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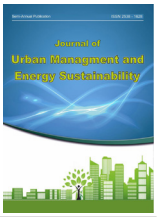

ORIGINAL RESEARCH PAPER

# Presenting a conceptual model in architectural design education, considering the effective factors of activism

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ABSTRACT

Activism, as a fundamental concept in various disciplines, particularly architecture, refers to designers' sensitivity to social, political, economic, and environmental conditions. This awareness encourages designers to focus more on these elements in their design processes. Nevertheless, a primary challenge in architectural education is the ineffective transmission of activism-related concepts to students. In many curricula, discussions on activism are often unproductive and oversimplified.This research is divided into two main sections. The first section examines key resources in architectural education and activism, analyzing the perspectives of influential thinkers. The second section presents a conceptual model developed through data collection from experts, aimed at enhancing the educational process in architectural design. This model seeks to identify and strengthen factors crucial for teaching activism.It is anticipated that the findings will contribute to optimizing university curricula. Finally, suggestions for future research on activism in architectural education will be proposed.

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## INTRODUCTION

Activism, defined as individual or collective proactive efforts to bring about changes in social, economic, political, or cultural domains, has always been at the center of societal attention. Activists strive to raise public awareness about specific issues, creating a platform for documenting events and influencing social and cultural decision-making. Activism activities can encompass a wide range of actions, from information dissemination to organizing individuals within the community. The primary goal of activism is to enhance public awareness and influence behaviors and decision-making processes within society. In the field of architecture, activism is examined in a more nuanced and profound manner, addressing the impact of social, political, historical, and cultural phenomena on architectural works. Recent research and studies indicate that architects worldwide are increasingly incorporating the concept of activism into their work. However, in Iran, despite its rich architectural history, critical examinations and an active perspective on activism in architectural works receive less attention. It is noteworthy to consider the extent to which the topic of activism is studied and taught in architectural design and the related educational system in Iran. Are the new generation of architects familiar with the concept of activism and its application in their designs? Undoubtedly, a lack of familiarity with this concept among architects can hinder the reflection of activism in their design work. The aim of this research is to evaluate the influence of key factors in teaching activism in architectural design and to examine their application from the perspective of community experts. This study seeks to identify influential factors on teaching activism from the viewpoints of prominent Iranian and international researchers, as well as to assess the significance of each of these factors in architectural design. The organization of this research will proceed as follows: first, the scope of the research and activism factors will be explored, and then these factors will be analyzed from the perspective of community experts. Subsequently, through a statistical study, the influential factors in teaching activism in architectural design will be identified, and finally, a conceptual model will be presented for the application of these factors in architectural design education.

This research examines the impact of activism on architectural design education and utilizes several key theories and concepts to create its theoretical framework, which aids in a better understanding of the factors influencing activism in architectural design. Firstly, the social activism theory explores the role of activists in creating social changes. This theory demonstrates that architects, as social activists, can influence the design and construction processes of public spaces (Kimbell, 2011). emphasizes that culture and social context significantly impact the thinking of architectural designers. In this research, the role of culture and social contexts is examined as key factors in the activism of architectural design. The participatory design theory also highlights the importance of collaboration and stakeholder involvement in the design process. This theory indicates that architects can better incorporate the needs and desires of the community into their designs through a participatory design approach (Schuler & Namioka, 1993). In this study, the use of participatory design methods is proposed as a key tool for enhancing activism in architectural design education. Finally, the theory of social ethics in design underscores the significance of ethics and social responsibility in the design process, indicating that designers must be attentive to the social and cultural impacts of their designs (Fuad-Luke, 2013). In this research, the examination of the ethical and social dimensions of design is considered one of the key aspects of activism in architectural design education. Considering the discussed theories, it can be concluded that activism in architectural design is influenced by various factors such as culture, social contexts, stakeholder participation, and ethical dimensions. This theoretical framework aids the present research

in conducting a more thorough investigation of the impacts of activism on architectural design education and provides strategies for improving educational processes. The aims of the current study are to investigate the key resources available in the field of architectural education and activism, and to present a conceptual model based on the most influential factors of activism in the architectural design education process. This study has been carried out in Tehran, Iran, in the year 2024.

## MATERIALS AND METHODS

*Research Domain*

This section reviews the available resources in the areas related to the research. For ease of work, the research topic will include the sections shown in (Fig. 1).


Fig. 1: .Scope of topics covered in the research literature

*Design*

Design is the most important aspect of architectural science. This process is the translation of the architect's thought into the language of role and design, which becomes the connecting link between his mental aesthetics and what will be extracted in the future. As Kimbell has pointed out, one of the most important factors influencing the architectural design process is the role and influence of the culture of a specific environment and landscape on the designer's thinking (Kimbell, 2011). On the other hand, La Fortuna, taking a deeper look at the issue of culture and society from a socio-political perspective, has examined the link between design and democracy. He also defined it from other perspectives such as science, aesthetic discourse or philosophy of life (Jamshidi, Ziari, Zarabadii, & Bahmanpour, 2023; La Fortuna, 2015). In summary, the studies conducted indicate that culture and socio-political contexts play a significant role in how architectural designers think and approach, and paying attention to this issue can be effective in rethinking and improving the architectural design process.

Therefore, the influence of culture and the understanding of the cultural and political patterns that govern society can be considered as two main factors influencing the issue of activism in architectural design.

*Architectural design*

is considered a creative and technical process that involves the use of natural elements and the organization of spaces by utilizing the designer's artistic taste in order to create living environments with diverse uses. Among them, one of the most important factors influencing this process is the designer's personal position and interests. Etezadi showed that architectural design and the production of architectural works have a direct relationship with the designer's creativity and artistic vision (etezadi, 1991). In addition, another study found that if design software is developed with a focus on increasing individual creativity, designers will have more maneuverability to shape their thoughts. On the other hand, Tom Billing, by examining the relationship between design and everyday politics, found that design and democracy are closely related to each other and play an important role in shaping and influencing social behaviors (Bieling, 2021). Finally, Taneri and Dogan concluded that the problem-solving approach to design is the most common description, but students believe that

design is not a simple problem-solving, but is more related to art and creativity (Taneri & Dogan, 2021). A review of the above research shows the researcher that factors such as the position of the designer's personal interests, the use of technology and social factors (positions and roles of individuals), and problem-solving are among the most important factors that should be considered in architectural activism.

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*Architectural Education*

Architectural education, as the cornerstone of cultivating future generations of architects, has taken a pluralistic path and is evasive of accepting theoretical formats. The topics studied are in architectural education (Nazir & Abro). It examined the conditions for the development of future methods, tools, or structures of architectural education in Iran. The results of the research show that the two factors of science and technology and innovation and change have a special look at architectural design and the cultivation of creativity (Azadkhani, 2022). Education as an informal tool is undeniable(Karslı & Özker, 2014). Architecture is related to creating a sense of experientiality and motivation in students by teaching media concepts, which can be achieved by considering architecture as a communication issue between the architect and the audience (Nejad & Mahdavi, 2005).

