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Sustainable Residential Complexes Design with Incorporating Internal & External Landscape and Using Ecological Design (Case Study: Residential Complex Of Apadana, Tehran,Iran)

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----------ABSTRACT----------
Designing for human life related environment and landscapes requires noticing the environment values and potentials on one hand, considering human needs on the other hand. Such environment designing should persistently be performed by the interaction and balance with the environment. The goal of the present research was to provide designing strategies in order to connect internal and external landscapes of residential complexes horizontally and vertically. The study region is Apadana residential complex located at 5th district of Tehran. The research method is descriptive- analytic and of applied kind. Performing this research both through field and documentary methods, data collection, analysis, and their integration were done. In order to distinguish Weakness and internal weakness, and also external opportunities and threats we used the SWOT analysis model, following the most preferred strategies to design Apadana was determined along with integration of external and internal environment landscapes using the QSPM matrix. Results showed that the most preferred strategy to design open area and landscapes considering ecological vision and visual quality improvement is through spatial and visual continuation approaches with internal atmosphere of residential complexes.

KEYWORDS: *Residential Complex, Sustainable, Ecological Design, Apadana.*

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I. 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) (Rewal, 2006). 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.

Sustainable Residential Complexes

The Sustainable construction is defined as follows:

Managing a clean and healthy environment based on efficient application of natural resources and ecologic principles; designing Sustainable constructions is to decrease their damages on environment and energy resources and nature which containing the following rules (Taleb and Sharples, 2011):

1. Decreasing consumption of non-renewable resources
2. Expanding the natural environment
3. Removing or decreasing poisonous or harmful materials used in construction industry on nature

Therefore briefly one can define the Sustainable complex as follows: a complex which has the least controversy and inconsistency with the environment around and more expanded with the district (Stang and Hawthorne, 2005). In a broad field, construction techniques try to provide integrated quality regarding economic, social and environmental aspects. Therefore, rationally using of natural resources and proper managing of construction would help protection of limited natural resources and decreasing energy consumption and also led to environmental quality promotion (Kim et al, 2009).

General goals of Sustainable construction are as follows: (Li and Liu, 2007)

- Proper application of resources and energy
- Preventing from air pollution
- Consistency with the environment

Ecological Design

This is a designing method which to connect in a healthy way, human hand- made with natural environment such that draw the least danger and harm to environment (Van der Ryn, and Cowan, 2007). There is a good level of ecologic design understanding now. In fact the subject of healthy artificial environment creation in contrast to many other problems can't be solved using developed technologies. Many designers misbelieve that they immediately would capture their ecological design, if they equipped the building to mechanical clean energy absorption including solar panels, wing generators, and other modern equipment. Most of architectural magazines provide such landscapes. Though, such an attitude has significant difference with ecologic designing. The environmental movement toward green designing is different from engineering one (Kong-jian et al, 2001). In a mere engineering attitude from the first steps the designing goal is to achieve economic interest and applying increasingly economic sources and facilities, but ecologic designing which we consider here starts with environmental vision and knowledge and keeps continued through the process to attain consistency with environment. Therefore, from the very first steps designed systems nature and form should be led toward safe integration with natural environment whose first stage can be started through building artificial environment resembling to the nature. (Yeang. 2006)

One should notice that having healthy connection with the environment is theoretically very simple but to achieve it practically may be very difficult and complicated in all aspects (Bergen et al, 2001).

Samples of architects landscape designs applying natural elements in residential complexes

Frank Lioyd Wright

Frank Liyod Wright who had reclaimed his high affection to nature through designing of Waterfall House, used to tend to apply directly nature and green plants forecasting flowerbeds and waterscapes in terraces. His tendency to combine the nature with architecture was showed up again getting back to design houses including Waterfall House (Treiber, 2008) (Fig 1).

