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Original Research Article

A Qualitative Analysis of Public Buildings on Contemporary Iranian Architecture in the Second Pahlavi Era based on the Architectural Tectonic Approach*

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Abstract

Problem statement: The relationship between construction, structure, and architecture will be discussed here as it seems sort of divergence has been appearing between them. Here, the connection between structure and architecture will be defined by a word called 'Tectonic. It seems it can create a coherent and meaningful framework for the connection between design, structure, architecture, and construction.

Research objectives: The purpose is to provide a precise definition of architectural tectonic interpretation, recognizing the possible unity or disconnection among the structures, construction, and architecture, performing analytical knowledge and determining the factors affecting the spatial uniformity by studying the public buildings of contemporary Iranian architecture in the second Pahlavi era.

Research method: For doing a tectonic reading of case studies according to the target design, the method of document analysis and descriptive observation has been used based on the phenomenology that was driven by the elite. Meantime, the selection of case samples has been made by examining the results of questionnaires that were distributed among the architectural experts. Moreover, in the research process, the MAXQDA quality software and SPSS statistical software were used to provide more conceptual outputs. Finally, using the Triangulation (the phenomenological reading, researcher's inferences based on available documents and rich tectonic literature), the strength and validation of research in various aspects have also been studied.

Conclusion: The results show that architectural tectonic can be explained by the dimensions of the structure, shell, materials, details, and facilities, which are structurally related to geometry, participation in space organization, and visual induction of stability, in particular with shells, materials, and micro-criteria. Furthermore, the dimensions of architectural tectonic structures with their various components, compared to other related parts have been more presented in the structural tectonic reading of contemporary Iranian public buildings which were available in the second Pahlavi era.

Keywords: *Contemporary Iranian Architecture, Architectural Tectonic, Public Buildings, Structures and Architecture, Second Pahlavi Era.*

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Introduction and Problem Statement

This article is a report of another comprehensive research about studying the relationship between architecture and the construction's creating factors such as the relation of structure and construction issue or in other words is an architectural tectonic concept that is regarded as an artistic combination of technical factors and building semantic. This is somehow a tectonically reading of typical buildings in contemporary architecture which is kind of an architectural style based on the advanced technology in the west, that its structure and technological supplements have gradually entered Iran in the current century. For instance, the present structures do not include aesthetical qualities that much. Most of the spaces in buildings are just made for covering the structure and sometimes structural elements exposed just for decorating purposes, which may be considered as a false element. This combination of meaning and construction in architecture can be explained as tectonic. This concept is based on construction and is also a forum for representing the architectural work artistically. It always includes the following quadratic factors: 1) structure 2) construction 3) meaning and 4) function. In summary, the main point of this study is to explore the relationship between construction, architect, and structure in the process of making an architectural building by using the tectonic framework. Then, the reading of contemporary public buildings in the second Pahlavi era of Iran is aimed to study according to this tectonic framework. In another view, this research is a try to make a hybrid synthesize of existing theories in the field of tectonics from the related theoretician, at the first step and then to test, make a criterion for scale determination and then improve a theoretical framework by analysis of selected public buildings of contemporary Iranian Architecture at the second Pahlavi era at next step. Indeed, the public building as a basic term in this research refers to the buildings that belong to the community of people and might be constructed either by the government

or at the expense of people. These public buildings usually are designed and built in accordance with the opinion and approval of authorities for public use (Zarkesh, 2012, 24). As described before, the necessity of selecting the selecting contemporary time for this case study is due to this fact that the unity of architecture, structure and construction element of the building has become a challenging issue in contemporary time and even earlier, after the industrial revolution; as before this time, the buildings often arose as the results of coordination between architecture and the construction orders, and the construction elements were following the whole of architecture entity (ibid, 44).

As mentioned earlier, this study is centralized on the tectonic matter in architecture. The period covered by the research to select the public buildings belonged to the second Pahlavi era. In this regard, the research findings over architectural tectonic are used as the primary source and the other scientific texts related to contemporary Iranian architectural studies are considered as dependent sources.

Among these buildings, many cases are selected by architectural experts and elites and used as a case study/ (multiple cases). From historical point of view in the second Pahlavi era, selection and priority are given to the buildings that are more readable based on the tectonic conceptions; for sampling, the desired items for this purpose has been used. The main reason for choosing public buildings is because of the fact that these constructions are usually designed by the best architects due to their large national budgets and their special importance; their durability is also long-term in case of material and semantic aspects.

The other reasons for selecting these buildings are referred to the prominent presence of them in the specific era and the greater effect of these buildings on the public architectural culture. Moreover, considering that from the time of coup d'état of 1299 Shamsi (1920 AD) in which the whole country has been under the control of central rule, the public and government activities, and building constructions

were first concentrated in the capital, and then it often becomes a model for other cities (*ibid*, 24). That's why most of the public buildings are built around the capital Tehran. To achieve these research objectives, an analytical-descriptive method, basic and field studies, distribution of questionnaires among experts¹ in architecture, phenomenological descriptions by the elites² of architecture, and MAXQDA software, as well as SPSS, have been used.

Regarding the innovation and necessity of conducting this research, it should be noted that what makes this research necessary is the current separation of space, structure, and architecture from each other and the existence of individual structures without integration in contemporary Iranian architecture. Technology and new structures, apart from their conceptual and semantic burden, have quickly been exploited by the manufacturers in the field of construction, without considering the architectural criteria, and therefore the presence of many useless constructions is quite obvious due to the lack of specific measurement criteria in this field. This study points to the need of reviewing the interaction of structure, architecture, and construction in contemporary Iranian architecture. It also tries to analyze the public architecture of the second Pahlavi era by adopting a tectonic view and reading, that is the right outcome of semantic and constructive forces. Although tectonic reading in the past could only be a criterion for technology, construction, and function, today it can also be an aesthetic criterion due to the combination of techniques and arts. However, today, despite of passing a hundred years since the introduction of modern construction technology into Iranian architecture, a suitable criterion for adapting and matching architecture and technology has not yet been achieved. This issue highlights the necessity of adopting a way to explain and upgrade a related framework and criterion as one of the main goals of this study. On the other hand, due to the criticisms have been levelled against the research on the history

of contemporary Iranian architecture, the evolution of modernism in Iranian architecture based on the intra-institutional factors such as structure, climate, etc., are considered as an unstudied area and necessary platforms for research (Nari Ghomi, 2015, 98). The necessity of this matter in terms of being applicable is related to the existence of weakness and confusion are available both in the way of interaction and about the function of technology and leading structures in today's Iranian architecture, to the extent that this issue has become quite clear not been covered by the contemporary architecture researchers. Among the practical applications of this research in architecture, the following can be mentioned:

- To initiate wide-ranging research in which the results would be applicable for professors, students, and researchers in the field of design and architecture.
- Creating a platform and a special epistemology for researchers, designers and architects to design and study on the subjects related to the adaptation of the constituent factors of building construction in combination with the poetic and semantic dimensions of architecture.
- Increasing the authenticity of contemporary architecture and an interdisciplinary approach to the exploration and development of architectural boundaries with tectonic views and reading.

In general, it can be said that the coordination and integration of building constructive elements are currently the missing links in contemporary Iranian architecture. Building-related specialties are separated from each other, and sometimes installation, structural, and even electrical elements are not in harmony with the architecture. Beyond this, these seemingly separate elements from architecture can be considered as spatial elements, or at least as ones have a great impact on building space. Today's Iranian architecture is sometimes reduced to pure form, while other elements are neglected. In many cases, it can be seen that each of these elements is the best constructed and created

in its place, but they do not have the necessary harmony to build the real architectural space. The selected buildings, which are among the most significant architectural buildings of contemporary Iranian public buildings, have been read in terms of harmony (architectural tectonic) and have created a framework as criteria for measuring the originality and beauty of architecture and a separate conceptual model for designers and constructors.