From the review of articles in the architectural education section, it can be concluded that the lack of a coordinated method, designers' cognitive strategies, problem-based design and creating a sense of experientiality, science and technology and innovation, educational spaces, educational workshops, skills, knowledge and wisdom, among others, are important factors that should be considered in order to examine activism in architectural design education.

*Architectural Design Education*

Architectural design education fosters creativity, builds self-confidence, and develops design thinking in architectural design students, which consists of teaching methods, teaching techniques, educational environment, educational tools, educational psychology, social skills, assessment, and evaluation. An extensive explanation of this topic is provided below (Rasouli Amin, Khanzadi, Ahmadi, & Abdoli Sejzi, 2024). Researchers in visual analogy and its place in creative education of architectural design, using qualitative methods and content analysis methods, concluded that the more visual awareness a student has, the better he will be able to pass the visual analogy stage in the design process and present a creative design in the inspiration (Mehdi, Farhang, & Mohsen, 2010). In a study aimed at investigating the role of creative thinking and learning styles in architectural design education, researchers found that learning styles differ among architecture students and the level of creativity and creative thinking also varies based on these styles (Hosseini, Sadat, Falamaki, Mansour, & hojat, 2019).

Researchers sought to understand the reasons for the failure of professional education and paid attention to social issues. In a study on professional skills in architectural design education, Saber and his colleagues concluded that design decision-making is a social skill and architects and students must learn the ability to work in social contexts (shabak & behnamiri, 2023). In their study, they found that the lack of necessary skills in students has a negative impact on design education and this has created many differences between architecture schools and the professional market (Arash, Mohsen, & Sirous, 2022). Haghighi and his colleagues state that these techniques can increase students' self-confidence, creativity, and social (Haghighi, 2023). Ghaempanah and his colleagues stated that some critical architectural issues can be raised in Iranian architectural education, despite cultural differences (Ghaempanah, 2024; Qaempanah, memarian, & Moradi, 2024).

Taghizadeh and his colleagues recommended transforming educational and research groups to remove bottlenecks and make training more practical (Taghizadeh, Mohammad, & Aminzadeh, 2002). Carazzo also specifically examined the contribution of the studio's physical space to educational processes and expanded the idea of collaborative learning, stating how the studio itself is part of the shared learning process (Corazzo, 2019). Subasinghe, believing that the studio is a place to cultivate curiosity and wonder, has recently become a limited space for innovation. He considers the lack of educational infrastructure to create a somewhat impersonal attitude towards studio learning (Subasinghe, 2024). In recent years, research on building an architectural education model based on the interdisciplinary role in education shows that interdisciplinary studies in architecture can help design different educational models with an interdisciplinary focus by linking the needs of society, research, and education, incorporating different areas of knowledge into the curriculum content, and achieving and creating interdisciplinary knowledge that is the topic of the day (Dasht-e-Gard, Bazrafkan, Kaweh, Jahanbakhsh, & Haider, 2021).

Mehlbani's research examined the future of architectural design and found that foresight should be formally considered at all stages of the architectural profession and education (GORJI MAHLABANI, 2010)In the same year, studies were conducted on students' emotional intelligence, which showed that this factor can play an important role in the success of architecture students (Hosseini et al., 2019).

*Activism*

*In this section, we first examine the concept of activism and then examine the most important sources of activism in relation to the research topic. Activism refers to various activities in the economic, social, political, cultural, and environmental fields that aim to create balance (or even prevent change) when faced with changes or external conditions and with the aim of improving society. Activism can be individual or organized or unorganized groups. This term is closely related to the concepts of social movement, resistance, support, and protest (Kaun & Uldam, 2018).*

Activism has been proposed as a new method of learning in the field of social issues. But the important point is to ask why and what activism is as the first step in education. The results of a study show that questioning allows for the perfection of everything that a person faces, provided that the question is the starting point (Borazjani, 2009). In a study titled Learning about Activism, Hudson showed that learning about socio-political action means taking action and evaluating its various aspects and activities. Therefore, learning in these fields by focusing on science and technology and recognizing social, cultural and economic contexts helps to develop scientific knowledge and better understand the issues (Hodson, 2014). Activism may be interpreted as a form of protest, but Svirsky showed in his study that activism can be considered as an endless process, emphasizing the role of action research in future social issues (Svirsky, 2010). In terms of the typology of professional activism and its effects on society and education, activism can be divided into collective, individual, specialized, and radical categories, each of which can directly affect social justice.Campana examines art education with an approach that examines the intersections of art, education, and activism, concluding that art and education are tools for social justice and social and political activities(-Campana, 2011). Also, in research on social media and activism, networks and communication practices are increasingly being raised as contested issues that relate to digital freedoms and the legal agenda (Cammaerts, 2015). One of the main challenges in activism is the different understanding of social findings. Researchers using qualitative methods have concluded that both consistency and discrepancy in reports of activism and participatory behaviors create different perceptions of levels of activism. Therefore, the accuracy of perceptions of the conditions of a social event is a key factor in the discussion of activism (Fiorito, Padavic, & DeOrtentiis, 2015).

*Design Activism*

What is design activism? Fuad-Luke defines design activism as conscious or unconscious thinking and action to create positive social, economic and environmental change. In his book, he examines design activism from a historical and cultural perspective and states that design plays a key role in the realization of our lives. What has already been designed has a great impact on our lives and our future, and design transforms natural and human capital into new forms. Design helps to evolve human capital and define our social capital, transforming these capitals into material and symbolic languages (Fuad-Luke, 2013).

The question that arises here is what good design means, where is the place of activism, and how should it be measured? Good design involves designs that legislate within a social contract, and some designs are special because of their social activism. They aim to create tangible changes in society. Activism in design usually seeks social justice, i.e. a society where everyone benefits from their rights, and this is achieved by studying ethics, philosophy, social sciences, and epistemology that can directly influence design (Shelley, 2017). How can activism in design be assessed? In other words, what is the criterion for measuring activism in design? To answer this question, Crysler addresses the paradoxes of design activism, scale, and exchange. Scale can act as an unspoken framework for design activism (Crysler, 2015).

The main issue regarding design is its relationship with influential social, political and economic approaches that can define the boundary between design and activism. Çetin and aryana presented a study on the impact of design activities with a socially responsible approach. They concluded that activism and responsible design approaches are necessary and inevitable in design education (ÇETİN & ARYANA, 2015). Thorpe, in an article titled Architecture and Design versus Consumerism, showed that in the face of economic and social crises, designers and architects must question and change the principles of modern design. To survive in the world of mass production and consumption, we need a revolution in design (Thorpe, 2012). Shelley addressed the issue of design and society with a technological approach and social issues. He believes that activism is divided into different categories such as guerrilla, philanthropic, and social entrepreneur, and each category has its own unique approach and determines how to help vulnerable social groups (Shelley, 2017; Shelley & Shelley, 2017).