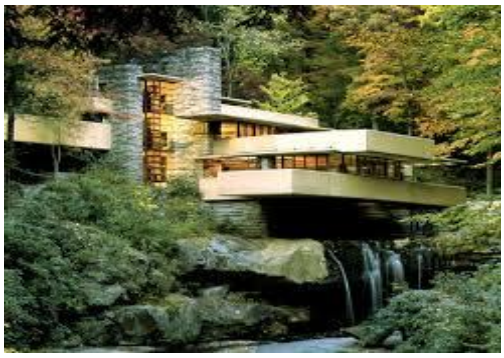

Fig 1: a work designed by Frank Lioyd Wright(Treiber, 2008)

II. ALVAR ALTO

Wood application in architecture would remind anyone Alto. Wavy terraces of consumptives' hospital in Pie Meo, south Finland, mushroom shaped roof basement of Toren Sunmat newspaper building (1930), wavy roof of lecture hall of Vipoori library (1934), and wavy walls of Finland Pavion at international exhibition, New York (1939) all imply affection and accessibility to the nature (Aimin, 2012; Passe, 2013) (Fig.2).

Fig.2: a work designed by Alto(Aimin, 2012; Passe, 2013)

III. RICHARD ROGERS AND NORMAN FOSTER

Rogers shows methods of direct applying of light, direction and speed of wind within different seasons, water and plant in stairs atmosphere to adjust environmental conditions while designing for Inland Revenue Offices. Foster also took a very stable step toward designing ecological construction in Commerce Bank Headquarters building, Frankfort (Elnimeiri and Gupta, 2008). This building having triangular plan contains a flowerbed in each floor whose trees height excess 12 meters. Flowerbeds turning around the building three faces and distribute. All administrative spaces have a landscape of flowerbeds and no column takes the landscape. Each flowerbed resembles Mediterranean, Asian gardens (Fei and Shiyuan, 2008).Residents can find themselves near a garden and touch plants on the land walking utmost two floors down or up while being tens of floors far from the earth (Elnimeiri and Gupta, 2008).

Fig. 3: a work designed by Richard Rogers and Norman Foster(Fei and Shiyuan, 2008)

Ken Yeang

Ken Yeang believes that a skyscraper can be nature friendly. Reinforcing ecologic green relationship in residential complexes is one of the features of ecologic designing landscape of residential complexes performed by Yeang (Yeang, 2009): broad landscape enriches the relationship between residents and nature, also allows us to use it as a lung for city and a reservoir for wildlife and ecology. Residential regions are connected to other parts of the city through green relationship networks in designs (Yeang, 2006) (Fig. 4).

Fig. 4: green landscape relationships of Yeang complexes(Yeang, 2006)

Case study

Apadana complex located at west of Tehran, region 5 (Fig. 5). The area is 304.407 m. It's bounded to Sheykh Fazllolah highway on the north, Ekbatan 3rd phase on the northwest, 1st Bime lane on the southwest, and from south to south west to barren lands of Fakoori and Apadana (belonging to ministry of defence).

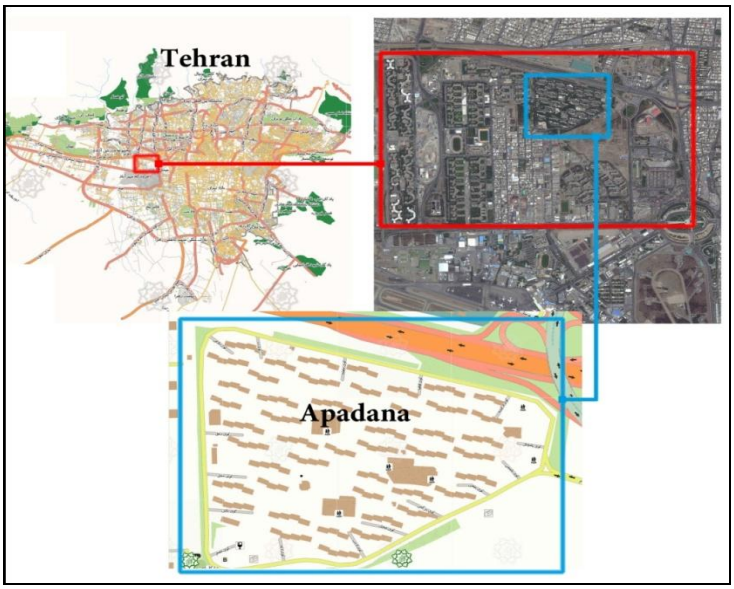

Fig. 5: Apadana residential complex location

All buildings of the complex include 2901 residential unit having 2 or 3 bedrooms and divided to 6 phases (Table 1).

