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Analyzing the Latent Logic of Inclusive Design in Vernacular Architecture of Iran with the Approach of Sustainability

Case Study: 12th District of Tehran (Safavid Fence)*

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Abstract

Statement of the problem: Demographic and climate changes are the main challenges in the present century. Since the 1970's, the sustainable development and complete inclusive design has been raised as an answer to these challenges. However, the inefficiency of the architectural spaces is still a controversial issue. Although the vernacular architecture has been responsive to the public needs, at the present era, this architecture has been neglected due to not keeping up with the developments of time.

Research hypothesis and questions: It seems that by analyzing the universal design and sustainable development key criteria as well as the vernacular architecture resuscitation, we can develop the effective patterns of architecture that can contribute to the universality of spaces and their sustainability. Now, the critical question is arisen that according to the needs of vernacular architecture, which one of the criteria of the inclusive design has the ability to be applied in the sustainable vernacular architecture.

Objectives: This is an attempt to identify the convergence or divergence level of the vernacular architecture components and universal design and tries to develop an interactive pattern that is in accordance with the universal design criteria and current ecological needs can be applied in the sustainable vernacular architecture.

The research methodology of this paper is a descriptive-analytical and is based on the content analysis technique using qualitative-quantitative mixed approach. That is to say, at first, the architectural interaction pattern in compliance with the criteria of vernacular architecture, complete inclusive design, and sustainable development were developed qualitatively and then the relationships of the key criteria in this pattern and the share of each in the interactive system was determined. In this study, the Safavid fence in the district 12 of Tehran was selected as of the research and simultaneously, the qualitative and quantitative data were gathered through a questionnaire.

The interactive model we developed based on the qualitative data included six factors as resilience, contextualize, universal usage, comfort, law, and management. Analysis of the quantitative data showed that resilience had the biggest share in the interactive system.

Keywords: *Vernacular Architecture, universal Design, Sustainable Development, Safavid fence.*

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Problem statement

The universal design is considered as a paradigm of the sustainable development that provides every one with the fair interest of environment facilities, considering the surrounding environment

Nowadays, the universality of spaces is not considered as a luxury method and extra on the main requirements, however, it is explained as a public concern and fundamental need of users in the circle of life from childhood to elderly. It seems that one of the main reasons for the emergence of the inclusive design theory after sustainable development is the unbalanced distribution of sustainability in its initial three dimensions of environmental, social and economic. That is to say, instead of simultaneous attention to the economic, social, and environmental dimensions, the sustainable development was turned to a tool to support the environment ecologically and by the expansion of the increasing supporting activities of environment, social and economic dimensions were neglected.

It is evident that in order to reach the sustainable architecture, performing confirming to the vernacular architecture principles can be helpful and in addition to the development of the sustainability in the environmental dimensions, the vernacular architecture has continued the social interactions as well, and plays a role in the sense of presence and belonging to the space; while the current society searches its need for the social sustainability, sense of place, sense of comfort and sense of belonging to the spatial territory in the inclusive design and considers the social participation and citizens interaction in the modern world as a discriminate design of the architecture environment and urbanization and introduces the justice-oriented design in creation of the architecture and urban spaces as a proper alternative to the mere ecological sustainable development and also vernacular architecture in the traditional terms; because it believes that while respecting the environment and the future generation rights in benefiting the resources, the time technology should be benefited and the vernacular architecture in the traditional terms are distanced from the technological world.

In this way, the simultaneous supply of environmental, social and economic sustainability in a noble, having an identity and efficient architecture pattern is considered that following it, the feelings of conformability and satisfaction could happen. This research is based on the access to an approach in the architecture by which, the intergenerational connection and social interactions could be kept and tried in the direction of inhabitants' mental identity resuscitation and the real identity of valuable patterns of vernacular and sustainable architecture.

Theoretical Foundations and Research Background

• Universal Design

Unfortunately, it seems that the human-oriented design that was considered as a great revolution in its time was not very effective and prosperous in action; because the human definition of the pioneers of this theory was considered a healthy, young, powerful man and in the ideal physical conditions and optimum light that is performing his daily biologic activities. Therefore, any other user that misses even one of the mentioned conditions was considered as the exclusive group (Burton & Mitchell, 2014, 1). However, half of the habitats of the earth are women and the elders, pregnant women, children and people with physical, sensory and motion disabilities are among the habitats of the international community. The reinforcement of the social activities of people has resulted in the presence and formation of various patterns in the urban spaces and has led to the presence of various groups with different ages and sexualities (Paknejad & Latifi, 2019). Despite this subject, ignoring human dignity, the independence needs of the people has been the victim of the reputational goals of the designers and beneficial policies of the economic merchants and capitalists. This issue had no result but the breakdown of the social connections, citizens' interaction weakness and their isolationism. Therefore, the human societies

have lost their dynamics.

For the first time, in the 1970s, an American architect named Michael Bednar presented the idea that if the environmental barriers are dismantled, the functional capacities of each person increases. He proposed that a new concept beyond the accessibility is needed that should be broader and more inclusive (Ostroff, 2010).

The universal design is the design of the product that can be used by all the people, the most diverse group, without the need for conformity or unique design. The universal design searches for the benefits of the general public in various ages and capabilities that the simplicity, easy understanding, flexibility, ability to use for everyone, perceptible by all the five senses, less physical effort, the least error probability and proper amount and space for approaching and use are considered as its primer principles (Mace, 1998). Incomplete inclusive design, the design of the products and environment is performed in such a way that could be used for all the people without any need to the compatibility or particular design (M.S., 2010, 4) and could have high aesthetic values. The aim of this design is not a confirmed term with the accessibility standards of the design. In fact, the principles of the universal design is a source for the use of all the designers and not just the specialists, and its obtained benefits include a higher range of the disables and elders and is not specific to a particular group (Abascal, Barbosa, Nicolle & Zaphiris, 2016, 180). Access to the universal design is mentioned as a goal that happens in the total process and is not considered just as a product (N.D.A., 2014).

