An Exploration of a Socio-Cultural Approach Using Significant Variables of Pattern Language Amongst Iranian Experts of Environmental Design

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Abstract
The value of socio-cultural aspects in the environmental design process and relevant issues are discussed in this paper. In addition, Alexander's Pattern Language theory is derived from human activity, perceptive and behavioural patterns and is associated with the Genius loci. Thus, the researcher considered the possibility of a relationship existing between Pattern Language and the field of Environmental Design (especially the socio-cultural dimension) that would arrive at a correlation model of "A Pattern Language for Environmental Design". The research method was a survey implemented to collect data from 129 MS (related to the Environmental Design field) graduates and students studying at various universities in Tehran. The sampling method was based on stratified random sampling. A 49-item questionnaire was used to collect data and the reliability of all subscales was more than 0.80 estimated by the Cronbach alpha test. Hierarchical Confirmatory Factor Analysis was used to analyse data by LISREL 8.72 software. The results of the analysis statistically confirmed the correlation model of "A Pattern Language for Environmental Design". While all correlations between pattern language components and their counterpart indicators were statistically significant, the correlation between the socio-cultural dimension and environmental design was the most powerful relationship in the model.

Keywords: Environmental Design; Socio-cultural dimension; Pattern Language; Iran

1. Introduction
The various design processes show a lack of specific theoretical approaches and depend entirely on designers' personal tastes. What can be seen today is affected by popular trends, fashions, imposed tastes and people's desires. Every environmental designer or landscape architect has a specific thinking process in his/her design and environmental patterns (ecological, physical and cultural) of which holistic and effective factors are the most important. Alexander (1979) asks in "The Timeless Way of Building": "How can designers design without connecting to the design context and environment?" The purpose of this paper is to achieve a correlation model based on "A Pattern Language for Environmental Design". In fact, achieving such a model would seem impossible if no relationship was found between "Pattern Language" and Environmental Design. It seems that humans are the connection between these two concepts, which is one of the main concerns of this study. Limited research into the theoretical approaches of environmental design has made this process more difficult since no theory has yet been found to determine such a relationship or similar relationships. However, this fact has helped this paper to become original. By studying many dimensions and considering many attempts, the importance of the social and cultural dimensions amongst others (ecological, aesthetic approaches) especially in the environmental and landscape design fields and the strong connection to Pattern Language theory, the researcher selected the most important and effective aspect of socio-cultural dimension. Pattern Language theory and the socio-cultural approach are especially of high importance to the environmental designer.

Thus, in this paper, the researchers explore the possibility of an existing association between Alexander's Pattern Language and Environmental Design. As these conditions are important in environmental design around the world, and in addition, landscapes and gardens have always been known as public places, not separate from man and his life, the researcher proposed a correlation model of "A Pattern Language for Environmental Design".
This research is not only a descriptive review of the key factor of the socio-cultural dimension, but also explores the explicit and implicit factors of pattern language. Considering that each place radiates a unique sense or, more specifically, owns a unique pattern language, the objective is to establish a pattern language for environmental design. Therefore, the main issue discussed in this paper is the question: "What is the relationship between the socio-cultural approach in Environmental Design and the Pattern Language theory?" After determining a relationship between pattern language and the specific aspects of environmental design (which was achieved through the meaning and perception of conceptual relations between these fields), researchers were able to discover this association in another form. Although Alexander's main focus was not architecture or urban design, what the researcher is suggesting here is an extension of Alexander's work to cover designed landscapes as well. Considering that so far, little has been said about pattern language affecting public landscape such as urban parks and squares, this mission seemed to be all the more challenging.

Communication concerning the contemporary environmental design process in Iran, the Pattern Language theory and the necessity of considering the socio-cultural aspect as a missing link, shows the novelty of a problem that has never been truly investigated in any research.

