/6% are the maximum and old ranges 20-25 with 23 means 6/1% are minimal. Among the samples 281 equal 47/7% in Rasht are the most recourse and 12 equal 3/2 out of the province are less recourse. In income situation aspect, the most amounts of the samples 112 equal 33/6% have 750000 tomans -1 million tomans.

Research Hypothesis

- 1-Place – finding efficient indices has the positive and meaningful influence on the purchase behavior
- 2-Indices of the place suitability and efficient has the positive and meaningful influence on the citizen purchase behavior.
- 3-Chain shop –presence in the quarters has the positive and meaningful influence on the citizen purchase behavior.

Covariance Matrix Data Analysis Application

Covariance matrix data analysis application of coherence analysis is covariance matrix analysis with coherence matrix. Considering the research purpose and the analysis does on this matrix split two basic groups

Factor Analysis and Structural Equation Model (SEM), both of these analyses performs through Lisrel software (Habibi, 2011).

Structural Equation Model (SEM)

Structural equation models are an especial structure between a collections of latent variables and observed variables. using the structural equation model, is investigable the relations between the latent variables with each other and kinds of the measurement of any latent variable with the respected variable .multivariable theory model not survey with 2-variable method that accounts every time just the relation of a single variable with a dependent variable. Multivariable analysis refers to a series of the analysis method that basic feature of their variables simultaneous analysis, k independent variable, and n dependent variable. (Habibi, 2011).

Questionnaire Tests**Test of Reliability**

Reliability is one of technical features of measurement instrument. This concept deals with this matter that how much the measurement instrument gives same results in the same situation (Moosakhani, 157, 2012). To determine the questionnaire concept and surface asked from experts about correct rate and clarity of the questionnaire questions and they confirm the questionnaire credit. To investigate the reliability, it was used of kron back Alfa coefficient. Kron back Alfa of whole questionnaire reported. 829 .if Alfa amount is 0.7 .is necessary a questionnaire with good reliability and If it is between 0.5-0.7 is necessary a questionnaire average reliability and if it is less 0.5 , is necessary a





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questionnaire without reliability in this research Alfa number shows that the questionnaire reliability is good (Habibi ,1390).

Validity

Before action to the model Fitting we can use factor analysis .Confirm factor analysis shows that if is it reliable deigned scale (questionnaire) to collect the data or not.

Confirm factor analysis is a structure justifiability Account, justifiability means that the measurement instrument is able to measure the respected characters and features, it is important because the unsuitable and insufficient Measurements can make non-reliable each scientific research. Reliability refers to the, researcher measurement accuracy. (Khaki, 2009) .so using confirm factor analysis, general structure of the questionnaire was based on the concept testing.

RESEARCH FINDINGS

To research of four latent variables, is a locality efficient index index, influencing indices and local suitability, chain shop presence in the quarters with and without the chain shops. If there is not any relation between these three latent unable, have been designed a questionnaire with 16 questions to fitting the structure equation models.

Confirm Factor Analysis Standard Factor Loads

Five Number diagrams, shows the research model in standard mode. This model has standard coefficient .The numbers located on the raw between the variables, shows the standard coefficient. Standardization has these privileged: 1- facilitates the interpretation the relation between the latent variables 2-helps to relative role identification of the independent latent variables in influence on the internal latent variables (Kalantari, 2009).

Results Analysis

If a factor load is less than 3% .so the relation is the weak and it will be ignored .A factor load between 0.3to 0.6 is acceptable and more than 0.6 is very suitable.

Model in Meaningful Mode

Statistical amount t shows the same indicated coherences meaningful in 5% error level. If each amount is less 1.96 it will be in red this shows that the indicated coherence in the standard mode is not meaningful. at the present study,

Modeling the Structural Equations

1-The relation between the purchase behavior in the quarters with the chain shops and local finding efficient is 0.27 that is good coherence. T amount is 4.73 too that shows the meaningful indicated coherence.

2- The relation between the purchase behaviors in the quarter with the chain shops and efficient and the local suitability is 0.71 that is good coherence .Statistical amount t is 5.18 that shows the meaningful indicated coherence.



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3- The relation between the purchase behavior in the quarters with the chain shops and the chain shops in the quarters is 0.92 that is very suitable coherence. Statistical amount t is 18.43 too that it is the meaningful indicated coherence.

Indices of the Model Fitting

The purpose of the model fitting is that it how much adjusts a model with the related data. It can be used of various indices to model fitting. One of the important indices is RMSEA index.

CONCLUSION

In today competition world, the chain shops should pay much attention to the costumers and come up on their needs to reach to the competition gain and priority. Today, all of the super retailer efforts to save the costumers and their trend to repurchase are to service in less time with high comfort. The aim of this article is the citizen purchase behavior analysis in the quarters with and without the chain shops used analysis method in this study, is the path analysis and the structural equation models (SEM). In this research used of Lisrel 8.53 to confirm factor analysis and the path analysis. Based on the findings, there is positive relation (4.73) between the purchase behavior in the quarters with chain shops and local finding efficient and between the purchase behavior in the quarters with the chain shops and efficient and local suitability (5.18) and there is a positive relation (18.43) between the purchase behavior in the quarters with the chain shops and the chain shops in the quarters. Considering the figure $RMSEA=0.69$. Based on the previous information because RMSEA index is less 0.1 so model fitting is suitable. Also normal χ^2 is acceptable research results shows that the citizen of the quarters without the chain shops, loss much time to reach the chain shops and have much expenses. So the existence of the chain stores in the quarters, decline the transformation expenses and then causes that the citizens' use of the more reliable and vast shops and purchase more qualified goods.

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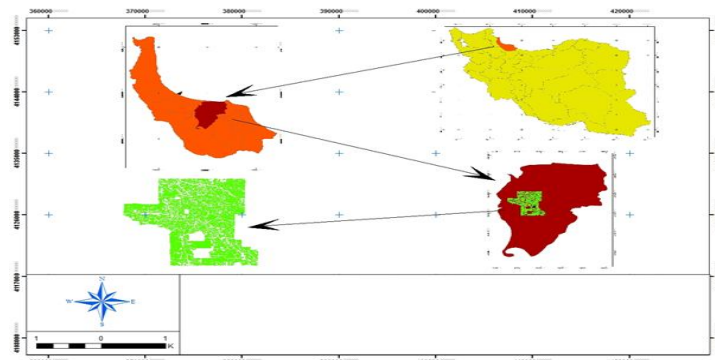


Figure 1: studied geographical position map in Gilan and the country





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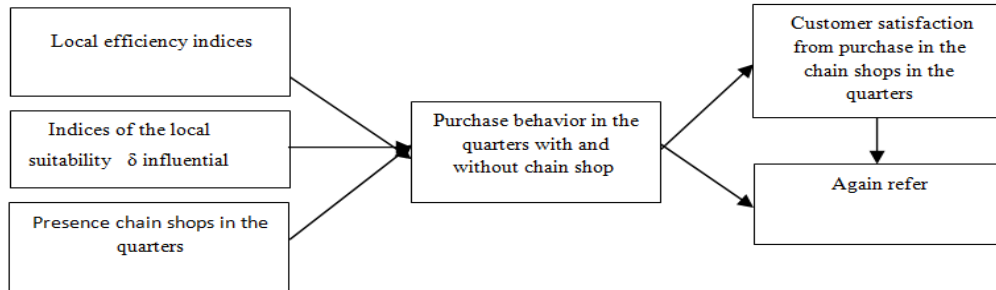