Nowadays, the universal design is the support of a win-win policy and mutual benefit that is unfortunately misunderstood as the design for all that is accused of having an impossible goal. Whereas, it is a practical and conceptual approach, not an imaginary or ideal concept that is searching for a non-discriminatory and non-hallmarking environment (Petrie, 2016). The universal design is a comprehensive and inclusive design against the unique design that leads to social justice (Clarkson,Coleman, Keates & Lebbon, 2003). This integrated design that includes all the aspects of the products used by the users in various ages and capabilities is proposed in a range of contexts (B.S.I., 2005); (Table 1).

The vernacular architecture

The vernacular architecture is used for a kind of architecture that is raised of unofficial local traditions than being presented by a unique designer. This is a kind of architecture that is formed based on the users' needs and presents the local traditions. The spontaneous architecture was first used by Giuseppe Pagano for the vernacular architecture. Of course, the meaning of the spontaneous is not accidentally but the naturally. In this architecture, all the things are selected in the maximum severity level and are obtained from the living necessities that does not only have the material and functional aspects. The vernacular architecture bonds to the civilization due to the commitment, where the objects, feelings and moments are continuously changing. The vernacular architecture demands the persistence of the thing that is transient (AlpagoNovello & Falamaki, 2006, 36). Rapaport, in presenting the governor atmosphere on the architecture acknowledges that this architecture is the immediate meaning of the needs, values, beliefs and the wish of the majority of the people of the society in a specific physical form. that presents the public culture instead of the glorious buildings made because of a specific and selected group of the people. The vernacular housing was the expression of the changing values, and also the picture of the house was the world-view and lifestyle of the people and is a result of a complex of the various situations (Beiker, 2006, 35). In Pitro Blochis' opinion, the vernacular architecture is the known architecture by the majority of the people with the same and limited heritage and experience and not the architecture that is built by the minority specialists and with the specific planning. The vernacular art is the art that is not built by some specialists and with the scheduled program but is formed in the continuation of the activities of all the people with the shared experience (heritage) and the limited spectrum of the experience of the ordinary

Table 1. The conclusion of the theorist viewpoint and the counts of the universal design indexes. Source: The author's.

Basic considerations of the theorists	familiarity	The customization capability	Ease of access	Access to the information	Proper size for approaching	Safety	Minimum physical force	Error tolerance	Predictable information	Simplicity and intuitive understanding	Conformability	Flexibility	Equity in utilization
Mace (1998)			*		*		*	*	*	*		*	*
Abascal Barbosa, Nicolle & Zaphiris (2016)		*	*	*	*	*						*	*
Burton & Mitchell (2014)	*		*			*			*		*		
NCSU 2014							*	*	*	*		*	*
Petrie (2016)													*
Persson, Ahmen, Yngling & Gulliksen (2015)		*	*		*							*	*
OliyaZadeh (2016)			*								*		*
Abdulkadir Jamaludin (2013)		*									*	*	
Fallahi (2007)			*	*		*					*		*

people (Rudofski, 1964, 74).

In the late 19th century, the application of the vernacular architecture in the work of the famous architectures like Hassan Fathy resulted in the natural architecture evolution during the time. He considered the basic principles like the belief to the human values priority to the architecture, the importance of the universal approaches compared to the limited approaches, the utilization of the proper technology, the necessity of being society-based and the collaborative construction

techniques, the necessary role of the tradition and re-establishment of the cultural glories among the building art as the basis of the formation of the vernacular architecture (Fathy Foundation, 2014). The vernacular architecture is the logical thought of a generation that is formed by the culture of the specific area in which, it is flourished. The vernacular design is the flourishment of the applied limitations by the guidelines of the area and culture in the architecture of a region. In other words, it is considered as the teaching to live with these limitations by the deployment of the maximum potential power of a region (The same). Hassan Fathy, in return to the vernacular architecture, considers the comprehensive patterning of the architecture form and the vernacular lifestyle as the existing fact that there is no need for its change and must be kept (Akrami & Damyar, 2016, 34). He believes that before the collapse of the cultural boundaries that happened in the 19th century, the particular forms and elements of the vernacular architecture are observed all around the world, the buildings of each region was the fantastic result of the blessed unity of the peoples' belief with the environment demands (Fathy, 2003, 59). Nowadays the vernacular architecture is considered as the cotext and the heritage of the past. The heritage of the people that have not been trained and created the architecture by using the architecture elements (Falamaki, 2006, 12). The vernacular architecture means the complex of the architecture and urbanization units that are gathered in a land and has the primary secret with the harmonies in the shape context, volume or "Volunometric plan" in the applied context, coloring and the tonality of the filled and empty surfaces and also in the material and all the construction systems that emerges in it. "This architecture is based on the harmony between the differences, the recognition based on the criteria and the traditions and tastes due to the environmental culture, the unity obtained from the mutual respect or having the environmental behavior and also implies on the paroles from the implicit contracts, unwritten and living contracts" (Ibid, 17); (Table 2).

An acceptable definition for sustainable development and a basis for beginning the studies of this field is the definition that Brundtland has presented in his report in 1987 to the World Development and Environment Commission (WCED), which includes his famous speech on the subject of our collective future: Sustainable Development is a type of development that will meet the current generation needs without causing any damage to the ability of the next generation in meeting their own needs (Motin & Shirley, 2007, 15). At first, this concept was considered in three aspects: social, economic, and environmental concepts. However, after a while, as soon as the environmental issues gain attention in the political debate, it was introduced as a tool for environmental ecosystem protection rather than a pressure on environmental change (Peirce & Wardford, 1998, 67). Although the sustainable development concept, in essence, was considered as a tool to balance the three elements (environment, society, and economy), its emphasis was moved from environmental protection to improving the quality of life by considering the capacity of the existing ecosystems (Detr & Doha, 2001). It can be said that the concept of sustainable development is the result of growing awareness of global links between growing environmental problems, social and economic issues, poverty and inequality, and concerns about the healthy future of humanity. Sustainable development strongly links environmental, social and economic issues together (Georgy Mahalbani, 2011, 2).