2. Literature Review
2.1 Pattern Language

Dictionaries and encyclopedias describe the word "Pattern" as a type of placement order, a type of plan, a style, a valuable model, a sample as a whole representative and a common path for an activity, etc. All the above-mentioned descriptions show the general and universal approaches of such a key word. Most of these patterns referred to above, which are found in the environment, are not the result of man's planning or design, but are self-organised patterns which are seen in different scales, shapes, types and in similar distribution. Indeed, a pattern is a set of relations which can be embodied objectively, using materials and geometry (Salingaros, 2007). On the other hand, the Pattern Language theory, developed by Alexander and his colleagues in 1977, is associated with Genius loci and space Gestalten (as Norberg-Schulz stated in 2000). This theory is an attempt to represent cognition and human behavioural patterns and their related architectural typologies. Pattern language seeks to identify and design physical elements often present in beautiful, humane environments and therefore helps foster a sense of place (Relph, 1981). Patterns are abstract concepts from fundamental environmental factors which make environmental complexities understandable. Alexander was trying to understand the failures of pattern languages and the deeper implications of geometry on a quality without name. Alexander (1977) and Salingaros (1999) argue that natural patterns were the origins for shaping various styles of architecture. Many universal and self-organised patterns exist in different aspects of our life and also in our architecture. According to Norberg-Schulz (1984), each indicator of place has a specific identity and has a public and common name which is used in order to distinguish it from others. Alexander defines patterns as particular aspects of the physical environment that assist a specific experience or activity: "Every place is introduced with its character by certain patterns of events" (Alexander et al., 1977) and Norberg-Schulz (1984) indicates that "the art of place is a totality and complex of various figures in different scales", but this composition represents a specific sense which is the value of place and this value is related to spatial Gestalten and Genius loci. Bell (1999) also argues that patterns which can be termed universal, as Alexander (1977) states, are based on repetition. The relationship between these patterns and natural patterns lead us to archetypes or basic patterns which are the result of pattern/process feedback. These patterns are man-made and show the domination of man over nature and the environment which causes the destruction of landscape unity. It may be that the importance of these patterns is due to the human domination of nature. Scholars think that Ardalan and Bakhtiar (2000) proceeded to write their great book, "The Sense of Unity", based on recognition of the contemporary evolution of Iran and lack of unity in current spaces. This paper endeavours to represent some of them as a pattern language for environmental design in Iran, based on the point of view of experts. The main aim of this paper is to achieve "A Pattern Language for Environmental Design". Firstly, the author presents some definitions in the area of pattern. There are two main approaches concerning the "pattern" concept and many researchers have made efforts on this topic, some using the first approach and some using both. These two approaches are categorized below:

- Physical patterns which lead to principles
- Eternal or universal patterns related to archetype and cultural patterns.

The first approach, which is explained in "Form and Fabric in Landscape Architecture" by Dee (2001), generally mentions physical principles such as spaces, paths, edges, foci, etc. and by Bell (2004) in "Elements of Visual Design in the Landscape", also by Ching (2007) in his book "Architecture: Form, Space, and Order" (2007) and by Booth (1983) and Jackle (1987). However, Bell (1999) in "Landscape: Perception, Pattern and Process" and Dee (2001) discussed archetypes, vernacular patterns and historic paradigms to some extent. The second approach, which has external presentations, is related to (vernacular) patterns all over the world. Alexander (1977), Norberg-
Schulz (2000) and Fathy (1973) have discussed this subject at a basic level and many authors have explained it in more detail. Alexander has specifically called each one (in any location) a "pattern language", according to their unique circumstances. In this context, pattern language gives us the tools, or the rationale, with which to build a new society base.

Just as Seamon (1993) shows the interaction between the Pattern Language theory and an ecological approach in an experimental work, it is now hypothesised that there is an association between this theory and the socio-cultural approach. A similar experimental research to Seamon's work can also be carried out. Hsu and Shih (2010) when considering school building design, argue that the type of perceivable campus architectural design method involves unique creations and can also be rooted in the "sense structure" of local community history and Alexandrian pattern language. According to Saunders (2002), each person has a pattern language in his mind and designs with the rules that exist in his language. So, it would seem that the meaning of an open space, a seating area and even a park is different in different cultures. The evidence obtained from the results of the survey adds weight to this argument.

2.2 The Socio-cultural Approach and Environmental Design

As can be seen in this study, the author is trying to extract a unique and local aspect of environmental design related to the Pattern Language theory in that, each place has a unique pattern language. Environmental Design has various dimensions and values. Among the most important is the relationship between man and environment, what the author terms: "a socio-cultural approach".