Table 1: the town units based on phase, block and entrance

Units	Entrance	Block	Phase
488	28	8	1
510	30	8	2
459	27	7	3
512	30	8	4
512	30	8	5
420	24	7	6
2901	169	46	Sum

Apadana complex is one of the wealthiest districts of Tehran regarding landscapes. An area approximately 8 m width along with concrete walls has been tree planted all around the complex. Inside the complex, the space between blocks and cement pavements is decorated with lawn, flowers, trees and shrubs. Therefore, the area can be as a big park for residents.

IV. METHODOLOGY

Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyzing method is one of the strategic and assessment planning models developed by Faculty of Business-Harvard university (Ziari, 2005). It is also a management tool suitable for codification strategic performance programs (Amin et al, 2011). SWOT method spots internal weaknesses and strengths and also determines external threats against the residential complex (Halla, 2007) . This is based on the logic behind the decision to use the model that is an effective strategy and supposed to maximize opportunities and chances and minimize weaknesses and threats (Hoseini, 2005). The most common result of the model is development of a rational framework for systematic navigation of issues and debates regarding the residential complex and different strategies, where the final result is choosing the best method (Hekmatnia and Mosavi, 2007). The factors under consideration were organized in a questionnaire using Likart's scale. The statistic society was grouped in two a: managers and experts in urban fields; b: academic experts.

Having the sample society determined, internal factors evaluation (IFE) and external factors evaluation (EFE) matrices were created and the experts from the two groups were consulted in ranking the factors from too high to too low. The results showed that context was a factor of external and internal factors. Then, comparative assessment was used to examine SWOT matrix through ST, WO, ST, WT Strategies. Afterward, the strategy with highest priority for designing reservoir of ides for the residential complex design of Apadana was obtained using QSPM matrix.

V. RESULTS

SWOT Matrix

The matrix classified internal factors as strengths and weaknesses and external factors as opportunities and threats. This analysis of strategy environment is known SWOT technique. Strength and weakness points of residential complex resist threats or overcome them and enjoy the resultant opportunities. On the other hand, Strategies act as mediator between internal and external factors (Table 1).

Table1: SWOT technique for residential complex of Apadana

External Factors		**Internal Factors**	
Threats	**Opportunities**	**Weakness**	**Strengths**
T1- high dense of construction and limiting landscape landscapes T2- turning green applications to other kinds and destroying natural landscapes T3- unconsciousness of residents about management and maintenance of landscapes T4- garbage pile in open areas and loss of visual quality T5- uncertain wall and foundation construction inconsistent with natural landscape T6- neglecting building and roof landscape regarding design and green making T7- open area and landscape designing regardless to ecologic vision and incorporating external and internal landscapes of complexes T8- management weakness T9- lack of specialists in case of landscape T10- overlooking people roles in decision making through all steps including provision, admittance, and performing the designs T11- lack of consideration for complex landscape from municipality and parks organization T12- unknown new constructions	O1- having natural, semi-natural, and urban sceneries at the suburb of the region O2- adjacency of other complexes O3- combination and relationship of residential complexes with urban ones O4- having attractions and urban sceneries O5- presence of grand green spots O6- the municipality and parks organizations support from green roof and green walls O7- native and natural materials to use in open area expansion O8- presence of various incorporated with trees and shrubs O9- residents cooperation and participation O10- existence of vertical and horizontal area within complex like vertical walls and roofs O11- proper design and internal architecture O12- existence of intact area within the complex O13- notice to beautiful landscapes, the quality of residential and entertainment area in the complexes statute	-W1- Irregular designs of landscapes of open area and landscapes for complex W2- improper management and maintenance of the existing landscape W3- using non-suitable and non- native plant coverage W4- failing to observe landscape per capita W5- paving vast area of sidewalks W6- improper designs of roofs for green roof W7- discontinuation among green spots of the complex W8- non- various plant coverage W9- large height difference of buildings W10- allocation landscape spaces to another applications W11- uncertain construction and inconsistent with natural landscapes of residential complexes W12- neglecting buildings landscape and vertical and horizontal relationships of internal and external landscape W13- neglecting natural and artificial landmarks in residential context	S1- the existence of natural and hand planted plant coverage S2- having contribution sense among residents in presence of nature inside buildings. S3- having centralized compressed plant coverage in complex area and marginal wall of site S4- having grand entrance lobbies for buildings S5- open area of roofs S6- having terraces at all floors in different directions S7- proper vertical walls with broad surface

