

Journal of Urban Management and Energy Sustainability (JUMES)

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CASE STUDY RESEARCH PAPER

The effect of socio-economic developments of the last four decades on the quality of architectural technology of residential buildings (Case Study: District 22 of Tehran City)

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ARTICLE INFO

Article History:

Received 2024-03-08

Revised 2024-05-09

Accepted 2024-06-13

Keywords:

Architecture, architectural technology, Socio-economic changes, Technology, Tehran city.

ABSTRACT

The entry of technology into a society raises challenges and pluralism in political, economic, cultural and social fields, the most important of which are the cultural crisis and the crisis of identity and meaning. The main purpose of this article is to investigate the impact of the post-revolution era on the quality of architectural technology in Tehran metropolis. The method used in this research is practical in order to extract data and information from the library and document method and to prepare 50 questionnaires by professors and investors in the field of construction, and SPSS software was used to analyze the data and information. Is. The criteria used in this research in order to check the state of technology quality in Tehran metropolis include the type of skeleton, the type of materials, the system used and the architectural form. Metal, 33.80% of concrete skeleton and 8.88% of other skeletons and unspecified. Similarly, in Tehran city, 80.72% have brick and iron materials, 4.75% a combination of brick and stone-brick, 3.70% a combination of brick-wood and all wood, 1.71% cement block, 2.10% clay-wood and clay-mud and finally 7.02 other materials are not declared. Finally, the results show that the criteria of culture, environment, employment and economy have an effect on the quality of architectural technology in Tehran metropolis by 64.8%. In this, two components of employment with 64.8% and economy with 75.5% have the most effect on the quality of architectural technology.

DOI: [10.22034/ijumes.2024.2029620.1213](https://doi.org/10.22034/ijumes.2024.2029620.1213)

Running Title: Socio-economic developments on the quality of architectural technology of residential buildings



NUMBER OF REFERENCES

15



NUMBER OF FIGURES

16



NUMBER OF TABLES

05

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INTRODUCTION

Different formative spaces in architecture represent the totality of the social, cultural and economic system ruling in the society. In the modern period, with the ever-increasing progress of technology, which is an inseparable part of architecture, the intensity of developments in Iran's architecture, especially in Tehran, also increased, so that today, in the facade, physical space and other aspects of architecture, and more specifically, in residential complexes, there are significant challenges. An observation has been created. On the other hand, following the developments of modernity, extensive changes took place in people's lives with a tendency towards western life and with a very fast process (Silvaye, 2022: 9). The introduction of new technologies to the lands whose identity and rich history in the field of art and architecture are in opposition to technological manifestations, fuels challenges; Because in most of these societies, like Iran, the necessary infrastructures to face the issue of globalization have not been provided. In the new millennium, a new world is being built and architecture is the most social art that can lead a kind of temporal continuity to the creation of a new foundation for the flourishing of a civilization by creating spatial coherence. In this regard, upgrading the scientific and specialized level of the country's engineering community and getting familiar with new construction systems and materials is inevitable.

The entry of technology into a society raises challenges and pluralism in political, economic, cultural and social fields, the most important of which are the cultural crisis and the crisis of identity and meaning. Architecture and culture have a mutual and two-way relationship, on one hand, architecture influences culture, and on the other hand, culture influences architecture. Therefore, architecture plays an important role in shaping people's relationships and culture. In the recent decades, it has been investigated and confirmed in various ways that the coordinates of the environment have a serious effect on the behavior and psyche and as a result of

the cultural changes of humans (Naghizadeh, 2022: 73) and considering that the investigation of the causes of these challenges and changes is an interdisciplinary issue and It is derived from architecture, economics, cultural, political issues, etc., therefore, in this article, an attempt has been made to investigate the impact of the post-revolution era on the quality of architectural technology in Tehran.

Technology

The origin of the words technique and technology is derived from the Greek root Technikon, which means something; which belongs to Tehna. In ancient Greece, tekhneh meant the industries of access to the skills of art and applied science (Parvizi, Mahdavinejad and Bamanian, 2013: 2). From a historical point of view, the term technology was used for the first time in 1615 AD in the English language and in the terminological sense of an art or profession. Then, in 1859 AD, it was used to mean a treatise on art or all arts. Therefore, history can be divided into two eras before the emergence of technology and after it. Although there are views that consider simple and uneven old tools as the first germs of today's dangerous technology. But "René Gunon" believes; The distinction between this period of technology is based on the contrast that can be identified between the two qualitative and quantitative views that prevail in the old professions and the new industry (Shayanfar, 2003).

The technology of methods and the use of tools, devices, materials and processes is the solution to human difficulties (Rezaei, 2015: 25). Being equipped with science and techniques and their systematic application to solve problems is called technology. In other definitions, technology can be expressed as follows (Ebrahimi, 2016: 51):

Technology is a combination of different techniques, including industrial and administrative skills.

- Technology is the factor that transforms the three elements of natural resources, capital and human resources into manufactured and deliverable goods.

- Technology means using knowledge, understanding skill and scientific competence in setting up, using, maintaining, improving and developing production facilities.
- Technology means the knowledge of how to design, develop and manufacture artifacts that meet human demand or needs.
- Technology means technical knowledge and it is created by combining manufacturing and production processes, product design, knowledge of materials and quality control (Wafamahr, 2013).

Technology is basically a collection of tools that have provided the expansion of human options and mankind has always depended on technology. Technology means the ability to make tools and now it is the basis for generating more wealth by increasing productivity. "Bernard Gendren writes: Technology refers to any systematic practical knowledge that is based on practical experience or theory and increases the ability of society to produce goods and services and is embodied in the form of production skills and organizations or machinery (Shahrudi, 2013: 49). Martin Heidegger is one of the greatest philosophers who lived in the 20th century and has paid attention to the issue of the day, i.e., technology, and reacted to it. In 1954, he published an article called "Question of Technology" in which he stated that technology has been viewed as a neutral tool in the western world and since Aristotle's time. According to Heidegger, this instrumental definition, although correct, is incomplete. "As long as we consider technology as a tool, we will remain captive to its domination and as a result, we will move forward unaware of the nature of technology" (Heidegger, 2013: 27). According to him, technology has an offensive character, an attack on nature in order to change it. Technology looks at nature as a source of raw materials and energy and demands to change its form, organize and use it (Heidegger, 2013)

Technology and Architecture

There are different views on the relationship between technology and architecture, which are

expressed based on this three-fold concept of the relationship between technology and architecture. In the first definition; Technology and architecture are a type of human activity, in the second case; Both are means to reach a goal and in the third case; Architecture and technology are introduced as a quality to discover and express realities. The first two states think that technology and architecture are two separate things, but the third state expresses the truth of architecture and technology. This definition pays attention to the nature of contemporary and modern life, contemporary architecture and modern technology and not to their appearance (Heidegger, 2015). Therefore, modern technology in its nature establishes a special relationship with man and nature. Sometimes the extreme and incorrect use of the manifestations of this technology turns nature into a tool for exploitation. Technology is not just knowledge and not just tools. In fact, technology, in its true nature, takes steps along with architecture in the creation and organization of space and provides the necessary requirements for this purpose. The request for a new space in the contemporary world cannot be expressed only through ancient languages. Therefore, a new language is needed. But the tool-oriented and human-oriented use of technology and consequently of architecture, in contemporary societies, has created an apparent architecture, so that the truth of both categories has been forgotten. However, new technologies can be used to continue and evolve yesterday's architecture and turn today's architecture into a legacy for future generations (Fazelnasab, 2012: 35).

