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Applied Research Article

# Study of Contextual Factors and Changes in the Physical Identity of Educational Buildings (Case Study: First Pahlavi High Schools in Tehran)

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**ABSTRACT:** The beginning of the Pahlavi period marked the onset of rapid changes. Architects, alongside the ruling power in the new conditions, sought to create a new Iran that aligned with global thought, while simultaneously preserving identity and occasionally fostering a sense of nationalism. Both the building and the educational system changed in response to shifting times and political developments. The traditional educational system evolved into the modern educational system. The research method is historical-analytical, drawing on both field surveys and library studies. This article aims to explain the principles and components of architectural design, presenting spaces that align with the structure of contemporary life, thereby enabling continuity and connection between the past and the present. For this purpose, the present study selected valuable examples from the Pahlavi period to present the components of Tehran high schools and analyzed the data using SPSS software and the Kolmogorov-Smirnov test. Then, the sign test was used to examine the status of the research variables, and the non-parametric sign test was employed to investigate the relationship between the facade and plan characteristics of the Pahlavi and modern periods. Finally, it was concluded that a significant number of Pahlavi-era buildings were influenced by the structures of the modernist era, according to experts. These buildings, of course, possess identity and cultural value and can be introduced as valuable examples.

**Keywords:** *Pahlavi I, Physicality Of Educational Buildings (High Schools), Modern Educational System, Contextualism in Architecture*

## INTRODUCTION

Architectural and urban development in each land is a reflection of its social, political, and cultural background. In the historical trajectory of Iranian civilization, following the two significant events of the emergence of Islam and the prolonged invasion and conquest by the Mongols, the tendency towards the West as the third event is perhaps the most important historical development in Iran. The beginning of the Pahlavi period marked the start of rapid changes and developments. These developments took on a new face with the construction of new buildings, including ministries, government offices, banks, universities, educational spaces, and museums.

Nationalism and modernism shifted the government's gaze to both the past and the future; consequently, the concepts of development and progress acquired two suffixes: "new" and "ancient." In this period, new architecture is officially and openly opposed to traditional architecture. There is a chaotic mix of different styles, ranging from early modernism to advanced modernism and from make-or-break architecture to traditional and national styles in the design of buildings (Etesam, 2009). New political and social views, including atheism, archaism, and modernism, are practically reflected in architecture, and the government openly expresses its thoughts through its new architecture (Kiani, 2014).

One of the rapid and challenging developments during the Pahlavi era was the construction of educational buildings, especially schools, the effects of which are still quite tangible in the country's educational spaces.

The beginning of modern education in Iran was marked by the establishment of the Dar al-Fonun School in Tehran by

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Amir Kabir during the Qajar era. Reza Shah is responsible for major changes in the Iranian education system. As part of his Westernization, modernization, and centralization program, he abolished the maktabkhanehs. The content of textbooks was updated and modernized, and he also established the university as an institution. With the establishment of the university, students could continue their education after completing high school.

The importance of educational buildings from this era and their impact on today's architecture, many of which remain and form an integral part of contemporary buildings, is a significant topic in the country's architectural literature. Educational spaces, as one of the most important urban spaces, should be considered. The education system, due to the necessity of social changes, is considered one of the most complex and large social organizations in every country and is inextricably linked to social, cultural, and economic growth and development. The effectiveness of this system, on the one hand, lies in transforming healthy, thriving, balanced, and developed talented individuals, and on the other hand, it meets the needs of society's human resources in various cultural, social, and economic sectors. It is for this reason that, in the present era, all world governments, from small to large, powerful to weak, industrial to developing, consider the education and upbringing of their people as one of their primary duties (Babaei & Khakzand, 2022).

The purpose of this research is to understand the architecture of today's educational spaces and its development and evolution in the context of understanding contemporary architecture, especially the last century, which can be very helpful in solving today's problems and shortcomings in the field of architecture of educational spaces, including schools; therefore, understanding more about the architecture of this era and deciding how to use the values and indicators of that era in the future of the country's architecture is important and necessary.

Research question

- What are the factors influencing the trends and approaches to the architecture of educational buildings (high schools) in the Pahlavi era?
- How can the influential components in the formation of school architecture in the Pahlavi era, and how contextual factors influence it, be explained as a basis for contemporary architecture?

## MATERIALS AND METHODS

- The research method of this thesis is fundamental-applied in terms of purpose
- And in terms of nature and method, it is historical interpretation and content analysis
- And the following methods will be used to collect the required information:

1. Library and documentary methods
2. Field methods (questionnaire, photographs, and images, etc.)

In this article, an attempt is made to extract the cultural and physical criteria and characteristics of such buildings that distinguish them from ordinary buildings, using a descriptive, historical, and analytical research approach based on library resources and case studies from Tehran. This research was conducted in five stages (Figure 1).

A questionnaire was prepared and distributed to 21 architectural experts, including three postgraduates (faculty) and 11 Ph.D. students (7 faculty members).

Based on the research conducted, 10 high school buildings from the first Pahlavi period, which were selected for the study of contextualization in terms of their physical characteristics as cultural heritage, are as follows: Fakhr al-Dowleh Pavilion (Roshangar School), Dar al-Fonun, Alborz Boys' High School, Hafez High School, Anoushirvan High School, Marvi High School, Jeanne d'Arc Girls' High School (Aramane), Firouz Bahram Girls' High School, Sepahsalar School, Girls' Conservatory, and Shahpour Orphanage.