This development has some purposes in its original three dimensions that were able to meet the basic needs of today and future generations of the human being. Also, it was able to promote the standard of living for all, maintain and manage biological systems (ecosystems) for a safer future, pay attention to the animal habitat and provide tools and facilities. According to these objectives, sustainable development can be defined as a kind of development that protects natural resources and biological systems through using the tools and technology, while utilizing these natural resources. Therefore, it emphasizes on the quality of life of today and future generations (Mofidi Shemirani & Moztarzadeh, 2014, 29).

Overview of Sustainable Development Principles by the United Nations in the 2030 Perspectives

David Griggs, an Australian scholar, believes that the sustainable development had three basic principles, social, economic, and environmental, for almost three decades; however, this definition is no longer useful in the present timeline and must be revised (Grixs, 2013). In an article prepared by the United Nations on the international risk reduction strategy for the Rio +20, it was suggested that reducing the risk of natural disasters and risk management are essential for achieving sustainable development. All frameworks that were defined for sustainable development requires a clear program for natural disasters and climate risk management. The risk of natural disasters is rising globally and is considered a

Table 2. The conclusion of the theorist viewpoint and the counts of the vernacular design indexes. Source: The author's.

Theorizing considerations	Belong to context	Vernacular materials and techniques	Public participation	Sense of place	Spatial organization	Simple and having no style	Gradual change (Flexibility)	Compatibility with the environment	Having no specified design and designer	Human scale	Common heritage	Response to the needs	The connection of the valuables
Falamaki	*		*		*			*	*	*	*	*	*
Fathy	*			*			*	*			*	*	*
Damiar&Akrami	*	*	*					*		*		*	*
Haeri		*				*	*						*
Pitro Blocci		*							*				
Rodowski	*	*						*	*				
Alpago Novello	*			*	*		*		*				*
Povel Oliver)	*	*	*				*	*	*				*
Rapaboret	*		*		*		*	*			*		*
Alexander	*	*	*				*	*					
Stralous	*						*	*					
Chamski	*						*	*					
Lidoman	*							*					*
Alsob								*		*			
Yal Krishna Doshi								*				*	*
Christopher .Day		*						*				*	*
Brand Ferry		*	*									*	
Grix	*	*	*					*					
Stedman		*	*									*	

real treat to people, assets and any kind of endeavor to achieve sustainable development. The catastrophic events in 2011, notably the great earthquake and Tsunami in the east of Japan, indicated that the consequences of these disasters are beyond any borders. Therefore, practical programs, policies, finance, and technology are required to reduce the risk of natural disasters and should be enhanced as an essential shortcut to reach sustainable development (UNISDR, 2011); (Table 3).

Summarizing the Existing Texts and Literature and Extracting Criteria and Indicators

In order to develop a conceptual model for this study, qualitative content analysis was used for investigating the Eastern and Western theorists' view on each category and their considered criteria. Then, these studies were categorized after reviewing their contents. In this regard, cases that have overlapping content were removed or placed into the commiserate category in order to summarize the information and obtain the appropriate result. In this category, the ability to recognize, navigate, and to position is called "legibility"."The minimum physical effort, durability, and comfort are all called "comfort." Additionally, the variability and convertibility are called "flexibility"; lastly, the tolerance to space and compatibility are called "resilience (Fig. 1)."

Finally, after interpreting the past theoretical literature and analyzing their qualitative content, it was possible to enter the perturbation criteria of each category as the factors of the interactive model.

Factors such as valuable links, responding to everyday needs, connecting to the environment, gradual evolution (flexibility) at both levels of access (physical) and spatial perception (semantic), popular participation, belonging to the spatial environment, and the use of indigenous materials and technology, were used as indices of vernacular architecture. Also, concerning the design of complete inclusion, the following seven criteria were chosen because the author believed that they have greater comprehensiveness with the universal design. Widespread usage, flexibility, convenience, safety, readability, access to the physical body and information, and resilience are these seven criteria. For measuring sustainable development, these criteria were extracted by reviewing the opinions and view of theorists on sustainable development. Most of them were in agreement in term of legal, social, economic, environmental, risk management, skills, and ecosystems aspects. In order to formulate the theoretical framework of the study, the convergence or divergence among the qualitative criteria of the three mentioned issues in diagram 2 has been studied (Fig. 2).

During binary evaluation of the correlation relations between sustainable development criteria and complete inclusion design, it is possible to consider the universal Fas a right for the general public, which is related to the social and legal dimensions of sustainable development.

Moreover, the safety features in universal design, which includes indicators such as physical safety of space, can be addressed in the community risk management section as well as in the social dimension of sustainable development. Also, the accessibility criterion in the universal design, including physical accessibility and environmental facilities accessibility indicators, appears in the legal and environmental dimensions of sustainable development. Flexibility is also an integral part of the universal design and is considered in the universal design. Hence, it is reflected in the environmental, skills and risk management sectors of sustainable development. The readability criterion is the generalized version of features such as intuitive perception, orientation, routing, and positioning, which are characterized by indicators such as a map or a mental schema. This category is connected to the individual skills, environmental characteristics, and symbols while correlating with issues of inclusiveness and memory. Therefore, in social, environmental and skill dimensions, it is consistent with sustainable development. The convenience criterion appears more comprehensively than

Table 3. Summarizing the viewpoints of theorists and indicators of sustainable development indicators. Source: The author's.