The presence of technology seriously in architecture can be attributed to the post industrialization era. The period that led to the beginning of the era of modernity. Technology is one of the manifestations of modernism. In this era, human needs and desires are reduced to physical needs and fulfilling material desires. To the extent that the boundaries of architecture become narrow and limited in terms of providing a decent space for human life, providing shelter to meet material needs. Such a matter

turns architecture into a commodity for trading in the economic market and from there into a tool to achieve the goal of maximum efficiency and more profit (Parvizi, Mahdavinejad and Bamanian, 2013: 2). The presence of technology created a new culture in all aspects of life. Architecture was also included as the most important manifestation of life. Standardization, mass production and globalization of architecture is one of the most important events that happened. Siegfried Gideon stated in 1929 AD: The recent development in the matter of building has undoubtedly been centered around housing and especially housing for the general public (Shayanfar, 2003).

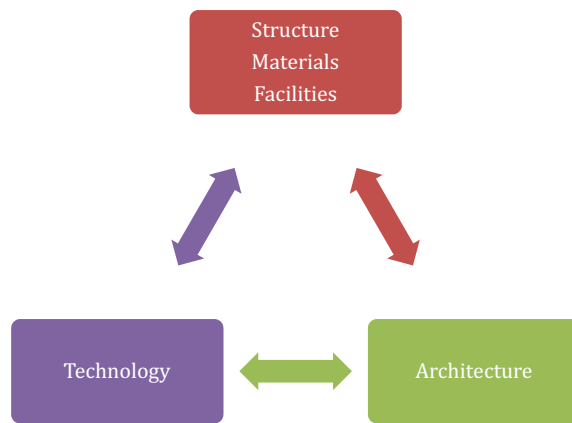


Chart 1: How to Communicate Technology and Architecture

Fields affected by technology in today's era

Areas where technology is directly or non-existent. It directly affects them, including culture (Postman, 2015), environment (Toffler, 2014 and Brown, 2015), employment and economy (Savili, 2015):

Culture: After the industrial revolution, technology began to emerge and progress in different societies at a dizzying speed and became widespread. This is where the word technocracy or technocracy comes into play. In a technocratic society, tools and devices play a key role in all affairs and especially the culture of that society, and all developments and social conditions must be subject to technological demands and regulations to a large extent. Today, man lives in a world where at every moment something

is appearing and disappearing immediately. An improbable world full of wonders. A world where technological progress has replaced the progress of humanity (according to Francis Bacon). A world where eliminating human ignorance and pain is not the goal; Rather, the final goal is to be aligned with the trends and expectations of technology. Man is unconsciously creating a culture with the help of information and he does not even think about how to control it (Postman, 2015).

Environment: Our technological powers are increasing day by day. But its side effects and potential risks are increasing every day. There are many environmental hazards and they are increasing every day. These risks include air pollution, noise pollution, soil and chemical pollution, etc. (Toffler, 2014).

Employment: One of the constant discussions about technology is its effect on employment. The direct consequence of the development of production technologies is the saving of labor force, and this unemployment appears in the society when the unemployed people cannot work elsewhere. These debates have created new concerns with the spread of computers and the mechanization of work. There is not enough information to be able to say with certainty what part of unemployment is caused by the economic and political conditions of the world and what part is caused by the use of technology in the world? Another issue is skill. After the spread of automatic machines, the demand for workers with manual skills has decreased and instead, the demand has gone towards workers who have the ability to perform several functions.

Economy: Unfortunately, until today in developing countries, appropriate technologies could not play an important role in industrial development and raising people's income. Their goal is to provide maximum employment, maximum production for low capital and produce the cheapest goods. But they never had the ability to stand up to the existing problems. Probably, the acceptance of modern technologies by developing countries, despite the many drawbacks

that they face, such as high complexity, low employment, high maintenance costs, and high investment costs, is due to the desperation of finding suitable technologies. What should be recognized and dealt with consciously today is that developing countries understand what tricks are used to prevent the development and design of suitable technology in them and how they can develop and expand suitable technologies in themselves. (Sauli, 1372).

MATERIALS AND METHODS

The entry of technology into architecture has been investigated and analyzed from four different aspects. These four aspects include the presence of the structure in the facade of the building, the type of materials used in the facade of the building, the type of construction system used and the importance of form in the architecture of Tehran city between the last three decades. On the other hand, how the four fields of culture, environment, employment and economy affect the quality of technology through the preparation of a questionnaire and its analysis in SPSS software and with the help of regression method have been analyzed.

Technology Status in Residential Units Architecture of Tehran

The scope of the current research is temporally related to the post-revolution period (1365 to 1395) and is limited to the metropolitan city of Tehran. Tehran metropolis, based on the statistics and information of the statistical blocks, Iran Statistics Center has 2,864,366 residential units in 2015, and districts 4, 5, 2 and 15 have the highest percentages with 10.44, 10.05, 8.26 and 7.02 percent, respectively. residential units and have the highest amount of resident popu-

lation. Table number one shows the distribution of residential units and population at the level of 22 districts of Tehran metropolis. Also, in map number one, the percentage of residential units' distribution in Tehran metropolis is presented by statistical blocks (Population and Housing Census - Iran Statistics Center, 2015).

Table 1: Distribution of residential units and population in 22 metropolitan areas of Tehran

Area	Residential Units (Qty)	Residential Units (%)	Population (People)	Population (percent)
1	163,279	5.70	485,547	5.60
2	236,712	8.26	699,482	8.07
3	116,993	4.08	330,004	3.81
4	298,954	10.44	911,864	10.52
5	287,834	10.05	853,312	9.84
6	82,956	2.90	250,753	2.89
7	114,521	4.00	312,002	3.60
8	147,303	5.14	425,044	4.90
9	56,938	1.99	174,115	2.01
10	116,008	4.05	326,885	3.77
11	106,262	3.71	308,176	3.56
12	76,197	2.66	240,909	2.78
13	83,185	2.90	248,725	2.87
14	168,926	5.90	515,258	5.94
15	200,961	7.02	639,670	7.38
16	85,686	2.99	267,767	3.09
17	86,521	3.02	273,003	3.15
18	128,479	4.49	419,249	4.84
19	78,428	2.74	260,795	3.01
20	114,240	3.99	364,569	4.21
21	59,863	2.09	186,319	2.15
22	54,120	1.89	175,323	2.02
Total	2,864,366	100.00	8,668,771	100.00

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

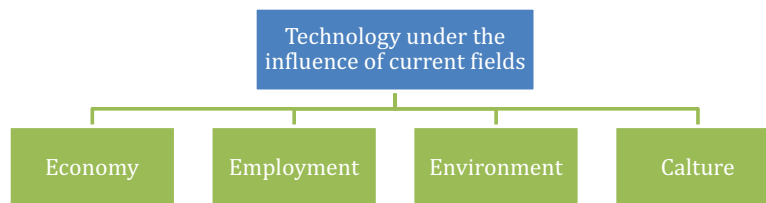


Chart 2: Areas Affected by Technology in the Present Era (Source: Vafamehr and Majidi, 2007)