Figure 2: Research concept model

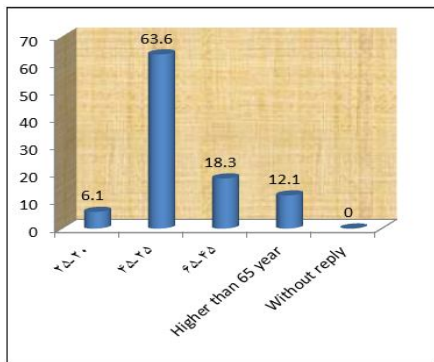


Figure 3: sample old situation

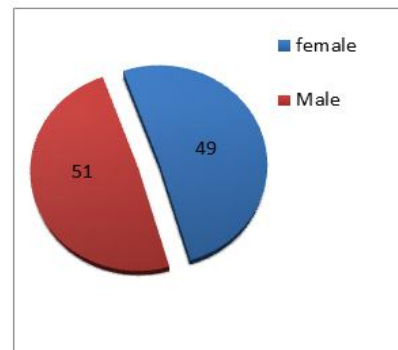


Figure 4: sample sex ratio

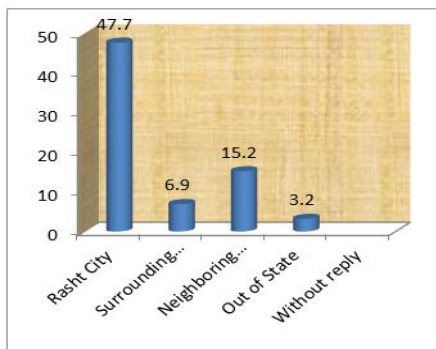


Figure 5: sample income rate

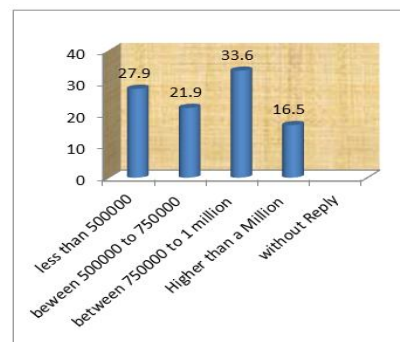


Figure 6: sample residence place





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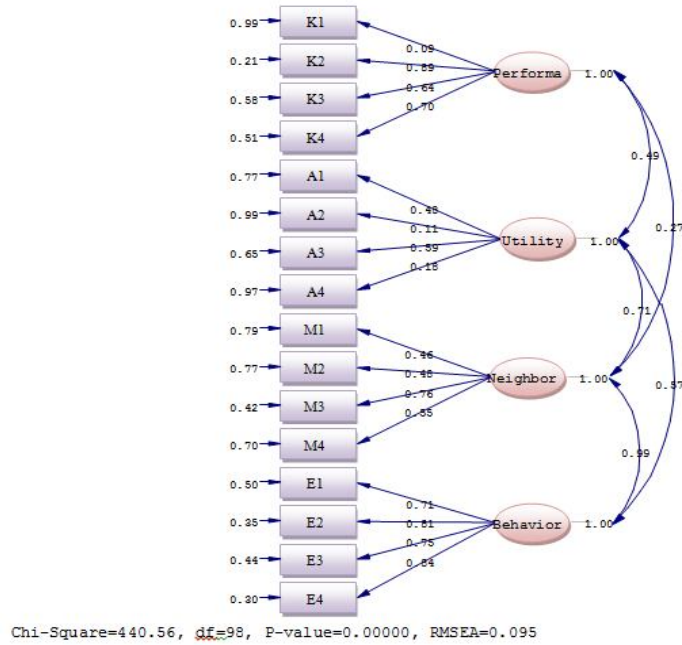


Figure 7: Research model in the standard mode

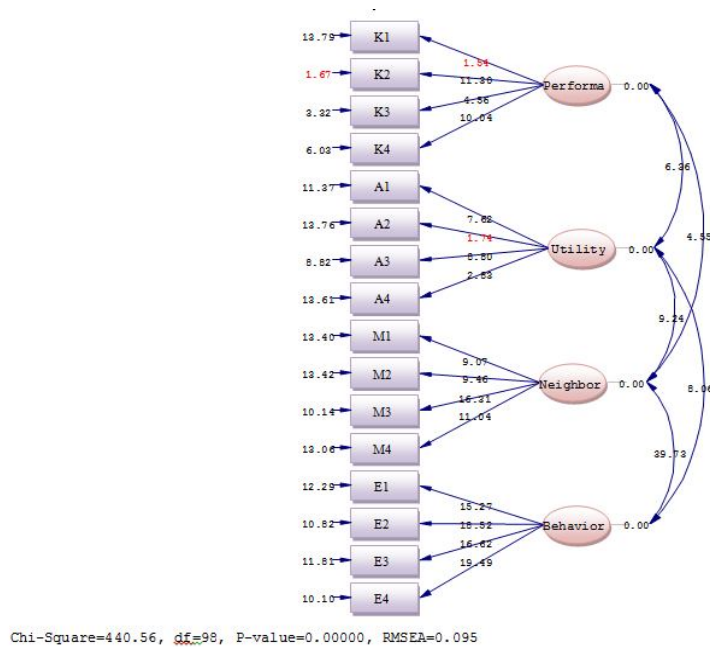


Figure 8: Confirm factor t-value analysis factor loads





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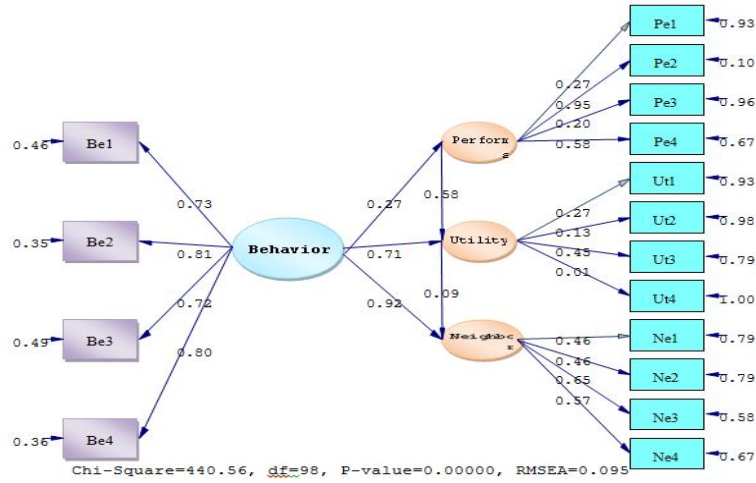


Figure 9: Factor load sum and the error coefficient

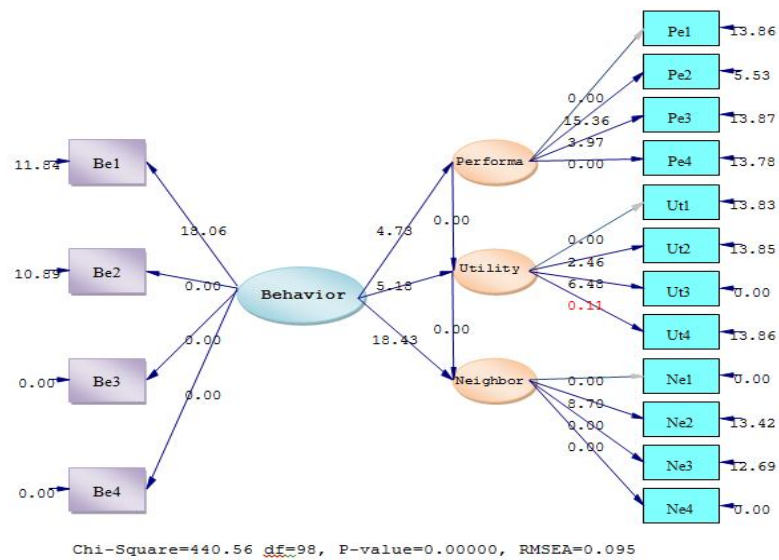


Figure 10: t-value sum

Table 1: Reliability

Cronbach's Alpha Rate	Question number
0.829	16





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Table2: Latent and visible variables

visible variables	Latent variables
k_1, k_2, k_3, k_4	Efficient and suitability indices
A_1, A_2, A_3, A_4	Chain shop presence in the quarters
M_1, M_2, M_3, M_4	Behavior purchase in the quarters
E_1, E_2, E_3, E_4	With chain shops