How can elements of social movements be integrated into design? Chen addressed the lack of equality and personal connections of designers. He found that activists in design try to understand the intersection between social issues and design and provide opportunities for the evolution of design thinking (CHEN). Song and Lou examined design activism as an approach to design with social innovation and proposed the action research design method to integrate it with political and social events (Song & Lou, 2016). Thomas Marcussen pointed out the politics of design activism and how activists use methods to protest social and political issues and concluded that design activism is tied to contradictions and paradoxes (Markussen, 2020). Julier addressed the impact of political movements on the political economy and design and found that these movements play an active role in the economy (Julier, 2011). Design activism was addressed as an emerging movement in response to the crises of neoliberalism (Julier, 2015).

A review of the available sources on the topic of design activism shows that, from the perspective of researchers and critics in this field, various factors such as the existence and functioning of active design groups creating challenging processes and frameworks, the existence of social justice, economic and social crises, critical analysis, elements of social movements, the flexibility of the ruling system, design research methods and critical theory, neoliberalism of

maximal free competition without government intervention, living conditions in deprived communities, and economic sustainability affect design activism.

*Participatory Design*

Participatory design is an important factor in the activism of architectural education. Teachers and experts can make changes towards utopia by using the concept of participatory design and participatory learning and professional interventions. (Costa, Vaz, & Menezes, 2021; Julier, 2015) One of the most important factors in the field of participatory design is the issue of group architecture as a missing link in architectural design education. In this regard, Javedan Farhi and his colleagues developed a comprehensive model of the participatory design process. Based on their findings, in order to achieve an efficient model by combining several patterns, the designer starts the work with planning and continues with decision-making, organization, and identification of perception factors in the individual, social, and spatial domains until the final stages of design and then reaches the necessary output (Farhi, Maedeh, Panahi, & Siamak, 2021). Research findings in this field indicate that the consequences of participatory experience in teaching architectural design courses with a participatory learning approach and with the aim of measuring the effectiveness of the participatory teaching method in architectural design courses can increase student interaction and participation in the design process and lead to improved learning capacity, increased motivation, communication, social, and problem-solving skills (Jafar, Ali, Kermani, & Yaghoubi, 2023; Soleimani & Zadeh, 2023).

Current findings from studies conducted in the field of collaborative learning show that collaborative learning space, collaborative design, the role of the individual in the group, individual perception, social perception, spatial perception, and fostering creativity can be considered as key factors influencing the issue of collaborative learning.

## DISCUSSION AND FINDINGS

*Factors Influencing Activism in Architectural Design Education According to Research Objectives*

Following an extensive review of reputable domestic and international scholarly sources and the categorization of factors from the perspectives of experts, a total of 40 factors were identified, organized into four distinct factor groups. The chart below illustrates the factors identified through the library study (Chart 1).

*Clustering the Effective Factors of Activism in Architectural Design Education to Present a Conceptual Model*

In this section, following the identification of factors influencing activism in architectural design education, we will classify these factors into new clusters to develop a conceptual model. This classification is essential for enhancing the effectiveness of the proposed model in its presentation. To achieve this, individual interviews were conducted with five expert professors from Islamic Azad University. The consensus among the experts indicated that the factors should be organized into four new clusters: the individual, the educational system, the educational infrastructure, and environmental phenomena. This categorization will facilitate the development of the conceptual model based on these four critical dimensions, as perceived by the experts. The details of this clustering will be discussed in the subsequent section.

*Conducting a Field Study and Assessing the Effectiveness of Activism Factors in Architectural Design from Experts' Perspectives*

Following the extraction and clustering of the identified factors into four main groups, this section involved distributing a questionnaire to experts within the community. A total of 25 experts responded to the questions in accordance with the central limit theorem. The primary objectives of this research are as follows:

a. To gather their insights regarding the factors under investigation.

b. To assess the validity and reliability of the questionnaire items using appropriate statistical formulas (Fig. 2).