Internal factors evaluation (IFE) and external factors evaluation (EFE) matrices

Taking into account disadvantages of SWOT analysis and to improve its efficiency, a list of factors of SWOT was obtained after consulting with experts and scholars based on Likart's scale. Afterward, relative weight of each factors was obtained using the following relations:

Equation 1. $R_{ij} = \sum Si\,F_i$ variable rate

Equation 2. $Y_{ij} = Rij \Big/ \sum Rij$ proportional weight of the variable

R_{ij} is the variable rate of j in group i

S_i is Likert's score in five categories

F_i is frequency of alternatives

Y_{ij} is final weight of j factor in group i

The method, among the many, is used to quantification of SWOT factors, which also enables positional assessment of relative importance of the factors in each group (Table 2 , 3). In general, evaluation of decision making situations was combined with SWOT.

Table 2: Internal factors evaluation For residential complex of Apadana

	Strengths				Weaknesses			
Rank		Relative Weight	Score	Final Weight		Relative Weight	Score	Final Weight
1	**S3**	0.165	3.000	0.496	**W7**	0.090	1.000	0.090
2	**S7**	0.153	2.000	0.306	**W2**	0.088	1.000	0.088
3	**S4**	0.149	4.000	0.595	**W9**	0.085	3.000	0.255
4	**S2**	0.140	4.000	0.562	**W8**	0.083	4.000	0.331
5	**S5**	0.136	3.000	0.409	**W13**	0.075	4.000	0.302
6	**S6**	0.132	3.000	0.397	**W5**	0.078	2.000	0.156
7	**S1**	0.124	3.000	0.372	**W1**	0.071	1.000	0.071
8				0.000	**W6**	0.068	1.000	0.068
9				0.000	**W10**	0.066	1.000	0.066
10				0.000	**W3**	0.051	4.000	0.204
11				0.000	**W4**	0.083	2.000	0.165
12				0.000	**W11**	0.075	2.000	0.151
13				0.000	**W12**	0.088	1.000	0.088
	sum	1.000		3.136	**sum**	1.000		2.034

Table 3: External factors evaluation For residential complex of Apadana

	Opportunities				Threats		
	Relative Weight	Score	Final Weight		Relative Weight	Score	Final Weight
O10	0.105	4.000	0.421	**T7**	0.111	2.000	0.221
O2	0.093	4.000	0.374	**T12**	0.106	2.000	0.211
O1	0.084	4.000	0.337	**T3**	0.099	1.000	0.099
O6	0.082	4.000	0.328	**T9**	0.094	1.000	0.094
O11	0.080	2.000	0.159	**T10**	0.091	1.000	0.091
O13	0.071	1.000	0.071	**T2**	0.089	3.000	0.267
O3	0.071	3.000	0.212	**T8**	0.072	1.000	0.072
O8	0.057	1.000	0.057	**T6**	0.067	3.000	0.202