Table 3: Model fitting indices

Index name	Found amount	Allowed rate
Fitting Good ness (GFI)	0.88	More than 0.9
Average root of the estimate error squares (RMSEA)	0.96	Less than 0.4
Mediated suitability CFI propriety	0.89	More than 0.9
Mediated fitting goodness AGFI	0.82	More than 0.9
Smoothed suitability NFI	0.87	More than 0.9
NON-smoothed suitability(NFI)	0.87	More than 0.9

Table 4: Hypothesis test

Number of the hypothesis	Hypothesis related to the influence	Etc, marks of the variance	Coefficient of the standard	t-value	result
1	Local efficient indices on the purchase behavior in the quarters with the chair shops	k	0.27	4.73	ok
2	Influential & suitability indices on the purchase behavior in the quarters with the chain shops	A	0.71	5.18	ok
3	Presence of the chain shops in the quarters on the purchase behavior in the quarters with the chain shops	M	0.92	18.43	ok





RESEARCH ARTICLE

A Review of the Relationship between Quality of Home Construction with the Behavior of Home Builders

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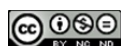
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ABSTRACT

One of the most important issues in the field of housing is its quality. There has always been the worry about the effectiveness of the behavior of home builders on the quality of the homes they build. In this research, quality of construction has been studied from two aspects, first the behavior of the home builders and second, the quality of the homes they build. The study was carried out in Urmia. Number of the study samples was calculated to be 385 persons, so the same number of questionnaire was distributed randomly among the population randomly. The research method in the research was descriptive and by-survey in nature. Kolmogorov-Smirnov test was used to check the normality of the data collected, Spearman-Kendal test to find out the correlation extent of the variables and Friedman Test for grading each of the components. Considering the results of Friedman Test in respect of the behavioral components of the home builders it was understood that employing the expert teams, using standard construction materials, sense of professional responsibility, housing market conditions, and the supervising body, form the first to the fifth grade factors influencing the behavioral components of the home builders with the mean respective grade of 4.94, 4.43, 3.44, 2.98 and 1.83. The useful life of the buildings, installations, safety system, climatic conditions, structure, construction materials, are first to the fifth effective factors with the mean grade of 6.19, 5.42, 5.24, 4.31, 3.83, and 3.40, respectively.

Key words: Quality housing, construction, behavior of builders, national Construction Regulations, supervising body, construction materials.



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INTRODUCTION

Statement Problem

Access to suitable housing is the ideal of human. Housing is something more than a mere physical shelter (Mohammadi & et al, 2012:88) and includes all the services and facilities necessary for the welfare and health of their families (Pour Mohammadi, 2000; Dejhkam, 1994) and its user should have be fairly long and secure tenure than it. Housing is second human need after food and supplying it are always concerns of families (Mohammadi & et al, 2012:88and Asgari & et al, 2002:97). Moshiri believes that home is one of the key elements related to housing that needs of people living in it based on the needs of a residential unit, it specifies its dimensions and sizes(Shieh,2010:207). In view of Hekmatnia & et al Most applications of housing are people calm located in it that this calm encompasses both physical and mental aspects it (Inanloo, 2001:11 and Soltani Arabshahi, 2004:21). Having housing is one of the indicators in development of countries and areas that can be examined by rate of construction in the city (Karimi, 2012:61). The city is open system. It means that cannot be complete and set of all the elements necessary for its survival. In general, the relatively dense population, the streets and business centers, high buildings, which is different than the villages and rural areas, and facilities of welfare and training and extensive vehicles are all signs in the city (Shieh, 2006:4).

In Iran from 1962 to the present time due to the implementation of land reforms and rising oil prices in the world market, the main center of economic activities and macro investments were transferred to cities. Development of construction jobs, trade, and educational services, industrial and ... in cities has increased rural migration from villages and small towns to larger cities and urban areas (Zangabadi & et al, 2007:48).

Zangabadi & et al believe that during the period from 1990 to 2030, the population of urban area will grow approximately 3/3 billion people. Thus 90% will be living in urban areas of developing countries (Mohammadi, 2001:95). In opinion of Rakhshanasab & et al, consistent with population growth, development of urbanization and social change and economic in cities is observed problems and deficiencies in cities. Cities will extend in terms of physical and develop staggering around it(Mostofialmamaleki, 2001:53). Housing problem in the past few decades has become one of the main challenges in economic and social development of the country. Transition from situation in providing housing that is characteristics of modern societies to necessity planning in providing adequate housing for accelerated development conditions that is features of the modern era specified and clarified housing characteristics in our country from decade 1961 (<http://www.hamkelasy.com/content/view/40595/52>).

Due to population growth and physical development of urban areas, necessity of attention to urban construction is more than before important (Zangabadi & et al, 2007:49).

Research questions include

A: is there significant relationship between quality of construction and housing builders' behavior? B: is there significant relationship between quality of construction and housing quality? C: is there significant relationship between quality of construction and regulatory observation of national standards? D: is there significant relationship between quality of construction and application of expert team? E: is there significant relationship between quality of construction and work conscious together? F: is there significant relationship between quality of construction and monitoring supervisory system? G: is there significant relationship between quality of construction and situation of housing market?





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Theoretical Foundations

Currently construction in urban areas, especially in third world cities is one of the most dramatic landscapes. Mode of function of construction in urban areas and its analysis is one of basic steps in order to optimize planning in this matter (Karimi, 2012:61 and Javadi,2009:16). Human resources possesses high quality has a generative behavior. Job behavior of workers, engineer or manager actually makes more efficiently or less of works. This behavior in turn is the result of complex compounds, but quite distinct personal characteristics, institutional such as attitude to work, knowledge, skills, opportunities and ect (Sokna, 2011:19, Mirmoezi, 2009:27 and Khalili Araghi & et al, 2012:34). Factors affecting housing market affect the formation of demand directly that include:

Interest rates, the economy, employment, level of wages, region (sutton, 2002) shows that one percent increase in growth rate of gross domestic product will be increase between one and four percent housing prices. On the other hand, with rising incomes, demand for housing capital will even increase that lead to an increase in housing prices (Samadi & et al, 2012:85).

Currently several major factor affect the rise of building prices: 1 - Sanctions 2- Foreign shocks 3 - Remove subsidies 4 - Unbalanced price (mirsadeghi, 2012:1). The quality of construction materials is one of the important pillars of structural stability and implementation of the architecture. The use of materials with standards quality according to technical standards enhance safety and durability of building and maintaining national assets. threatens of the country's building industry today is rooted in two following factors:

1) The use of materials with lower quality standards 2) Improper use of high quality materials of standard.

Certainly in these two cases the design expectations have not been met and structures cant have optimum performance and the result is the destruction of buildings during earthquakes (Vafamehr, 2010:64).

Construction materials must be presented by observing relevant standards. By use of professionals and competent people cannot achieve to achieve executive optimal quality, if materials is not sufficient standard quality or appropriate tools and procedures shouldnt used (mirghaderi & et al, 2002:10 and Ghaemian & et al, 2011:13).