Research Questions

1. What is the definition of tectonics in architecture? What are their components and dimensions?
2. How were the architectural tectonic readings of public buildings in contemporary time of the second Pahlavi era, in which technique of this era has had the most convergence in case of tectonic dimensions?
3. What is the most presence factor of architectural tectonic based on the advanced technology in the contemporary public buildings of Iran during the second Pahlavi era?

Research Hypotheses

- The architectural tectonic has structural dimensions, shells and materials, details, facilities, and articulation between them to coordinate and harmonize the constructive factors of the building.
- Based on the dimensions and components received from the history of architectural tectonics in the world, it is possible to read the public buildings of contemporary Iranian architecture of the second Pahlavi era.
- Due to the advanced technology in contemporary Iranian architecture, the dimension of structural tectonic has had the most extensive presence among the tectonic aspects of modern public buildings in Iran.
- It seems that the dimensions and components of tectonic can create a framework for critique and evaluation of contemporary Iranian design and architecture.

Literature Review

Scattered researches have been done in the field of the architectural tectonic in the world, which they can be pointed here generally. Kate Nesbit wrote an introduction to the article of the Kent Frampton: “Frampton believed that construction is an act of establishing, it means that it is a technical activity and not scenery”. Frampton thought that the concept of establishment and construction can resist against the postmodernism matter of “complement crust “ in architectural designing which have been declared by Robert Venturi, et al. Tectonic looks like a strong panacea and immethodical matter which seems it is inherent in the architecture and myth (Frampton, 1995, 132). Frampton is an English architect, critic, historian, and professor at the School of Complementary Architecture and Planning at Columbia University in New York. He is best known for his writings on twentieth-century architecture and the publication of ‘Modern Architecture: A Critical History’, as well as ‘Studies in Tectonic Culture’. Of course, his article, “Critical Criticism,” has had a profound effect on architects since its publication and is well illustrated by Frampton’s approach. The idea of building the site is one of her main ideas, which is attributed to Vittorio Gregotti and can be seen in the works of Louis Kahn and Alvar Alto. Dealing with topography and highlighting it is in stark contrast to the ideal of the international style, that is, a smooth, pure, and unobtrusive site (Frampton, 1990, 522). Professor McDonald’s is a researcher and teacher of architecture in the fields of architectural structure, cultural landscape design, and architectural history. He is one of the key authors of Rutledge’s Architectural Design and Campaign, in one of its chapters, as a complement to its original book (Structure and Architecture), describes the tectonic form from its point of view. McDonald’s describes six broad categories of diverse relationships between structure and architecture: 1- The decoration of structure 2- The structure as decoration 3- The structure as architecture 4- The structure as a generator of form

5- The accepted structure 6- The ignored structure (McDonald's, 2004, 87).

Gottfried Semper, the German architect, emphasized contextually root of tectonic and indicated that; the knot is the first type of connection. The connections are considered as a fundamental and major matter [in architecture]. Still, it is not a cheap one, and this cannot possibly lead to an abuse extremist, which is a contemporary architectural disease (Semper, 1851, 133). Frascari as written in the article of "spokesman details" believed that the tectonic details can be a stage for producing innovation and ingenuity. He thought that detail is the finest unit of indication in producing architectural semantic. His article by emphasizing restoring architect into its original tectonic is considered as a semantic generator, proposing the main postmodernisms concepts (Frascari, 1984, 128). Patrik Schumacher is an architect, theoretician, and the main membership of the architectural office of Zaha Hadid in London. Schumacher visualized a quadratic process for an architect designing including 1. The space order, 2. The technical performance, 3. The materialization and finally and 4. The articulation, as one of the most important parts of the process (Schumacher, 2012, 26).

Demetri Porphyrios, a contemporary Greek architect, theorist, and professor of architecture at Yale University, that refers to the matter, connection, and the visual stability of form as a tectonic basis. "Tectonic is important in three ways," says Demetri Porphyrios in a comprehensive definition in the article "From Techne to Tectonic" on the concept of tectonic. First, the finite nature and shape properties of building materials such as beams, bricks, stone, metal, etc. Second, the connection procedure, in such a way that it brings the building elements together. Third, visual stagnation, in a way that convinces our sense of sight about the stability of form, their unity, balance, and diversity or contradiction" (Porphyrios, 2002, 136). Andrea Deplazes is also a professor of architecture and head of the architecture department at the University of Zurich in Switzerland. Deplazes

is one of the architects who has combined theory and practice together and is currently working on several architectural projects. "A strong design process to perfect the architectural body is only possible with the connection of the concept with the separate technical and structural parts," he admits. In this case, the component and the whole affect each other and create a perfect complementary face. This is a step from construction to architecture, and it is also a step from integration to tectonic (Deplazes, 2009, 10). Besides, a series of research studies have been introduced in Chad Schwartz's book in the field of tectonics, which can be considered as one of the last researches on this subject so far. This book provides an understanding of the integrated potential of architectural tectonics. It seems like the original text entitled "The Tell-the-Tale Detail" provides a discourse on the construction of the architecture to understand the artificial environment of architecture further. The main content of this book is extracted from two sections: an initial introduction to tectonic and a collection of sample analyzes. The initial article serves as the basis for the book "Fundamental Background" on tectonic theory. It consists of three types of critical information. At first, the article begins with individual perspectives and elders' views on tectonic theory and its motion. Second, the terminology enters into the basic terms, and finally, the article provides a framework for the internal concept through which these analyzes are performed (Schwartz, 2017, 45). In the field of contemporary Iranian architecture, several studies have been conducted that can be said to be largely unrelated to the architectural tectonic (Diba, 2001; Razavi, Akbari, Jafarzade & Zali., 2013; KabirSaber, 2015, 400; Ghobadian, 2015, 25; Nari Ghomi, 2015,100; Tashakori & Teddli, 2016, 26; Ansari, 2016, 35). An article in 2017 also examines and expresses tectonics in architecture (Schwartz, 2017). In 2018, the digital tectonic design was addressed in an article as a new approach to architectural design (Balinski & Januskiewicz, 2016). In 2013, research on contemporary tectonic thinking in architecture

and urban planning was carried out by Biem (Beim, 2013). There are other articles in this field, some of which can be mentioned here (Schumacher, 2012; Oxman, 2014; Dickson & Parker, 2015; Januskiewicz, 2014, 2013, 2012). By examining and thinking about the background of researches conducted in the field of architectural tectonics, it can be said that so far no research has been formed with the objectives and research methods such as the present research in contemporary Iranian architecture. Also, this issue has been a very critical and considerable topic in the contemporary architecture of Iran and the world, in a way that many types of research have discussed in this field. The importance of this issue has also doubled in recent years. Therefore, researching this field is very necessary, and it can also respond to the research gap in this field and be a step towards the goals of the present research.