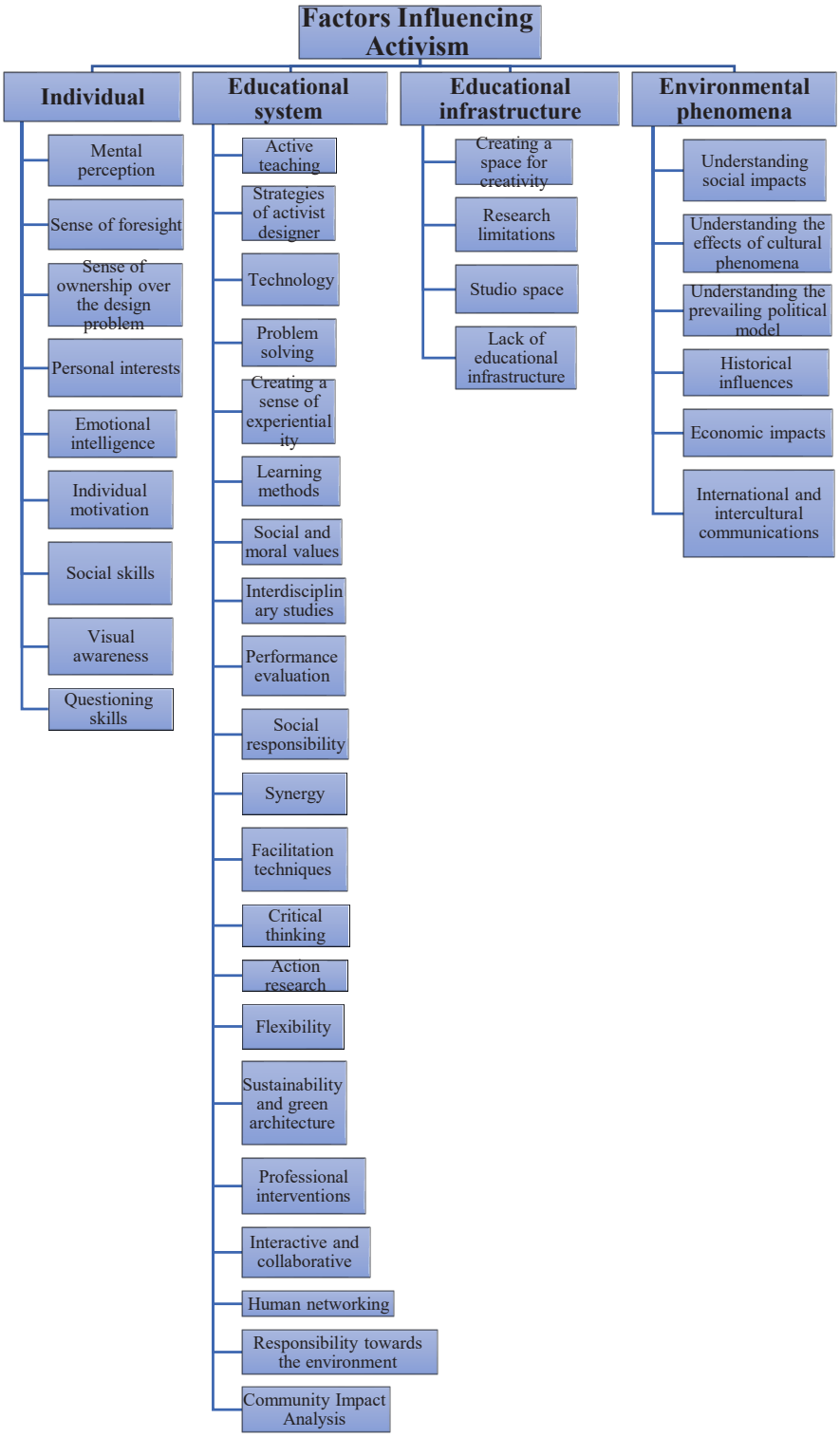


Chart 1: Identified influencing factors on activism

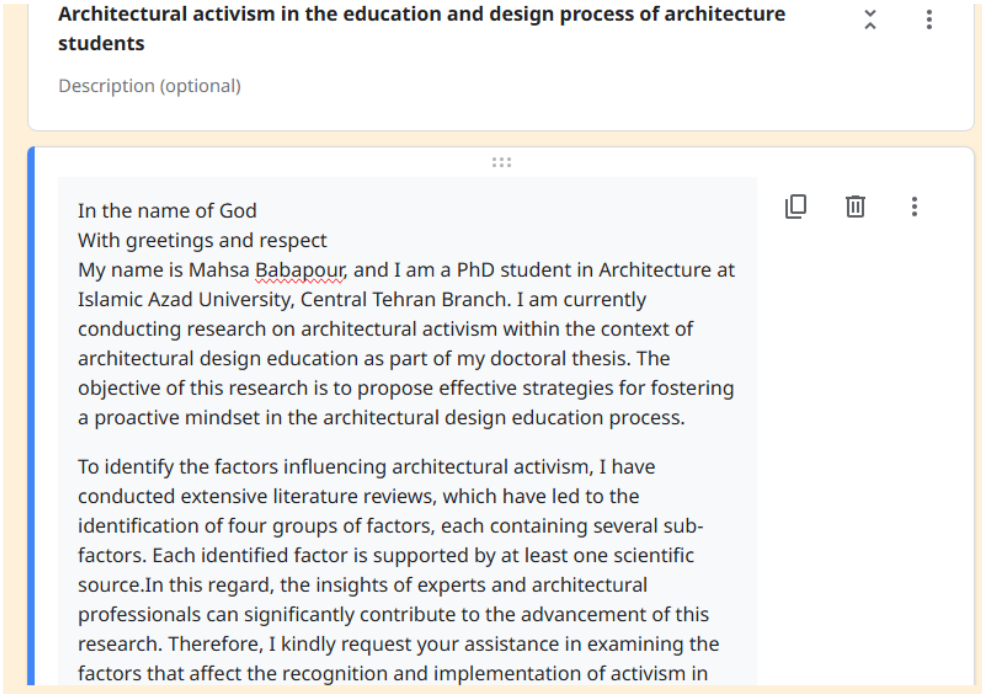


Figure 2: Image of the expert questionnaire in Google Form

*Validity and Reliability of the Questionnaire*

The results indicate that the questionnaire, in its final version, has been deemed appropriate regarding the adequacy of its questions from the experts' perspectives. This suggests that the questionnaire effectively measures what it is intended to measure. In other words, the current questions, according to the experts, comprehensively cover all the desired aspects of the study (Tab. 1).

Reliability: To assess the reliability of the designed questionnaire, Cronbach's alpha coefficient was calculated using a confidence level of 95%. As presented in the table below, the overall Cronbach's alpha for the questionnaire is 0.947. This value, which exceeds the threshold of 0.8, indicates a high level of reliability for the questionnaire as a whole.

Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .947 | 40 |

The table below presents the results of the Cronbach's alpha calculations for each individual question. The Cronbach's alpha for every question in the questionnaire exceeds 0.94, indicating that, according to the experts surveyed, each question demonstrates a high level of reliability. Consequently, there is no need to modify or eliminate any of the questions (Tab. 2).

*Performing Statistical Calculations and Analyzing Factors Affecting Activism*

*Descriptive Analysis*

Following the collection of data from the expert statistical community and the assessment of validity and reliability, a descriptive analysis was conducted for the variables, as shown in the table below. The results indicate that the highest average values among the studied factors belong to Q18 (Interdisciplinary Studies), Q38 (Understanding the Effects of Social Phenomena), and Q37 (Understanding the Effects of Cultural Phenomena), with averages of 4.64, 4.64, and 4.6, respectively. These values highlight the sig-

Table 1: Calculations related to questionnaire validity

| Factor | CVI | Factor | CVI | Factor | CVI | Factor | CVI |
|---|---|---|---|---|---|---|---|
| Designer's personal interests = Q1 | 0.88 | Strategies for Activist Designers=Q11 | 0.96 | Synergy=Q21 | 0.8 | Creating a space for creativity=Q31 | 0.92 |
| Questioning skills = Q2 | 0.88 | Technology=Q12 | 0.8 | Action Research=Q22 | 0.88 | Research limitations=Q32 | 0.8 |
| Visual awareness = Q3 | 0.96 | Problem Solving=Q13 | 0.8 | Sustainability and Green Architecture=Q23 | 0.8 | The role of the studio space=Q33 | 0.8 |
| Social skills = Q4 | 0.92 | Creating a Sense of Experience=Q14 | 0.88 | Facilitative Techniques=Q24 | 0.8 | Lack of educational infrastructure=Q34 | 0.84 |
| Individual motivation = Q5 | 0.88 | Social and Ethical Values=Q15 | 0.92 | Professional Interventions=Q25 | 0.8 | The prevailing political model=Q35 | 0.8 |
| Sense of ownership over the design problem = Q6 | 0.76 | Performance Assessment=Q16 | 0.8 | Flexibility=Q26 | 0.84 | Historical influences=Q36 | 0.8 |
| Sense of foresight = Q7 | 0.8 | Learning Styles=Q17 | 0.84 | Interaction and Participation=Q27 | 0.92 | Understanding the effects of cultural phenomena=Q37 | 1 |
| Emotional intelligence = Q8 | 0.76 | Interdisciplinary Studies=Q18 | 0.92 | Human Networking=Q28 | 0.84 | Understanding the effects of social phenomena=Q38 | 1 |
| Mental perception = Q9 | 0.88 | Social Responsibility=Q19 | 0.88 | Environmental Responsibility=Q29 | 0.84 | International and intercultural communication=Q39 | 0.88 |
| Active teaching = Q10 | 0.84 | Critical Thinking=Q20 | 0.96 | Social Impact Analysis=Q30 | 0.92 | Economic impacts=Q40 | 0.88 |

nificance of these factors from the perspective of the experts surveyed.