Mechanical building systems refers to equipment and components that meets required expectations of thermal facilities, replacement of air conditioning, health facilities, natural gas pipeline buildings and fire control facilities (Department of Architecture and Urban Planning , Twenty-first topic, 2012: 9). Based on established minimum requirements for safety and health of individuals and generally represents the best situation balance between safety and economic facilities (Cote, 1991 and Coles et al, 2006).

To create flexibility and profession fire safety design in many countries around the world including the United Kingdom and Australia, have moved toward performance-based rules and have distance limitations of previous laws (Yung et al, 1998).

Research Background

In 2009 Naser Feghie Farahmand has done research about economic and social priorities of the key factors for quality housing. Result show that there is a large difference in prioritizing between people and housing makers. Thus it is better that their Disagreements and misunderstandings reduced to a minimum. Mousavi believe that the most important factors affecting the quality of the construction are as follows:



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1) Sites conditions 2) design, 3) the quality of material 4) ways of implementation 5) maintenance and repair conditions of buildings (Majedi Ardakani, 2003).

In view of Hakimi and others, suitable housing with minimal living conditions and means safe shelter is housing that its physical life to the materials used has not ended, and according to the weather and climate and relative safety against natural disasters are made from durable materials, semi-durables (Fanaei,1998:77).

According to belief of Vafamehr, life of buildings in Iran is less than-life buildings in developed countries. One of the reasons is the use of sub-standard materials and poor quality. Many residential buildings in foreign countries are more than 200 years that without a significant change in terms of strength and beauty are still in use (Jafarpour, 2001:22).

In view of Mohammadi & et al, types of materials used in buildings represent the useful life of the building. Having a useful life of building types is one of the requirements of the planning housing and the calculation of the planned housing and Calculation of need to housing (Pourmohammadi, 2003:57-58). Mirmoezi believe that construction supervision enforce public agencies for the control of urban planning issues and also supporting people as operation of buildings and urban spaces and buildings public construction and maintaining and increasing the productivity of resources, materials and energy, and national assets (Moshiri, 2010:6).

Research Methodology

This study in term of objective is applied and in term of data collection is descriptive and type of survey. In this study, the quality of housing construction is the dependent variable and housing builder's behavior is the independent variable. Cochran formula is used to calculate the sample size. The amount of sample size for the study 385 people has been calculated because statistical population number isn't significant. In practice, 385 questionnaires for data collection were randomly distributed among people. To do tests was used questionnaire made according to operational model of research to measure the quality of the construction and housing builder's behavior. According to the theoretical framework research the factors affecting the quality of the construction in term of two dimensions the housing builders' behavior including (Regulatory observation of national standards, application of expert team, work conscious, supervisory system, condition of housing market) and quality of housing, including (materials, construction, building structure, useful life of the building , facility, safety, weather conditions and climate) and other negative factors affecting decline housing quality has been measured.

Examining the validity and reliability of measurement tool in research

Concurrent validity was used to assess validity the questionnaire of housing construction quality and this validity suggests when measurement tool can distinct effectively together different tests and however, since the purpose of the tool is to identify the quality of housing construction, so concurrent validity has been proposed and examined. To determine the validity of the questionnaire were distributed approximately the 30 questionnaire among faculty members and experts and practitioners that after collecting comments was also performed corrections needed about the questions number and methods expression to derive the final form. Cronbach's alpha method is used to reliability of questionnaire by using SPSS software that for positive questions has been calculated 0/78 and for negative questions has been calculated 0/86.



**Seyed Ali Hosseini et al.****Methods of Statistical Analysis**

For this study to analyze the data by using statistical software of SPSS in descriptive dimension is used indicators of frequency, percentage, cumulative percent, frequency tables and charts and In analytical dimension to test the hypotheses and to determine the correlation between variables is used Spearman correlation coefficient test and Kendall and to rank the influencing factors is used Friedman ranking.

Analytical Findings of Research**Demographic Findings**

With regard to statistical results from total number 385 respondents, 90% were male and 10% were female. About 36/6% of respondents were 25-30 years old that constitute the largest number. 79/5 % of respondents to the research questionnaire were married and the rest were singles. 47/3% were bachelor and 19/5% of them were a diploma. Field of 61/3% of people was technical and engineering. About 90% of respondents consist indigenous individuals living in the city of Orumieh; and 64/7% of them were property owner and the rest were tenants. 61/3% was employee and 29/4% was self-employed.

Analytical Findings

A: The relationship between quality of construction and housing builders' behavior variable: The correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/405) and by using Spearman test equal to (0/564) and its significance level in both tests is (0/000) and it means that there is significant relationship between housing builders behavior and construction quality at level $p < 0.01$. So that any amount improves housing builder's behavior, the quality of construction will enhance in the positive direction (table 1).

B: The relationship between quality of construction and housing quality variable: The correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/578) and by using Spearman test equal to (0/751) and its significance level in both tests is (0/000) and thus there is significant relationship between housing quality and construction quality at level $p < 0.01$. It means that if quality of construction improves, thus will enhance quality of housing (table 2).

C: The relationship between Qualities of construction with regulatory observation of national standards: the correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/206) and by using Spearman test equal to (0/282) and its significance level in both tests is (0/000). Thus there is significant relationship between construction quality and regulatory observation of national standards at level $p < 0.01$. So that any amount housing builders must follow standard national regulations, quality of construction will significantly enhance. Friedman test shows that this component is fourth rank of importance (table 3).

D: The relationship between qualities of construction with application of expert team: The correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/159) and by using Spearman test equal to (0/200) and its significance level in both tests is (0/000). It means that there is significant relationship between construction quality and application of expert team at level $p < 0.01$. So if to apply specialized people be more careful, construction quality will improve and Friedman test results indicate the importance of this component. So that in the ranking has the first priority (table 3).





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E: The relationship between qualities of construction with work conscious: the correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/162) and by using Spearman test equal to (0/224) and its significance level in both tests is (0/000). It means that there is significant relationship between construction quality and work conscious at Level $p < 0.01$. So any amount work conscious of individuals be more, construction quality will be improved and in Friedman test ranking the third component is in third ranking of important (table 3).

F: The relationship between qualities of construction with supervisory system: the correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/324) and by using Spearman test equal to (0/436) and its significance level in both tests is (0/000). It means that there is significant relationship between construction quality and supervisory system at level $p < 0.01$. Means that any amount supervisory monitoring systems such as municipal and engineering organization and also supervisor engineer be more, construction quality significantly will be improved (table 3).

G: The relationship between qualities of construction with condition of housing market: the correlation coefficient between these variables with construction quality by using Kendall's test is equal to (0/319) and by using Spearman test equal to (0/438) and its significance level in both tests is (0/000). Thus there is significant relationship between condition of housing market and construction quality at level $p < 0.01$. Means that whatever the housing market condition improve and becomes more stable, construction quality is also improved but if the housing market become suffered instability and anarchy, the quality of construction is considerably reduced (table 3).

According to other results obtained, housing builders behavior in time span of this study with mean of 74/77 rating in accordance with table 4 is in ranking of with quality, the quality of housing built with mean of 86/89 rating in accordance with table 3 is in ranking of medium and the quality of construction with mean of 161/66 rating in accordance with table 2 is in ranking of medium with quality. According to above findings, the two variables of housing builders behavior and the quality of construction has ranking of with quality but housing quality ranking is medium ranking, it can be inferred that factors related to the quality of housing (materials, construction, building structure, useful life of the building, facility, safety, weather conditions and climate, and other negative factors affecting mentioned in research) has been resulted obstacle to improving housing quality built.