Methodology

This article is done based on the basic library studies, field research, the distribution of questionnaires between architectural experts, and phenomenological description by the architectural elite. Also, MAXQDA software is used for reaching the goals of the study. In this regard, according to the hybrid approach, the research structure is divided into stages and sections: At the first stage, the basic concepts in architecture in the field of tectonics, the architecture related to the second Pahlavi era, as well as the dimensions (conceptual and physical aspects) and tectonic criteria (structural focus, architecture, facilities, communication with the environment, details, and materials) were extracted and explained. The second stage is to determine, analyze, and study a sample of the statistical data representing the public buildings of contemporary Iranian architecture. In this section, 30 buildings of contemporary Iranian architecture belonging to the second Pahlavi era were selected based on the purposeful classified plan (Razavi et al., 2013, 234). The proposed sample for quantitative and qualitative schemes was

provided to 30 architectural experts by using Google Form. Before submission, to ensure the validity, the questionnaire was given to several experts on a trial basis for ultimate control and correction. Among the reasons for selecting architectural experts and elites is applying the phenomenological methods in this research, which requires participants who have common experience about the phenomenon under study and can comprehend the nature and meanings of research concept for sharing with the author; The expert was also considered to assist the project in identifying and removing “the possible disturbing data and meaningless outcomes that may occur to validate the results. To achieve this, a long and in-depth interview has been conducted with each of them. After obtaining the four selected buildings of contemporary architecture belonged to the second Pahlavi era extracted from the studies of architectural experts, to perform a tectonic reading on them the following steps were taken, A detailed documents consisting of 160 printed A4 colorful pages related to the complete plans of the building, the internal and external images, together with the detailed and general images related to the environment have been collected from various sources; These resources than provided to seven elites for observational descriptions based on phenomenology in a codified manner according to the smallest sample size for doing quantitative and qualitative designs (ibid). Besides, due to the evaluation and validity of the building in the sample selection stage, most of the buildings were previously visited by observers, and sometimes even they were in full contact with the buildings (the reliability of the observation tool). Before the selected documents being observed and described by the elites, the axes and dimensions of architectural tectonic were described and made available to them (the criterion reliability). However, since this observation was also based on the analysis of documents, images, and phenomenological results, it cannot be evaluated with low inference and the observers, of course, had their evaluations. To increase the reliability of this collection

method, in addition to explaining the axes and dimensions mentioned, the architects with different specialties, according to the extracted dimensions of architectural tectonic, were asked to participate as observers (the observer reliability). It should be noted that the observer reliability is a prerequisite in the data gathering process, but it is not sufficient to collect reliable observation data. Due to adopting the method of data triangulation, the inference of the researcher, and the elimination of minor errors (often in the climatic dimension), the conflict in descriptive codes were minimized (the reliability of the observers' agreement).

Moreover, the SPSS software was also used to analyze the data in this section, and the reliability of the questionnaire was calculated using Cronbach's alpha³ method. The statistical reliability of 89% with an α range between $0.9 > \alpha > 0.8$ due to the fluctuations of Cronbach's alpha³ was obtained, which means that the result was significantly reliable. In the third stage, the documents of selected buildings were presented to the architectural elite for observation and description based on phenomenology, and the relevant results by focusing on tectonic and its criteria were entered in MAXQDA software and then the output data were categorized

and analyzed. It should be noted that this article is the result of a larger study that has been carried out over 80 buildings of three different eras of contemporary Iranian architecture; among them, only the public buildings of contemporary architecture belonged to the second Pahlavi era as the subject of research were studied. Moreover, four main tectonic indicators, including structure (McDonald's, 2004, 15), articulation, relationship with the environment, and space poetry (RezaKhani, 2014,103), have been studied. In general, as a research method, both the theoretical and practical dimensions have been considered. In theoretical dimension, mainly descriptive-analytical methods were used and dependent to the condition of different parts of the research other previous studies that were looking at past events were also being applied, with this aim to review the theories of architectural tectonics and its components, and also to deal with the criteria were existed at the second Pahlavi era of contemporary Iranian architecture.

In this section, the library-based and internet tools (printed, digital and online resources), have been used to gather information other than written documents. Table 1 summarizes the general research methods used in this study.

Table 1. Types of research methods used in this research. Source: Authors.

Research steps	Research methodology	Collecting information method	Analytical method	Description
Investigating the concept of tectonic from theorists	Interpretive-historical and descriptive-analytical	Library	Summary, categorization, and conclusion based on logical reasoning	Mixed method
Determining the dimensions and criteria of tectonics in architecture	Descriptive and analytical	Library	Summary, categorization, and conclusion based on logical reasoning	Feedback from experts
The architecture of contemporary Iranian public buildings	Descriptive and analytical	Library	Summary, categorization, and conclusion based on logical reasoning	-
Sample size design	Mixed (typology and survey)	Document analysis-questionnaire	Induction method - Likert scale (based on purposeful floor plan)	Expert opinion
Analysis, evaluation, and reading of case studies	Documentary-phenomenological analysis	Field study-descriptive observation of elites - documentary interpretation	Open, central and selective coding, analysis with MAXQDA software	Triangulation data gathering technique

Definition and Theoretical Framework

• Tectonic, Concepts and Criteria

The word tectonics is derived from a similar Greek root from which the terms of architecture and technology came from; that through the basic human actions is being manifested to us by shaping new things and making them visible.

Today, this word might be used in biology and geology as well, but originally is known by referring to the carpenter or masonry jobs, that was called Tecton in ancient Greece (Sekler, 1965, 89). This word appears in ancient Greece poems, and Homer points out to this word as the art of building in general. The poems about this word were first found in *Sappho's* Songs (600 B.C.), in which Tecton was used for talking over a carpenter that his job was mixed with poetry (Frampton, 1995, 3). The first architectural usage of this term dates back to 1830 AD in Germany where Carl Gottfried Moeller described the tectonic term in his archaeology art handbook as an application that is available in sets of form and artistic shapes, for example, kitchen accessories and utensils, pots, residential and visual places of human beings (ibid, 4). But in modern times this term was first introduced by Karl Bötticher. This matter developed by Gottfried Semper, that his uncompleted studies were then published from 1863 to 1868 (Semper, 1851, 56). However, it should be pointed out here that the subject of architectural tectonic is not studied well in Iran. In the field of architectural tectonics, many experts and theorists have commented that it is not possible to mention all of them here. Therefore, to better understand the tectonics of architecture, Figure 1 shows the applied studies on the opinions of architectural thinkers and the theories of some of the most prominent methods of contemporary Western manufacturers.

The order of precedence and the latency of their theories are depicted based on the lifetime and the activity of the theorists in this field; and also an attempt has been made to provide a brief and concise definition of these ideas. It should be

noted that in the present study, tectonic means the “art of joining’s”. Art is perceived here as *Techne* or technique. Thus, tectonic is considered as accumulating not only the components of a building but also the elements of objects; in fact, resembles the works of art with a subtle sense. Due to the prior understanding of the word, tectonic tends to build a structure or construct a skillful and artistic product.

The Architecture of the second Pahlavi Era

The second Pahlavi era (1941-1978) is synchronized with the recent modern architect in the west (1945-1972). In this era, many different modern architectural texts and books entered into the country of Iran. Along with the returning of educated architects from the west and also entering the graduated architects from Beauty Arts college of the Tehran University to the art world, the followers of the Bauhaus school, modernism school, international architect, etc. have proceeded different ways. The well-known international architects also entered into the architectural scene of Iran and the professional standards have been improved as far as this era named as a professional awaking era (Diba, 2001, 75).