Furthermore, the average values of the remaining factors are all greater than 2.5, suggesting that the factors identified by the researcher hold high relative importance according to the expert community. On the other hand, the standard deviation of the factors, based on the 5-point Likert scale, is acceptable, with the highest standard deviation associated with Q35 (The Prevailing Political Model), which has a value of 0.9. The relatively low standard deviations observed for the other factors indicate a consensus among the expert community regarding the ratings assigned to each question (Tab. 3).

*Assessing the Normality of Factors Using Shapiro's Method*

Although the Shapiro ranking algorithm is not a specific ranking method, it serves as a technique for assessing the normality of feature distributions. Commonly utilized in the context of one-dimensional feature ranking, individual features are evaluated based on their distribution characteristics. In this research, the Shapiro-Wilk test is applied using Python to determine the normality of the factors. The closer the Shapiro-Wilk index of a factor is to 1, the greater its normality (Chart 2). To perform this analysis, the following code snippets have been used in this study to rank the factors:

```
visualizer=Rank1D(algorithm='shapiro')
visualizer.fit(Crysler)
# Fit the data to the visualizer
visualizer.transform(Crysler)
# Transform the data
visualizer.ax.set_ylabel("Activism Factors")
visualizer.ax.set_yticklabels (values)
visualizer.show
```

Table 2: Calculations for Cronbach's alpha

**Item-Total Statistics**

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Squared Multiple Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|---|
| Designer's personal interests | 166.9200 | 257.243 | .738 | . | .944 |
| Questioning skills | 166.8000 | 261.167 | .492 | . | .946 |
| Visual awareness | 166.7200 | 262.127 | .541 | . | .946 |
| Social skills | 166.6000 | 269.750 | .082 | . | .949 |
| Individual motivation | 166.7200 | 256.543 | .686 | . | .944 |
| Sense of ownership over the | 167.1200 | 256.777 | .521 | . | .946 |
| Sense of foresight | 166.8800 | 257.610 | .580 | . | .945 |
| Emotional intelligence | 167.0400 | 253.623 | .675 | . | .944 |
| Mental perception | 166.8800 | 265.360 | .315 | . | .947 |
| Active teaching | 166.9600 | 257.123 | .695 | . | .944 |
| Strategies of activist | 166.7600 | 260.523 | .644 | . | .945 |
| Technology | 166.9200 | 253.410 | .675 | . | .944 |
| Problem solving | 166.7600 | 258.107 | .530 | . | .946 |
| Creating a sense of | 166.9600 | 266.040 | .307 | . | .947 |
| Social and ethical values | 166.6400 | 261.323 | .507 | . | .946 |
| Performance assessment | 166.9600 | 255.540 | .704 | . | .944 |
| Learning styles | 166.9600 | 255.540 | .772 | . | .944 |
| Interdisciplinary studies | 166.4400 | 260.007 | .583 | . | .945 |
| Social responsibility | 166.5600 | 261.173 | .465 | . | .946 |
| Critical thinking | 166.6000 | 264.583 | .393 | . | .946 |
| Synergy | 166.8400 | 258.057 | .549 | . | .945 |
| Action research | 166.8400 | 258.557 | .629 | . | .945 |
| Sustainability and green | 166.9200 | 252.827 | .697 | . | .944 |
| Facilitative techniques | 167.1200 | 251.943 | .740 | . | .944 |
| Professional interventions | 166.9200 | 255.243 | .697 | . | .944 |
| Flexibility | 167.0000 | 257.083 | .726 | . | .944 |
| Interaction and participation | 166.8400 | 259.973 | .627 | . | .945 |
| Human networking | 166.7600 | 257.940 | .579 | . | .945 |
| Responsibility towards the | 166.9200 | 255.660 | .555 | . | .945 |
| Social impact analysis | 166.5200 | 261.510 | .498 | . | .946 |
| Creating a space for creativity | 166.7200 | 256.460 | .761 | . | .944 |
| Research limitations | 167.0800 | 254.993 | .603 | . | .945 |
| The role of studio space | 166.8800 | 258.027 | .562 | . | .945 |
| Lack of educational | 166.7600 | 258.690 | .474 | . | .946 |
| Dominant political paradigm | 166.8400 | 265.723 | .182 | . | .949 |
| Historical influences | 166.9200 | 261.243 | .440 | . | .946 |
| Understanding the effects of | 166.4800 | 261.260 | .674 | . | .945 |
| Understanding the effects of | 166.4400 | 264.340 | .492 | . | .946 |
| International and intercultural | 166.5200 | 259.677 | .533 | . | .946 |
| Economic influences | 166.6000 | 269.750 | .092 | . | .949 |

Table 3: Standard deviation of factors

| | Y | Q 1 | Q 2 | Q 3 | Q 4 | Q 5 | Q 6 | Q 7 | Q 8 | ... | Q 31 | Q 32 | Q 33 | Q 34 | Q 35 | Q 36 | Q 37 | Q 38 | Q 39 | Q 40 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| count | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | ... | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| mean | 4.12 | 4.16 | 4.28 | 4.36 | 4.48 | 4.36 | 3.96 | 4.2 | 4.04 | ... | 4.36 | 4 | 4.2 | 4.32 | 4.24 | 4.16 | 4.6 | 4.64 | 4.56 | 4.48 |
| std | 0.526 | 0.625 | 0.678 | 0.569 | 0.770 | 0.700 | 0.889 | 0.764 | 0.841 | ... | 0.638 | 0.866 | 0.764 | 0.852 | 0.970 | 0.746 | 0.500 | 0.490 | 0.712 | 0.714 |
| min | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | ... | 3 | 2 | 3 | 2 | 2 | 3 | 4 | 4 | 3 | 3 |
| 25% | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | ... | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 50% | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | ... | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 |
| 75% | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | ... | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| max | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | ... | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

The results of this test are presented as follows:

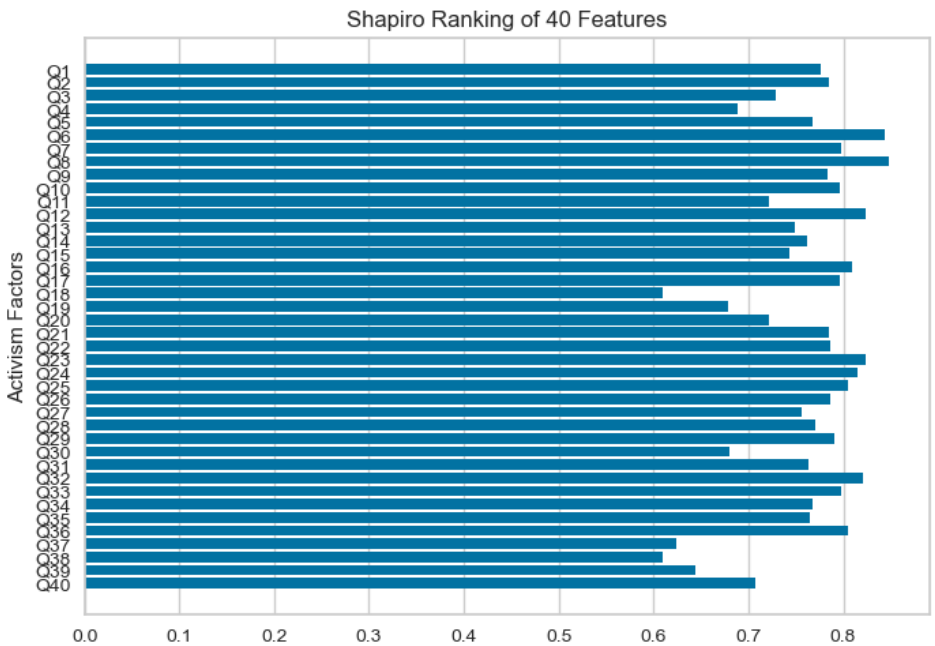


Chart 2: Normality of factors using Shapiro's method

As illustrated, nearly all the factors analyzed in this study exhibit an acceptable level of normality according to the Shapiro-Wilk test. Consequently, parametric statistical tests can be employed with confidence.

*Factor Correlation Test*

The Pearson correlation coefficient quantifies the degree of linear relationship between quantitative variables and is often abbreviated as "r." In any given study, there may be a relationship between variables, meaning that changes in one variable can influence changes in another. For instance, an increase in the value of one variable may lead to an increase in the value of another variable. The strength of this relationship is reflected in the correlation coefficient; values close to r = 1 indicate a strong positive correlation. Conversely, if there is no relationship between the two variables, they are independent, resulting in a correlation coefficient of r = 0.

It is also essential to recognize that variables can influence each other in an inverse manner. In such cases, an increase in one variable may lead to a decrease in the other, resulting in a negative correlation, denoted by a negative r value.

The Pearson correlation coefficient for two random variables is defined as the covariance of the variables divided by the product of their standard deviations. For a statistical population, the population correlation coefficient is defined as follows:

$$\rho X,Y=\frac{cov(X,Y)}{\sigma X\sigma Y}=\frac{E[(X-\mu X)(Y-\mu Y)]}{\sigma X\sigma Y}$$

In this equation, cov represents the covariance, σx denotes the standard deviation of variable X, μx is the mean of variable X, and E signifies the mathematical expectation. The mathematical expectation refers to the expected value of a discrete random variable, which is calculated as the sum of the products of the probabilities of each possible event and the value corresponding to that event.

For a statistical sample consisting of n pairs of data (Xi,Yi), the Pearson correlation coefficient is defined as follows:

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

To conduct the correlation coefficient test in this study, the Pearson t-test will be utilized in Python. The diagram below illustrates the correlation between factors using colored blocks. A greater contrast in color among these blocks indicates a stronger correlation depth between the factors. The accompanying table demonstrates that the factors exhibit suitable correlation coefficients(Table 3.3.3).

Particularly, values in this table with significant positive correlation coefficients (greater than 0.5) should be taken into account when developing a conceptual model. This implies that when considering one of the two factors, incorporating the factor that has a positive correlation can enhance the influence of activism in architectural design schools, as these factors mutually reinforce each other's effects. The factors with a positive interaction effect are highlighted in the chart below(Chart 3).

Next, the Pearson coefficient was calculated for all factors. The above table shows the importance of the first 20 factors. As the above table shows, there is both positive and negative correlation between the studied factors. The highest correlation belongs to factors Q11, strategies of active designers, and Q18, interdisciplinary studies, with a value of 0.812, respectively, which indicates a very high interaction effect between these two factors. Calculating these values is important because in the next section, when recommending a conceptual model, the researcher can, after selecting a factor with a high regression coefficient (which will be explained in the next section), also consider factors that have a very high correlation coefficient with that specific factor (with a high regression coefficient), so that the synergy between the factors is strengthened and a stronger conceptual model is formed. Conversely, if a factor with a high regression coefficient is selected, the researcher should avoid those factors that have a negative interaction coefficient with the selected factor because selecting those factors together will neutralize each other's interaction effect. This issue is discussed in the conceptual model section.