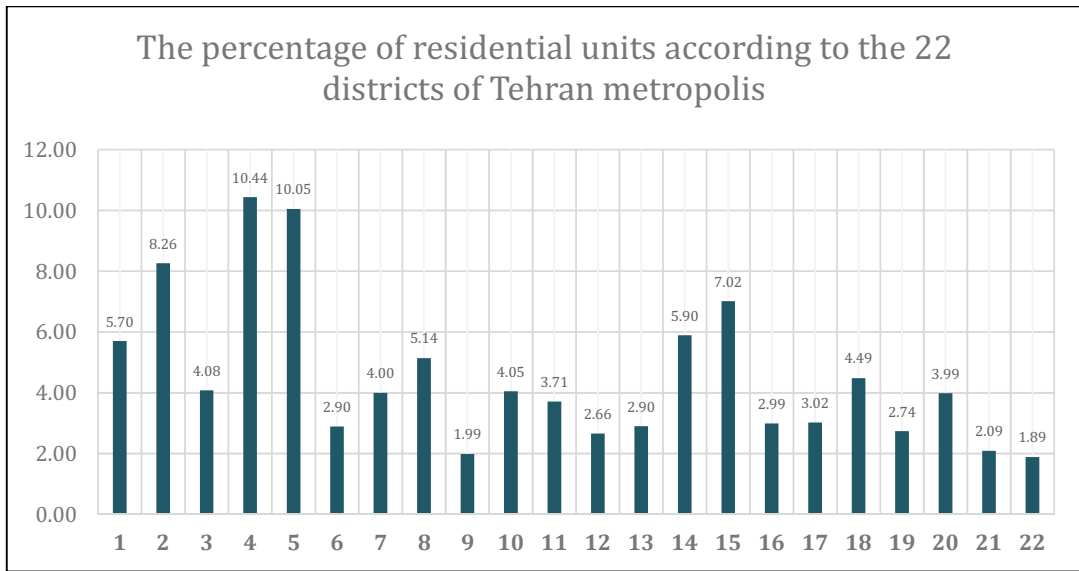
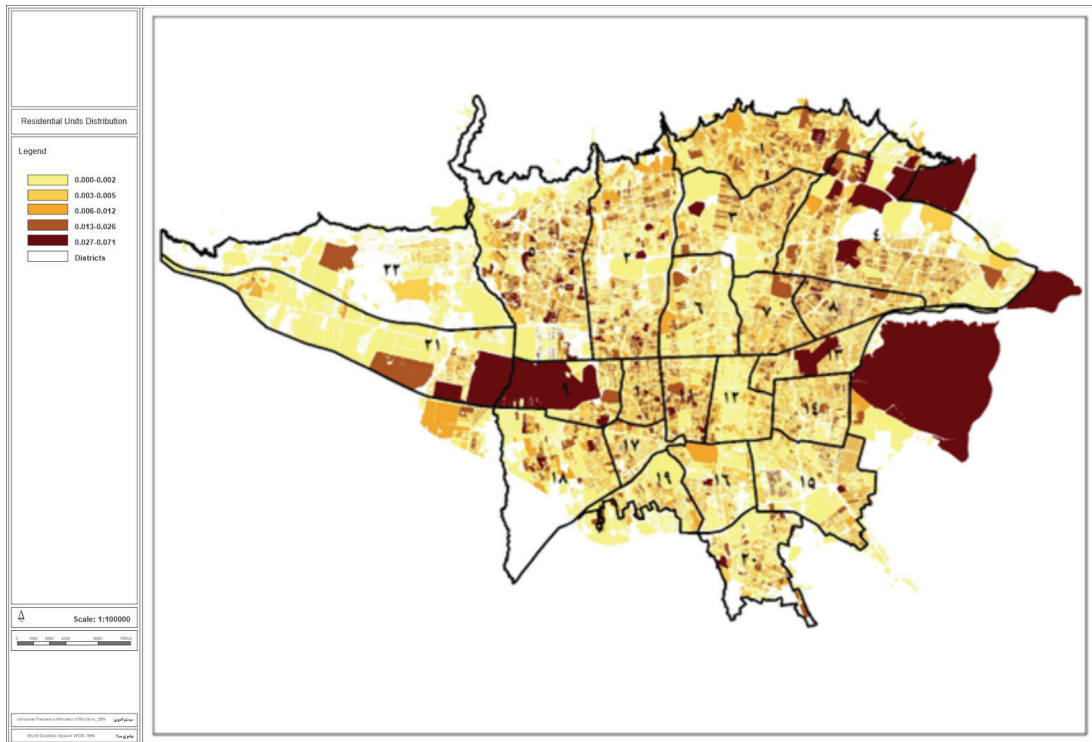


Chart 1: Percent of Residential Units Separated by 22 Metropolitan Areas of Tehran



Plan 1: How to distribute residential units in 22 metropolitan areas of Tehran
 Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

A- Structural condition of residential units in 22 districts of Tehran metropolis

According to statistics and information in 2015 in Tehran metropolis, 32.57% of residential units have metal frame, 33.80% have concrete frame, and 88.8% are another frame and not declared (Table No. 2 and Chart No. 2).

Table 2: Skeleton type of residential units in 22 metropolitan areas of Tehran (%)

-	Steel Structure (%)	Skeleton concrete (%)	Other skeletons and unstated (%)
Tehran	57.32	33.80	8.88

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

Steel structure: Area 13 with 80.17%, Area 15 with 78.27 and District 14 with 76.75% have the highest percentage of housing units with steel structure and Area 5 with 13.39%, Area 18 with 39.58% and Area 17 with 42.64% have the lowest percentage of housing units with steel structure (Chart 3).

DISCUSSION AND FINDINGS

Reinforced concrete structure: Area: 5 with 65.27% has the most residential units with reinforced concrete skeleton structure in Tehran

metropolis. Also, District 15 with 10.27%, District 13 with 11.18%, Area 14 with 13.40%, Area 7 with 17.99%, District 8 with 18.18% and District 19 with 19.11% have the lowest residential units with reinforced concrete skeleton structure in Tehran Metropolis (Chart 4).

Other skeletons and uncertainties: Area 16 with 17.15%, Area 17 with 15.12%, Area 20 with 13.53%, District 10 with 13.48% and District 9 with 13.39% have the highest unstructured and unspecified residential units in Tehran metropolis. Also, Area 5 with 2.77%, Area 22 with 66.4%, Zone 2 with 13.5% and District 1 with 18.5% has the lowest housing units with unsuitable and unspecified skeletons. They are (Chart 5).

B- Condition of materials type of residential units in 22 metropolitan areas of Tehran

According to statistics and data in Tehran metropolis in 2016, 80.72% have brick and iron materials, 75.4% a combination of brick and stone-brick, 70.3% a combination of brick-wood and all wood, 71.1% of cement blocks, 10.2% clay-wood and clay-mud, and finally 7.02% other materials and undeclared (Table 3 and Chart 6).