Considerations of theorists		Brattleland	Grixs	Zahedi	Aminzadeh	Laghai & Mohammadzadeh Tikanlou	UN
Economical	Dynamics						
	Eternal						
	Poverty Reduction	*	*	*	*	*	*
	Zero carbon						
social	Social interaction						
	public participation	*	*	*	*	*	*
	social responsibility						
environmental	Resource protection						
	Environmental protection	*	*	*	*		*
	Biological protection						
risk management	Practical plan						
	Politics						
	financial issues		*		*		
	Integrated attitude						
Skill	Technology						
	Education and training			*	*		
	Information and documentation						
Rights	Human needs						
	Intergenerational rights						
	Flourishing			*			*
	satisfaction						
	Peace and tranquility						
Ecologic	Culture and tradition						
	Identity				*	*	
	Ethics						
Spatial Sustainable development	Decentralization of the satellite centers						
	Prevent of Destruction					*	
	Industrialization with biomass						
	Non-agricultural employment						
Cultural continuity	Cultural Roots						
	Finding Cultural Systems						
	Change in cultural continuity					*	

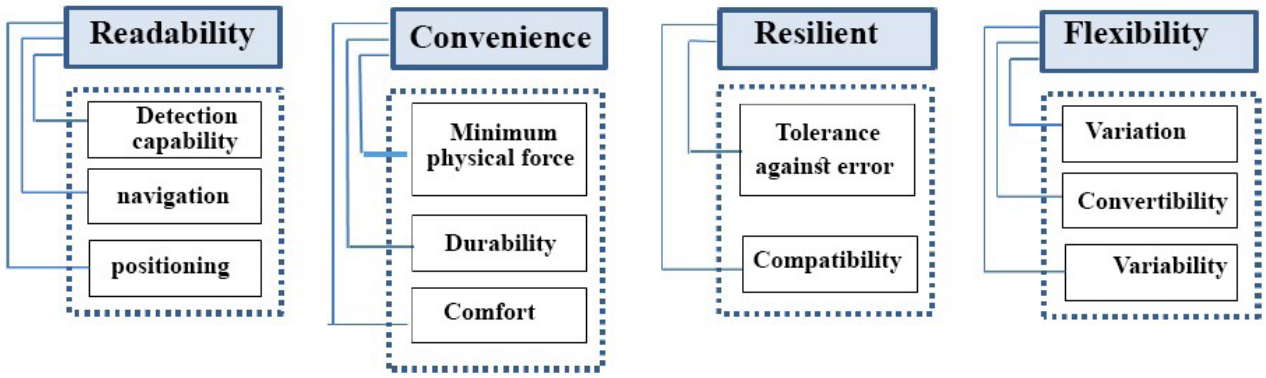


Fig 1. Combination and Layout of Overlapping Indicators. Source: The author's.

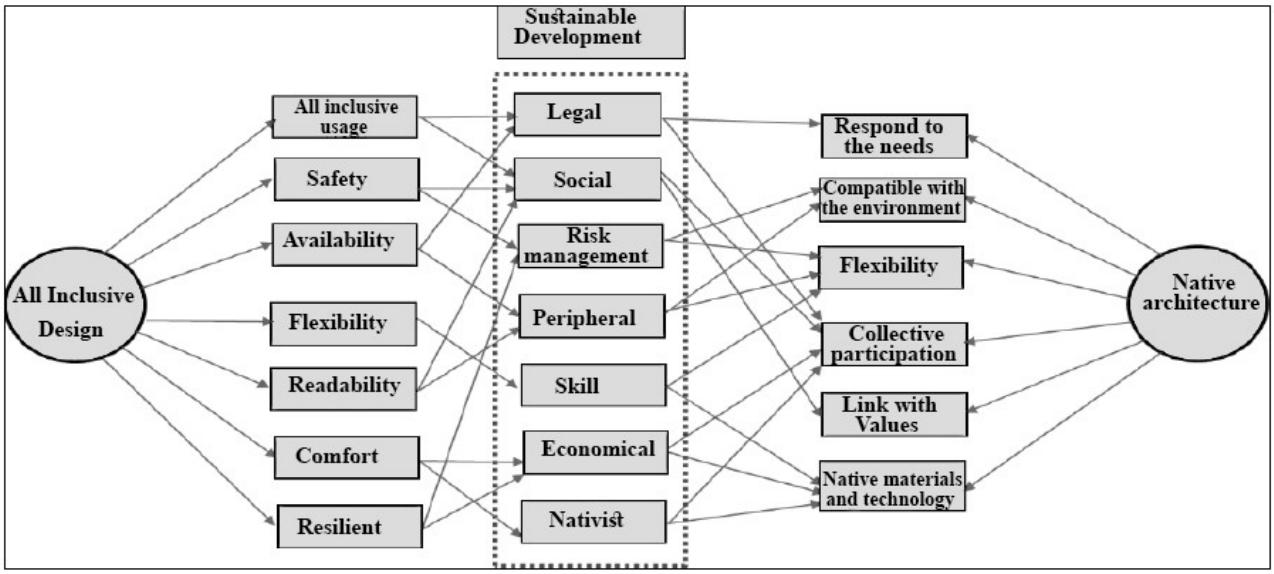


Fig 2. Investigating the Binary Relationship of Criteria in Three Categories. Source: The author's.

concepts such as mental relaxation and climatic comfort in the environmental, economic, and social dimensions of sustainable development. Adherence to indigenous characteristics, customs, and culture, and the traditions of societies, while providing a sense of comfort among the community, can guarantee other sustainability features as well. Resilience, which includes indicators such as compatibility and error tolerance coefficient, is also one of the universal design criteria that are directly related to the economic, social, environmental, and risk management dimensions of sustainable development. By considering the concepts mentioned above, it is possible to design the binary relations as a three-dimensional and straightforward algorithm that its regular page reflects indigenous architectural criteria, the middle circle representing sustainable development criteria and the external criteria include the universal design criteria. This relationship has evolved continuously throughout the ages, from the time of the formation of the vernacular architecture to the modern era and the formation of the concept of sustainable development in the seventies and the post-modern era, with the emergence of the theory of universal design.