Ranking Research Factors

Ranking (behavioral component of housing builders)

According to Friedman test about behavioral components of housing builders were identified, applying expert team ranking 4/94 has the highest priority ,means that respondents knows these component more important than other components. The use of standard materials with ranking mean of 4/43 is in second priority and work conscience with ranking mean of 3/44 is in the third priority and the housing market condition with ranking mean of 2/98 is in fourth priority and monitoring supervisory system with ranking mean of 1/83 is the final ranking (table 4).

Ranking (components of housing quality)

According to result of Friedman test component of housing quality was determined that structures and useful life of building are components that have the highest priority by acquiring ranking mean of 6/19 that has been more important than other components for respondents. housing facilities has been important with ranking mean 5/42 that is in second priority and safety systems of building with ranking mean of 5/24 is in third priority and weather and climate conditions is an important component of effective in housing quality that with ranking mean of 4/31 is in fourth priority and buildings structures with ranking mean of 3/83 is in fifth priority and materials used in buildings



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with ranking mean of 3/40 is in sixth priority and negative factors affecting in quality of housing is in final ranking (table 5).

SUMMARY AND CONCLUSION

Having house of people is one of development indicators for countries and areas that can be examined through amount of construction in the city. Due to population growth and physical development of urban areas is more than before important necessity of attention to urban buildings. So in order to check the quality of construction in the city of Urmia were selected 385 respondents to complete the questionnaire that 347 respondents (90%) were male and 38 (10%) were females. Finally, to check the normality of the data collected from the questionnaire variables was used Kolmogorov - Smirnov and Kendall and Spearman correlation tests was used to determine the relationship between the research hypotheses and Friedman test was used to rank each component. In this research has studied two dimensions of the construction quality including housing builders behavior as human factors, including components (regulatory observation of national standards, application of expert team, work conscious, supervisory system, condition of housing market) and in dimension of housing quality as physical factors, including components (materials, construction, building structure, useful life of the building , facility, safety, weather conditions and climate, and other negative factors affecting). The results indicate that housing builders behavior and construction quality in Urmia City quality is high quality and housing quality is moderate. Such as components affecting the quality of construction used as hypotheses in the study include:

A: the relationship between housing builders behavior and construction quality: there is significant relationship between these two variables. So that if the housing builders behavior improves, thus the quality of construction will enhance in the positive direction.

B: the relationship between housing quality and construction quality: there is significant relationship between these two variables. It means that if quality of construction improves, thus quality of housing will enhance.

C: the relationship between construction quality and regulatory observation of national standards: there is significant relationship between these two variables. So that if housing builders follow regulations of national standard, thus construction quality will significantly promote.

D: there is significant relationship between construction quality and application of expert team. So that much more careful in the use of specialized people will improved construction quality.

E: there is significant relationship between construction quality and work conscious. It means that if work conscious of individuals increase, thus the quality of construction will enhanced.

F: there is significant relationship between construction quality and supervisory system. It means that if monitoring supervisory systems such as municipalities and Engineering Disciplinary Organization and also supervisor engineering be more, then construction quality will be improved significantly.

G: the relationship between construction quality and housing market: there is significant relationship between construction quality and Housing market. Means that if the housing market condition improves and becomes more stable, construction quality will also improve but if the housing market is experiencing instability and anarchy, the construction quality will significantly reduce.





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Table1 :Kendall test and Spearman correlation coefficients of the variables in the sample

Test	Variable	The indicator	Quality of construction
Kendall's tau_b	Housing Builders behavior	Correlation Coefficient	.405**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	Housing Builders behavior	Correlation Coefficient	.564**
		Sig. (2-tailed)	.000
		N	385

p<0.01





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Table2 :Kendall test and Spearman correlation coefficients of the variables in the sample

Test	Variable	The indicator	Quality of construction
Kendall's tau_b	Quality of housing	Correlation Coefficient	.578**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	Quality of housing	Correlation Coefficient	.751**
		Sig. (2-tailed)	.000
		N	385

Table3 :Kendall test and Spearman correlation coefficients of the variables in the sample

Test	Variable	The indicator	Quality of construction
Kendall's tau_b	Regulatory observation of national standards	Correlation Coefficient	.206**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	Regulatory observation of national standards	Correlation Coefficient	.282**
		Sig. (2-tailed)	.000
		N	385
Kendall's tau_b	Application of expert team	Correlation Coefficient	.159**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	Application of expert team	Correlation Coefficient	.200**
		Sig. (2-tailed)	.000
		N	385
Kendall's tau_b	work conscious	Correlation Coefficient	.162**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	work conscious	Correlation Coefficient	.224**
		Sig. (2-tailed)	.000
		N	385
Kendall's tau_b	supervisory system	Correlation Coefficient	.324**





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		Sig. (2-tailed)	.000
		N	385
Spearman's rho	supervisory system	Correlation Coefficient	.436**
		Sig. (2-tailed)	.000
		N	385
Kendall's tau_b	condition of Housing market	Correlation Coefficient	.319**
		Sig. (2-tailed)	.000
		N	385
Spearman's rho	condition of Housing market	Correlation Coefficient	.438**
		Sig. (2-tailed)	.000
		N	385

p<0.01

Table 4: Ranks

Components	Ranking mean
Regulatory observation of national standards	3.38
The use of standard materials	4.43
Application of expert team	4.94
Work conscious	3.44
Supervisory system	1.83
Condition of Housing market	2.98

Table 5 : Rank

Components	Ranking mean
Materials	3.40
Construction	6.19
Building structure	3.83
Facility	5.42
Safety	5.24
Useful life of the building	6.19
Weather conditions and climate	4.31
Negative factors affecting	1.42





Tuning the Pulse Duration of High Intensity Ultrafast Laser Pulses

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ABSTRACT

In this work, we control the pulse duration of few-cycle fs pulses using a neon-filled hollow-core fiber. The observed transform limited pulses varied from 4.65 fs to 7.9 fs with pulse energy of 0.6 mJ and repetition rate 1 KHz. The pulses were compressed by self-phase modulation in nonlinear medium (neon gas) at filled hollow fibers while pair of chirped mirrors performed the dispersion compensation. Moreover, the applied method permits for a direct tuning of the pulse duration through variation of the chirping of input pulses at different pressure of neon gas. The observed spectral phase of these ultrafast pulses was found to be highly stable. The observed results may give an opportunity to controlling the progression of strong-electric-field interactions on the ultrafast time scale and are crucial to regenerate attosecond x-ray pulses.

Key words: Ultrafast lasers, femtosecond, few-cycle, self-phase modulation **PACS:** 78.47.jj

INTRODUCTION

Ultrashort laser pulses were crucial for many advanced applications like: femtosecond laser pulses induced high harmonic generation [1], as an essential tool for generation of ultraviolet coherent attosecond laser pulses [2-4], and x-



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ray free electron laser generation X-FEL [5]. Usually, intensity of the driving radiation controls the strength of a laser-plasma interaction dynamics will rely on the, which reached high values recently for extremely shorter laser pulses as an essential tools for ultrashort time-resolved spectroscopy of those fast processes [6]. Recently, huge Nd:Glass-based facilities represent main tool in the current state-of-the-art which capable to deliver peak power in the petawatt range for pulses with duration about 400 fs [7, 8, 9]. Moreover, for shorter pulse durations, Ti:Sapphire systems demonstrated a breakthrough for producing 0.85 PW in 33 fs pulses [9]. Lately, high power table-top laser systems typically depends on Ti:Sapphire as an amplifier medium, and many terawatt-class laser systems have been demonstrated [10 - 13]. However, these complex system have several problems like pulse deformation which appear due to thermal load on the amplifiers and thermal lensing specially inside the laser rod [13]. So that, reaching short laser pulses represent a challenging task that including elaborate complicated systems for 20 fs with high energy up to joule levels [14].