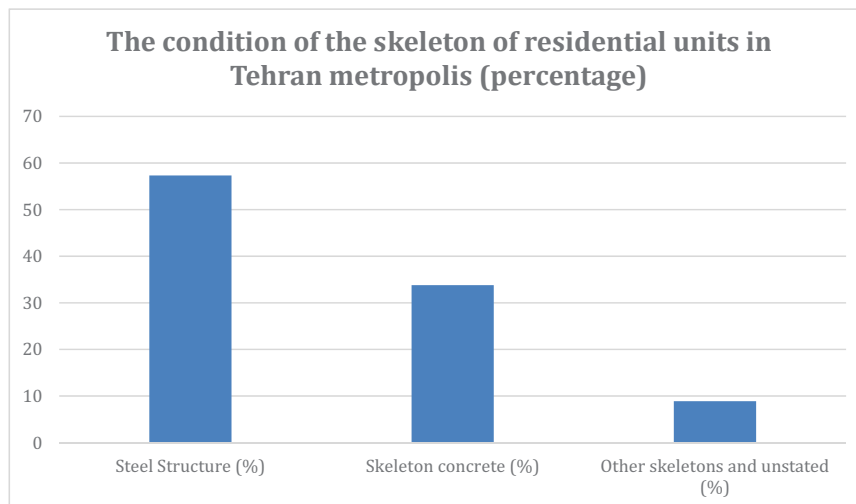


Chart 2: Skeleton type of Tehran Metropolis residential units (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

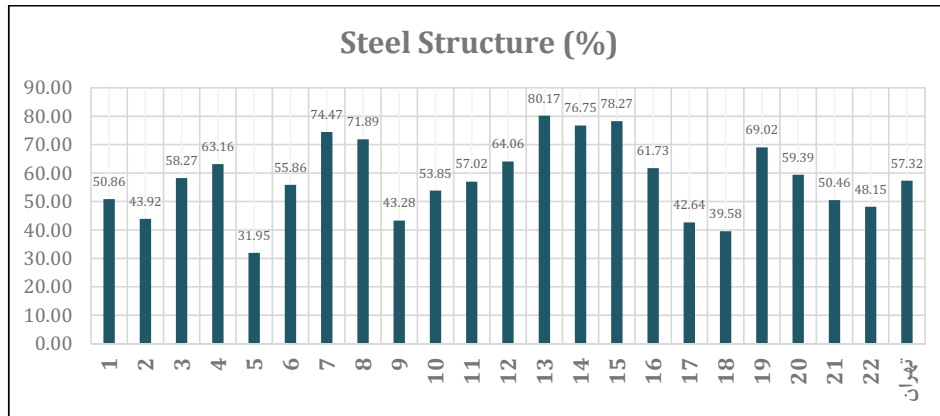


Chart 3: Status of Steel Structure of Residential Units in 22 Metropolitan Areas of Tehran (%)
Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

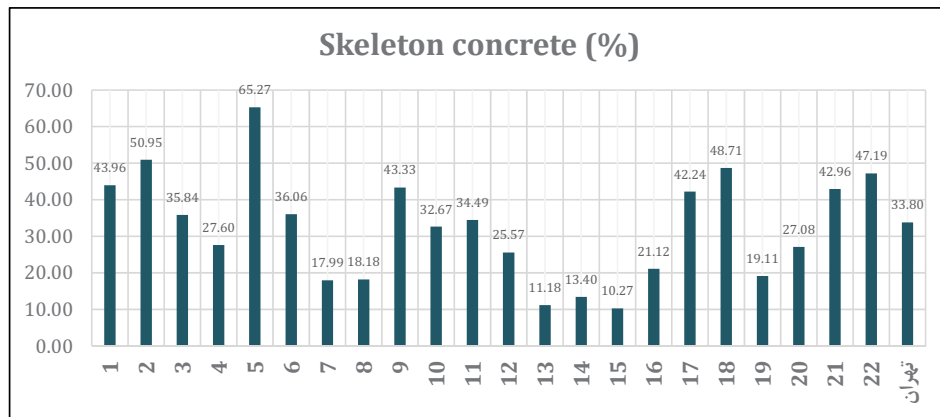


Chart 4: Structural Status of Reinforced Concrete Units of Residential Units of 22 Metropolitan Area of Tehran (%)
Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

Table 4- Investigating the Status of the Effect of Cultural, Environmental, Employment and Economy Characteristics on the Quality Criteria of Architectural Technology in Construction in Tehran Metropolis

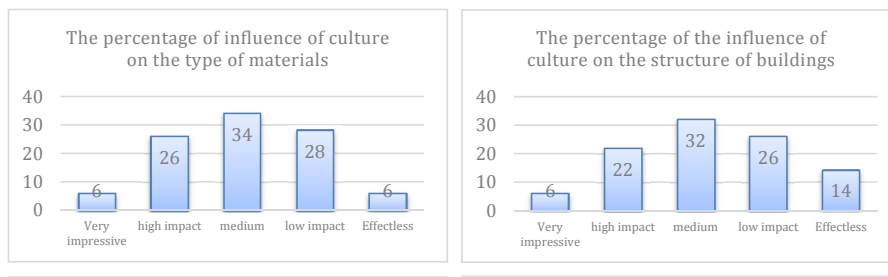


Chart 5: Status of other skeletons and undeclared residential units of 22 metropolitan areas of Tehran (%)
Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

Table 3: Housing Aggregate Type of 22 Metropolitan Areas of Tehran (%)

Other undeclared materials	Clay and Wood Clay and Mud	Cement Block	Brick and wood Just wood	Brick and Brick	Brick And Iron	-
7.02	2.10	1.71	3.70	4.75	80.72	Tehran

Text: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

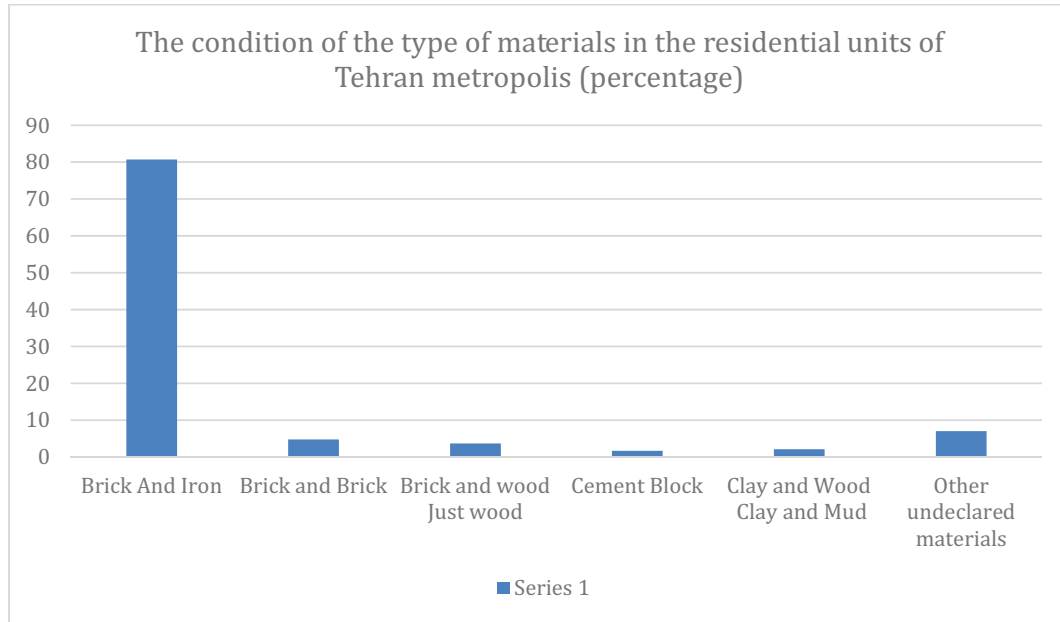


Chart 6: Aggregate type of housing units of Tehran Metropolis (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

Brick and Iron Materials: In the 22 metropolitan areas of Tehran, District 19 with 92.42%, District 18 with 89.57% and District 20 with 89.22% have the most housing units with brick and iron materials. Also, District 12 with 58.81%, Area 5 with 65.02% and District 11 with 65.74% have the lowest housing units with brick and iron materials.