Introducing the range of study

By considering the concentration of vernacular buildings with legacy value in the Safavid frontier located in area 12 (regions 2 & 3), and also by considering the fact that the municipality of Tehran's 12th district selected this area - it is enclosed to Imam Khomeini, Molavi, Rai, and Vahdat Islami Street and includes essential sites such as Oudlajan, Bazar and Sangelaj, etc. - as a pilot for the implementing an appropriate plot; this area was selected as a research site (Fig. 3); (Table 4).

Research Methodology

The method used in this paper is a combination of quantitative and qualitative research. This approach is in line with the combined research approach in the typology of (Creswell., 2009), which is a simultaneous combination type. That is, quantitative and qualitative data are collected simultaneously in the research field. In this regard, first, the interactive architectural model has been developed by the three categories of vernacular architecture, universal design theory, and sustainable development, based on the qualitative research method. Then, the relationship between the critical factors involved in the elaboration of the interactive pattern and the contribution of each of them in this model has been examined through quantitative research method. In order to develop an interactive architecture model, which is by the key criteria of vernacular architecture, universal design and sustainable development, all the dimensions and components considered by the major theorists have been extracted, after conducting a comprehensive review on relevant theoretical and

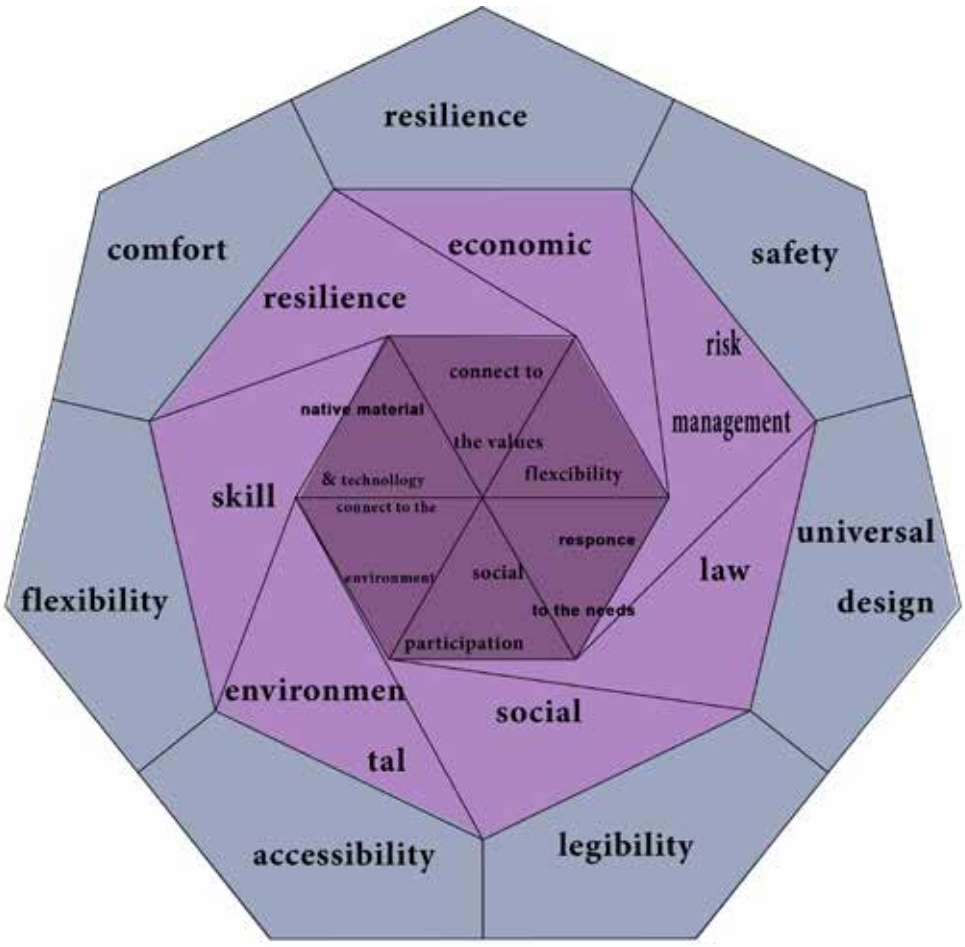


Fig 3. the flat algorithm of complete inclusion design, sustainable development, and vernacular architecture. Source: The author's.

The position of Safavid and Naseri area

Street of Safavid area

Districs of Safavid area

Fig.4. Residential spatial profile - Safavid monument. Source: Herampey consultant engineers.

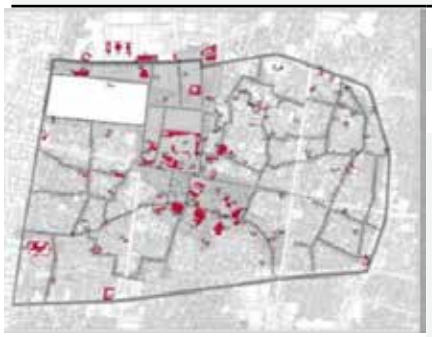
empirical literature. The resulting components are categorized and coded. By examining the abundance of each class, the most robust factor was determined through considering various sources as the main criteria in each category. Then, the result analysis was conducted according to a logical process. Afterward, the main criteria were combined, and the theoretical framework of the conceptual model of the research was identified and selected based on the common explanatory indicators among the three categories by using expert opinions and interpreting the results.

