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Research Paper

JAAD: A Model for the Judgment of Academic Architectural Designs

Case study: Undergraduate Designs with the Subject of Designing a Commercial Complex

Mohammad Reza Haidari [1], Vahid Sadram [2*]

[1] *Master of Architecture, Faculty of Architecture and Urbanism, Hakim Sabzevari University, Tohid Town, Sabzevar, Iran*

[2] *Assistant Professor, Faculty of Architecture and Urbanism, Hakim Sabzevari University, Tohid Town, Sabzevar, Iran*

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Abstract

Architectural training is a part of higher education. One of the most important issues in this context is the judgment and measurement of design students' abilities and achievements. This research aims to answer the question of possibility of a model or method for a purposive and clear judgment, so that in addition to the academic achievements of architecture as a field of study, the level of architectural design for future engineers and designers will be promoted. Reviewing the literature of the context, the two terms "assessment" and "evaluation" are initially clarified. Through these two concepts, the JAAD (Judgment of Academic Architectural Designs) model is introduced and then examined for the judgment of undergraduate architectural designs, considering design of a commercial complex as a sample to arrive at a prototype. It is expected that by using this model, lecturers will be able to achieve more purposive and accurate judgments. In addition, students can take effective steps through purposive designs in order to improve the level of training and learning of architecture, which ultimately results in flourishing architectural achievements in future.

Keywords: *Architectural design training, JAAD model, Process assessment, Product evaluation, Undergraduate architectural designs, Commercial complex.*

1. INTRODUCTION

The judgment and measurement of students' abilities in architectural design courses is considered an inseparable part in the realm of education and assumed as the last step in the process of architectural training. Therefore, this research explores this realm of inquiry to reach the JAAD – the abbreviation for "Judgment of Academic Architectural Designs" – model for judging academic architectural designs based on the AHP model. Specifically, this model is used for the judgment of undergraduate students' architectural designs with the subject of designing a commercial complex in order to arrive at a prototype, so that interested lecturers can benefit from it in their judgment. According to this model, based on two concepts of assessment and evaluation, judgment consists of two stages of process assessment and product evaluation. In the first stage, student's performance and design process are assessed according to predetermined indices and in the second stage, student's final project or product is evaluated according to the predetermined criteria. The next section poses the main research question and sub-questions emerging from it.

1.1. Research questions

The main question

• What kind of model can offer an accurate and quantifiable definition for the judgment of students' architectural design, so that jurors can distance from personal verdicts?

Sub-questions

• In judging architectural designs, what kind of indices and criteria should be measured to make the judging concepts quantifiable?

• What degree of importance can be assigned to the judging indices and criteria of undergraduate students'

[*] *Corresponding author: v.sadram@hsu.ac.ir*

architectural designs with the subject of designing a commercial complex?

1.2. The statement of the problem and the necessity of research

Today's students are in fact the designers of tomorrow's living environment. By evaluating their current designs, it could be understood whether the required issues for future designs were accurately passed on to them or not. Thus, they will show the shortcomings of their curricula, and some steps can be taken in regard to improving their curriculum and promoting their designs with a purposeful manner (Bayazidi & Hamejani, 2017).

Due to the shortage of common vocabulary for judging architectural designs in the schools of architecture in the Middle East, there is a need to create a model or method with a common tool (Uzunoglu & Uzunoglu, 2011). Judgment of architectural designs is one of the most important and challenging parts in the architectural training. Lecturers and students struggle with it in all academic semesters. On the other hand, there are neither approved standards nor regulations or at least, they have not been published yet (Mahdizadeh Seraj & Mardomi, 2008). Judgment is one of the most important stages of training; the stage by which the strengths and weaknesses of students, lecturers, methods and processes of training are identified, and the stakeholders involved in it, including decision-makers, lecturers and students, try to improve the existing conditions to take advantage in the next semesters. It seems that only in this way, will the growth of students' theoretical and design skills take place and the level of scientific knowledge in the faculties of architecture and the architectural community be realized.

Probable weakness in students' architectural designs (Mirriahi, 2006) and their dissatisfaction with the ambiguity in the results announced by the professors (Utaberta & Hassanpour, 2012), and the possibility of inadvertent errors or conflicts of taste in judgment (Mahdizadeh Seraj & Mardomi, 2008) and the complexity and ambiguity of the judgment method on the other hand can be the reasons for the need to take more measures to consider the structure and transparency of the judging process and weighting tools (indices and criteria) (Guarini, D'Addabbo, Morano, & Tajani, 2017).

If a structure for judgment is agreed and the students become aware of the method and judging factors, then their efforts to reach the educational objectives will be particularly focused. In addition, they will be able to take cautious and effective steps during the process and formation of the outcome (Bayazidi & Hamejani, 2017; Utaberta, Hassanpour, & Usman, 2010). Ultimately, it will help both students and lecturers to improve their performance (Ragheb, 2016).