Brick/Stone and Brick Materials: In the 22 metropolitan areas of Tehran, Area 5 with 47.7%, District 4 with 6.81% and District 7 with 6.05% have the most residential units with brick/stone and brick materials. Also, District 20 with 31.2%, Area 19 with 42.2% and District 16 with 31.3% have the lowest residential units with brick/stone and brick materials.

Brick and wood/all-wood materials: In the 22 metropolitan areas of Tehran, District 12 with 19.44% and District 11 with 12.03% have the most residential units with brick and wood/all-wood materials. Also, District 22 with 0.60%, Area 19 with 0.81%, Area 21 with 0.99 and District 18 with 1.03% have the lowest residential units with brick and wood/all-wood materials.

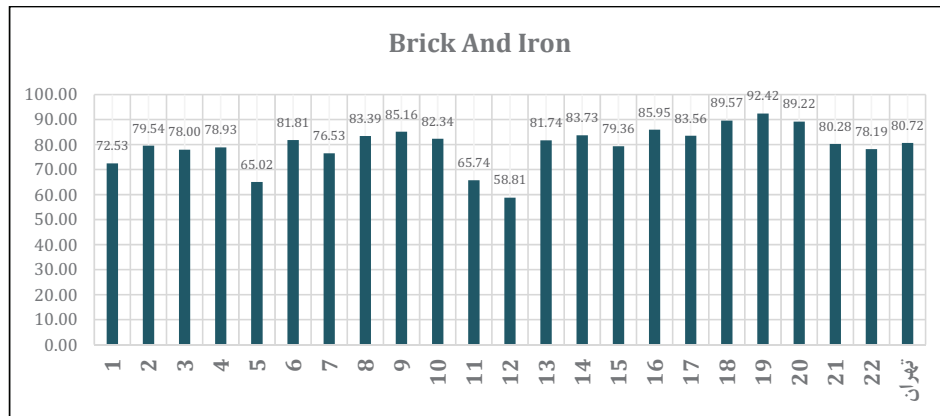


Chart 7: Condition of Brick and Iron Materials in Residential Units of 22 Metropolitan Areas of Tehran (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

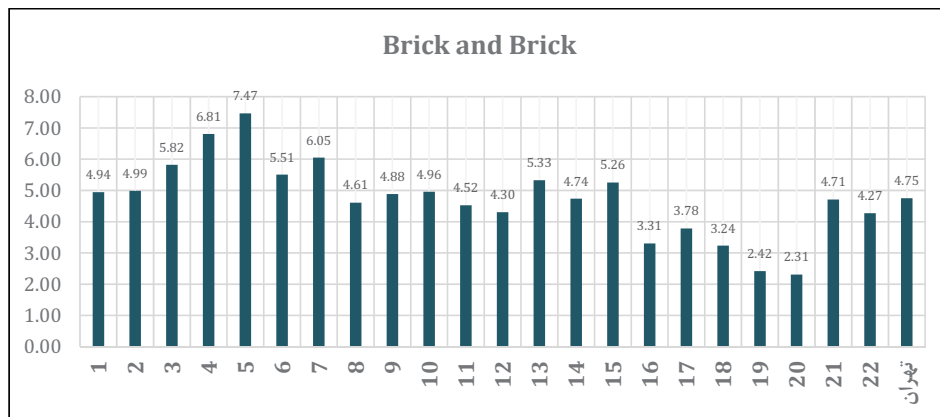


Chart 8: Condition of Brick / Stone and Brick Housing Units in 22 Metropolitan Areas of Tehran (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

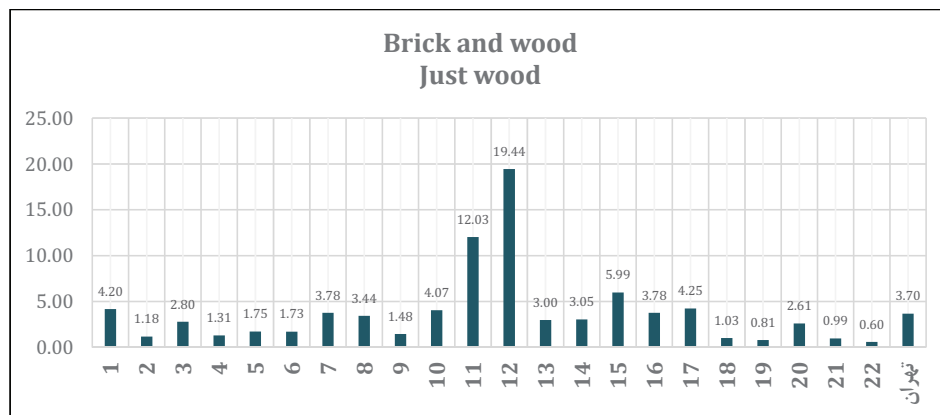


Chart 9: Condition of Brick and Wood Materials/All Residential Units of 22 Districts of Tehran Metropolis (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

Cement block materials: In the 22 metropolitan areas of Tehran, Area 5 with 31.5% has the most residential units with cement block materials. Also, District 19 with 0.69%, Area 17 with 0.81%, Area 16 with 0.90 and District 18 with 0.93% have the lowest residential units with cement block materials.

Clay and wood/clay materials: In the 22 metropolitan areas of Tehran, District 12 with 9.68% and District 11 with 7.14% have the most residential units with brick and wood/clay and

mud. Also, District 22 with 0.64%, District 19 with 0.69% and District 18 with 0.97% have the lowest residential units with clay and mud materials.

Other Undeclared Materials: In the 22 metropolitan areas of Tehran, Area 5 with 18.58% and District 22 with 13.22% have the most housing units with other and undeclared materials. Also, District 19 with 2.96%, Area 20 with 3.38% and District 16 with 4.05% have the lowest residential units with other and undeclared materials.