In the next step, a quantitative exploratory factor analysis method has been used to determine the relationships between the critical factors involved in the interactive model. Thus, based on the results obtained for each of the concepts in the interactive model, the operational definition and indicators were extracted, and the questionnaire was designed based on the specific measures. Then, by selecting the expert panels, university professors and experts in each category, an in-depth interview was conducted with each of them, and the importance coefficients of each concept were extracted. In this regard, with field surveys in the area of research and involving the NGO, it was assured that the environmental perceptions in this field survey are accurate. Then, the results of the questionnaires were analyzed in the SPSS software, and after extracting the required data, the key factors were identified and named through exploratory factor analysis and their actions, and the amount of their contribution in the interactive model was determined. The factor analysis is a multivariate analytic technique used to reveal the latent structures of a set of variables. This technique is used to extract a group of non-convergent variables called agents, which describe the changes observed in the initial data (Zebardast, Khalili & Dehghani, 2015). Due to the contrast between quantitative and qualitative criteria in this research, the combined methodological paradigm was the purpose of conducted actions, and the factor analysis method has been used in order to summarize the variables and facilitate the analysis of the high number of variables.

Designing the questionnaire

In order to set up the questionnaire, first, the library and documentation information related to the three categories of vernacular architecture, universal design theory, and sustainable development was investigated through discovering the hidden layers in the opinions of the theorists, and then factors were extracted from each category in order to classify and interpret them. Since the number of factors in each category was multiplied, the dimensions of each concept were diminished in order to identify the overlapping concepts and eliminate them to reach an optimal result with similar concepts. For the remaining concepts, clear and measurable indicators were determined, and questions were developed based on the measurements. The content of the target tables was set up and consulted by experts that were active in the field of research; the contents and the questions of the questionnaire were

Table 4. Residential spatial profile - Safavid monument. Source: The author's.

107 Native cons tructions registerd in the national monuments list	Household Population		Districts
	3535	9133	**Market**
	2263	6034	**Arq- pamenar**
	3795	15470	**Imamzadeh Yahya**
	6377	26393	**Sunglang**

formed. Finally, the questionnaires were compiled in two large sections including vernacular buildings and public spaces in the local area and the data were collected. For the 14 identified indicators, a questionnaire with 61 items in a 5-point Likert scale was prepared from very low to very high. To validate the questionnaire before distributing it among the citizens, the pre-test was prepared by people who were experts in the questionnaire preparation and the supervisor as well as experts from the municipality of district 12, regions 2 and 3, and members of the municipal associations of the headquarters of the city of Tehran, whose research findings would be generalized to them, and consultant engineers who were responsible of preparing a detailed plan for the 12th district of Tehran and will use the results of this research. Then, for formal pre-test, the information was collected at a limited level, and a pattern of responses was extracted. Finally, the final questionnaire was completed with 55 items.

Sampling method and determining the sample size

The statistical population of this study consists of a wide range of ordinary people with each level of physical and skill ability in different ages and gender within the Safavid frontier (Tehran's historical context). Due to the high volume of statistical population and the lack of access to the list of members of the statistical community for maximum coverage, a simple cluster and random sampling method were used to determine the sample. Therefore, the sample size of 381 was determined by using the Cochran formula with an error level of 5%. However, after considering the probability of not returning the questionnaire, and for the accuracy, the number of questionnaires was increased to 400, and was distributed among the sample population.

Research findings

In order to perform exploratory factor analysis after extracting the criteria and indices, invalid texts and forming the initial matrix of information, the values of the shared variables of each variable are compared with other through a correlation matrix. In this analysis, the variance level of a variable was determined in relation to other used variables. The high level of the relevant index indicates its relevance to other indicators that were used in the research.

Analyzing the quantities of Kaiser Meyer Olkin, Bartlett's test, and Correlation matrix

The Bartlett Spread Test should be used to ensure that the data is appropriate for factor analysis. Also, the coefficient (KMO) measurement is used to determine the adequacy of the samples in this method. If the KMO value, which is always a number between 0 and 1, is more than 0/5, then the structure is acceptable, and if it is more excellent than 0.7, then the structure is desirable. In this research, the obtained KMO value is (0.838) and is suitable for the factor analysis of the relevant data. As a result, the explanatory power of

the model is high, and there is no need to remove any items (questions), and the amount of Bartlett's statistics is also admissible (Table 5).

Investigating the variance for the research subject and determining the number of selected factors

In the next step, after controlling the corresponding statistical tests that evaluate the raw data for its usage in factor analysis, a preliminary and final calculation matrix was prepared, in which the variance explained by each factor is determined. In other words, the corresponding matrix that was shown in the form of the explained variance table, clearly indicate that the factor analysis for the reduction and summarization of some final indicators have led to several final factors, and more importantly, determined the role and amount of each relevant factor's contribution in explaining the subject of the research. This table is presented in two parts. The first part is related to the contribution of each factor before applying the Varimax rotation and the second part indicate the contribution of each factor after the respective rotation and the final distribution of the factors' score that happened after examining the correlation of each index with the relevant factor (Table 6).

According to the above table, the particular values are higher than 1, so that the highest value for a factor of one is equal to 13.13 and the lowest value for the sixth factor is 73.2, and all factors are higher than one. The amount of cumulative variance, which is the sum of the cumulative variance of the finalized factors, is higher than 60% (minimum) and is equal to 78/83%, indicating that the factors are entirely relevant to the subject matter. The obtained variance for the first factor is higher than the rest of the factors. This factor has about 15.88% of the variance that is greater than the rest of the factors. The lowest value is for the sixth factor, which is 10.9% (Fig. 5).

Calculation of the rotated factor matrix and determination of the relationship between the indices and the selected factors for naming

According to the final rotated factor matrix, after the repetition of the Varimax period, six final factors were obtained. All factors obtained a variance of 83.73 %(cumulative variance).