The modern architecture style that was formed during this era was mainly influenced by the familiar European architects and ideas, such as the international style of architecture, the Bauhaus school and the great works of artists such as Le Corbusier, Frank Lloyd Wright, Richard Neutra, Alvar Alto, to the extent that an Iranian form of modern architecture emerged, which has been referred to as quasi-modernist architecture (BaniMassoud, 2009, 243). The international style, Art Deco, brutalism, the tendency to sculpture and minimalism, and even high-tech and organic architecture which are all sub-branches of modern architecture in the West, and are kind of thought-provoking works, all were addressed in Iran as new styles at the time. The available architecture during

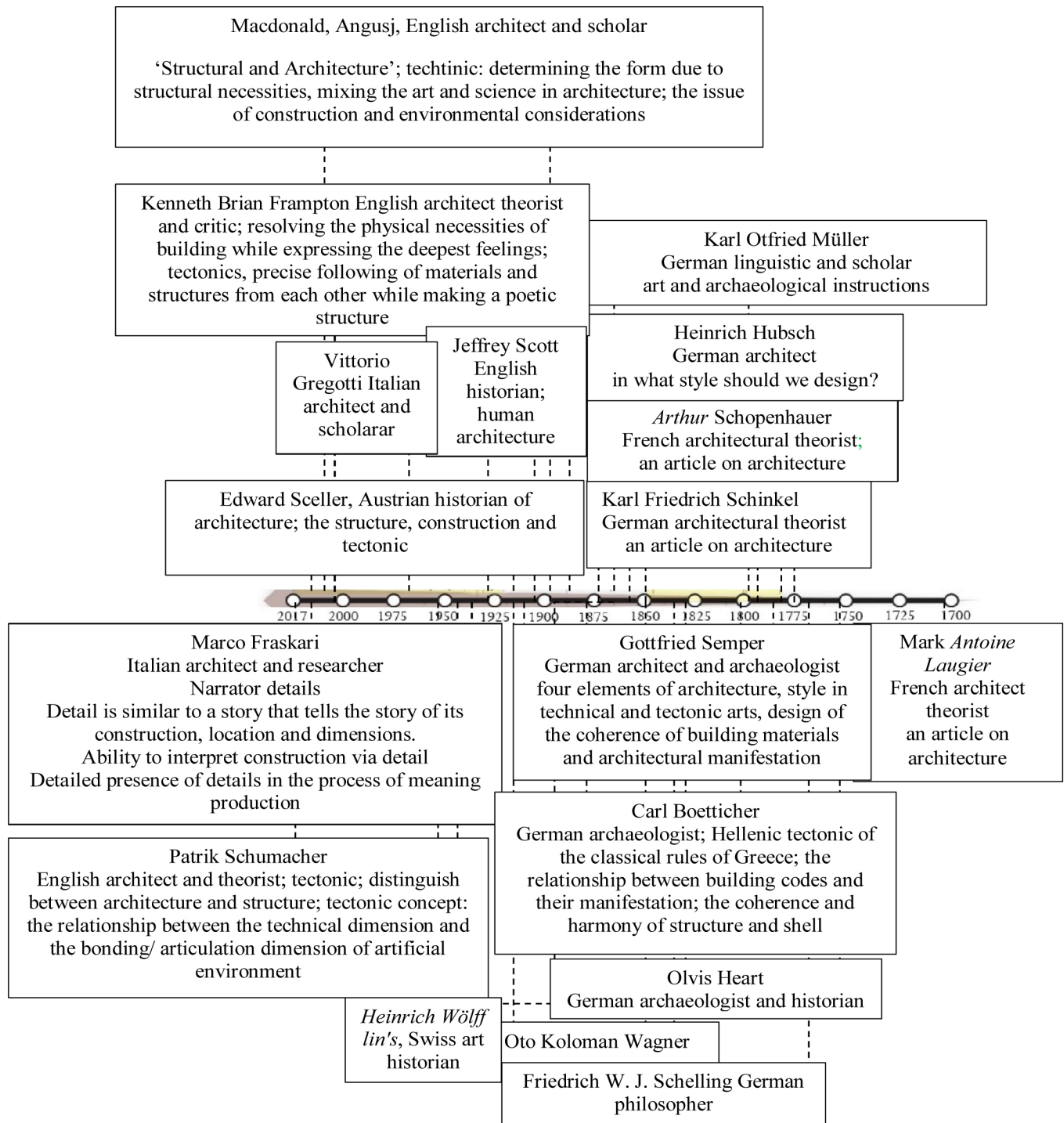


Fig. 1. The timeline of specific theorists on tectonic and their perspectives. Source: Authors.

the second Pahlavi era has had specific aspects and contexts in comparison with the other era, for instance:

- The architectural and urban development and also enhancement of well-known first-class international architect's presence in Iran;

- The variable designs and construction of public buildings in this era;
- The concurrency of this era with the prosperity time and the golden age of modern architecture (recent) in the west.

- The presence of foreign educated architects together with those who studied in the country;
- The political stability compared to the previous time, followed by more flourishing aspects of architecture and construction.

Besides, researchers have divided the various architectural insights of this era into several categories in the form of architects:

A. The Modernists: a continuous flow of the international style and the fellow of the Bauhaus school and modernism. Although this group is not unaware of the native architecture and history, they choose the international style in their designs. Some of the prominent people in this group are Farmanfarmaian, Seyhoun, Aftandilian, Ghiaei, Iraj Etesam, Yousef Shariatzadeh. The presence of famous international architects in the Iranian architectural scene in this era is a reason for coordination between modern Iranian architecture and world-class architecture (Habibi, 2016, 38).

B. Neo traditionalists: Proponents of the re-creation and rebirth of indigenous and Iranian architectural values (ancient and post-Islamic). Influenced by the critiques of modern European architecture in the 1960s, they reread the importance of indigenous architecture and use the metaphorical nature of Iranian expression in the arts to create their architectural works. These groups also try to spread their ideas by presenting them in the field of education and profession and display them on a global scale. Mohammad Amin Mirfenderski, Nader Ardalan, Kamran Diba, Hossein Amanat, Latif Abolghasemi can be considered from this spectrum. The works of this range of architects are among the first Iranian post-modernism works that deal with the ancient Iranian concepts (ibid, 38).

C. Expressionists: They have also taken advantage of the world's standard architecture and believe in announcing artistic declarative states in the form of architecture. The residential construction by the private sector and the typical construction business shed light on the state of affairs in some architectural works of this era (ibid, 39).

Of course, there are architects in the first and second categories who have built buildings in different styles. For example, Nader Ardalan, who seems traditionalist in theory and practice, has displayed a kind of architectural style based on brutalism in the design of the central building of Behshahr Industrial Group; Or in another example, the architectural works of Houshang Seyhoun that cover a wide range of international styles, such as Sepah Bank, Tehran's Artillery Square, to historical past works like the complex of Avicenna Mausoleum. With this look, these works are not considered in the same category as [the works of] Farmanfarmaian, which are dominated by modern buildings, and international style; so it might be more accurate to classify the architects and their types of architecture according to time.

Discussion

After introducing and presenting the basic requirements of research, now in this section, the findings and results of the theoretical and physical studies are illustrated. In this regard, according to the aggregation of contemporary architectural researcher's studies of Iran, four types of styles were extracted from three different eras in contemporary architectural of second Pahlavi; Following this, the most important buildings of each style were selected according to their frequent presence in modern architectural literature of Iran. Indeed, the number of 30 buildings was selected from the public buildings of the second Pahlavi era as the final selection for tectonic readings by distributing the questionnaire to the architectural experts. The survey was given to some experts on a trial basis for final control and correction. Finally, according to Table 2, by distributing the questionnaire among 30 architectural experts, four buildings from the most prominent and significant structures, considering the maximum average value (by using SPSS and statistical analysis), were selected and studied. It is further explained that these four general buildings of contemporary Iranian architecture in the second

Table 2. The numerical results of public buildings' preferences belonged to the second Pahlavi Era according to the opinion of 30 architectural experts, based on the questionnaires and statistical analyzes. Source: Authors.