O4	0.055	3.000	0.164	**T11**	0.065	3.000	0.195
O5	0.052	2.000	0.105	**T1**	0.060	4.000	0.240
O7	0.098	4.000	0.392	**T5**	0.074	1.000	0.074
O12	0.061	4.000	0.244	**T4**	0.073	1.000	0.073
O9	0.091	3.000	0.273				
sum	1.000		3.137	**sum**	1.000		1.839

Results obtained from the prioritization of weak and strength points, opportunities and threats and also experts and officials' evaluation about SWOT factors in the form of relative weighting method show that in the S3 group the most important strength is the presence of dense plant coverage within residential complexes and marginal walls of the site (relative weight 0.1653), while W7 was identified as weakness factor. In case of opportunity factors one can name 010 (relative weight 0.152) having the highest relative weight in both SWOT and this group. Also T7 is preferred with the highest relative weight and stands in the second place regarding total SWOT factors.

Codification of strategy (comparison)

SWOT matrix and internal/external factors assessment matrices were used to devise different types of feasible Strategies in planning (Table 4):

- Codification of SO Strategies
  All residents desire a situation where they all can maximize their strengths and opportunities. In spite of defensive strategy, as a reactive one, invasive Strategies are proactive.
- Codification of WO Strategies
  The Strategies are aimed to use opportunities in the outside and to improve internal weaknesses. Sometimes, there are several opportunities outsides while the residential complex fails to use them due to some internal weaknesses.
- Codifications of ST Strategies
  The Strategies are designed based on strength point of the residential complex to fight the threats. The main goal is to maximize the advantages and minimize the threats. However, as suggested by experiment, inappropriate use of strength point may end up in negative results. Any reasonable plan shall be cautious when it uses its strength points to fight the threats.
- Codification of WT Strategies
  The most conservative Strategies are WT Strategies which mainly adopt defensive modes and try to minimize internal weaknesses and avoid threats caused by external factors (Golkar, 2005; Eftekhari and Mahdavi, 2006).
  At each moment, two factors are compared with each in SWOT, as it is not to find the best strategy. In fact, the matrix is aimed to find feasible Strategies so every strategy in SWOT is not necessarily feasible.

Table 4: Strategies for residential complex of Apadana

ST Strategies	SO Strategies
ST1.nitice and enrich natural landscapes and preventing the destruction of them ST2. Encouraging the participation and positive attitude of residents in presence of nature within buildings and relating internal and external landscapes ST3. Paying attention to residential complexes and buildings landscapes along with coordination and incorporation with internal architecture of blocks ST4. Designing open area and landscape considering ecologic vision and improving visual quality by means of methods of visual and spatial continuation with internal atmosphere of residential blocks ST5. Incorporation and solidarity among residential blocks vertical and horizontal green spots with each other and internal area of blocks	SO1. Creating corporal, spatial and communicative connections among the landscape of complex blocks with adjacent blocks and internal area of blocks SO2. Considering the size of green spots so that to be big enough or connected to the others SO3. Creating vertical and horizontal green surfaces through greening open areas within the complex SO4. Creating entertainment and general places with ecologic application suitable for ecologic principles of the landscape SO5. Forming cooperative work groups with related executive systems in order to harmonizing systems and speeding executive affaires regarding to make green residential complexes SO6. Increasing spatial variety and landscapes combination and connection and green spots with

	urban landscapes
WT strategies	**WO strategies**
WT1. Control for excessive constructions and prevent destruction of green areas WT2. Reinforcing the landscape of buildings and improving roofs to expand green walls and roofs WT3. Complying integrated plans in order to inform residents and their participation and cooperation with the municipality WT4. Connecting internal and external green spots within blocks and relating them to urban landscape	WO1. Combination and connection of residential complexes landscapes to each other WO2. Using required facilities to incorporate residents and the parks organization in design procedure and integrating external and internal landscape of blocks WO3. Incorporation and solidarity between external and internal applying landscaping technics WO4. Sustainable and harmonized construction with present landscapes of the complex WO5. Noticing buildings landscape and improving vertical and horizontal relationships of internal and external landscapes of blocks WO6. Relating big green spots to each other and urban landscape

Internal and external matrix (IE)

The matrix is used to determine general status of the Strategies. Development of IE matrix based on previous surveys enables us to predict effect of strategic decisions on the residential complex. The IE matrix can be divided into four regions each of which dictates different Strategies. (Fig.6)

Average total points of external/internal factors assessment matrix (2.58 and 2.48 respectively) showed that the factors under consideration are located in the second regions. Thus, based on the analyses and the explanations, ST Strategies are feasible.