2. METHODOLOGY

In this paper, descriptive-analytical method was used. Firstly, the stages and factors of judgment were identified through desk research. Afterwards, lecturers[1] of architectural design were interviewed in several universities and the data were gathered using Analytical Hierarchy process (AHP) in order to weight the judgment factors for undergraduate students' architectural designs with the subject of designing a commercial complex. Finally, the data were analyzed by Expert Choice 11[2] software, to achieve some weights in this way.

3. LITERATURE REVIEW

The literature on this research topic includes the description of the concepts, judgment, assessment, and evaluation, as well as the stages and factors of judgment, which will be followed later in this section.

3.1. Clarifying the concepts

Judgment: Gullickson defines judgment as the process of collecting data on learners in order to help the decision-maker decide regarding their progress (Mahdizadeh Seraj & Mardomi, 2008). The function of judgment is to "make visible the distance between the work that students produced, and the standards deemed acceptable by experts". This can be a great help to students to show a better performance (Marie, 2014, pp. 36, 45).

It can be understood from the definitions that judgment ends with a verdict and eventually leads to decision-making to remove the weaknesses and enhance the strengths of the agents involved.

Assessment: Assessment in architectural training is measuring the rate of progress of each student within the design process in accordance with the training program. The important point in assessment is the proximity to the destinations set by the aims of a training program, which is related to the adopted strategies by the designers. Therefore, this method is "evolutionary, process-driven, purpose-oriented, and quantitative". It considers "continuous measurement" of students during the design process through the supervision of a supervisor (Sameh & Izadi, 2014, pp. 6, 7).

[1] Interview in this research was used because by using a questionnaire, the matrices had to turn into clear questions. Thus, about 104 questions were to be answered. Answering those numbers of questions was very timely and tedious on the one hand, and on the other hand, to obtain accurate results, the content of the interview to each interviewer had to be explained. The interviews were conducted by the first author. A community was selected as interviewees of this research to weight the process of judgment, the indices of process assessment, and the criteria of product evaluation to judge the undergraduate architectural designs with the subject, designing a commercial complex. Members of this community included 14 lecturers of architecture from Shahid Beheshti University, Ferdowsi University of Mashhad, Hakim Sabzevari University, Azad University of Mashhad, University of Neyshabur and Azad University of Neyshabur. Thirteen interviewees had a PhD degree in architecture and one of them had a Master's degree. Thirteen interviewees were faculty members of the universities.

[2] Expert Choice 11 is a tool for the analysis of statistical data. It calculates and analyzes the data obtained from the AHP matrices through the geometric mean, and gives weight and priority of the factors stated in the research.

Evaluation: Evaluation is a systematic process of collecting, analyzing and interpreting information that is undertaken to determine the rate of fulfilling the aims (Gray, 1991).

Evaluation is a cross-sectional study into the internal values of each product, comparing and judging these values in order to achieve a valid ranking (Seyf, 2010). Therefore, it is "comparative, product-driven, and pluralistic", depending on the "cross-sectional judgment" of lecturers at a certain time (the project deadline) through controlling the results of the design (Sameh & Izadi, 2014, p. 7).

3.2. Stages of Judgment

To judge academic architectural designs, two different, yet effective, subjects are being measured, which indicate that the framework of judgment is based on two stages. Whereas having an appropriate term for using in the analysis of judgment and ranking seems necessary (Utaberta & Hassanpour, 2012), the first stage, which is related to the "process of design formation and student’s performance", can be termed "process assessment", and the second stage, which is related to "the outcome of the design”, can be called" product evaluation".

Stage 1: Process assessment

An assessment is made by students’ supervisor within a semester (Sameh & Izadi, 2014; Seyf, 2010). This stage portrays each student's activity during a semester in the form of "process assessment".

Stage 2: Product evaluation

This stage pictures the outcome of each student’s design at the end of the semester in the form of “product evaluation”.

3.2.1. Judgment factors

According to Lawson (2006), to judge a number of architectural designs in a way that they are prioritized and ranked, first each design with each of the judgment factors should be evaluated. The factors explored in previous scholarly works are shown in Table 1. The factors investigated in this paper are the result of these previous factors.