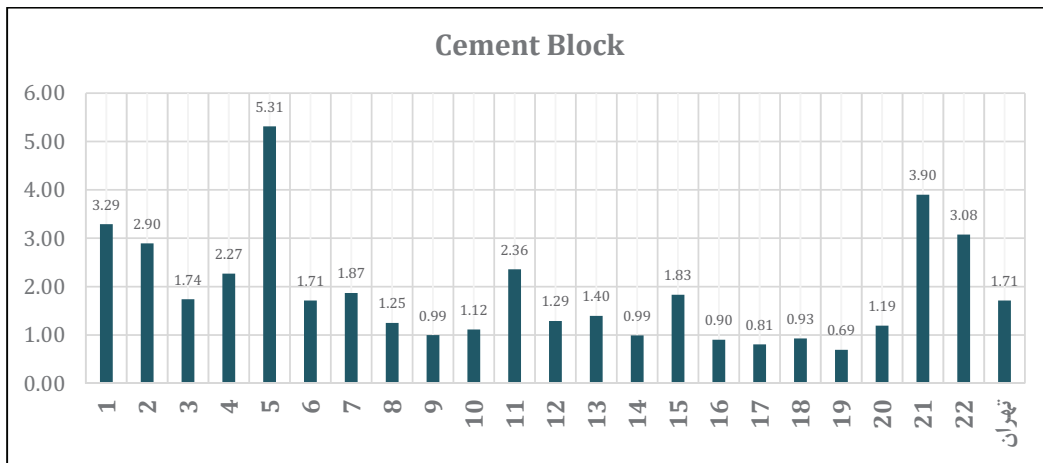


Chart 10: Cement block material status of residential units of 22 metropolitan areas of Tehran (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

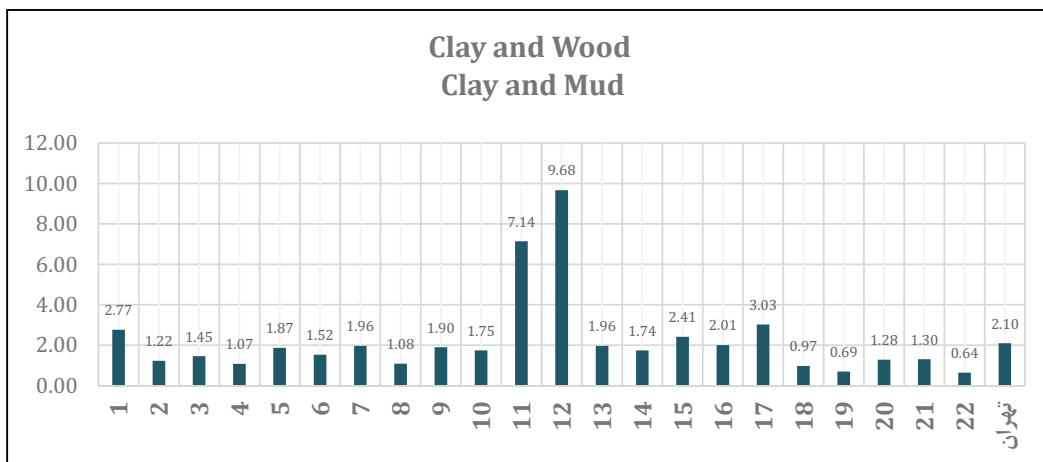


Chart 11: Condition of Clay and Wood Materials/Clay of Residential Units of 22 Metropolitan Areas of Tehran (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

In general, in terms of the construction of residential units with metal and reinforced concrete, Tehran metropolis has a better situation than Tehran province and country, and Tehran province has a better situation than the urban parts of the country.

Type of construction system used in 22 metropolitan areas of Tehran

According to the Building and Housing Research Center (1400), the building systems used include cold-rolled light steel frames (LSF), prefabricated light load-bearing walls (LSF), semi-prefabricated buildings with individual roof and wall sandwich panels including polystyrene and sprayed concrete intermediate layer, Buildings with two-layer 3D sandwich panels with in-situ intermediate concrete, semi-prefabricated non-load-bearing walls of 3D sandwich panels, the implementation method of roof and wall concrete structures is integrated formwork. Also, the construction system of reinforced concrete buildings with the method of tunnel molds, the system of prefabricated buildings with a load-bearing wall consisting of a roof and reinforced concrete walls with structural light concrete, semi-prefabricated buildings with

simple composite steel concrete frames with a reinforced concrete shear wall on the exterior with fiber cement boards, Wall blocks made with light gas concrete are other technologies approved by the Housing and Building Research Center.

New technologies include reinforced concrete buildings consisting of a two-layer load-bearing wall and semi-prefabricated roofs with in-situ concrete, the method of implementing reinforced concrete buildings with a permanent insulation mold, production of reinforcement mesh with resistance welding by machine method, production of beam metal trusses with resistance welding to Machine method, formwork system of reinforced concrete buildings, reinforced concrete hollow roof using durable hollow block made of polypropylene, concrete steel composite slab system, prefabricated concrete roof wall with Lyca light concrete, integrated formwork system and cement board facade are also new technologies. It has been used in the construction of Tehran for the last ten years.

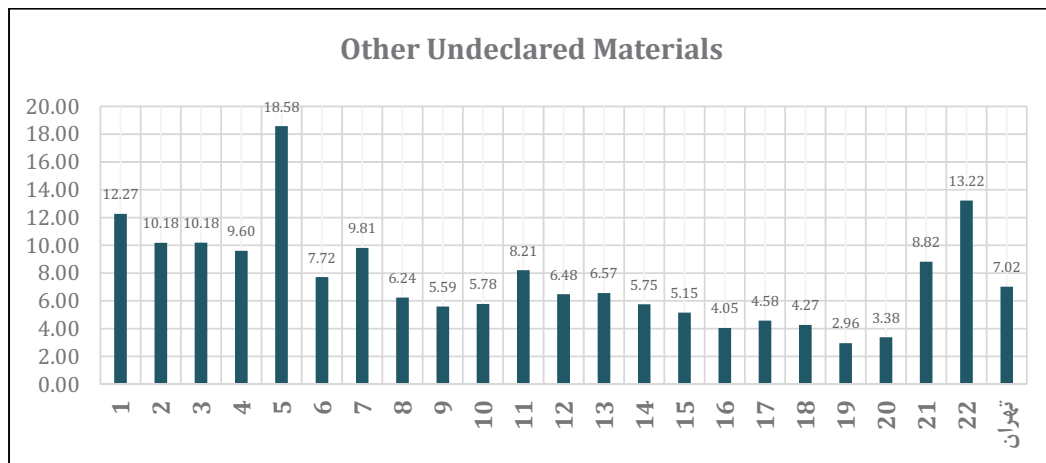


Chart 12: Condition of Clay and Wood Materials/Clay and Clay of Residential Units of 22 Metropolitan Areas of Tehran (%)

Source: Author (2022) Based on Statistical Blocks, Population and Housing Census (2016)