Basically, there are two methods can be applied to compress long pulses in the picosecond regime or shorter to a very short pulse regime to be compressed down to light oscillation frequency. This can be done through linear-pulse compression and nonlinear-pulse compression [15]. In the first method, as soon as laser pulses are chirped, their period can be shortened by reducing this chirp, i.e. by spectral-phase broadening. Thus in linear pulse compression a chromatic dispersion takes place if the laser pulses go through a dispersive optical element like a diffraction grating pair, an optical fiber, chirped mirrors, and a pair prisms [16-17]. The optical bandwidth of the pulses that cannot be changed by dispersive compression limits the shortest possible pulse duration. Alternatively, for the case of nonlinear pulse compression method; the optical bandwidth can be increased by supercontinuum which can be created due to self-phase modulation (SPM) in nonlinear medium [18]. Subsequently, after SPM, the resulted chirped pulses can be extremely compacted by linear compression [17].

In 1986 Alfano et al. was the first to report the generation of white light generation via SPM. He obtained an optical spectral broadening due to Nd:YAG picosecond laser pulses at 532 nm with energy of 5mJ passing through borosilicate glass [18]. Recently, important development has been made in the creation of supercontinuum in the optical region using two gas-filled microstructured hollow fibers [19]. Basically, Nonlinear pulse compression depends on the quadratic dispersion and interaction of Kerr nonlinearity [20]. These methods are fundamentally nonlinear and can cause increasing in the pulse bandwidth, which purely linear devices unable to have such effect directly [21]. Following this significant property, shorter transformation-limited pulses can be achieved by the compression of pulses using nonlinear pulse compression [21]. In the nonlinear fiber optics, the pulse compression following two types of compressors: grating fiber and soliton-effect. For the VIS-NIR optical regions, usually fiber compressors are used while for IR range from 1.3 to 1.6 μm pulse compressors of soliton-effect are typically used [22]. For the wavelengths around 1.3 μm both types of compressors can be combined to yield large compression which offers special opportunities to reach shortest possible pulses [23]. Chirped pulse amplification (CPA) represent an alternative simple solution compared to complex Ti:Sapphire amplification which can be used to generate few-cycle laser pulses [24]. Actually, Amplification of the ultrashort laser light pulses in solid-state lasers using CPA has promoted the power of the generated optical pulses up to GW and may be exceed this in future [25-27]. In fact, nowadays CPA systems are now favourite in high-field laser science and ultrafast spectroscopy applications [28-30].

In the current research, we describe a new capability to control tuning the pulse duration of few-cycle fs light pulses. In the proposed setup, the pulse compressing achieved by the supercontinuum generated in gas-filled hollow fiber with neon gas while the dispersion compensation is achieved using chirped mirrors. Further more, in this experimental configuration, the effect of changing applied pulse chirping at different neon pressure on the output pulse duration was studied.



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METHODOLOGY

Experimental setup

A schematic of our developed compressor stage which is composed of a one-meter hollow-fiber filled with neon gas followed by multilayer chirped mirrors compressor as shown in fig.1. In this system, the amplification was done via 1 KHz CPA regenerative-amplifier which produced 32 fs pulses of 2.5 mJ at 800 nm. A 15 fs mode-locked Ti:sapphire of 400 mW and 75 MHz at 800 nm seed oscillator generates femtosecond laser pulses in TEM₀₀ mode. The basic oscillator setup consists of pump beam mirrors, folded cavity mirrors, a pump beam focusing lens, a pair of concave spherical mirrors aligned with the Ti:Sapphire laser rod, an output coupler, metal coated mirrors, a set of prisms used for dispersion compensation and a slit as a spectral tuning element. The oscillator can be tuned from 780 nm to 820 nm. The seed oscillator is pumped by a 4 W CW 532nm green diode-pumped solid-state DPSS laser Opus (Laser Quantum).

Then, the observed seed pulses were stretched in temporal domain by means of a stretcher. The stretcher is employed as standard two passes scheme with a single diffraction grating SG and a telescope formed by a flat mirror SM4 and a spherical mirror SS with broadband dielectric coatings. After passing through a Faraday isolator to change the polarization from horizontal to vertical, the stretched pulses are injected into regenerative amplifier by means of the first Pockels cell. After necessary number of resonator round trips, the energy of the laser pulse reaches its maximum value >3mJ. The produced amplified laser pulses are released from the RA resonator by a Second Pockels cell. That was done by applying short bell-shaped high voltage pulses to the RPC2 which acts as quarter-wave plate. The RA is pumped by a pulsed green 527 nm laser (diode-pumped Nd:YLF Q-switched green laser) with energy of 20mJ at duration of 170 ns and repetition rate of 1 KHz vertically polarized laser model DM20-527 (Photonics Industries).

After the RA, the laser pulse sent to a gate subsystem consists of two crossed polarizers and a third Pockels cell placed between them. This pulse picker is used to control the laser output by an external gate signal and to enhance the contrast. Finally, the pulse is compressed back to femtosecond regime via a compressor. To prevent damage of the optical elements of the compressor, the beam is expanded by a telescope composed of mirrors TT1-TT2. The compressor composed of input mirror, diffraction grating, mirror assembly, "roof" mirror assembly, and output mirror CM4. In the compressor the laser beam strikes the grating four times. After the compressor the laser pulses reach 32 fs duration at energy 2.5 mJ and repetition 1 KHz.

Then, the resultant amplified pulse is directed to a final stage to produce the fewcycle pulse regime, we will call this stage Compulse compressor. The Compulse is composed of a one-meter hollow-fiber filled with neon gas followed by multilayer chirped mirrors compressor. Using a concave mirror with $f = 1.2$ m, the laser radiation was focused into the fused silica fiber of inner diameter of 250 μ m. The pulse spectrum was broadening via the SPM in the neon gas at controlled pressure up to 2.5 atm. Finally, the output beam is collimated by mirror M6 and then compressed with 6-passes between two chirped mirrors to reach fewcycle regime.

RESULTS AND DISCUSSION

The final output beam features depend on several parameters include the nonlinear phase shift due to nonlinear interaction in the neon gas, the gas pressure and CPA amplifier output. Moreover, the throughput efficiency oscillator of the optical fiber and the beam bandwidth affect the output properties as well.

The optimized the output, the oscillator pulses were optimized as well in mode-locked at 18 fs for central wavelength of 795 nm and bandwidth of 52 nm as shown in fig.1. The seed laser wavelength can be slightly tuned in the range of 750 – 850 nm using a couple of prisms and a variable optical slit. The Ti:Sapphire emission are spatially spread and



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the wavelength can be tuned by changing the horizontal position and the width of the slit, respectively. The CPA amplified fs pulse can be chirped by changing the distance between the gratings in the compressor. Figures 3, 4, 5 show the effect of varying the chirping of the pulses from 32 fs to 56 fs on the final output of the system. The observed characterizations of the compressed output pulses were obtained using spectral phase interferometry for direct electric field reconstruction (SPIDER). The bandwidth of the amplified pulse was measured using a spectrometer and the pulse bandwidth observed to be 25.8 nm at central wavelength of $\lambda_0 = 795$ nm and pulse duration of 32 fs at 1 KHz.