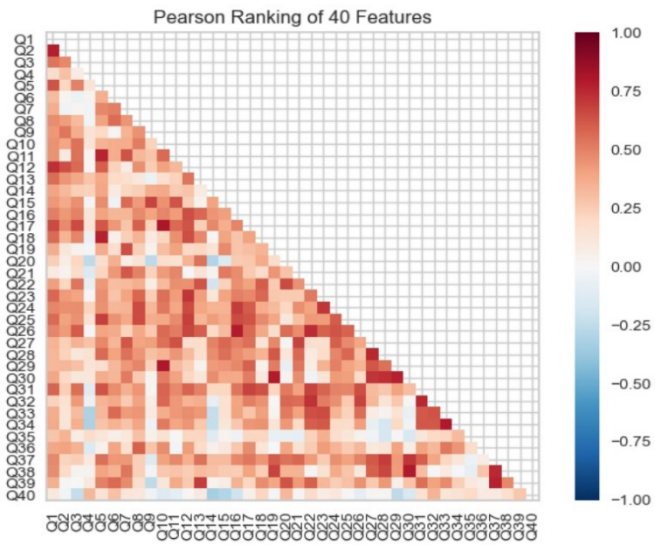


Chart 3: Correlation coefficient between factors

Table 3.3.3: Correlation coefficient between factors

| Now | Y | Q 1 | Q 2 | Q 3 | Q 4 | Q 5 | Q 6 | Q 7 | Q 8 | Q 9 | Q 10 | Q 11 | Q 12 | Q 13 | Q 14 | Q 15 | Q 16 | Q 17 | Q 18 | Q 19 | Q 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y | 1 | -0.323 | -0.027 | -0.067 | -0.09 | -0.213 | 0.057 | 0.134 | 0.037 | 0.296 | 0.07 | -0.179 | -0.102 | 0.2 | -0.162 | -0.462 | 0 | 0.039 | -0.077 | 0.284 | -0.103 |
| Q 1 | -0.323 | 1 | 0.446 | 0.369 | 0.267 | -0.045 | 0.444 | 0.1 | 0.353 | 0.177 | 0.049 | 0.314 | 0.575 | 0.328 | 0.399 | 0.349 | 0.448 | 0.288 | 0.314 | 0.383 | 0.382 |
| Q 2 | -0.027 | 0.446 | 1 | 0.775 | 0.535 | 0.18 | 0.625 | 0.312 | 0.367 | 0.464 | 0.434 | 0.453 | 0.446 | 0.734 | 0.559 | 0.391 | 0.435 | 0.507 | 0.653 | 0.569 | 0.366 |
| Q 3 | -0.067 | 0.369 | 0.775 | 1 | 0.484 | 0.29 | 0.218 | 0.019 | -0.032 | 0.418 | 0.533 | 0.384 | 0.084 | 0.641 | 0.441 | 0.324 | 0.37 | 0.437 | 0.476 | 0.339 | 0.117 |
| Q 4 | -0.09 | 0.267 | 0.535 | 0.484 | 1 | 0.065 | 0.498 | -0.053 | 0.019 | 0.317 | 0.363 | 0.541 | 0.542 | 0.565 | 0.376 | 0.234 | 0.455 | 0.497 | 0.652 | 0.487 | 0.033 |
| Q 5 | -0.213 | -0.045 | 0.18 | 0.29 | 0.065 | 1 | 0.13 | 0.029 | -0.028 | -0.031 | 0.134 | 0.127 | 0.016 | 0.005 | 0.281 | 0.231 | -0.023 | 0.116 | 0.127 | -0.058 | -0.018 |
| Q 6 | 0.057 | 0.444 | 0.625 | 0.218 | 0.498 | 0.13 | 1 | 0.359 | 0.483 | 0.399 | 0.203 | 0.35 | 0.761 | 0.599 | 0.38 | 0.389 | 0.461 | 0.404 | 0.619 | 0.769 | 0.36 |
| Q 7 | 0.134 | 0.1 | 0.312 | 0.019 | -0.053 | 0.029 | 0.359 | 1 | 0.503 | 0.56 | 0.015 | 0.36 | 0.364 | 0.229 | 0.194 | 0.088 | -0.04 | 0.331 | 0.431 | 0.047 | 0.165 |
| Q 8 | 0.037 | 0.353 | 0.367 | -0.032 | 0.019 | -0.028 | 0.483 | 0.503 | 1 | 0.441 | 0.338 | 0.361 | 0.627 | 0.077 | 0.163 | 0.218 | 0.57 | 0.331 | 0.279 | 0.24 | 0.642 |
| Q 9 | 0.296 | 0.177 | 0.464 | 0.418 | 0.317 | -0.031 | 0.399 | 0.56 | 0.441 | 1 | 0.445 | 0.512 | 0.328 | 0.457 | 0.104 | 0.238 | 0.424 | 0.47 | 0.587 | 0.339 | 0.242 |
| Q 10 | 0.07 | 0.049 | 0.434 | 0.533 | 0.363 | 0.134 | 0.203 | 0.015 | 0.338 | 0.445 | 1 | 0.233 | 0.278 | 0.243 | -0.048 | 0.366 | 0.675 | 0.391 | 0.233 | 0.081 | 0.036 |
| Q 11 | -0.179 | 0.314 | 0.453 | 0.384 | 0.541 | 0.127 | 0.35 | 0.36 | 0.361 | 0.512 | 0.233 | 1 | 0.566 | 0.406 | 0.159 | 0.38 | 0.45 | 0.486 | 0.812 | 0.204 | 0.301 |
| Q 12 | -0.102 | 0.575 | 0.446 | 0.084 | 0.542 | 0.016 | 0.761 | 0.364 | 0.627 | 0.328 | 0.278 | 0.566 | 1 | 0.327 | 0.228 | 0.254 | 0.63 | 0.417 | 0.566 | 0.455 | 0.402 |
| Q 13 | 0.2 | 0.328 | 0.734 | 0.641 | 0.565 | 0.005 | 0.599 | 0.229 | 0.077 | 0.457 | 0.243 | 0.406 | 0.327 | 1 | 0.533 | 0.287 | 0.244 | 0.643 | 0.627 | 0.648 | 0.2 |
| Q 14 | -0.162 | 0.399 | 0.559 | 0.441 | 0.376 | 0.281 | 0.38 | 0.194 | 0.163 | 0.104 | -0.048 | 0.159 | 0.228 | 0.533 | 1 | 0.09 | 0.038 | 0.576 | 0.237 | 0.479 | 0.207 |
| Q 15 | -0.462 | 0.349 | 0.391 | 0.324 | 0.234 | 0.231 | 0.389 | 0.088 | 0.218 | 0.238 | 0.366 | 0.38 | 0.254 | 0.287 | 0.09 | 1 | 0.393 | 0.444 | 0.484 | 0.009 | 0.14 |
| Q 16 | 0 | 0.448 | 0.435 | 0.37 | 0.455 | -0.023 | 0.461 | -0.04 | 0.57 | 0.424 | 0.675 | 0.45 | 0.63 | 0.244 | 0.038 | 0.393 | 1 | 0.413 | 0.354 | 0.398 | 0.473 |
| Q 17 | 0.039 | 0.288 | 0.507 | 0.437 | 0.497 | 0.116 | 0.404 | 0.331 | 0.331 | 0.47 | 0.391 | 0.486 | 0.417 | 0.643 | 0.576 | 0.444 | 0.413 | 1 | 0.486 | 0.277 | 0.277 |
| Q 18 | -0.077 | 0.314 | 0.653 | 0.476 | 0.652 | 0.127 | 0.619 | 0.431 | 0.279 | 0.587 | 0.233 | 0.812 | 0.566 | 0.627 | 0.237 | 0.484 | 0.354 | 0.486 | 1 | 0.4 | 0.301 |
| Q 19 | 0.284 | 0.383 | 0.569 | 0.339 | 0.487 | -0.058 | 0.769 | 0.047 | 0.24 | 0.339 | 0.081 | 0.204 | 0.455 | 0.648 | 0.479 | 0.009 | 0.398 | 0.277 | 0.4 | 1 | 0.337 |
| Q 20 | -0.103 | 0.382 | 0.366 | 0.117 | 0.033 | -0.018 | 0.36 | 0.165 | 0.642 | 0.242 | 0.036 | 0.301 | 0.402 | 0.2 | 0.207 | 0.14 | 0.473 | 0.277 | 0.301 | 0.337 | 1 |

*Weight Calculations for Factors Influencing Activism*

Regression analysis is employed to examine the effects of variables by considering their simultaneous relationships. The term “regression” literally means to return to the past, reflecting the method’s reliance on historical data to predict future outcomes. Through regression analysis, a linear relationship is established between the response variable and one or more explanatory variables. The response variable is often referred to as the dependent variable, while the explanatory variables are known as independent variables.

In this study, regression is utilized to assess the impact of each independent variable (denoted as x, representing the factors identified in the previous chapter) on the dependent variable (denoted as Y, which signifies the effectiveness of activism in the architectural design education process). This analysis helps determine the weight of each factor and its influence on activism within the educational context. Understanding these relationships is crucial for identifying and selecting the factors that will be used in the subsequent step to develop effective training solutions.