## Research Background

### Architectural Trends and Approaches of the First Pahlavi Period

The different and sometimes contradictory trends in the architecture of this period are due to the differences in the

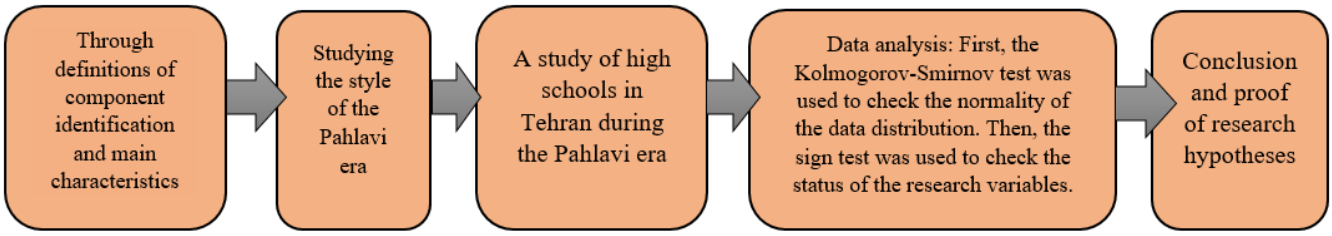



Fig. 1: Research steps

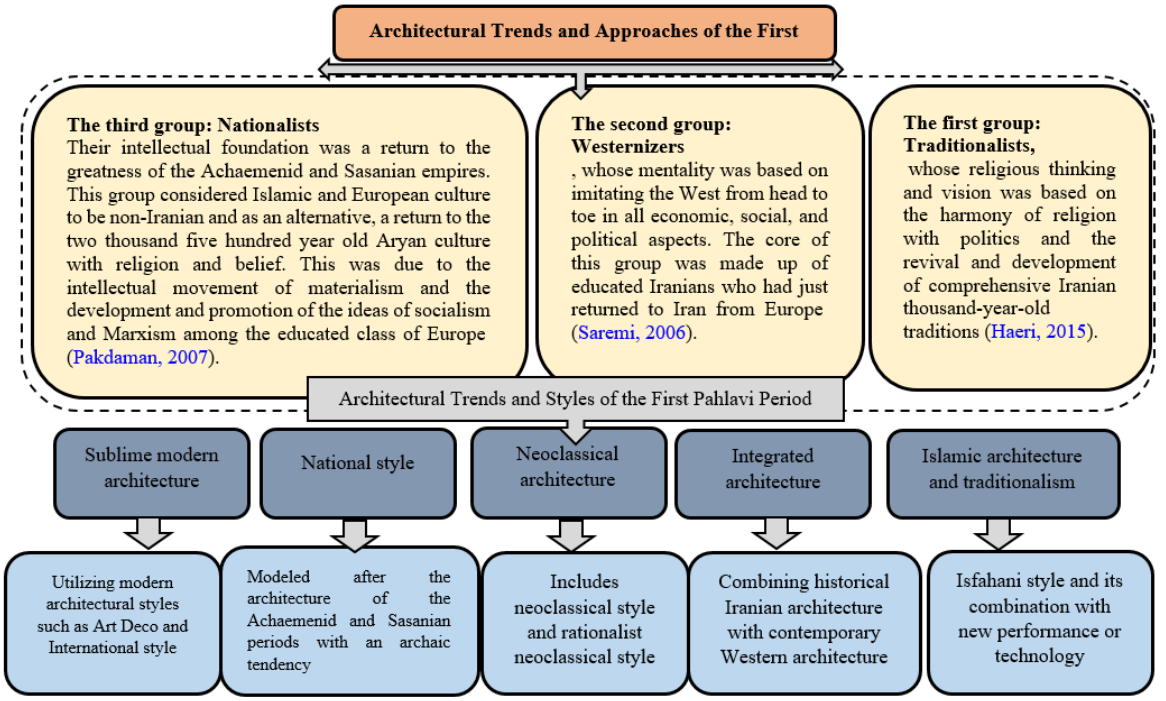



Fig. 2: Architectural trends and styles of the first Pahlavi period

political and ideological trends of this era in Iranian history, which have their roots in the ideological and political movements of the late Qajar period and the early Pahlavi period. The aforementioned movements can be categorized into three groups (Figure 2).

## RESULTS AND DISCUSSIONS

### Backgrounds and Factors Influencing the Transformation of School Architecture in the Contemporary Period

The history of the educational system can be divided into three periods:

1. The period when the educational system was completely in the hands of the seminaries and the religious students directly and indirectly managed the school system. This period existed before the Qajar era, making it the longest of the three educational periods (Adamiyat, 2019).
2. The second period, which began in the middle of the Qajar era, when Iranians became familiar with Western culture and civilization, was a time when clerics and individuals educated in the West, both groups, simultaneously and sometimes together, led the educational system. (Polloc, 1989).
3. In the third period, which began during the first Pahlavi era and gradually expanded, the seminarians and clerics left this circle, and only Western graduates took the helm of guiding and managing the educational system (Adamiyat, 2019).

### Iran's Educational System in the Modern Era

With the coming to power of the first Pahlavi and the introduction of changes in the political system, in 1306 AH, the initial step was taken to universalize education and establish the government's practical rule over it, leading to the creation of a centralized educational system (Table 1).

In this new and comprehensive movement (in line with the nation-building plan, the importance of practical education, and the expansion of general education for all Iranians), schools with new features and characteristics were established, the founders of which tried to avoid the problems of the old schools as much as possible. Among the features of the new educational system were the centrality of children in education and the transformation of the educational environment from the private home of the mullah or a shop in the market to a larger setting with a large courtyard featuring tables, chairs, and educational aids.