RESULTS AND CONCLUSION

Form in architecture in the construction of 22 districts of Tehran metropolis

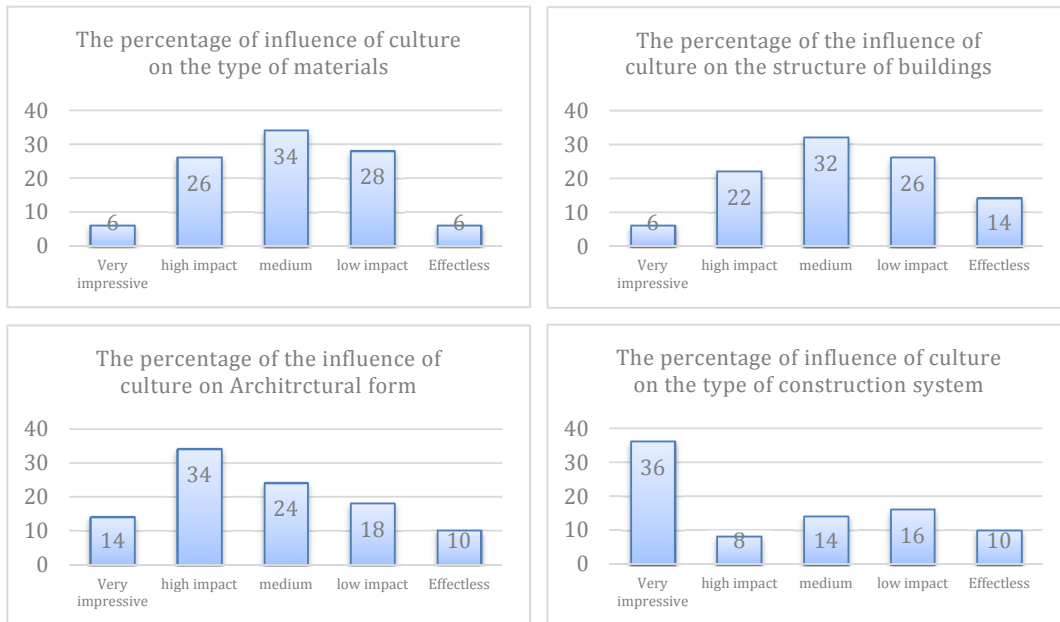
Form formation in architecture is not only affected by environmental conditions, performance, structure, climate, but also value system, beliefs and ideas are considered as its shaping factors. With the occurrence of the Islamic revolution in 1357 and the extensive political-social changes that resulted from it, a break occurred between the architectural process before and after the revolution. In fact, the emergence of new perspectives that originated from cultural, national and religious ideals were among the first factors that transformed architecture and urban planning. Changes in the educational system, the suspension of many investments in civil affairs, the closure of many consulting engineer offices, the migration of a number of professors and engineers abroad, and the eight-year Iran-Iraq war were other events that overshadowed architecture and urban planning.

Explaining the Effect of Post-Revolutionary Developments on the Quality of Residential Buildings Architecture Technology in Tehran Metropolis

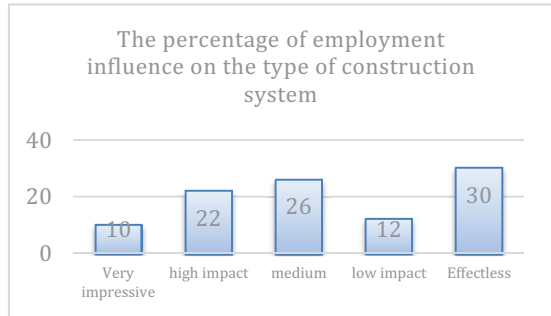
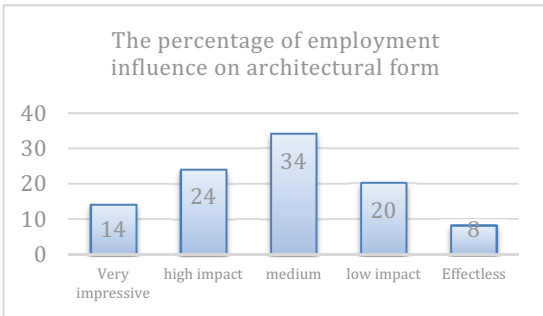
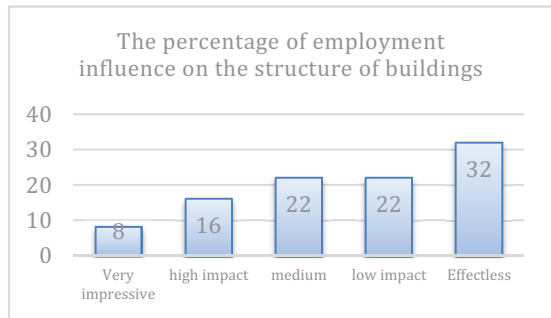
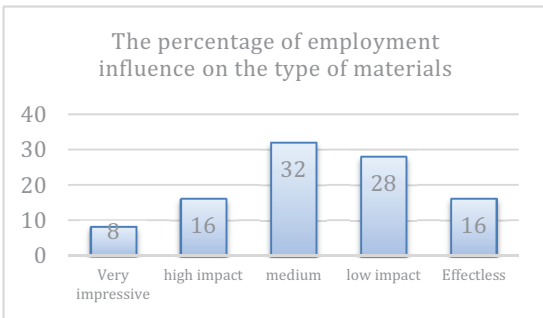
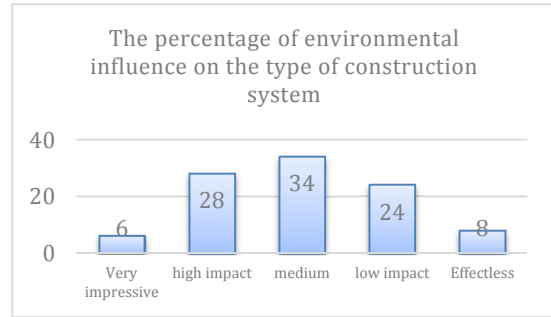
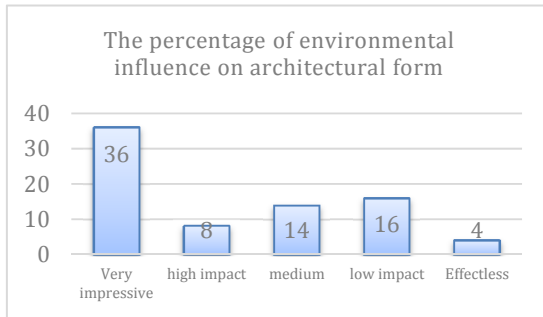
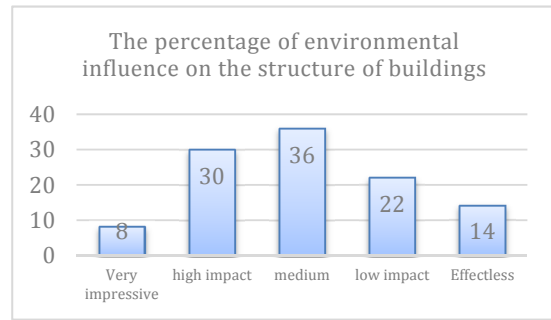
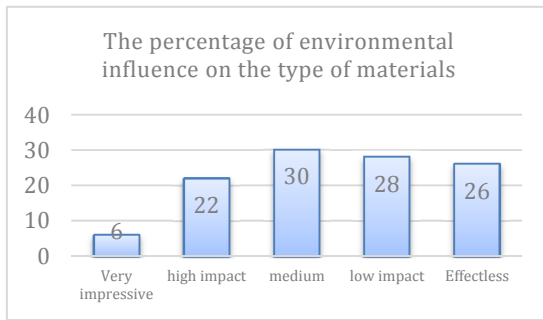
As mentioned before, the post-revolution developments in Tehran can be categorized into four sectors: culture, environment, employment and economy, and in this sector, the percentage of influence of these four sectors on the quality of architectural technology (structural criteria, materials, type of system) construction, architectural form) in residential buildings in Tehran metropolis. The number of 50 questionnaires prepared and completed by university