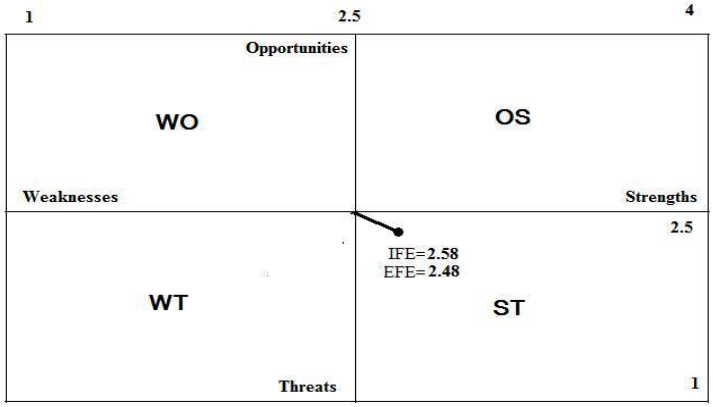

Fig. 6: Final Score external and internal factors evaluation matrix

Qualitative Strategies Planning Matrix (QSPM) – Decision Making

Above all, based on the priority of the acceptable Strategies, found in previous stage, final Strategies were selected through intuitive judgment and final point of each measure was obtained using QSPM (Table 5). Results of analyses in the first stage and results of comparison of internal/external factors in the second stage were used in QSPM and explicit methods of the Strategies were obtained (David et al, 2009).

That matrix was used to determine advantages of each strategy so that it determines explicitly what strategy is the best choice among the other.

- All factors were ranked from 1–4 based on the importance. The rank determines efficiency of current strategy to react to such factors. Rank 4 corresponds with high reactivity, 3 with reactivity more than average, 2 with average reactivity, and 1 with low reactivity.
- Score of each factor (0-1) was multiplied by the pertinent Attractiveness Scores (AS) to obtain Total Attractiveness Scores (TAS).
- Total Attractiveness Scores (TAS) of each variable was obtained to achieve Sum Total Attractiveness Scores (STAS) of each strategy.

  Through the three stages internal factors can be studied in form of internal factors evaluation matrix. These stages correspond with stages of development of external factors evaluation.

Table 5. QSPM Matrix

ST5		ST4		ST3		ST2		ST1			Strategy
TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	Final Weight	Factor
0.124	1	0.496	4	0.496	4	0.496	4	0	0	0.124	S 1
0.42	3	0.56	4	0.56	4	0.42	3	0.42	3	0.14	S 2
0	0	0	0	0	0	0.66	4	0.33	2	0.165	S 3
0.447	3	0.596	4	0.596	4	0.298	2	0.447	3	0.149	S 4
0.408	3	0.272	2	0	0	0.136	1	0.544	4	0.136	S 5
0.528	4	0.528	4	0	0	0.264	2	0.132	1	0.132	S 6
0.612	4	0	0	0	0	0.612	4	0.612	4	0.153	S 7
0.336	4	0.336	4	0.252	3	0.336	4	0	0	0.084	T1
0.093	1	0	0	0	0	0.093	1	0.372	4	0.093	T2
0.213	3	0.213	3	0.142	2	0.284	4	0	0	0.071	T3
0.22	4	0.055	1	0.165	3	0.055	1	0.165	3	0.055	T4
0	0	0.156	3	0	0	0	0	0.052	1	0.052	T5
0.246	3	0.328	4	0.082	1	0.328	4	0.246	3	0.082	T6
0.21	2	0.21	2	0.42	4	0.21	2	0.105	1	0.105	T7
0.057	1	0.228	4	0	0	0.228	4	0.171	3	0.057	T8
0	0	0.273	3	0	0	0.364	4	0.182	2	0.091	T9
0.392	4	0.392	4	0.294	3	0.294	3	0.294	3	0.098	T10
0.08	1	0.24	3	0	0	0.32	4	0.16	2	0.08	T11
0.183	3	0.244	4	0.183	3	0.244	4	0.244	4	0.061	T12
4.782		5.127		3.332		5.642		4.476		مجموع	