## Findings

### Contextualism

Contextualism is a common perspective in architecture and urban planning that considers context as a historical event. Contextualism initially focused on purely physical dimensions but gradually shifted to human dimensions, expanding its scope of study to include socio-cultural aspects of society (Tavalaei, 2002). In this area, the architect tries to adapt himself to the characteristics derived from the immediate environment surrounding the project. In the early years of this theory, only formal dimensions were considered; however, in later years, human and socio-cultural dimensions were also taken into account. (Beaver, 2006). Rapoport divided culture into tangible

Table 1: Characteristics of the educational system during Reza Shah's reign in the field of education, which was later renamed culture

| Events | Description of events |
|---|---|
| Unveiling the Hijab | Compulsory removal of hijab for female students and female teachers to attend classes (Bemanian, 2006). |
| Deleting course topics | Removing religious instruction from primary education (Zanganeh et al., 2023). |
| Mixed schools | Establishing co-educational schools for the first time since 1312 (Ayatollahi, 2001). |
| Modern educational programs | Establishment and development of educational and training programs, such as scouting and physical education, by American and Iranian teachers. Dr. Jordan, the president of the American College (Alborz High School), was active in this field (Habibi, 1996). |
| Establishment of the Academy | Establishment of the Academy (Literature) and the establishment of the Music Conservatory and the fight against the religious ban on music in 1314 AH (Kargar Esfandabadi, 2017) |
| Establishment of the Thought Cultivation Organization | The establishment of the Thought Cultivation Organization in 1318 AH, which, in the form of reforming and unifying the curriculum, was tasked with effectively cultivating the thoughts of patriotism and kingship in the content of elementary and high school textbooks (Safaei,1977). |

subsets in the process of architectural design and established a relationship between these concepts and concepts related to architecture (Rapoport, 2000). Context is derived from a Latin word that refers to the connection between words and the coherence between them (Porter, 2005).

Context is the place where processes occur, characterized by dynamic connections rather than static features (Spieren & Whiston, 2016). In other words, a coherent whole has unity, which is considered the highest formal value (Capon, 1999). Therefore, in other words, a coherent whole has unity (Capon, 1999). Contextual means contextual, and contextualism means contextualism (Babaei & Khakzand, 2022). The designer and architect must understand the message of the context and the context of the design; the design must be based on a realistic view of environmental information (Bahmani et al., 2017). The dimensions of contextualism generally include: 1. physical context, 2. historical context, 3. socio-cultural context, and 4. climatic context. The theory of contextualist architecture is based on finding a solution or a middle way that is satisfactory, provided it is done skillfully. In any case, if strong and clear visual relationships are created instead of imitative styles or extreme innovations, it will not be a source of visual annoyance (Brolin, 2004) (Table 2).

Physical contextualism encompasses elements such as form and shape, scale, proportions, material details, texture, color, geometry, access and orientation, material type, material composition, the combination of volumes and forms adjacent to each other, the proximity of buildings to one another, and the connection between old and new spaces, and many other issues (Ghanbari, 2015).

**Skeleton**

In the Amid dictionary, the word form is defined as follows: "mold, body, body" (Amid, 2011). The Moeen dictionary introduces this word as follows: 1- The mold of anything (in general), body 2- The mold of bricklaying (especially) 3- The body (human and animal), body (Moein 2016). In the literature of urban design and architecture, the form of the city can be considered the body of the city (Lynch, 2018). Some experts have considered the body of the city to be synonymous with artificial and inanimate elements (buildings), and some others believe that human desires and values are hidden in the body of the city and that studying the body of the city requires studying humans and anthropology. In other words, it establishes a connection between the spatial and material elements of the city and social, cultural, and economic forces (Mir Moqtadai, 2004) (Table 3).

## Research Information and Data

### The Architecture of Educational Spaces in Tehran During the Early Pahlavi Era

The Pahlavi era in Tehran was a period of striving to achieve a modern society. New architectural needs such as hospitals, universities, and factories. On the other hand, the presence of Western architects and the government's desire for Westernization led to the introduction of new architectural styles in the city.

In Table 4, based on the opinions of experts, a number of prominent high schools in Tehran were identified from the various areas mentioned in the research.

Table 2: Elements of contextualism in combination with architecture in the present era in ancient contexts

| Elements of contextualism | Description |
|---|---|
| Physical | Understanding the architectural elements of the past |
| Climatic | Considering the climatic arrangements of the past |
| Social | Culture and the desired privacy in the urban context |
| Historical | .History is human identity, design in the dimension of time |