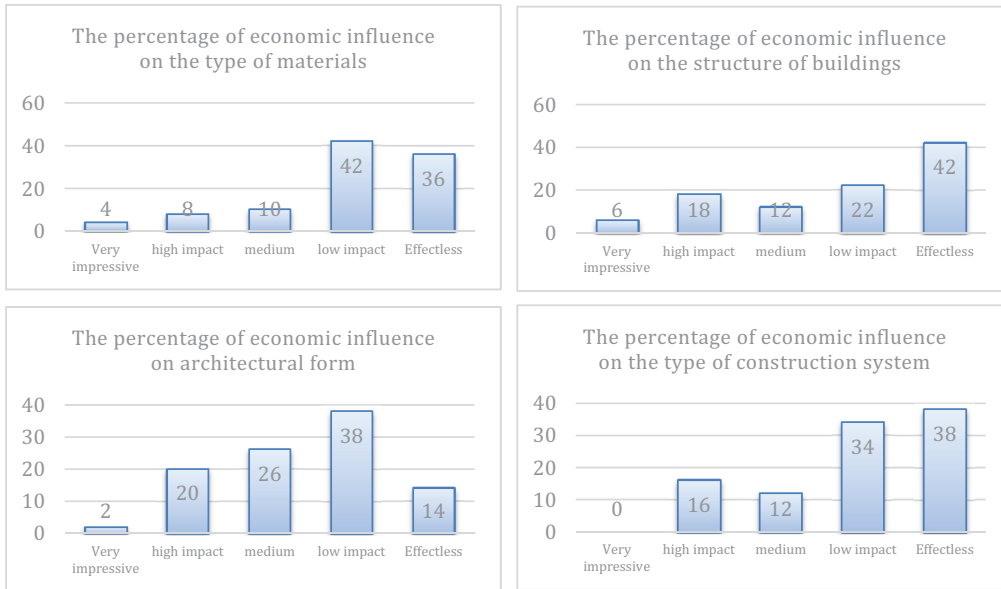
professors and investors in the housing and construction sector, whose initial results are presented in the table below, separated by the studied criteria.

Table 4: Investigating the Status of the Effect of Cultural, Environmental, Employment and Economy Characteristics on the Quality Criteria of Architectural Technology in Construction in Tehran Metropolis



Socio-economic developments on the quality of architectural technology of residential buildings



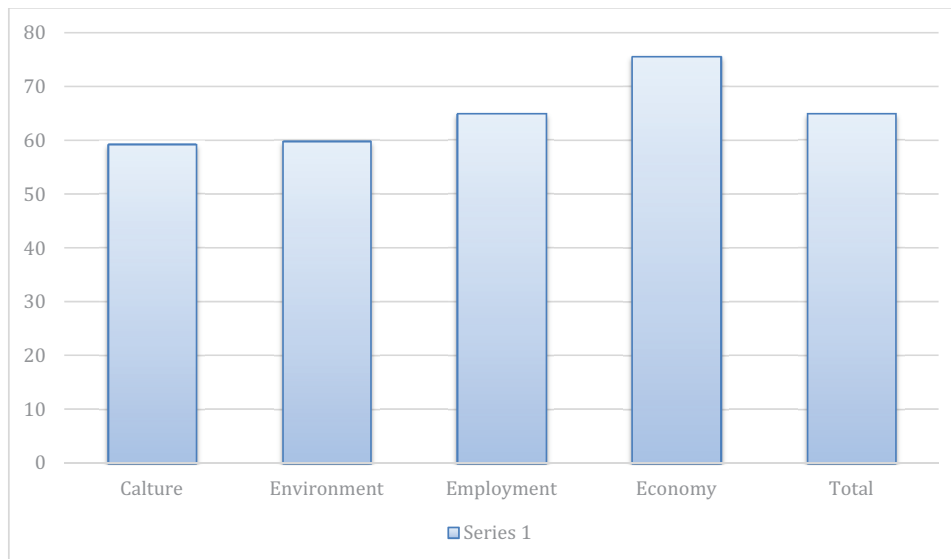


Source: Author (2022) Based on SPSS software using questionnaires

In general, the total criteria of culture, environment, employment and economy have had an impact on the quality of architectural technology in Tehran metropolis by 64.8%. In this, two components of employment with 64.8% and economy with 75.5% have the most effect on the quality of architectural technology.

In Chart 13, the impact of four components of economy, employment, culture and environment on different quality criteria of construction technology in Tehran metropolis is presented. As it can be seen, the economy and employment have had the greatest impact on the criteria of the type of structure, materials, and construction system.

Table 5: The Impact of Cultural, Environmental, Employment and Economy Criteria on the Quality of Architecture Technology



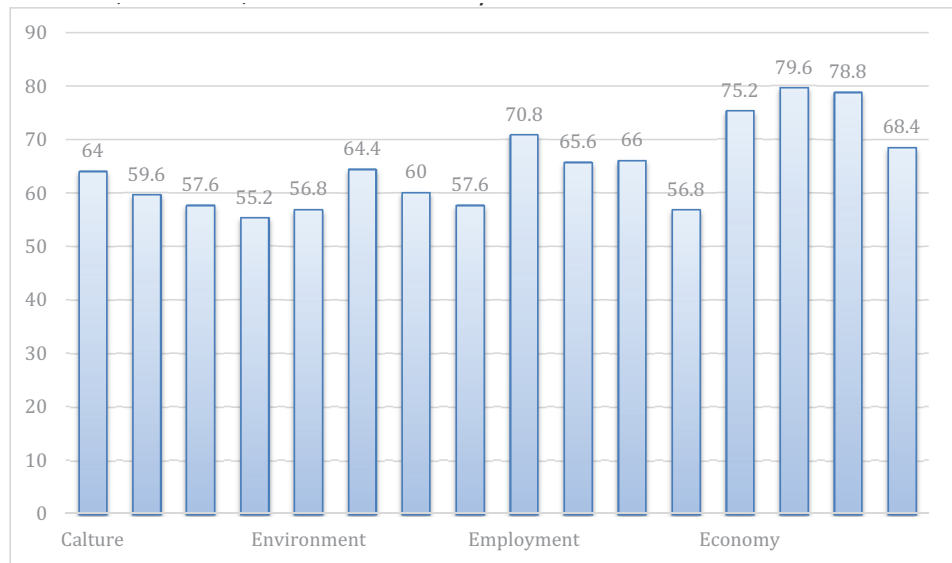


Chart 13: The impact of the criteria for culture, environment, employment and economy on the quality criteria of architectural technology

Thinking about the impact of economic, cultural, economic and employment conditions on the quality of architectural technology is a very important issue that was addressed in this research. The results show that economic conditions have an effect of more than 70% on the four criteria of structure, materials, construction system and architectural form in construction and construction in Tehran metropolis. Also, the 16th, 17th, 20th, 10th and 9th regions have unfavorable conditions compared to other regions of Tehran metropolis in terms of the quality of architectural technology in the construction of residential units. Also, districts No. 5, 22, 2, 1, 3, 21 and 7 have more suitable conditions in terms of the quality of architectural technology in the construction of residential units in Tehran metropolis.

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HOW TO CITE THIS ARTICLE

Nikoomanesh, J., Pourzargar, M. R., & Aivazian, S. (2024). The effect of socio-economic developments of the last four decades on the quality of architectural technology of residential buildings (Case Study: District 22 of Tehran City). *International Journal of Urban Management and Energy Sustainability*, (), -. DOI: [10.22034/ijumes.2024.2029620.1213](https://doi.org/10.22034/ijumes.2024.2029620.1213)