The first factor: this factor explains 15.88% of the total variance and is called according to the questions posed in the resilience questionnaire.

The second factor: this factor explains 12.86% of the total variance and is named according to the questions posed in the contextualize part of the questionnaire.

The third factor: this factor explains 11.94% of the total variance and is called the universal according to the questions of the questionnaire.

The fourth factor: this factor explains 11.52% of the total variance and according to the questions of the questionnaire is named "convenience."

The fifth factor: this factor explains 11.51% of the total variance and according to the questions posed by the questionnaire is called "the right."

The Sixth factor: this factor explains 9.10% of the total variance and according to the questions

Table 5. Calculation of Kearson values of Mir Uplinck and Bartlett-Bright statistics.Source: The author's.

KMO and Bartlett›s Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.838
Bartlett›s Test of Sphericity	Approx. Chi-Square	26120.476
	df	1128
	Sig.	.000

Table 6. Calculating the factors extracted in the interactive model and their percentage change. Source: The author's.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.998	29.163	29.163	13.998	29.163	29.163	7.243	15.089	15.089
2	7.373	15.359	44.523	7.373	15.359	44.523	6.175	12.864	27.954
3	4.837	10.077	54.600	4.837	10.077	54.600	5.734	11.945	39.899
4	3.720	7.749	62.349	3.720	7.749	62.349	5.531	11.523	51.421
5	2.778	5.788	68.137	2.778	5.788	68.137	5.528	11.517	62.939
6	2.737	5.701	73.838	2.737	5.701	73.838	5.232	10.900	73.838

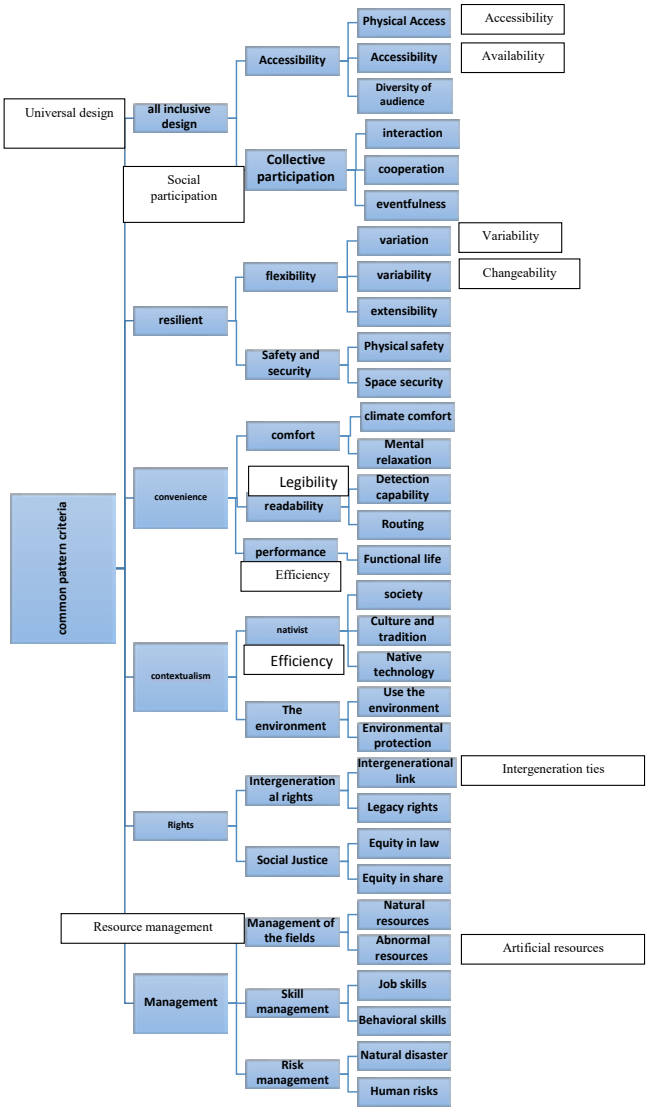


Fig. 5. Summarize and categorize indicators and name the key elements of an interactive model of inclusive design, indigenous architecture and sustainable development. Source: The author's.

posed in the questionnaire, is called "management (Table 7)."

Conclusion

Universal design is part of a process that has become a form of demand and public demand today and is rooted in vernacular architecture. The vernacular architecture also has a kind of sustainable architecture claim. Thus, the multifaceted theme of its universal design contains… signs of renewed aspects of sustainable development and vernacular architecture in the context of contemporary and postmodern perspectives. The results of this study on analyzing the hidden logic of universal design in vernacular architecture include practical and theoretical conclusions. Theoretical results that were obtained based on the qualitative methods include the development of an interactive architecture model by original architectural standards, the theory of universal design and sustainable development, which has been achieved with a qualitative approach and the integration of their primary criteria. Seven critical factors of resilience, context, convenient, use of universal plan, rights and management have been effective in compiling this interactive model. In this way, achieving a pattern of architecture that delivers the above seven factors will ensure the formation of an all-inclusive, sustainable and cohesive architecture. In order to determine the contribution of each effective factors in the interactive model through quantitative methods, strengthening the principle of resilience including

flexibility concepts, physical safety, and spatial security can have the most significant impact on their complete inclusion (Fig. 6).