Table 3: Summary of architectural features of the first Pahlavi

| Physical characteristics of Pahlavi period architecture | Feature | Description | The results of the changes compared to the previous period |
|---|---|---|---|
| | Facade | The building is elevated above ground level. | Its obvious display is determined in the central axis and the entrance of the building. The building's rise from the ground level is intentional, rather than due to the site's condition, i.e., being built on a slope, which significantly separates it from its surroundings, emphasizing its appearance by creating a false and, of course, pleasant height. |
| | | Tall entrances and tall, elongated columns in buildings | This psychological diversity in form and space, which interrupts the continuity of visual uniformity, is one of the characteristics of buildings from this period. All government buildings, educational institutions, banks, and private buildings of this period are the embodiment of these displays. |
| | | Showing grandeur and authority in the facades | From one perspective, the architecture of the German power-oriented period and the beginning of the 20th century |
| | | Window placement | – Windows and porches that previously opened onto the courtyard now open to the street, in the form of new windows, sometimes with balconies, according to designs implemented and supervised by the municipality's urban planning system.<br>– In addition to the use of wood and glass in a simpler and more practical form, metal is used for the first time in the form of railings and guards.<br>– To coordinate with the balcony railings, metalwork with new designs and patterns, which more reflect the metal works of 19th-century Europe than are derived from old and traditional patterns, adorns the buildings and facades of the city, an influence that comes directly from the West.<br>– Glass was used as a decorative element in windows and building facades before the Pahlavi period, and it was used to reduce the intensity of light with colored glass. During the Pahlavi period, large sizes were used to illuminate most spaces, without considering the desired lighting for each space (Hagh Jou et al., 2019).<br>– Colored glass is also removed from the facades of buildings. Until the late Qajar period, windows that were arched became completely square in the early Pahlavi period, but they had a slight arch on the upper side. |
| | | Utilize linear and verti-.cal elements effectively | Columns, windows, and pillars have played the most important role in this application, adding to the sense of grandeur and magnificence of the building for the viewer. |
| | | Horizontal elongation of the overall volume of the building | In contrast to this vertical movement, it is the buildings themselves that are stretched horizontally and sit heavily and massively on the ground. The combination of these horizontal and vertical linear elements in the facades of the buildings gives the impression of non-uniform repetition. The presence of the building, due to its length, is a powerful and effective analogy for the observer who moves in front of it, as a citizen whose background is characterized by small, shell-like, and flimsy buildings of Qajar architecture. |
| | | Decorations on the facade | – A notable development during this period is the incorporation of volumetric and sculptural elements, which again clearly reflects the dual influence of ancient and Western architecture. The use of "Farohar" and "Lotus" motifs, as well as columns, is well-known in this period (Kiani, 2014).<br>– In the houses of the First Pahlavi Period, stucco decorations on the capitals of columns are observed; however, the design and pattern of these decorations differ.<br>– In this period, decorations from Roman Corinthian capitals were sometimes used.<br>– Centuries of brickwork above porches or windows introduced architectural decorations from the beginning of this period (Hagh jou et al., 2019).<br>– **Examining the types of decorative arts:**<br>– **Bricklaying:** In the architectural decorations of the first Pahlavi period, techniques and materials from the Qajar period are also evident. This decorative heritage is a combination of various materials in the decorative arts of building.<br>– 1- Metalwork 2- Tilework 3- Stonework 4- Plasterwork 5- Cement 6- Wood (Kiani, 2014)<br>– **Location of Decoration in the Building**: 1- Roofs 2- Column Capitals and Column Bases 3- Entrances and Inscriptions Above the Entrances 4- Inscriptions Above Windows and Brick Window Frames 5- Bevels and Corners 6- Walls and Bodies 7- Field and Urban Bodies (Kiani, 2013) |
| | | Symmetry in design | One of the characteristic features of the decorations in the buildings of this period is the observance of symmetry in the designs. In fact, all the buildings created in the style of ancient Iranian architecture, traditional and Islamic styles of the past, or European neoclassical architecture also share the characteristic of symmetry. However, the buildings created in the late Pahlavi period and in the modern architectural style do not show much respect for symmetry. Basically, brick was not used in these buildings. Therefore, the characteristic of symmetry in brick decorations can be considered a tendency towards the past or the use of pre-modern styles. |
| | | Valuing the staircase as an artistic and ceremonial element (in addition to its structural function) | - The staircase was a space of little value in the architecture of the period preceding contemporary architecture, and it was a lesser place than other interior architectural elements. This feature was present in all buildings, houses, mosques, and schools, which became a larger, more impressive, and ceremonial space. |
| | | Diminishing the role of the veranda and using the terrace as a communal space | Cantilevered terraces were a new element added to the plans and were used for communal space. As an imported phenomenon during the Pahlavi period, they were heavily used in the function of architectural spaces; thus, the role of the porch in architecture was diminished, and rain and moisture easily damaged the walls. |

Continiue of Table 3: Summary of architectural features of the first Pahlavi

| | Feature | Description | The results of the changes compared to the previous period |
|---|---|---|---|
| Physical characteristics of Pahlavi period architecture | Plan | Incompatibility of the plan with the climatic situation | – Contemporary Iranian architecture in the late Qajar period introduced the first changes to the decorative and external elements of buildings, with these changes being gradual and proportionate. This influence had a minimal impact on the architectural plan and design of that period. In the first Pahlavi period, on the contrary, the greatest impact and perhaps the most severe changes took place in the area of building plans.<br>– Due to the rapid and uninterrupted introduction of new functions in architecture, plans entered the field of Iranian architecture directly and without local and cultural adaptation, and the growth of this phenomenon, unprecedented in its kind, primarily occurred in public and government buildings.<br>– The orientation of buildings in the direction of appropriate light (radiation), favorable wind, and proper ventilation was not considered, and the buildings were far from comfortable conditions. |
| | | Changing the function and use of space | The buildings constructed during the previous period had their own designated fronts, which were allocated according to the activity carried out and the different seasons, such as summer residences and winter residences. Additionally, for heat exchange and creating shade in different spaces, a small courtyard was formed. At the same time, the plans in the Pahlavi period were divided into two or more halls depending on their function and scale. Including a uniform corridor with rooms adjacent to each other and eliminating the courtyard, the possibility of creating blinds and controlling the flow of moisture in the building is reduced |
| | | The effect of extroversion on the structure of plans | - A phenomenon that completely entered Iran from the West. The outward orientation of buildings in this period reached a point where it even affected the plan, so that in the past, plans operated radially due to having a central courtyard; however, in this period, the form of the plan completely changed. |
| Physical characteristics of Pahlavi period architecture | Construction materials | Replacing modern materials with traditional (ones (construction | - During the Pahlavi period, the use of materials in construction changed, and those with low thermal capacity were no longer employed. These new materials had high thermal capacity; as a result, the heat exchange between them was very low (in the hot seasons, the space was warm, and in the cold seasons, the space was cold). The structure of the government center was formed entirely from concrete and iron materials, and there was no longer any load-bearing wall, as the beams and columns took on the task of transferring the load. As a result, the wall's thickness was reduced (Kiani, 2013). |
| | | Extensive use of bricks | - For the sake of speed and ease of work, he prioritized the use of brick, so that in a short period, the new texture of those decades became harmonious and consistent in these brick buildings, featuring yellow and red colors.<br>- The decorations with brick are more reminiscent of the motifs of the pre-Safavid era. During the first Pahlavi period, the presence of brickwork is more visible than that of other materials.<br>- A notable development during this period is the approach to volumetric and sculptural elements, which again clearly reflects the dual influence of ancient and Western styles. The use of "Farohar" and "Lotus" motifs, as well as columns, is well-distinguished in this period.<br>- In many designs, various combinations with other purposes, including cement, have been implemented, allowing for coexistence and placement side by side, resulting in several decorative designs with different purposes.<br>- Due to the influence of European architecture and modern architecture in this era, the influence of Western-style decorations is also observed in the works of this period. Therefore, in the brick decorations of buildings from the first Pahlavi period, we are faced with two types of decorations: brick decorations with traditional and Islamic designs and patterns, and brick decorations in the style of European architecture. |
| | | Harmony and coordination in urban facades | During this period, for the first time, a unified urban planning style was implemented in Tehran and other cities, due to unified guidelines that had no precedent before. |
| | | Changing roofing materials | Changing roofing materials from clay to tin |
| | Extraversion | Transforming introverted thinking into extroverted thinking | - The formation and presence of this ancient phenomenon in Iranian architecture continued decisively until the end of the Qajar period. The first government buildings of the late Qajar period, as well as the ideological and social developments at the beginning of the first Pahlavi period, altered the most significant feature of Iran's architectural heritage, causing buildings in all categories to undergo a sudden transformation from the inside out. The first large and important buildings of the city, such as the police station, the municipality, ministries, banks, and commercial centers, began to display their activities and behaviors on the streets, which had previously been done inside. |

**Statistical Population**

Based on the research conducted, 10 high school buildings from the Pahlavi period were selected as cultural heritage buildings due to their distinctive physical characteristics. The names are as follows to examine the context (Table 5).