	Building style	The name of selected building	Building year	Average	Mean deviation	Median	Mode	Standard deviation	Variance
The architecture of the second Pahlavi era (1941-1978)	Traditional & traditionalist architecture	Shah Abbasi hotel	1957	7.82	0.4271	9	9	2.30	5.29
	Modern architecture Art Deco	Jeep office building	1941	7.37	0.477	9	9	2.56	6.6
	Late modern architecture international style	Behshahr industrial group building	1970	7.93 7.31	0.377 0.35	8 8	9 9	2.03 1.91	4.137 3.65
	Iranian modernism (Iranian modern architecture)	Museum of contemporary art	1967	9.03 8.172	0.24 2.74	9 9	10 10	1.32 2.74	1.74 7.50

Pahlavi era have been analyzed using the methods used in the research and the results have been presented in the form of figures and tables. In fact, these cases and documents of selected buildings have been provided to 30 architectural experts. Finally, the results of their phenomenological descriptions have been given in the form of figures. In this regard, the architectural elite has tectonically read each of the four selected buildings, which were obtained from the review studies of experts on 30 historical monuments. Architectural elites, while reading the tectonic phenomenology of the target buildings, have examined the tectonic axes derived from the literature of the subject according to Fig. 2 for each building. In this way, some buildings have all the axes, while the others have not, or might not be that much significance to this. Therefore, the results obtained from in-depth interviews and other documents have been entered and coded (selective, main, sub-code) in MAXQDA software. The outputs have been collected in different forms for reading each building, according to Figs. 3 to 6. Among the 80 buildings, according to the opinion of 30 experts, four cases related to the contemporary architecture of the second Pahlavi era were randomly selected according to Table 2. They were considered with the maximum average value in each era, and the same number was selected as the sample members. The

people who completed the questionnaires were all architectural experts, with 17 graduates, six doctoral students and seven PhDs in architecture, four of them were between 25 to 30 years old, 12 of them between 30 to 35 years old, four people were 35 to 40 years old, seven people 40 to 45 years old and three people over 45 years old. As it is clear, in each building, the axes and criteria studied in the tectonic reading of that building have been different from other structures due to this issue, and this result seems natural as mixed readings also give these kinds of various diagrams. Finally, according to the results obtained in this section, the necessary and essential criteria in the tectonic interpretation of the building are provided. According to the outcomes of descriptive observations and analysis of selected buildings, the following characteristics have been extracted:

Structural focus:

- The role of structural elements (beams, columns, slabs, etc.) in organizing space
- Compatibility of structural elements with the dominant spatial geometry
- Inducing visual stability of the integrative form of building in the viewer

Climate environment:

- Environmentally compatible form
- Adaptation of form to climate

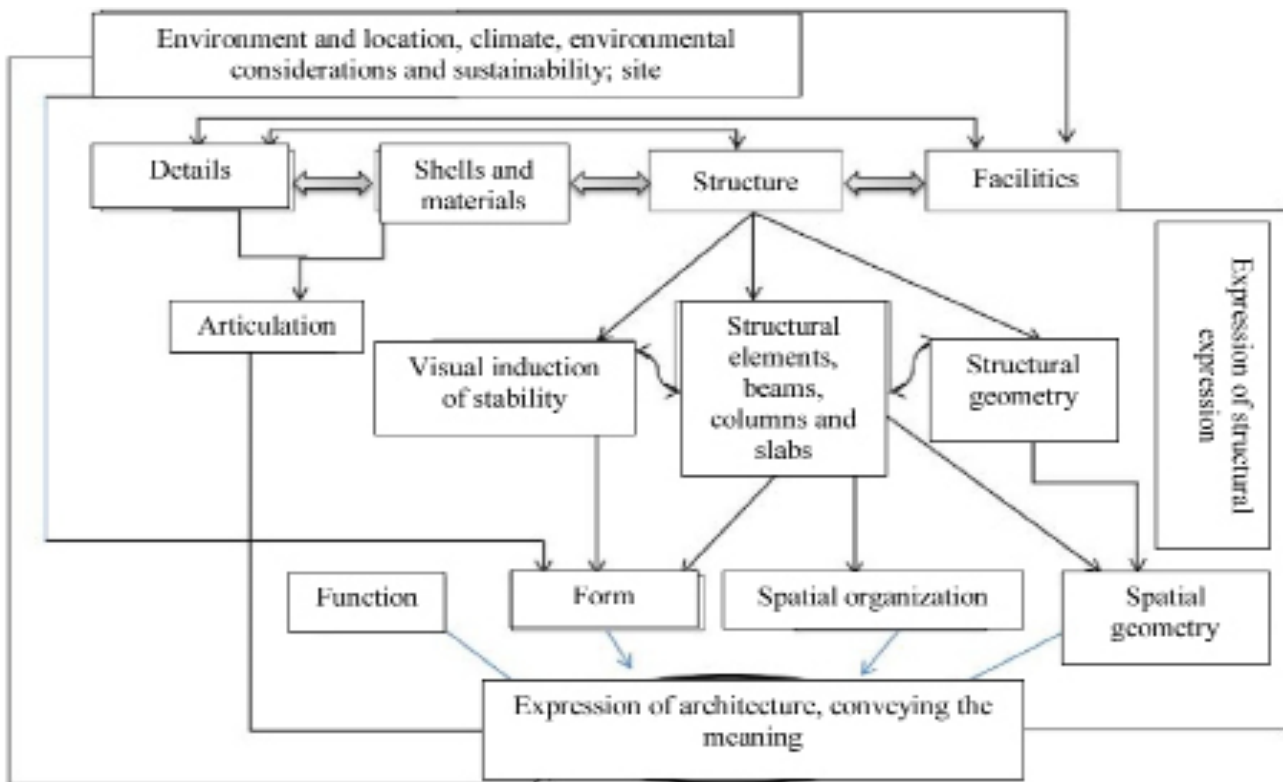


Fig. 2. The conceptual framework derived from the subject literature, dimensions and tectonic criteria in architecture for reading the buildings studied by architectural elites. Source: Authors.

The focus on the shell and materials:

- Participation of details in inducing the whole architectural meaning
- Correlation of shell material and elements with the generality of architectural expression
- Matching the material and the shape of the shell with the structure
- Articulation and the constructional poetry

The focus of the facility:

- Adaptation of artificial lighting equipment and other electrical elements with geometry and architectural expression of the building
- Balance and proportion of heating and cooling features such as visible channels and equipment with form, geometry and space organization

In the following, according to Table 3, the frequency distribution and the percentage of the answers given to each of the components of research through statistical results and SPSS software analyzes have been studied separately from the existing buildings in the studied samples. The coefficient of change (dispersion) is an indicator used to measure the distribution of statistical data dispersion. The factor of change is used to compare the scatter of two or more attributes (variables), and its primary application is to examine variables that have different units of measurement. The coefficient of change expresses the degree of scattering per unit of average. This indicator is only applicable to the relative measurement level. They usually multiply

Table 3. The coefficient of variation (CV) of 4 selected buildings obtained from the studies of architectural experts, results and statistical analysis. Source: Authors.

	Shah Abbasi hotel	Museum of contemporary art	Jeep office building	Behshahr industrial group building
Coefficient of variation	0.184	0.1916	0.25	0.198

percentage of each research question for each of the four studied buildings is given in Tables 4 to 7 and Figs 3 to 6.

• **A Modern Architecture, Art Deco: The Jeep Office Building**

The Jeep building with commercial office use constructed on a land of 640 square meters and a

total area of 2923 square meters on the four floors in 1941. The building is positioned in Ekbatan St, Saadi St., Tehran. The architectural design of the building is a combination of flat and curved surfaces, modular pop-ups and various divisions. The volume of the building, because of being placed in a rhombus shape- a plane form on the ground,

Table 5. Frequency percentage of research questions related to the Jeep office building. Source: Authors.