Regarding the matrix for internal and external factors, to design Apadana complex certain ST strategies are selected as follows:

[1] Designing open area and landscape considering ecologic vision and improving visual quality by means of methods of visual and spatial continuation with internal atmosphere of residential complexes (5.642).
[2] Incorporation and solidarity among residential blocks vertical and horizontal green spots with each other and internal area of blocks (5.127).
[3] Encouraging the participation and positive attitude of residents in presence of nature within buildings and relating internal and external landscapes (4.782).
[4] Paying attention to residential complexes and buildings landscapes along with coordination and incorporation with internal architecture of blocks (4.476).
[5] Notice and reinforcement of current natural sceneries and preventing from destruction of hand planted and natural landscapes (3.332).

VI. CONCLUSIONS

In this paper, after expressing the necessity of integration of internal and external landscapes of residential complexes, we proceeded step by step by strategic tools of planning. After selection of sample population, we formulated the evaluation matrix for internal factors (IFE) and external factors (EFE), expertise comments were used in order to determine the coefficient for each factor and decision making about low and high significant strategic factors until results obtained from matrices to be used acquiring final score; results indicate the state kind of residential complex compared to internal and external factors. Next step through adaptive evaluation, we performed the SWOT matrix in the form of strategies St, WO, ST and WT, then using the matrix QSPM the most preferred strategies were selected for designing Apadana along with incorporation of internal and external areas landscape. In this complex designing open area and landscapes considering the ecological vision and promotion of visual quality through spatial and visual continuation with internal area of blocks was identified as the most preferred strategy.

VII. DISCUSSION

In general, specifications of residential units tend to decline particularly for certain classes of the society. Houses getting smaller, thus most f life current needs and the presence of natural landscape can't be appeared in a limited space. It's here that the internal atmosphere and connection with external one assumes its serious function and significance. These atmospheres should in small houses enjoy from maximum facilities. Since in most these facilities haven't received required reasonable expansion, these atmospheres are needed to defined properly, and also to design the residential complex landscape and along with incorporation of internal and external atmosphere of residential places the following should be studied: noting different scales of designing urban, site, and design basis scales and architectural design scale, and noting internal space of each unit, social relationship recognition, and its significance in the project formulation.

VIII. SUGGESTIONS

Suggestion policy of designing for landscape of residential complexes along with incorporation of internal and external spaces:

- Applying ecological design principles to design continuous areas of residential complexes in order to create Sustainable and integrated landscapes
- Improving the quality of the environment and increasing the level of geen areas in residential complexes through making green the existing horizontal open areas and vertical walls of the complex
- Improving visual quality through visual and spatial continuation methods for human made elements with environment, expanding environmental elements
- Creating gardens on the roofs, green vertical walls, green terraces and patios in order to increase green area and reinforce vertical and horizontal relationships in residential complexes.
- Maintaining landscape integration through relating green spots of adjacent complexes and creating bigger green spots an if possible connecting them to green landscape of the city.
- Relating buildings and surrounding area and indeed the relationship between internal and external area through environmental design and borderline spaces like: patios, terraces, roofs, and vertical walls
- Public participation through places like: public gardens of vegetables, and herbal plants in order to provide new experience and creating dynamic space and making direct relationship between people and nature particularly foe elderly and kids
- Using suitable plants in different floors to improve visual quality and decrease the air pollution

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