A questionnaire was prepared and given to 21 experts in the field of architecture, divided as follows: (3 postgraduates (faculty), 11 Ph.D. students - 7 faculty members). It is divided into the following tables. In other words, the job status of the respondents is as follows: according to the job results, 85.7 percent of the respondents are university faculty, and 14.3 percent are students (Tables 6 and 7).

## Data Analysis

### Inferential Findings of the Research

Here, various analytical methods have been used to analyze the research data. First, the Kolmogorov-Smirnov test was used to examine the normality of the data distribution. Then, the sign test was used to examine the status of the research variables.

**Normality of Research Data Distribution**

The Kolmogorov-Smirnov test was used to examine the normality of the data distribution and its components. The null hypothesis was that the data were normally distributed, and the Kolmogorov-Smirnov test was used at the 5% significance level. The results of this analysis are presented in Tables 8 and 9.

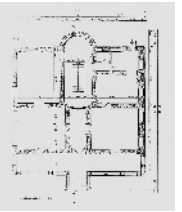
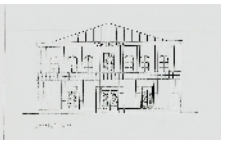
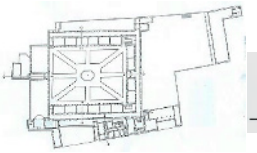
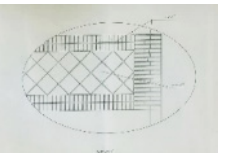
According to the results presented in Tables 8 and 9, it is observed that the significance level of the test is less than 0.05 in all cases; therefore, the assumption of normality of the data is rejected, and non-parametric tests are used to test the hypotheses.

Sign Test

To examine the relationship between the facade and plan characteristics of the Pahlavi era and the modernist era, a non-parametric sign test was used, the results of which are given in Tables 10 and 11.

(Due to the large volume of research, we analyzed one sample in full and presented the rest in the form of tables 12 and 13,

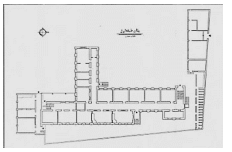
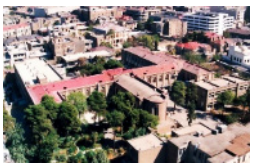
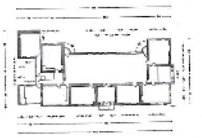
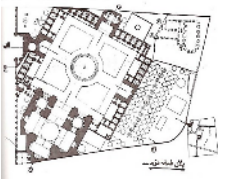
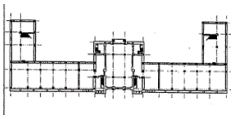
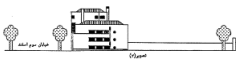
Table 4: Examples of high schools and art schools during the first Pahlavi period in Tehran

| Row | Building | Year | Architect | Characteristics and location of the building and decorations | Plan | Facade |
|---|---|---|---|---|---|---|
| 1 | Fakhr al-Dawlah Pavilion (Roshangar School) | 1282 AH | Founder: Haj Mirza Khan Amin al-Dawlah | Period: Late Qajar and Early Pahlavi<br>Style: Western Neoclassical and Iranian Neo-classical<br>Location: Baharestan Street - Amin-od-Dowleh Alley<br>Decoration: Corinthian capital - Marble stairs - Plasterwork and metal railings - Beautiful Chinese knotwork - Stained glass<br>Facade: Molded brick facade cladding<br>Plan: Extroverted and square plan |   |   |
| 2 | Darul Fonun (This building is the basis for entering modern education.) | 1230 AH | Founder: Mirza Taghi Khan Amirkabir<br>Architect: Mirza Rezai, Engineer Zaman Abbas Mirza | Period: Late Qajar period<br>Style: Traditional Iranian<br>Location: Built by the Tehran Police Department<br>Facade: Main facade of the building, 5 cm brick, and facades on the east and west sides with mullioned windows<br>Plan: Central courtyard<br>Decoration: 5 cm brick - classroom and corridor without decorations and seven-color tiles as inscriptions<br>Second architect, Markov, Entrance facade, Lorzadeh |   |   |

Continiue of Table 4: Examples of high schools and art schools during the first Pahlavi period in Tehran