Research Questions	Abundance	Percent	Frequency	Percentage of cumulative frequency
0	1	3.3	3.3	3.3
3	2	6.7	6.7	10
5	3	10	10	20
6	5	16.7	16.7	36.7
7	3	10	10	46.7
8	4	13.3	13.3	60
9	4	13.3	13.3	73.3
10	8	26.7	26.7	100
Total	30	100	100	

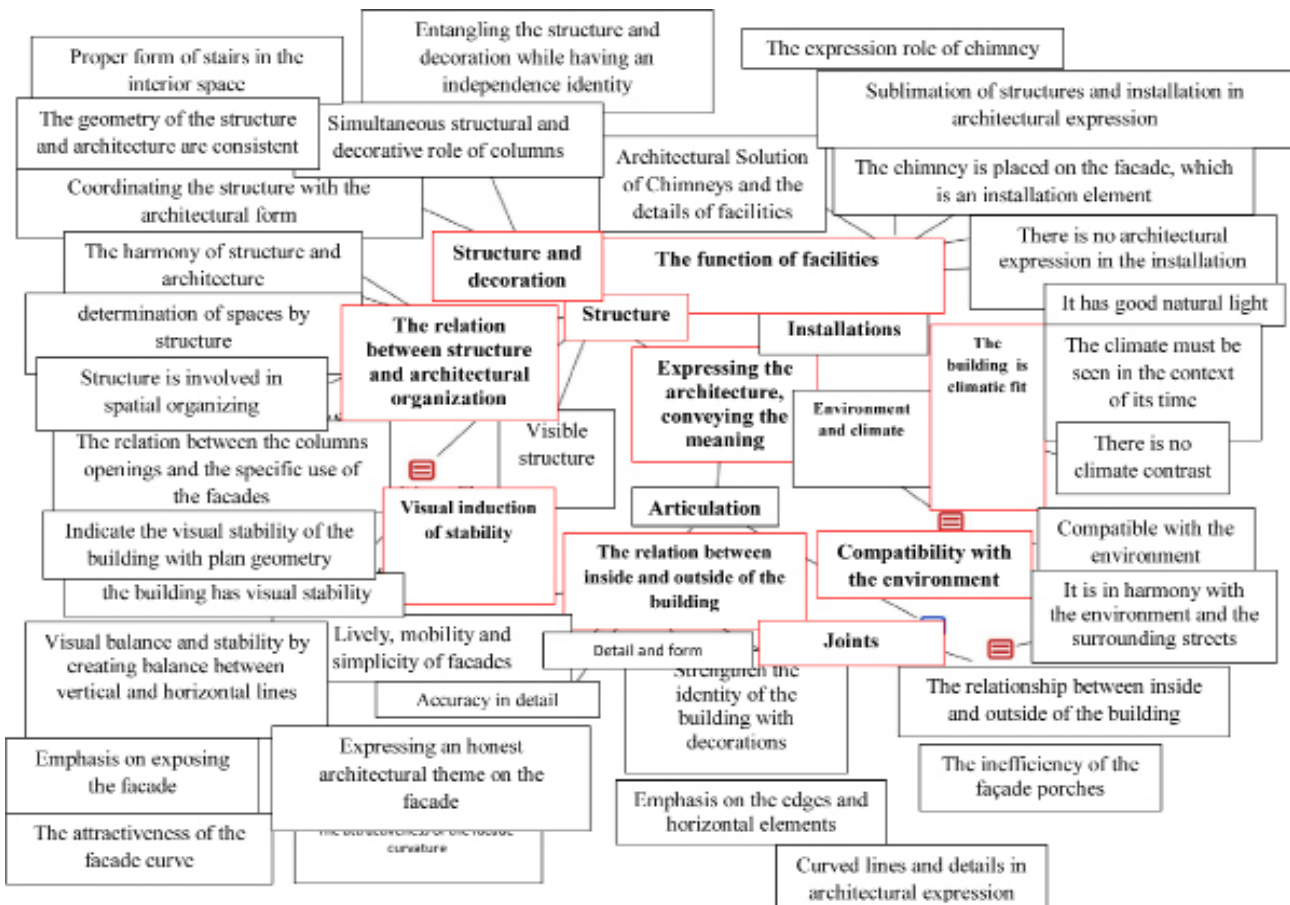


Fig. 4. The diagram of data analysis for Jeep office building architecture based on the descriptive observations by elite. Source: Authors.

and the warm colors used in the view of building displays the main body of the plan.

• The Iranian Modernism (Modern Iranian Architecture): The Museum of Contemporary Art

The Museum of Contemporary Art's building with cultural use was built in 1967 for the Management and Planning Organization of Iran (Program and

Budget Organization). It is placed on a land area of 17,600 square meters with a foundation of 4,224 square meters' foundation on two and three floors with a concrete frame structure that was put into operation in 1977. The urban location of this building is in Tehran, at the North Kargar Boulevard, - the western side of Park-e-Laleh. The museum has two entrances located on the east and west sides of the land, respectively. The east entrance is allocated

Table 7. The frequency percentage of research questions related to the Museum of contemporary Aat building (Tehran). Source: Authors.

Research questions	Abundance	Percent	Frequency	Percentage of cumulative frequency
0	1	3.3	3.3	3.3
1	1	3.3	3.3	6.7
3	1	3.3	3.3	10
5	1	3.3	3.3	13.3
6	1	3.3	3.3	16.7
7	2	6.7	6.7	23.3
8	3	10	10	33.3
9	7	23.3	23.3	56.7
10	13	43.3	43.3	100
Total	30	100	100	