In fact, the narrow bandwidth of the used laser gain media restricts the generation of few-cycle pulses directly from a CPA system. To minimize this basic limitation, external spectral broadening via hollow-fiber and subsequent pulse compression can be utilized through as shown in Fig. 1. By optimizing the one meter hollow-fiber at pressure different pressures from 2 atm to 2.5 atm, and pulse energy of 2.5 mJ at the entrance of the fiber, the observed pulses can be optimized. The temporal profile changes for the incidence pulse chirping (ICP) on the output pulse are described in sequences at neon gas pressure from 2 atm. – 2.5 atm. are shown in fig. 3,4,5. The Fourier limit of the measured pulses was represented for each case. The average peak power of these observed pulses close to 0.1 TW. The measured pulse-to-pulse output power variations are about 2.5% for the final output after the compressor stage. Figure 3, shows the transform limited pulse (TL) measurements from 5.59 – 7.44 fs for ICP values from 32 – 54 fs at 2 atm pressure of the neon gas. Figure 4, describes TL measurements from 5.62 – 7.9 fs for ICP values from 32 – 54 fs at neon gas pressure of 2.25 atm. Figure 5, demonstrates the transform limited pulse measurements from 4.65 – 6.84 fs for ICP values from 34 – 56 fs at 2.5 atm pressure of the neon gas. Figure 6, shows a summarized 3D representation of the temporal profile change of the transform limited of the output pulses (green curve) for ICP values of 34, 54, and 56 fs, respectively at different neon gas pressures from 2-2.5 atm. The colour pattern describes the output pulse from most compressed output pulse (red) for value 4.65 fs to the low compressed pulse (violet) at 8.92 fs.

CONCLUSION

In conclusion, we have demonstrated the production of a very low pulse duration of 4.65 fs pulses with a peak power in the ~ 0.1 TW at repetition rate of 1 KHz. The system demonstrates its capability to vary the pulse duration from 4.65 to almost 9 fs with maintaining a constant energy of 0.6 mJ. The observed wide spectral band pulses can be used to study the transient interaction of ultrafast pulses at different pulse durations with large molecules which have different life times. Moreover, the observed ultrafast pulses are very useful in high harmonic generations HHG which could produce short pulses down to x-ray regime with very low pulse durations down to attosecond regime in the prospective future.

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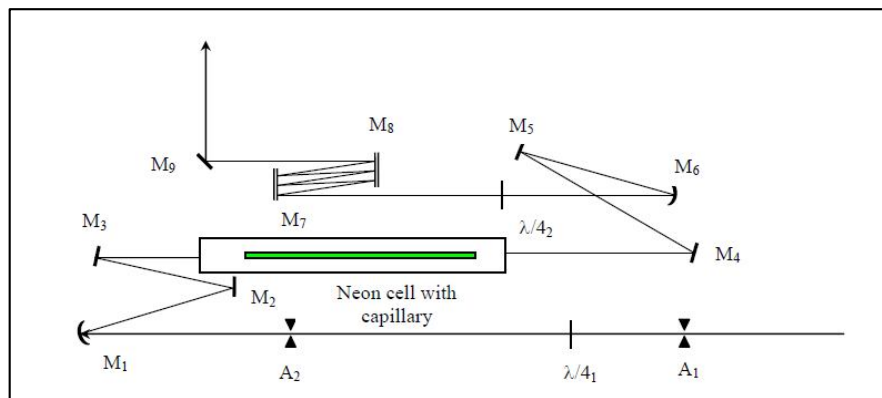


Fig. 1- Optical layout of the Compulse compressor.

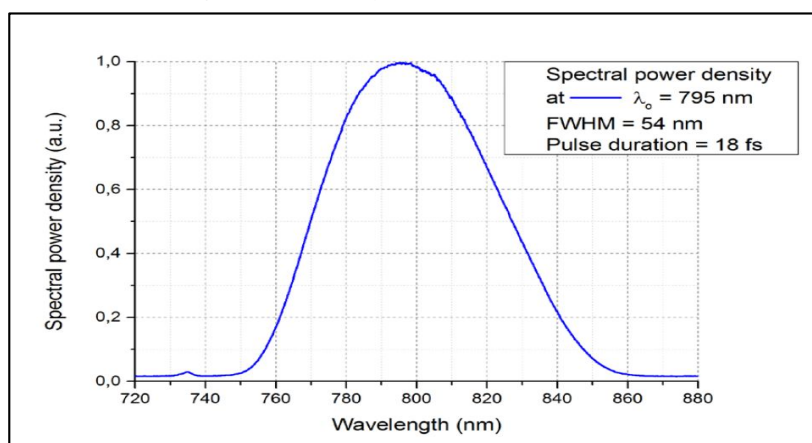


Fig. 2- The 52 nm bandwidth of the Ti:sapphire oscillator at $\lambda_0 = 795 \text{ nm}$ and 18 fs pulse duration.





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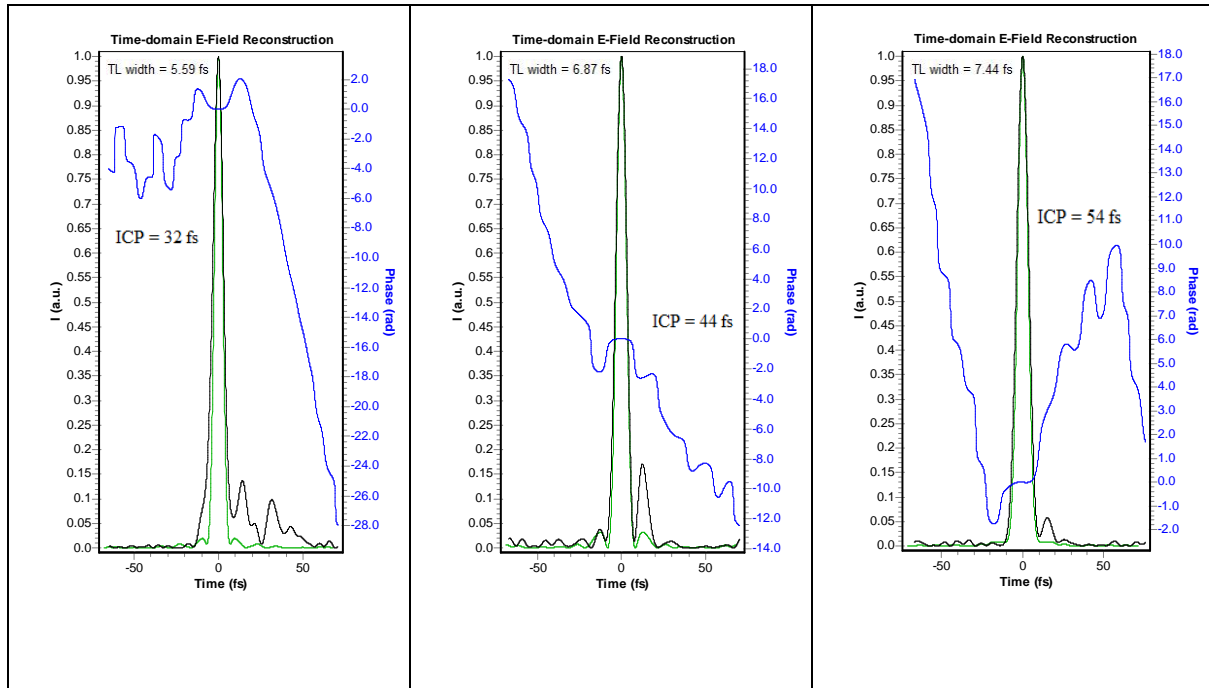


Fig.3. The temporal profile change of the transform limited of the output pulses (green curve) for ICP values of 32, 44, and 54 fs, respectively at neon gas pressure of 2 atm. The compressed output pulse (black curve) and temporal phase (blue curve) of the compressed output pulses measured using SPIDER.