| Row | Building | Year | Architect | Characteristics and location of the building and decorations | Plan | Facade |
|---|---|---|---|---|---|---|
| 3 | Alborz Boys' High School | AH 1303 | By order of Reza Shah<br>Architect: Nikolai Markov of Russia | Period: First Pahlavi<br>Style: Iranian neoclassical and a sign of pre-Islamic and eclectic architecture<br>Location: West side of Hafez Street<br>Plan: Extroverted and symmetrical in a modern style<br>Facade: Predominant brick materials<br>Decorations: Beautiful brickwork in the porch and entrance areas, mogharnas in the niches and roof-shaped congeries, four-part arches in the corridors of the ground and first floors |  |    |
| 4 | Hafez High School | AH 1315 | Architect: Roland Marcel Dubrol, French | Period: First Pahlavi<br>Style: Neoclassical and Modern<br>Location: Panzdeh Khordad Street - Sabzeh Maydan<br>Facade: Brick and cement in the window awnings and gray stone plinth<br>Plan: Symmetrical and outward-facing in terms of similarity to Alborz High School and the elongated<br>Decoration: No decorations and a combination of brick and cement |   |  |
| 5 | Anoushirvan High School | AH 1315 | Founder: E. Tata<br>Architect: Nikolai Markov, Russian (most likely) | Period: First Pahlavi<br>Style: Iranian Neoclassical (Achaemenid and Sasanian Palace) and Eclectic<br>Location: Intersection of Hafez and Vali Asr<br>Facade: Brick<br>Plan: Similar to Alborz and Joan of Arc School - elongated, symmetrical, and extroverted plan<br>Decorations: Column capitals in the shape of animals and the congeries of the roof and Iranian arches, windows, and colored tiling with the motif of the Achaemenid Palace |   |   |
| 6 | Marvi High School | AH 1232 | Founder: Hajj Muhammad Hussein Khan Marvi, nicknamed Fakhr al-Dawlah | Period: Late Qajar Period<br>Style: Traditional Iranian<br>Location: Pamenar Neighborhood of Tehran, and on South Saadi Street, Naser Khosrow Street, Marvi Street<br>Plan: Central Courtyard and Symmetry<br>Facade: Tile and Brickwork |  |  |

Continiue of Table 4: Examples of high schools and art schools during the first Pahlavi period in Tehran

| Row | Building | Year | Architect | Characteristics and location of the building and decorations | Plan | Facade |
|---|---|---|---|---|---|---|
| 7 | Joan of Arc Girls' High School (Armenian) | 1265 AH St. Joseph's School<br>1317 AH Officially renamed | Architect: Nikolai Markov, Russian<br>Founder: Moshir-al-Dawlah<br>For foreign religious missionaries in Iran | Period: Early Pahlavi<br>Style: Neoclassical and eclectic<br>This school is next to a monastery belonging .to French Christians<br>Location: Between Jomhuri Street, Manouchehri<br>Plan: Extroverted, elongated, and modern<br>Facade: Brick<br>Decoration: Lattice windows and motifs of Achaemenid palaces and interior without decorations |  |  <br>  |
| 8 | Girls' High School<br>Firoz Bahram | 1311 AH | Founder: Bahramji<br>Built on the land of the Zoroastrian Association | Period: First Pahlavi<br>Style: Iranian Neoclassical and Eclectic<br>Location: Jomhuri Street, Mirza Kuchak Khan Street<br>Plan: Elongated, outward-facing, and symmetrical rectangle<br>Facade: Special brick facade and tile, stone, and plaster<br>Decoration: The use of arches in window construction is a symbol of Qajar architecture |  <br>  |  <br>  |
| 9 | Sepahsalar School | It began in 1258 AH and continued until the beginning of the first Pahlavi era | Founder: Mirza Hossein Khan Sepahsalar<br>Engineer Mirza Mehdi Khan Shaqaghi (Mumtahan-e-Dawla) | Period: Late Qajar<br>Style: Traditional Iranian architecture<br>Location:<br>View:<br>Plan: Central courtyard, introverted<br>Decoration: The closest integrations are in the architecture of Istanbul mosques. Yazdi bandi and muqarnas, as well as very exquisite bowl bandi and tiling, are used on a large scale. |  <br>  |  <br>  |
| 10 | Shahpur Girls' Conservatory and Orphanage | 1314 to 1317 AH | It was established by order of Reza Shah | Period: Early Pahlavi<br>Style: Iranian Neoclassical and Eclectic<br>Location: Ferdowsi Street<br>Plan: Extroverted and elongated east-west and symmetrical<br>Facade: Brick |  |  <br>  |

according to the research results.)

According to the data in Table 10, it can be seen that the average correlation between facade indicators in the Pahlavi era and the European modernism era at Alborz Boys' High School is 2.32, with a standard deviation of 0.45. Also, the test statistic is 3.789, and the significance level of the test is less than 0.05. Now, considering that the average correlation between facade indicators in the Pahlavi era and the European modernism era in the National Bank of Iran collection is less than average and the significance level of the test is less than 0.05, it can

Table 5: Sampling table for Tehran city

| Building Name | Style | Year of establishment |
|---|---|---|
| Fakhr-al-Dowleh Pavilion Building (Roshangar School) | Modern Architecture + Sasanian Architecture | 1282 AH |
| Dar al-Fonun | Neoclassical Iranian Architecture | 1230 AH |
| Alborz Boys' High School | Neoclassical Iranian Architecture | 1303 AH |
| Hafez High School | Neoclassical Iranian Architecture | 1315 AH |
| Anushirvan High School | Neoclassical Iranian Architecture | 1315 AH |
| Marvi High School | Mid-Modern | 1232 AH |
| (Jeanne d'Arc Girls' High School (Arameneh | Neoclassical Iranian Architecture | 1317 AH |
| Firoz Bahram Girls' High School | Neoclassical Iranian Architecture | 1311 AH |
| Sepahsalar School | Modern | 1258 AH started |
| Shahpur Girls' Art School and Orphanage | Modern | 1314 to 1317 AH |

Table 6: Respondents' level of familiarity with the architecture of the Pahlavi era of the statistical population

| Familiarity level | Abundance | Percentage |
|---|---|---|
| Very little | 0 | 0 |
| Little | 0 | 0 |
| Average | 9 | 42.9 |
| High | 12 | 57.1 |
| Very much | 0 | 0 |
| Abundant | 21 | 100 |

Table 7: Respondents' level of familiarity with the architecture of the modernist era of the statistical population

| Familiarity level | Abundance | Percentage |
|---|---|---|
| Very little | 0 | 0 |
| Little | 0 | 0 |
| Average | 8 | 38.1 |
| High | 13 | 61.9 |
| Very much | 0 | 9 |
| Abundant | 21 | 100 |