According to Meinig, each landscape has a secret and studying that secret means discovering the truth about a socio-cultural concern (Meinig, 1979:1). Harvey (1990: 135) believes that environment is reflected in the attitudes and priorities of the entire community. Recent studies around urban and suburban landscapes lead to the hypothesis that environmental and social problems and concerns are inter-linked (Stanners & Bourdeau, 1995; Bennett, 1996; Phillips, 1998: 29; Höll & Nilsson, 1999: 18). Thrift & Whatmore (2004) and also Stephenson (2008: 135) discuss the impacts of human activities on the natural processes of the environment. Syamwil (2012) based on Fisher's study in 2004, mentioned that, "environmental behaviour research shows an architectural discipline that has been overeager to impose its aesthetic ideologies and utopian visions on others, particularly the most vulnerable among us". He states that, "built environment is produced and reproduced all the time to serve the livelihood of the people". El Husseiny and El Husseiny (2012) consider Islamic Heritage Experience and other cultural approaches and try to rediscover a value-oriented architecture that is capable of moving spiritual feelings towards the built environment, even if its formalistic and visual attractiveness is controversial.

The author invites architects to express values in a daily use context and initially interact with people's feelings. Midgley, based on Kant's point of view, argues that a human, exclusive of his independency, is a member of many groups worldwide and has ethical relationships to all of them (Midgley, 1995: 92). Eckbo (1950) under the influence of Gropious and Thanard at Harvard University started to respond to social issues through environmental design, in his book: "Landscape for Living". Reading and shaping the landscape is not a modern phenomenon and humans have learned how to modify this around the environment (Taylor, 2003) and this is the beginning of environmental design. Cosgrove (1998) and Stefanou (1978) discussed the human cognitive and psychological interpretations concerning landscape and reading it. Faizi et al. (2009) also state that contemporary landscape reveals apparent and obvious manifestations of humans and their functions. Swaffield (2002: 80-82) believes that Jellicoe (1987) has a people-friendly approach to landscape, a valuing perspective, in his famous book, "The Landscape of Man". Tunnard (1948) believes that "landscapes should be designed in accordance with human needs" (Tunnard, 1948: 78). Treib also emphasises that "landscapes are for people, according to their activities" (Treib, 1993). Even Pye admits, in a modern and functional perspective that "environmental designers such as architects and engineers are responsible towards their clients and users to produce functional and safe landscapes" (Pye, 1978: 77).

According to some researchers such as Potteiger and Purinton (1998), patterns are mostly referred to as mental issues and group memories which they re-tell and describe as stories. Thompson also believes that a good environmental design is related to people's lives and the political and economic conditions they live in (Thompson, 2005: 124). In Halprin's works (1970), it can be clearly seen that people are a part of landscape. He argues that landscape designs need people to become complete (Spirn, 1998). Bell (1999) mentions (cultural) landscape assessment covering physical aspects and functional (patterns) and human aspects. Patterns are fully human-based so that they can be represented in many visual formats. They are not physical, but we can perceive them through our sensations (Salingaros, 2007). Each pattern language tries to adjust humans with their local environment.

Barati (2004) underlines culture in space language. As in the Alexandrian pattern language, Barati believes that humans need specific tools to represent space and to transfer spatial data to others and this is called "spatial language". Naming components and environmental factors is a kind of symbolism in any culture. For example, Rapaport (1998) diagnosed about 700 different languages, various house patterns and rural shapes in New Guinea. This means that the built
environment such as residential areas (as an important part of vernacular culture), has a close relationship with language as a specific society and gives special meaning and credit to language according to its value system and worldview. According to Alexander (1979), it is still not known how perfect spatial patterns connect to social patterns. Fathy (1973) states that design patterns are related to local residents. Jo and Lee (2007) believe that by ignoring the inherent differences between people, places and things that exist in our world, we run the risk of losing contact with the authentic world. Kanazawa (2002) stressed the importance of creating environments which fulfill more human needs and enhance people's sense of identity in relation to their living environments.