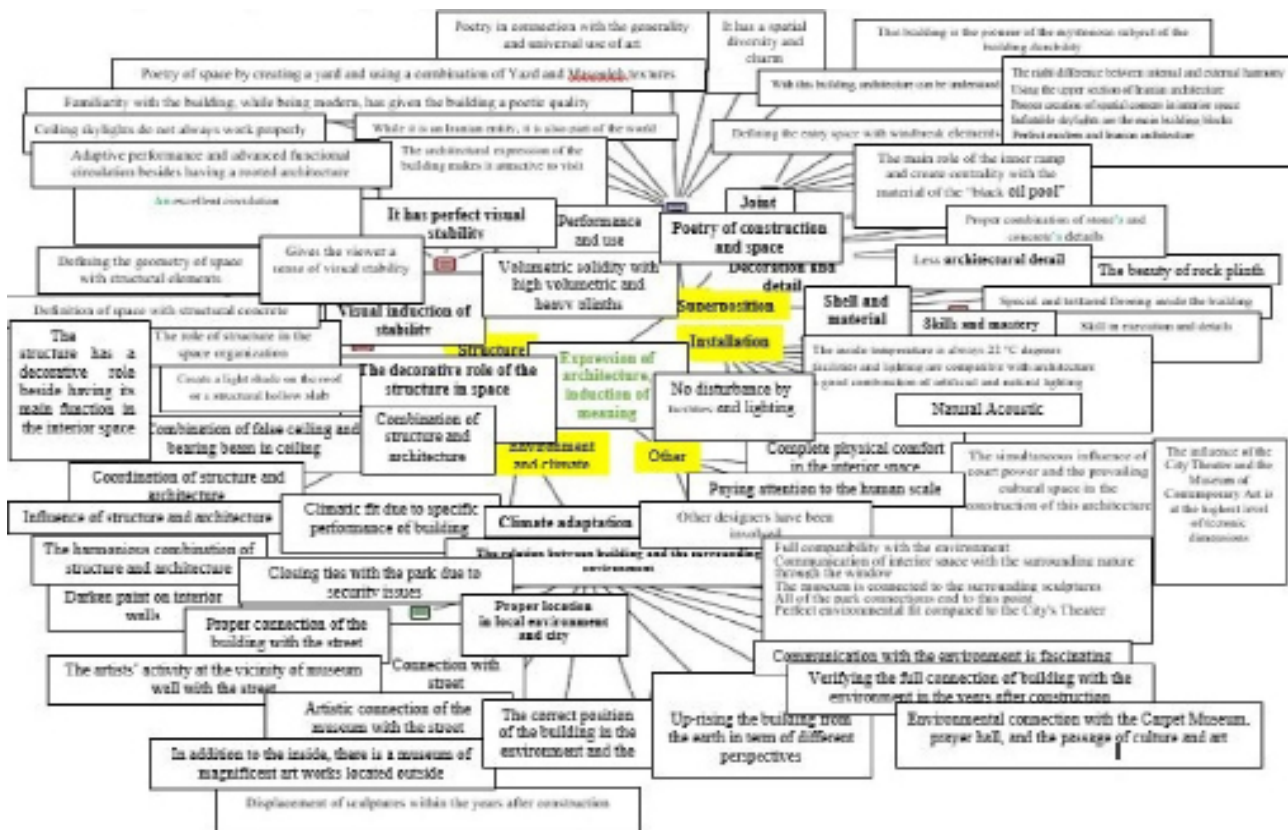


Fig. 6. Diagram of data analysis from descriptive observations of the Tehran museum of contemporary art. Source: Authors.

for particular vehicle that extends to the southwest, leading to the museum's repositories and office space.

The architectural tectonic reading of the public buildings related to the second Pahlavi Era

In this part of the research, the final results of architectural tectonic readings related to the public buildings of the second Pahlavi era are illustrated. It doesn't seem that the constructed buildings in the traditional architectural style are fully compliant with tectonic architecture, in terms of the connection between the structure, architecture and shell. The reason can be found in this point that the structure has improved and most public buildings have a distinct structure (concrete or steel) from the shell. It has just been tried that the form of buildings becomes similar to the traditional Iranian architecture. The same rule can be seen in the semantics micro-articulation of the buildings which relate to this era. In these buildings, even if a tectonic dimension is seen, it is supposed to be related to the previous main body of the building, which belongs to an era other than the contemporary one and has a different scope of the present study. In a style of modern architecture known as Art Deco, there are some interesting differences with the previous form of buildings in this era. The most buildings of this era belong to the works of Vartan, or they show the exact style of Vartan's work. The artist has produced a level of architecture in which all the constituent elements serve the whole body. The structure organizes the architectural space and plays a role in determining the form; besides it is active in emotional transferring of structural forces and induces visual stability. The proper materials used in the shell seem to make a complete match from micro and macro articulation's dimension; even some of the installation elements, such as chimneys, unprecedentedly serve to express

architecture. The most important point is the presence of elaborate details in this building which are shown in proportion to the structure and shell.

It seems that the conformity of the tectonic dimensions in public buildings of the late modern architecture (the international style) and more completely the architecture of Iranian modernism (modernist Iranian architecture) can be seen in this era. Also, in the building of Behshahr industrial group, which represents the late modern architecture style, in addition to the complete tectonic cover of architecture in structure and articulation due to the use of Iranian architectural elements and familiar motifs, the contemporary Iranian architecture reaches a degree of tectonic maturity. Although this building uses prefabricated concrete skeletons in its structure and shell and also has less variety of materials than the previous buildings, it can combine the structural elements of the building and serve to express the architecture of the building. Besides, this building is well connected to the artificial environment and the urban elements; moreover, it is associated with the natural environment (land) through the use of familiar elements in the central courtyard and its all-round use. Despite the use of prefabricated and machine-made systems in its construction, this building has also acquired the poetic dimension of space. The more complete degree of this maturity can be found in the Iranian modernist style in both buildings of the City Hall and the Museum of contemporary art. This style of structural architecture is in perfect combination with the body and expression of architecture. Although these buildings use structural (concrete) skeleton like the previous modern buildings, the obvious difference between these buildings with their counterparts is in having a more complete look to the past of Iranian architecture despite of using modern technology. In the City Theater Complex, the familiar decorations and geometry of

Iranian architecture are well integrated with the modern structure of the building. The structure represents all its tectonic patterns appropriately. The elements and installation equipment are in harmony with this architectural expression and has also created an urban memorial element. Although in this building, like other modern buildings, the structure of the shell is separated from the structure, but the materials of the shell in terms of type, color, texture and geometry have been perfectly in harmony with the structure and architectural expression. The Museum of Contemporary Art can be considered as the most complete tectonic building in contemporary Iranian architecture. In this building, in addition to having all dimensions of the previous building, the conformation of the structure and the shell have been combined with a complete connection. In the Museum of Contemporary Art, the facades, shells, decorations and joinery are unique and the most perfect articulation has been made in terms of micro and macro. The use of the windward familiar motif, in addition to defining the entrance space and creating natural light, has created an urban sign that distinguishes it from other architectural styles. The relation between the interior and exterior spaces of the building is exemplary, and the lighting, cooling and heating facilities and equipment participate actively in the expression of architecture in addition to playing their trace. The Museum of Contemporary Art has created poetic spaces, and the performance skills are clearly evident. In fact, it can be said that the Museum of Contemporary Art is a completely tectonic building. The final analysis of tectonic reading on target buildings, have been shown in [Figure 7](#), according to the results outcome. It well shows the connection between tectonic indicators (including structure, joint, relation with the environment and space poetry); the data have been acquired from the phenomenal tectonic reading by architectural elites ([Table 8](#)).

Conclusion

This study aimed to investigate the architectural readability of buildings related to the second Pahlavi era from a tectonic point of view by using the analytical-descriptive method basic and field studies, questionnaire distribution as well as MAXQDA quality software and statistical analysis. In this regard, by examining the results came from the technical reading of target buildings in the contemporary architecture of the second Pahlavi era of Iran, the following outcomes were obtained:

- The alignment of traditionalist style with tectonic dimensions were seen in this era.
- The late modern architecture style in the public buildings of the late Pahlavi era was more closely related to the architectural tectonics.
- Art Deco is one of the contemporary Pahlavi architecture styles in terms of micro and macro tectonic articulation.
- The Museum of Contemporary Art's Tectonic Architecture is more readable and closely related to the architectural tectonic than any other studied public buildings during the second Pahlavi era so that all tectonic dimensions are presented in this building.
- The tectonic aspect of structure can be seen in all buildings of the second Pahlavi era in terms of creating a spatial organization, having a role in determining the form and inducing the visual stability.
- It seems that in the second Pahlavi era, there was an evolutionary course of covering the tectonic dimensions of architecture from the beginning to the end, which is at its highest level in the buildings of the modern Iranian style (accepting the research hypothesis).
- It appears that the facility in expressing the architecture, as an inevitable architectural aspect, is presented here except for what is seen in the Museum of Contemporary Art.

In order to answer the research questions and hypotheses, it should be stated that the tectonic

Table 8. The final results of architectural tectonic readings on target buildings belonging to the second Pahlavi era according to the data presented in figure 3 (the four main parts of tectonic). Source: Authors.