Table 8: Results of the Kolmogorov-Smirnov test for the exponential variable in different locations

| Statistical indicators<br>Research variables | Z Kolmogorov-Smirnov statistic | Significance level |
|---|---|---|
| Fakhr al-Dawlah Pavilion (Roshangar School) | 0.447 | 0.0001 |
| Dar al-Fonun | 0.427 | 0.0001 |
| Alborz Boys' High School | 0.486 | 0.0001 |
| Hafez High School | 0.459 | 0.0001 |
| Anushirvan High School | 0.405 | 0.0001 |
| Marvi High School | 0.417 | 0.0001 |
| Jeanne d'Arc Girls' High School (Armenian) | 0.478 | 0.0001 |
| Firoz Bahram Girls' High School | 0.417 | 0.0001 |
| Sepahsalar School | 0.413 | 0.0001 |
| Shahpour Girls' Art School and Orphanage | 0.391 | 0.0001 |

Table 9: Results of the Kolmogorov-Smirnov test for the plan variable at different locations

| Statistical indicators<br>Research variables | Z Kolmogorov-Smirnov statistic | Significance level |
|---|---|---|
| Fakhr al-Dawlah Pavilion (Roshangar School) | 0.443 | 0.0001 |
| Dar al-Fonun | 0.369 | 0.0001 |
| Alborz Boys' High School | 0.360 | 0.0001 |
| Hafez High School | 0.405 | 0.0001 |
| Anushirvan High School | 0.405 | 0.0001 |
| Marvi High School | 0.417 | 0.0001 |
| Jeanne d'Arc Girls' High School (Armenian) | 0.423 | 0.0001 |
| Firoz Bahram Girls' High School | 0.389 | 0.0001 |
| Sepahsalar School | 0.445 | 0.0001 |
| Shahpour Girls' Art School and Orphanage | 0.445 | 0.0001 |

be concluded that the use of facade indicators in Pahlavi era architecture is less used than in European modernism era architecture in Alborz Boys' High School.

According to the data in Table 11, it can be seen that the average correlation between plan indicators in the Pahlavi era and the European modernism era at Alborz Boys' High School is 2.49, with a standard deviation of 0.46. Also, the test statistic is 3.833, and the significance level of the test is less than 0.05. Now, considering that the average correlation between plan indicators in the Pahlavi era and the European modernism era in the National Bank of Iran collection is less than average and the significance level of the test is less than 0.05, it can be concluded that the use of plan indicators in Pahlavi era architecture is less used than in European modernism era architecture in Alborz Boys' High School.

## Discussion

Based on the aforementioned research, the final results are as follows:

1- What was the impact of using facade indicators in Pahlavi era architecture compared to European modernism era architecture?

To answer the above question, the sign test was used, and its results are given in Table 14:

According to the data in Table 14, it can be seen that the average correlation between facade indicators in the Pahlavi era and the European modernism era is 2.59, with a standard deviation of 0.37. On the other hand, the test value is 3.83, and the significance level of the test is 0.000. Now, considering that the significance level of the test is less than 0.05, it can be concluded that the test is statistically significant, and the use

Table 10: Results of the sign test to check the status of facade indicators at Alborz Boys' High School

| Variable | Average | Standard deviation | Statistics z | P |
|---|---|---|---|---|
| The degree of relationship between the use of local materials and equipment in the Pahlavi era and the era of European modernism | 2.33 | 0.85 | 2.858 | 0.004 |
| The degree of relationship between the facades of buildings, which are simple and sometimes unmarked, in the Pahlavi era and the era of European modernism | 2.91 | 0.51 | 3.90 | 0.000 |
| The degree of relationship between the porch or veranda in the Pahlavi era and the era of European modernism | 2.95 | 0.38 | 0.577 | 0.564 |
| The degree of relationship between introversion and the use of windows facing the courtyard in the Pahlavi era and the era of European modernism | 2.14 | 0.47 | 4.025 | 0.000 |
| The degree of relationship between the use of traditional decorations, including the use of Chinese knots, moqranes, and shamseh. on the body of the facade in the Pahlavi era and the era of European modernism | 2.19 | 0.51 | 3.90 | 0.000 |
| The degree of relationship between the use of tiles and brickwork to decorate the building in the Pahlavi era and the era of European modernism | 2.14 | 0.57 | 3.838 | 0.000 |
| The degree of relationship between the characteristics of the facade in the Pahlavi era and the era of European modernism | 2.32 | 0.45 | 3.789 | 0.000 |

Table 11: Results of the sign test to check the status of plan indicators, Alborz Boys' High School

| Variable | Average | Standard deviation | Statistics z | P |
|---|---|---|---|---|
| The degree of relationship in terms of introversion in the Pahlavi era with the era of European modernism | 2.10 | 0.301 | 4.359 | 0.000 |
| The degree of relationship in terms of the use of traditional and indigenous plans in the Pahlavi era, with the era of European modernism | 2.14 | 0.573 | 3.838 | 0.000 |
| The degree of relationship in terms of the use of the characteristic entrance and invitingness in the traditional architectural style of the Pahlavi era, with the era of European modernism | 3.67 | 0.796 | 2.985 | 0.003 |
| The degree of relationship in terms of the pre-entrance and division of the building in the Pahlavi era, with the era of European modernism | 3.76 | 0.768 | 3.266 | 0.001 |
| The degree of relationship in terms of the climatic orientation of the building in the Pahlavi era, with the era of European modernism | 1.67 | 1.155 | 3.744 | 0.000 |
| The degree of relationship in terms of climatic arrangements for the use of spaces in the cold and hot seasons in the Pahlavi era, with the era of European modernism | 1.62 | 1.071 | 3.813 | 0.000 |
| The degree of relationship in terms of the characteristics of the plan in the Pahlavi era with the era of European modernism | 2.49 | 0.46 | 3.833 | 0.000 |