3. Research Method

Before examining the hypothesis and according to the literature governing environmental design (and pattern language), it is expected that Iranian experts will agree with the above conclusions. Though the importance of the socio-cultural dimension is set deep within pattern language, one of the most obvious features and values in environmental design is considering man, his past and his view of open space, which is what Thompson (2005) argues about the community. However, economics or even politics can also affect the (environmental) design process, but the three dimensions referred to above have been chosen according to their significance to the presented issues and the essence of pattern language and the importance of the socio-cultural dimension are very clear in Alexander's book (1979:21). As a result, in pattern language study and the process of environmental design, the author of this paper discovered a high convergence between the socio-cultural dimension in environmental design and pattern language issues. As mentioned in the literature review, the theoretical model in this study was derived from the Alexander theory and the research model has hierarchical components with specific individual indicators. This kind of structure can be investigated using a statistical method known as structural equation modelling. As the data was gathered using questionnaires by means of offering sketches to respondents, experts judged the importance of the indicators of environmental design in the selected Alexandrian rules which are related to environmental design. Then in order to recognise the relationship between the components and the indicators judged by experts, structural equation modelling was used as a powerful means of carrying out a valid investigation. In fact, this inferential method derives responses and analyses patterns of responses in order to reach a correlation model based on experts' opinions. It seems that in order to obtain a "timeless method" for environmental design, we should access a vernacular environment such as residential areas (as an important part of vernacular culture), has a close relationship with language as a specific society and gives special meaning and credit to language according to its value system and worldview. According to Alexander (1979), it is still not known how perfect spatial patterns connect to social patterns. Fathy (1973) states that design patterns are related to local residents. Jo and Lee (2007) believe that by ignoring the inherent differences between people, places and things that exist in our world, we run the risk of losing contact with the authentic world. Kanazawa (2002) stressed the importance of creating environments which fulfill more human needs and enhance people's sense of identity in relation to their living environments.

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method is correlation research (variance covariance matrix method) in which a hierarchical factor has been used for analysis. In order to study the validity of the test structure, a factor analysis was used. The research model (correlation model of "A Pattern Language for Environmental Design") was prepared in LISREL 8.72. In this method, the hypotheses on the latent and observed variables were examined and then presented and evaluated as a model of environmental design relationships including all (ecological, socio-cultural, aesthetics) dimensions, besides the aforementioned environmental design approaches with different pattern languages (related to landscape architecture). In this research, inferential statistics was used to extend the results obtained from the expert samples to all Iranian environment experts. This is because our research method is fundamentally a survey method and intends to gather different views on specific theories of pattern language from environmental design experts. In general, this kind of quantitative research method does nothing more than summarize responses in the form of a model which shows the network of relationships that has been formed in the beliefs of Iranian experts.

4. Data Analysis

In order to reach the analytical model of "A Pattern Language for Environmental Design", hierarchical factor analysis was applied. Before running hierarchical confirmatory factor analysis, normality, linearity and homedestesty were checked. The final correlation model of "A Pattern Language for Environmental Design" based on hierarchical confirmatory factor analysis was reached as shown in the following correlation model as Fig.1. This model is the standardised lambda coefficient for the final model and was achieved after multi-stage model modifications. Standardised values show the effect of variation in each indicator for the one unit change in the component.

![Fig.1. The Standard Model of Relationships between Variables and Model Factors in Hierarchical Analysis](image)

All values for lambdas show that all the relationships among the components of pattern language and its indicators are statistically significant (T>2).

The ecological, socio-cultural and aesthetical factors of the pattern language specifications (in environmental design) can be affirmed. All lambda coefficients are statistically significant. This shows that almost all micro scales of the test can measure the components of the above factors and all relationships are significant (see Table 2.). For the three main components of the pattern language model we can see that socio-cultural and aesthetical (in second degree) dimensions have a stronger impact compared to the ecological dimension (λ=0.68). This means that socio-cultural and aesthetical (in second degree) dimensions can represent pattern language components better than the ecological dimension.