Also, context-orientation factor was considered as the most critical paradigm in architectural and urban development, which is the second most effective factor in the interactive system in term of the hierarchy of the body, society, culture, and human. Factors such as the universal usage, the content of physical access and collective participation, the convenience with comfort, readability and efficiency concepts, rights with two aspects of intergenerational rights and social justice, and management with two aspects of risk management and skill, have a fewer contribution in the architecture pattern. The study of the spatial location of research and the generalization of the theoretical model obtained in the vernacular architectural archetype is evidence that the convergence of the basic standards of vernacular architecture, universal design and sustainable development in the vernacular architecture of the Safavid frontier is clearly understandable. It means that, by studying the public spaces of this area which are based on the fundamental principles of the interactive model, one can find architectural spaces that are compatible with the ecological environment and adapted to their livelihood patterns and their indigenous identity in promoting social interactions of the environment. All people of society have the right to use the environment reasonably, irrespective of age and gender, and the level of physical ability. Also, without the need to endure the suffering and adaptation, the general public can freely work and be active in an environment in which they have mental connections independently and inactive manner. Additionally, they can maintain the intergenerational links and transfer their common identity legacy to the next generation. According to this resilience and context-oriented model, they can enjoy their social rights and complete inclusion freely, and transfer their common heritage to the next generations through proper management.

Table 7. investigating the load and differentiation of Combined Rotary Matrix Factor. Source: The author's.

	Component					
	1	2	3	4	5	6
TAB1	.933					
TAB5	.923					
TAB7	.916					
TAB8	.912					
TAB2	.874					
TAB4	.866					
TAB3	842					
TAB6	.828					
Z2		.912				
Z4		.901				
Z5		.892				
Z3		.883				
Z1		.870				
Z6		.836				
Z7		.824				
Z8		.788				
SH4			.771			
SH9			.729			
SH11			.699			
SH3			.670			
SH2			.641			
SH8			.612			
SH5			.610			
SH6			.586			
SH12			.575			
SH7			.574			
SH13			.571			
SH10			.547			
SH1			.535			
R3				.911		
R1				.911		
R2				.908		
R4				.903		
R6				902		
R5				.888		
H5					.859	
H1					.851	
H6					.841	
H2					.839	
H7					.831	
H3					818	
H4					.747	
M1						.909
M5						.896
M2						.883
M4						.883
M6						.882
M3						.807

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization. a

a. Rotation converged in 6 iterations.

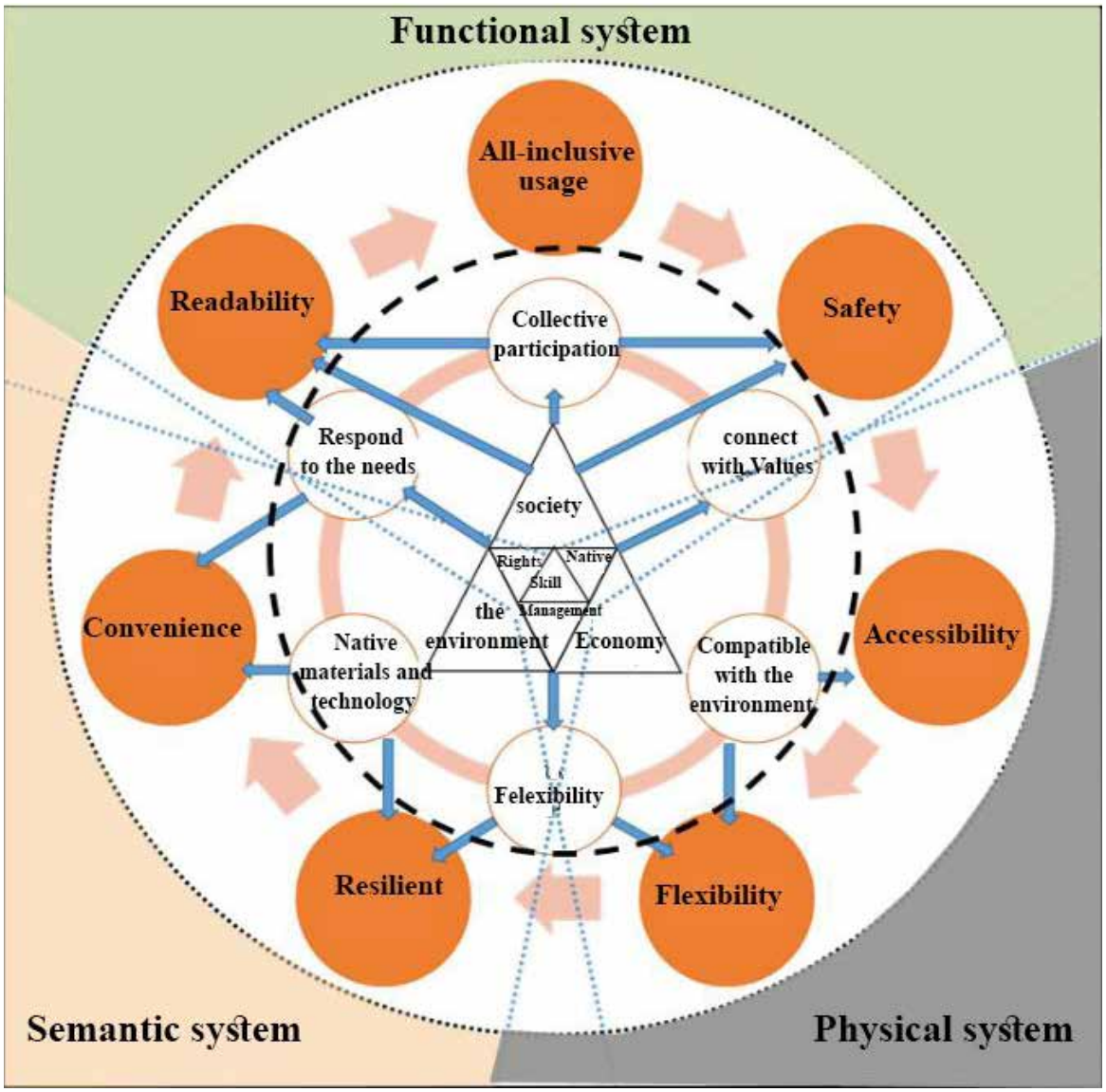


Fig. 6. Conceptual Model of the Communication of The universal design criteria, sustainable development and vernacular. Source: The author's.

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