Table 12: Results of the sign test to check the status of facade indicators

| Research variable | Average level of correlation between facade indicators in the Pahlavi era and the era of European modernism | Standard deviation | The value of the test statistic | Significance level of the test | As a result, the use of facade indicators in Pahlavi-era architecture differs from that in European modernist-era .architecture |
|---|---|---|---|---|---|
| Fakhr al-Dowleh Pavilion Building (Roshangar School) | 3.04 in other words, average level | 0.39 | 2.286 | 0.022 | Above |
| Dar al-Fonun | 3.49 in other words, average level | 0.53 | 3.10 | 0.002 | Average |
| Alborz Boys' High School | 1.84 in other words, less than average | 0.67 | 3.977 | 0.000 | Below Average |
| Hafez High School | 3.34 in other words, more than average | 0.31 | 3.223 | 0.001 | Above Average |
| Anoushirvan High School | 1.96 in other words, less than average | 0.55 | 4.033 | 0.000 | Below Average |
| Marvi High School | 13.3 in other words, more than average | 0.36 | 2.60 | 0.009 | Above Average |
| Jeanne d'Arc Girls' High School (Aramane) | 1.85 in other words, less than average | 0.72 | 3.870 | 0.000 | Below Average |
| Firoz Bahram Girls' High School | 1.34 in other words, less than average | 0.65 | 4.060 | 0.000 | Below Average |
| Sepahsalar School | 2.19 in other words, less than average | 0.41 | 4.010 | 0.000 | Below Average |
| Shahpour Girls' Art School and Orphanage | 3.48 in other words, more than average | 0.53 | 3.340 | 0.001 | Below Average |

Table 13: Results of the sign test to check the status of plan indicators

| Research variable | Average level of correlation between plan indicators in the Pahlavi era and the era of European modernism | Standard deviation | The value of the test statistic | Significance level of the test | As a result, the use of plan indicators in Pahlavi-era architecture is compared to that in European mod-.ernist architecture |
|---|---|---|---|---|---|
| Fakhr al-Dowleh Pavilion Building (Roshangar School) | 2.72 In other words, the average level | 0.37 | 2.532 | 0.011 | Near average |
| Dar al-Fonun | 2.60 In other words, below average | 0.563 | 3.266 | 0.001 | Below average |
| Alborz Boys' High School | 1.96 In other words, below average | 0.55 | 3.853 | 0.000 | Below average |

Continiue of Table 13: Results of the sign test to check the status of plan indicators

| Research variable | Average level of correlation between facade indicators in the Pahlavi era and the era of European modernism | Standard deviation | The value of the test statistic | Significance level of the test | As a result, the use of facade indicators in Pahlavi-era architecture differs from that in European modernist-era .architecture |
|---|---|---|---|---|---|
| Hafez High School | 3.50 Above average | 0.51 | 3.413 | 0.001 | Above average |
| Anoushirvan High School | 2.51 In other words, below average | 0.45 | 3.487 | 0.000 | Below average |
| Marvi High School | 3.03 In other words, the average level | 0.44 | 1.965 | 0.049 | Near average |
| Jeanne d'Arc Girls' High School (Aramane) | 3.78 Above average | 0.83 | 2.652 | 0.008 | Above average |
| Firoz Bahram Girls' High School | 1.69 In other words, below average | 0.74 | 3.979 | 0.000 | Below average |
| Sepahsalar School | 2.89 In other words, the average level | 0.17 | 2.339 | 0.019 | Below average |
| Shahpour Girls' Art School and Orphanage | 1.84 In other words, below average | 0.75 | 3.963 | 0.000 | Below average |

Table 14: Results of the sign test to check the status of facade indicators

| Variable | Average | Standard deviation | Statistics z | P |
|---|---|---|---|---|
| The degree of connection between facade characteristics in the Pahlavi era and the era of European modernism | 2.59 | 0.37 | 3.83 | 0.000 |

of facade indicators in the architecture of the Pahlavi era is lower than the average level compared to the architecture of the modernism era.

2- What was the impact of using plan indicators in the architecture of the Pahlavi era compared to the architecture of the European modernism era?

To answer the above question, the sign test was used, and its results are given in Table 15.

According to the results of the sign test in Table 15, it can be seen that the average correlation between plan indicators in the Pahlavi era and the European modernism era is 2.67, with a standard deviation of 0.32. On the other hand, the test value is 3.36, and the significance level of the test is 0.000. Now, considering that the significance level of the test is less than 0.05, it can be concluded that the test is significant and the use of plan indicators in the architecture of the Pahlavi era is less than average compared to the architecture of the European modernism era.

## CONCLUSION

The Pahlavi period is a pivotal era in the contemporary history of Iran, during which the country sought to transition from traditional to modern conditions in various ways, as observed in the contemporary advanced world.

- Civilization was a crucial factor in the transformation of identity in Tehran. It coincided with a pivotal period in the contemporary Western world, during which numerous inventions and developments occurred.

- Following the arrival of the new civilization and its impact on people's lives, the environment and, of course, educational issues also underwent significant transformation.

- Based on the available research statistics, it can be concluded that a significant percentage of buildings from the Pahlavi era have had a profound impact on educational institutions and students in terms of cultural identity.

- Finally, we have concluded that a significant number of Pahlavi-era buildings, in terms of plan and facade features, general materials, appearance and facade decorations, porch structure and type of windows facing the courtyard, entrance characteristics, and finally climatic principles, were influenced by modernist structures from the experts' point of view. Of course, they have a burden of identity and cultural value, and can be introduced as valuable examples.

## AUTHOR CONTRIBUTIONS

N. Jodeyri Heydari: literature review, conceptualization, data curation, prepared the manuscript text, and manuscript edition. H. Pourmand, J. Sabernejad, and Z. Rezakhani: Supervision, Project administration, and formal analysis.

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Table 15: Results of the sign test to check the status of plan indicators

| Variable | Average | Standard deviation | Statistics z | P |
|---|---|---|---|---|
| The extent of the relationship between the characteristics of the plan in the Pahlavi era and the era of European modernism | 2.67 | 0.32 | 3.36 | 0.001 |

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## CONFLICT OF INTERESt

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the authors have acknowledged the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy.

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