<table>
<thead>
<tr>
<th>Latent variables</th>
<th>Observed variables</th>
<th>Titles of relations between observed and latent variables</th>
<th>Correlation Coefficient (Lambda estimation)</th>
<th>Lambda standard value</th>
<th>Standard error</th>
<th>T value</th>
<th>Significant level</th>
<th>Coefficient representation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socio-cultural dimension in urban landscape</td>
<td>Socio_ur with Socio</td>
<td>0.24</td>
<td>0.52</td>
<td>0.02</td>
<td>7.89</td>
<td>P&lt;0/01</td>
<td>0.27</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Socio-cultural dimension in landscape and environmental effects</td>
<td>Socio_en with Socio</td>
<td>0.61</td>
<td>0.74</td>
<td>0.1</td>
<td>5.87</td>
<td>P&lt;0/01</td>
<td>0.55</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Socio-cultural dimension in landscape - human relationship</td>
<td>Socio_hu with Socio</td>
<td>0.23</td>
<td>0.56</td>
<td>0.03</td>
<td>6.03</td>
<td>P&lt;0/01</td>
<td>0.31</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Socio-cultural dimension in landscape and green space</td>
<td>Socio_pl with Socio</td>
<td>0.61</td>
<td>0.85</td>
<td>0.09</td>
<td>6.23</td>
<td>P&lt;0/01</td>
<td>0.71</td>
<td>Approved</td>
<td></td>
</tr>
<tr>
<td>Socio-cultural dimension in landscape and elements relation</td>
<td>Socio_el with Socio</td>
<td>0.49</td>
<td>0.75</td>
<td>0.09</td>
<td>5.42</td>
<td>P&lt;0/01</td>
<td>0.56</td>
<td>Approved</td>
<td></td>
</tr>
</tbody>
</table>
The goodness of fit results for the final correlation model are presented in Table 2. The results of this analysis confirm that the socio-cultural component is more essential than others, as evaluated in the Pattern Language theory in the literature review.

### Table 2. Values and Signs of Fitting for the "A Pattern Language for Environmental Design" Correlation Model

<table>
<thead>
<tr>
<th>Icon title</th>
<th>Icon description</th>
<th>Value</th>
<th>Acceptable domain</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>df/χ²</td>
<td>Chi square divided to degrees of freedom</td>
<td>1.2</td>
<td>2df&lt;χ²</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>p-value</td>
<td>Significance level</td>
<td>0.09</td>
<td>(P &gt; 0.05)</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>RMSEA</td>
<td>Root Mean Square Error of Approximation</td>
<td>0.044</td>
<td>(RMSEA &lt; 0.09)</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>GFI</td>
<td>Goodness of Fit Index</td>
<td>0.93</td>
<td>(GFI &gt;0.9)</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>AGFI</td>
<td>Adjusted Goodness of Fit Index</td>
<td>0.85</td>
<td>(AGFI &gt; 0.85)</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>NFI</td>
<td>Normed Fit Index</td>
<td>0.97</td>
<td>(NFI &gt; 0.9)</td>
<td>Model confirmation</td>
</tr>
<tr>
<td>CFI</td>
<td>Comparative Fit Index</td>
<td>0.98</td>
<td>(CFI &gt;0.9)</td>
<td>Model confirmation</td>
</tr>
</tbody>
</table>

5. Discussion

In response to questions about green spaces, most respondents think that the aesthetic dimension is very important in such spaces and this point indicates architects' lack of consideration concerning the ecological dimension. On the other hand, ecology (from a scientific perspective) does not have an important effect in relation to space and this seems logical. Thus, it is expected that the socio-cultural dimension should possess the highest level of significance (according to pattern language) and this was, in fact, true. This finding possibly indicates that Iranian designers have thought less about the other dimensions of ecological designs compared to designers in the West. As briefly mentioned, it can be claimed that pattern language is also based on socio-cultural aspects and emanates from people and the spirit of space. Assuming the relationship of the pattern language and the socio-cultural dimension of environmental design, it can be said that theories have their origin in thoughts and ideas and the architectural theories emanating from them is termed "Pattern Language" theory. All the indicated examples demonstrate a strong relationship between patterns in the space and pattern language and design socio-cultural dimension. Alexander (1977), Norberg-schulz (2000), Fathy (1973), Salingaros (2000), Bell (1999) and even Dee (2001), all discussed the quality of space and most of them defined pattern as cultural forms based on historical and vernacular aspects. In the following items, reports of the choices of selected dimensions by respondents (based on the highest percentages of descriptive statistics in the socio-cultural dimension (5 out of 19)) can be seen:

- Definition of independent areas from functional terms
- Design of spaces for spiritual improvement and internal relationships
- Design of spaces for public living, gathering and meeting points
- Design of suitable private and public spaces with proportional areas
- Design of high quality pedestrian spaces

By studying the relationship between socio-cultural factors and environmental design in the correlation model developed by the LISREL software, besides a logical analysis of literature review, it was seen that the strongest correlation between the hidden and seen variables was between the environmental design variable and the socio-cultural dimension with the correlation coefficient of 85%, whilst the weakest relationship was also between the environmental design variable and the ecological dimension with the coefficient of 27%.