The Multiple Linear Regression (MLR) method employs the following general relationship to establish connections between multiple independent variables and the dependent variable:

$$y_i=\beta_0+\beta_1 x_{i1}+\beta_2 x_{i2}+...+\beta_p x_{ip}+\varepsilon$$

In the formula above, i=n represents the number of observations, yi denotes the dependent variable, xi refers to the independent

variables, β0 represents the intercept (which is considered to be zero), and βp indicates the weight coefficients for each independent variable. In this section, we will implement the simple multivariate regression formula to calculate the factor weights using Python. The following code will be used for these calculations:

```
df = pd.DataFrame(Milan)
X = sm.add_constant(Crysler)
#Perform the regression analysis
model = sm.OLS(Crysler).fit()
Get the regression coefficients
coefficients = model.params
print('Regression Vector is',coefficients)
```

The weight results will be as follows:

Regression Vector is [ 0.137 0.565 0.061 0.058 0.154 0.106 0.013 0.073 0.309 0.037 0.25 0.099 0.154 0.692 0.041 0.557 0.104 0.131 0.021 0.136 0.286 0.038 0.004 0.025 0.212 0.033 0.309 0.241 0.128 0.143 0.466 0.067 0.413 0.224 0.103 0.297 0.109 0.174 0.048 0.103]

- From the table above, we can identify the factors that have the most significant impact on the dependent variable, which is the effectiveness of activism in architectural design education. For instance, since the coefficient for the second factor (questioning skill) is 0.56, this indicates that it has a considerable effect on the effectiveness of activism in this educational context compared to other factors. Therefore, it will undoubtedly be included as one of the key elements in the conceptual model presented in the next section.Definition of concepts and variables:
  - Dependent variable: The effect of activism on architectural design education, which is considered the Y variable in the tables.
  - Independent variables: 40 factors identified from individual factors, educational system, educational infrastructure, and environmental phenomena
- Regression results analysis:Regression coefficients reflect the weight of each factor's effect on the dependent variable. Factors with higher regression coefficients are considered more significant in the conceptual model. Based on the regression table, the factors that exhibit the highest correlation coefficients with the dependent variable have been identified as the primary factors:Q14: Creating a sense of experientiality factor with the highest impact with a value of 0.692
- Q2: The questioning skill factor demonstrates the highest impact, with a coefficient of 0.565.
- Q16: The performance evaluation factor follows closely, with a coefficient of 0.557.
- Q31: The factor related to creating a space for creativity has a significant impact, with a coefficient of 0.466.
- Q33: Lastly, the role of the studio space factor has an impact value of 0.413.
- These factors will be considered as the primary components of the conceptual model. In this model, the researcher has established a base of five main variables. It is important to note that this number is influenced by the budget allocated to the project. Should additional factors be identified, the same process of selecting those with the highest regression weight coefficients will be applied.
- Analysis of correlation results: Next, we will utilize the Pearson correlation coefficient matrix to identify the variables that exhibit the greatest interaction effects with the five selected variables mentioned above, as well as those that have high regression coefficients (Tab. 4).

The table above presents the most influential factors in the conceptual model: Q14, Q2, Q16, Q31, and Q33, along with their most relevant and irrelevant factors (i.e., those with the highest and lowest interaction effects, respectively). The interpretation of this table indicates that the five variables listed will serve as the primary components of the model.

When considering auxiliary (secondary) variables, the columns detailing "Factors with the Highest Positive Interaction Coefficient" and "Factors with the Highest Negative Interaction Effect" will serve as valuable guides for the re-

Table 4: Correlation analysis results

| Factors with the highest negative correlation coefficient | Factors with the highest positive interaction effect | The most influential factors of the model (with the highest weight coefficients) |
|---|---|---|
| Q21Synergy:(-0.289) | Q28: Interaction and participation (0.498) | Q14: The factor of creating a sense of experience with the highest impact with a value of 0.692 |
| There is no negative correlation coefficient with other variables. | Q18: Interdisciplinary studies (0.484) | Q2: The factor of questioning skills with the highest impact with a value of 0.565 |
| Q36:Historical Effects(-0.043) | Q2: Questioning skills (0.775) | Q16: The factor of performance evaluation with the highest impact with a value of 0.557 |
| Q5:Personal Motivation(-0.112) | Q13: Problem solving (0.734) | Q31: The factor of creating a space for creativity with the highest impact with a value of 0.466 |
| Q5:Personal Motivation(-0.312) | Q27: Flexibility (0.785) | Q33: The factor of the role of the studio space with the highest impact with a value of 0.413 |

searcher. For instance, if Q14 is designated as a main variable, selecting Q28 and Q18 would be advantageous, as these variables will enhance the effect of Q14 due to their positive interaction effects. Conversely, if Q14 is selected, the variable Q21 should be avoided, as it would diminish the impact of Q14 owing to its negative interaction effect. This same approach will be applied to the other main variables.

*Structuring the conceptual model:*

In this section, we present a conceptual model to examine the impact of the identified enabling factors on architectural design education. The following figure illustrates the steps involved in constructing this conceptual model:

- The identified relationships are organized into a graph or diagram.
- Key concepts (dependent and independent variables) are represented using circles or rectangles.
- Lines or arrows are utilized to depict the relationships (correlation and regression effects) between the variables.
- Different colors and symbols are used to categorize the variables, including individual factors, the educational system, educational infrastructure, and environmental phenomena. (Fig. 3).

This study identified a total of 40 factors influencing activism in architectural education, categorized into four main groups: individual factors, social factors, educational systems, and educational infrastructure. The descriptive analysis revealed that factors Q18 (interdisciplinary studies), Q38 (understanding the effects of social phenomena), and Q37 (understanding the effects of cultural phenomena) exhibited the highest average values, indicating their critical importance as perceived by community experts.

Correlation analysis demonstrated a strong relationship between factors Q11 (strategies of active designers) and Q18 (interdisciplinary studies), with a correlation coefficient of 0.812. Furthermore, regression analysis identified the most impactful factors on promoting activism in architectural education as Q14 (creating a sense of experience), Q2 (questioning skills), Q16 (performance evaluation), Q31 (creating a space for creativity), and Q33 (the role of studio space). These findings underline the necessity of integrating these factors into educational practices to foster a new generation of socially-conscious designers(Fig. 3).

## RESULT AND CONCLUSION

This study aimed to develop a conceptual model designed to enhance the curriculum related to architectural design. The conceptual model emphasizes the integration of various factors that affect educational practices, highlighting the importance of interdisciplinary approaches and social awareness in fostering active designers. The developed conceptual model serves as a


Figure 3: Conceptual model of examining the impact of activism factors on architectural education

framework for enhancing educational programs in architecture, with the recommendation for regular updates to address potential negative interactions among the identified factors, ensuring a dynamic and effective educational framework.

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