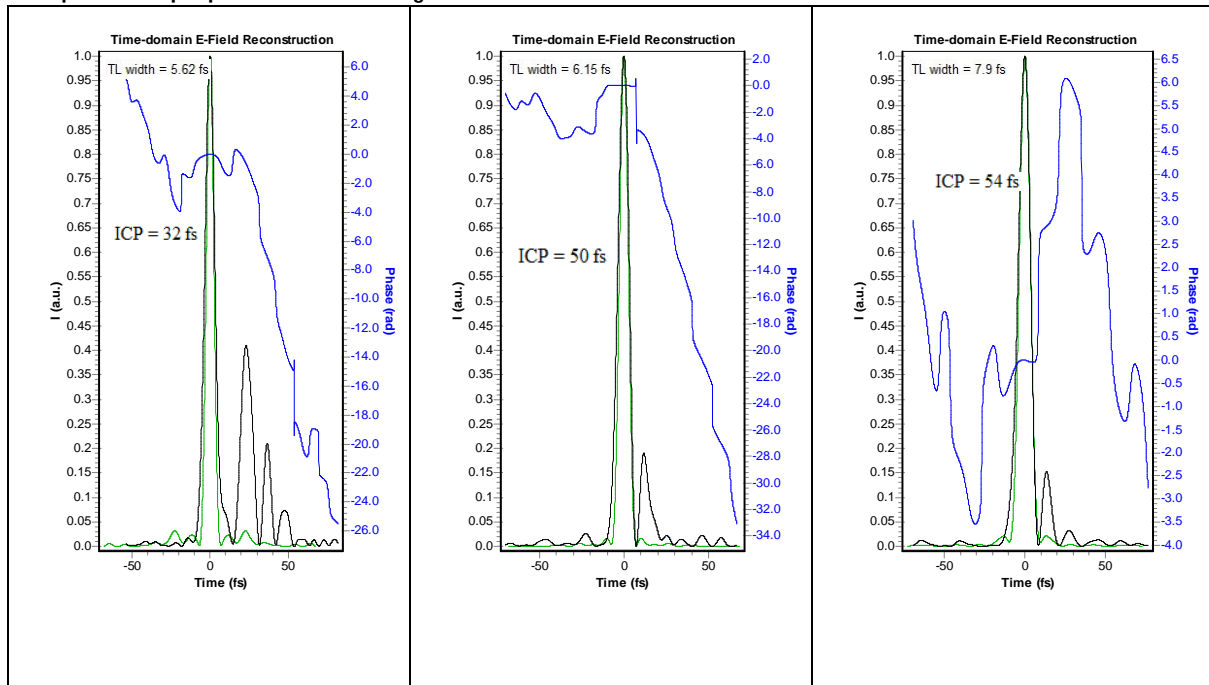


Fig.4. The temporal profile change of the transform limited of the output pulses (green curve) for ICP values of 32, 50, and 54 fs, respectively at neon gas pressure of 2.25 atm. The compressed output pulse (black curve) and temporal phase (blue curve) of the compressed output pulses measured using SPIDER.





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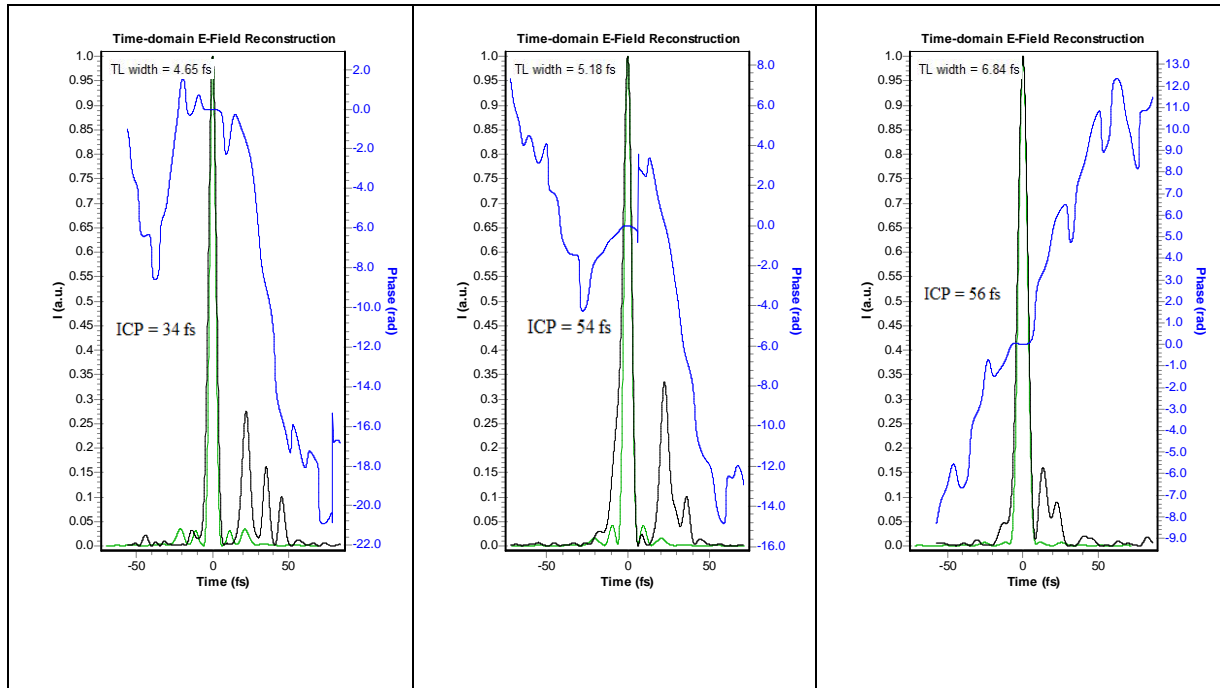


Fig.5. The temporal profile change of the transform limited of the output pulses (green curve) for ICP values of 34, 54, and 56 fs, respectively at neon gas pressure of 2.5 atm. The compressed output pulse (black curve) and temporal phase (blue curve) of the compressed output pulses measured using SPIDER.

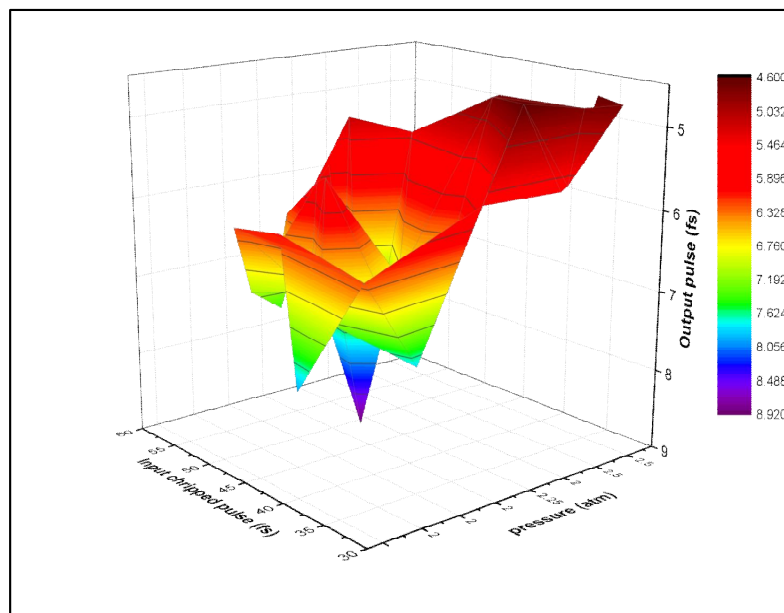


Fig.6. 3D representation of the temporal profile change of the transform limited of the output pulses (green curve) for ICP values of 34, 54, and 56 fs, respectively at different neon gas pressures from 2-2.5 atm. The colour pattern describes the output pulse from most compressed output pulse (red) to the low compressed pulse (violet).