6. Conclusion

One of the most important outcomes of this paper was to outline the significance of human culture and social values. By developing this approach and based on the real elements in creating identity patterns, such as society and climate changes, a unique applicable solution can be introduced to environmental designers, anywhere. In this research, many participants believed that the socio-cultural dimension is very important in devising high quality public spaces for public communication. At first glance, this judgement might seem very natural and simple, but the fact is that among 49 questions (each with three dimensions) most deem this point necessary and is a confirmation of the necessity of considering the socio-cultural dimension in landscape and environmental design. According to the findings, many of the respondents believe that the socio-cultural dimension is of high importance when designing spaces for encouraging the elderly to communicate with one another. On the other hand, the respondents believe that the socio-cultural dimension is very important for considering open spaces for the improvement or thriving of social activities. As pattern language is rooted in the sense of place and human nature, the relationship between this theory and the socio-cultural approach is rationally acceptable,
moreover, computer results confirm the relationship between the socio-cultural, ecological, and aesthetic dimensions with the pattern language features (in environmental design). Almost all micro scales of the test can measure the above factor components and show that all relationships are significant. Respondents only pay attention to the ecologic dimension in six questions. It is interesting that in answers to questions about green spaces, most respondents' opinions indicated the high importance of the aesthetic approach to such spaces. This shows that Iranian environmental designers do not pay much attention to the ecologic dimension of context.

The results of the hierarchic confirmatory factor analysis and the results for a correlation model of a pattern language for environmental design show the validity of this correlation model, as stated in the discussion section and also, the appropriate and correct quantities. All the results are acceptable and there are significant and meaningful relationships between the three dimensions of environmental design especially the socio-cultural dimension and all pattern language features are in accordance with the following figure. The results of the hierarchic factor analysis show that pattern language features are related to the socio-cultural dimension (λ=0.85), aesthetic dimension (λ= 0.81) and ecological dimension (λ= 0.68). The strongest and most meaningful relationship exists between the socio-cultural dimension and environmental design, which has been the focus of this paper. Also, the importance of the socio-cultural dimension in environmental design and emphasis on pattern language for space has been challenged and emphasised.

In general, it can be said that the important issue in this research (and specifically in the socio-cultural dimension) is the special attention of environmental designers to human factors and man's presence. The amount of people/users have been counted and considered in environmental design and as it was obtained through the deductive statistical analysis from LISREL, the socio-cultural dimension was the most important in the opinion of respondents.

It is intended to show "a Pattern Language for Environmental Design" in the form of a model, as can be seen in Fig.3. However, since this research only studies certain dimensions of environmental design and, as Alexander says, these languages are infinite, only one in a thousand is presented here. On the other hand, the title "Pattern Language" can be given to this paper since it has been seen that the socio-cultural dimension possessed the highest value among other dimensions in environmental design and this brings us closer to the spirit of the space and its functional outlooks. The highest convergence in the answers can be seen in the following statements:

- The socio-cultural dimension for devising qualified public spaces for establishing social communications
- The socio-cultural dimension for designing spaces for connecting old people to each other and others
- The socio-cultural dimension for considering open spaces for progression of social activities

As can be concluded from the pattern language approach, framing environments are by definition, vernacular, they are created in an integral manner and evolve within a defined locality, a vernacular aspect which evolves locally but is driven by outside forces, provides a potent opportunity to explore tensions and meanings embodied in the forms and styles that environmental designers and landscape architects employ in design.

Fig.2. Pattern Languages Based on Different Vernacular Structures in Iran (Left: Naghsh-e Jahan Square, Isfahan, Iran. Right: Ghadamgah- Neishabour, Iran; the places Alexander (1979) presented in his book)

Fig.3. Final Correlation Model
References