Architectural Style		Traditional and traditionalist architecture	Art Deco, the modern architecture	International style	Iranian modern architecture	
The selected building		Shah Abbasi hotel	Jeep office building	Behshahr industrial group building	Museum of contemporary art	
Structure	The structure plays a role in the organization of space	*	*	*	*	
	The structure plays a role in determining the form	*	*	*	*	
	The structure induces visual stability	*	*	*	*	
	The structural forces are obvious	*	*	*	*	
	The structural and shell materials are suitable	*	*	*	*	
	The continuity in structure and shell is obvious	*	×	*	*	
Articulation	Macro articulation	The Structural articulation and details are desirable	×	*	*	*
		The structure is in harmony with the concept of architecture	×	*	*	*
	Micro articulation	The materials are fit into the expression of architecture	×	*	*	*
		The composition of materials is appropriate	×	×	*	*
	Semantic articulation	It has semantic elements of architecture	×	*	*	*
		The structure contains details	×	*	*	*
Relationship with the environment	There is a meaningful relationship with the environment	×	×	-	*	
		The communication with the artificial environment is desirable	-	-	*	*
Space poetry	It is characterized by the poetic nature of space	×	×	-	*	
		It has a relative harmony with the climate	-	*	*	*

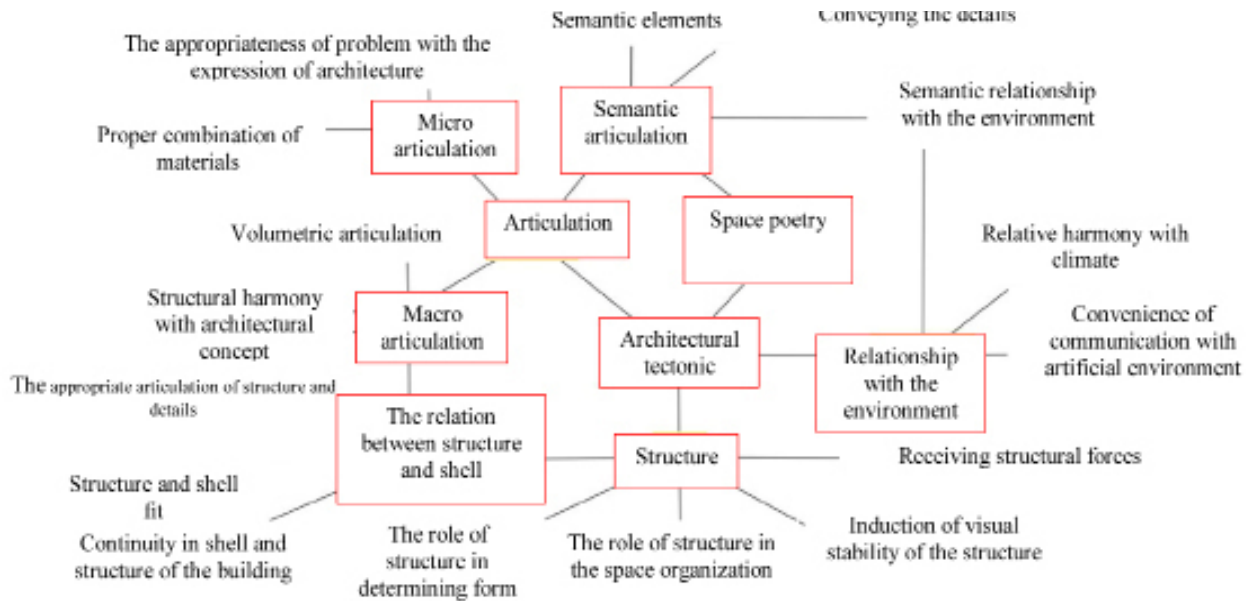


Fig.7. The modified conceptual framework, dimensions, and tectonic criteria in architecture, based on the reading outcomes on target buildings acquired by the architectural elites; according to the criteria which are more applicable to today's Iranian architecture. Source: Authors.

definition of architecture can be considered as an architectural manifestation of materials, constructional methods, semantic aspect of architecture and architectural technology in every age. Accordingly, architectural tectonic includes the integration of structural dimensions, shells, materials, facilities and the environment. In the tectonic reading of the public buildings of the second Pahlavi era in the architectural style of Iranian modernism (modern Iranian style), the most deconstructive architectural style has the least cover up with the tectonic dimensions and components. Besides, it seems that the structural dimensions of architectural tectonic with its various parts are more present in the tectonic reading of the architecture of contemporary Iranian public buildings than any other related components. The architecture of the mentioned buildings comprises all aspects of structural dimensions, shells, materials, details, facilities, and articulation between them to coordinate and harmonize the constructive factors of the building. Considering the advancement of

technology in contemporary Iranian architecture in the second Pahlavi era, the dimension of the tectonic structure has the highest presence among the tectonic proportions compared to other aspects of this era; The reason is that in this era the buildings' structure seems to have been developed and most of the public buildings appear to have separate skeletons (concrete or steel) from the shell, and sometimes (the traditionalist architecture) has only tried to be similar in form to the traditional Iranian architecture. In style of modern architecture called Art Deco, the exciting differences have been observed with the previous buildings of different techniques. In addition to the fact that structure organizes the architectural space and plays a role in determining the form, it also activates the sensory transfer of structural forces and induces the visual stability. A kind of appropriate materials has also been used in the shell, and in the case of micro and macro articulation, it seems a perfect match has been created. In Iranian modern architecture, the complete architectural tectonic cover in the

dimensions of the structure and articulation is well integrated with the modern structure, decorations and geometry, due to the use of Iranian structural elements and familiar motifs, that sometimes even goes beyond this. On the other hand, despite the use of prefabricated and machine-made systems in the construction process, the poetic dimension of space has not been neglected. And as a final word, it can be said that the tectonic reading of public buildings in Iranian modern architectural style in the second Pahlavi era shows the highest concordance with dimensions and components of tectonic, and it seems that the results of this research have been able to partially answer the existing research gap in this field.

Endnote

This article is taken from the doctoral dissertation entitled “Tectonic Reading of Contemporary Iranian Architecture: An Analytical Study of the Relationship between Architecture, and Construction in Contemporary Public Buildings of Iran since 1921” by Nourmohammad Afshari, with the guidance of Dr. Bijan Kalhornia and under the supervision of Dr. Ali Nouri. This article only refers to the tectonic reading of contemporary Iranian architecture in the second Pahlavi era.

1. Experts: In this study, an expert means the same as elites. According to the definitions, based on their Delphi method, they have at least four characteristics of knowledge and experience in the subject, desire, and sufficient time to participate in the survey. In this paper, architectural graduates with at least a bachelor's degree were employed. Their educational level is as follows: 17 graduates, 6 Ph.D. students and 7 people with PhDs degree in the field of architecture, four people aged 25 to 30 years, 12 aged 30 to 35 years, four aged 35 to 40 years, seven aged 40 to 45 years and three over 45 years old.

2. Elites: Elite refers to an outstanding and efficient person who plays a significant role in the creation and development of science, technology, art, literature, culture and management. In the present study, professors with academic degrees in different specialties of architecture have been employed due to the multifaceted nature of the tectonic subject. All of the elites selected for phenomenological reading had doctorates degree and were university professors. Various specialties in the fields of structural architecture (Mehrdad Shahbazi), urban architecture (Bijan Kalhornia), climate architecture (Abbas Mehravan), Islamic architecture (Saeed Moradi, Majid Rostami), landscape architecture (Morteza Mirgholami), sociological architecture (Babak Afshar).

$$3. \alpha = \frac{K}{K-1} \left(1 - \frac{\sum_{i=1}^K 1 \sigma_i^2}{\sigma^2} \right)$$

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