Table 1. Factors investigated in previous research

Researcher	Judgment Factors
Vitruvius	strength, efficiency, and beauty (Vitruvius, 1960)
Broadbent	A) Responding to human activities, proportion of the spaces with behavioral patterns and activities of the social and individual life of man; B) Protection against disturbing factors and environmental harshness, protecting man’s living spaces against climatic and atmospheric adversities and mischievous animal and human encroachment; C) Cultural symbolism, building’s significance for all of those who were in relation with it; D) Economic function, justifiability of the expenses of construction, management, reparation, and maintenance of the building; E) Environmental effectiveness, controlling building’s negative impacts on the natural environment and adjacent buildings. (Bayazidi & Hamejani, 2017, p. 55)
University of Hartford	Basic knowledge, presentation (oral, written, and graphic), practical experience (site design), concept, concept development, defenses (Mirriahi, 2003, p. 63)
University of Illinois	Considering environmental control systems, road from research to design, planning and designing a site, concept, spatial quality, building form (Mirriahi, 2003, p. 63)
University of Utah	Design-related factors (such as the site arrangement, program, content, structure, construction materials, and design system), presenting a three-dimensional striking design, graphical description and professional presentation (Utah, 2006)
Iranian Universities	The relationship between design and theoretical principles, technique and presentation, flexibility of design, innovation and creativity, student's implementation knowledge, student's capabilities of interacting with the judgment team, considering limitations and real possibilities of design, quality of concept development, addressing technical, structural, and mechanical principles of the design, timing and defending method, proper function of the spaces, paying attention to the climate, to the history, and to the volume and form of the design (Litkoohi, 2013, p. 83)
Mirriahi	Method of studying and physical planning of the design, analyzing the design context and appreciating the opportunities and limitations, innovation and creativity of the concept, quality of concept development, consistency of the theoretical principles with the implemented design, awareness of the factors influencing the design formation (religious, cultural, social, economic, and climatic factors, etc.), addressing technical principles, structural and mechanical systems, clarity of documents relevant to the design, attention to the methods and procedures appropriate to the profession, timing and oral presentation of the design (Mirriahi, 2003, p. 117)
Catherine Anthony	Concept of design, road from research to design, site design, planning and functional design, specific spatial quality, building form, design beauty, structural system, use of materials, environmental control systems, oral presentation, logical relationship between documents and

Researcher	Judgment Factors
	drawings, presentation of physical modeling (Anthony, 1991)
Mahdizadehseraj and Mardomi	Function and circulation, conceptualization and creativity, definition, proportion and beauty of space, architectural form and plastic, studies and analysis, consideration of history, realism and practical logic, environmental and climatic consistency, presentation and power of display, imagination and forward-looking, design engineering, active participation and accompaniment with class (Mahdizadeh Seraj & Mardomi, 2008, p. 504).
Sameh and Izadi	Factors associated with "the process of design formation": understanding the information and the ability to analyze and present them, awareness of methods and different design procedures, dynamic seeking attitude in the process of design research, considering methods and executive procedures appropriate to the profession, student's timing and oral presentation, number of correction meetings and way of expressing the process of design development, written evidence of previous projects and practices of architecture, participation and continuous attendance in the studio and sketch sessions, the degree of adherence to a specific design process, the relationship between design objectives and design theorization (Sameh & Izadi, 2014, p. 7) Factors related to "the content of design": paying attention to the studies and physical planning of the design, considering the design context and appreciating opportunities and limitations, observing the relationship between technical knowledge and design, innovation and creativity in the design concept and the quality of its development, The amount of flexibility and changeability of the design in the future, awareness of the factors affecting the design formation (climatic, cultural, etc), attention to innovation in the design, addressing technical principles and structural and mechanical systems, The method of graphic presentation, the clarity of the documents relevant to the design (Sameh & Izadi, 2014, p. 7)
RIBA Architectural Guidelines of the European Union	1. ability to create architectural designs that satisfy both aesthetic and technical requirements 2. adequate knowledge of the histories and theories of architecture and the related arts, technologies and human sciences 3. knowledge of the fine arts as an influence on the quality of architectural design 4. adequate knowledge of urban design, planning and the skills involved in the planning process 5. understanding of the relationship between people and buildings, and between buildings and their environment, and the need to relate buildings and the spaces between them to human needs and scale 6. understanding of the profession of architecture and the role of the architect in society, in particular in preparing briefs that take account of social factors 7. understanding the methods of investigation and preparation of the brief for a design project 8. understanding the structural design, constructional and engineering problems associated with building design 9. adequate knowledge of physical problems and technologies and the function of buildings so as to provide them with internal conditions of comfort and protection against the climate 10. the necessary design skills to meet building users' requirements within the constraints imposed by cost factors and building regulations 11. adequate knowledge of the industries, organizations, regulations and procedures involved in translating design concepts into buildings and integrating plans into overall planning (Uzunoglu & Uzunoglu, 2011, p. 1010).
Ahadi	dynamic seeking mind in the road of research to design, awareness of various methods and processes of design, data collection and the ability to analyze and present them, the quality of student's oral presentation, the degree of adherence to a specific design process, selection of strategies and appropriate methods for achieving the aims, the relationship between the objectives of design and theoretical principles, the number of correction meetings and the way of expressing the process of design formation, attendance in the studio and sketch sessions, The quality of presenting written evidence of the progress of the design project, paying attention to the studies and physical planning of the design, considering the design context and appreciating the opportunities and limitations, planning and design of the site, innovation and creativity in the design concept and the quality of its development, understanding the factors affecting the design formation, spatial organization and planning and functional design, consistency of form with the function and context of the design, addressing technical principles and structural and mechanical systems, the quality of the documents relevant to the design as well as observing the drawing principles, method of graphic presentation (Ahadi, 2018, p. 82)
Bayazidi & Hamejani	Selection, placement, relations of function, form, volume, internal arrangement and circulation; Considering the studies, analyzing and planning the body of the project; Considering the substrate of the project and recognizing the facilities and their limits; Engineering of the project:

Researcher	Judgment Factors
	considering the relationship between technical knowledge and designing; Using imagination, innovation and creativity when it comes to the idea of the project and the quality of developing this idea; Providence: flexibility and variability of the design in the future; Being aware of the factors affecting the formation of the design (moral, tribal, and cultural); Being practically logical and realistic, paying attention to the applicableness of the design and its compliance with the topic; Taking into account the technical principles, structural systems and machineries; Graphic (visual) and oral (introduction and defense) (Bayazidi & Hamejani, 2017, p. 47)
Massoudinejad	Clarifying the life story in the building, optimal organization of spaces, physical planning, appreciating the opportunities and limitations of the context on a micro-scale(the location of design) and on a macro-scale (climate and environmental issues), planning for the context, Fluidity in conceptualization, originality and innovation in conceptualization, selection of the final concept, flexibility in finding proper solutions, setting harmony amongst aims, regulations and the scheme, delivery of required documents with proper quality, quantity of the delivered documents (such as the design process, two-dimensional drawings, three-dimensional images and the physical model) (Masoudinejad, 2011, pp. 36-37)

Since measuring and judging the design embracees both qualities and quantities (Lawson, 2013), and whereas, they depend upon both the process and the content of the design product, which in turn require independent variables, judgment factors should also be of two types, quantitative and qualitative. They are called "index" and "criterion" (Sameh & Izadi, 2014, p. 6).

Index is defined as identifier and indicator, an informing tool for policy-making and decision-making. It is considered as the tools or factors in used in assessing the rate of progress (Tabibian, 2002). An index is a scientific portrayal of the features of a phenomenon (Gallopin, 1996, p. 102). In general, indices are used to assess, monitor, control, guide, support, and develop a process (Sameh & Izadi, 2014).

Criteria are factors for identifying and selecting the works. They are principles for judgment and help us identify a phenomenon as a valuable asset (Rahimzadeh, 2009, p. 133). A criterion is a distinguishing property or characteristic of anything, by which its quality can be judged or estimated, or by which a decision or classification may be made (Utaberta & Hassanpour, 2012, p. 144). Quality is identified through design criteria in a dialogue-based judgment of architecture and urban design projects (Rönn, 2011, p. 100). Criteria should arise from an intellectual model because otherwise it would become personal (Sameh & Izadi, 2014).

4. A FRAMEWORK FOR THE JUDGMENT PROCESS

In the present study, the framework for the judgment process is summarized in six steps:

1. Defining the aims (Raeesdana, 1991; Worthen & Sanders, 1987) 2. Determining proper factors for the judgment (Raeesdana, 1991), including indices and criteria that are directly related to the aims 3. Calculating the weight of each factor 4. Calculating the weight of the process assessment and product evaluation stages 5. Measuring the rate of success of each student in achieving the aims and the determined factors 6. Analyzing and comparing the results of the data (Worthen & Sanders, 1987) and calculating the final scores of each student.

Since the training and learning process of architectural design is different and more complex than the theoretical courses, having an integrated framework for judgment seems to be necessary. As a result, students will also be better prepared to receive criticisms (Utaberta, Hassanpour, Bahar, & Ani, 2013).

4.1. JAAD (Judgment of Academic Architectural Design) model

“In recent years, universities have made explicit overtures towards criteria-based grading and reporting. Under these models, grades are required to show how well students achieve the juror’s expectations. These expectations can be explained in different forms” (Sadler, 2005, p. 178).

Whereas the training process is completed when the judgment of architectural designs relies upon a purposive and clear method or model (Robert, 2006, pp. 167, 181), in this part, the JAAD (Judgment of Academic Architectural Designs) model will be introduced and tested for judging students’ architectural design.

This model is composed of three steps of identifying judgment factors, weighting judgment factors, and weighting the stages of judgment. These steps should be followed to judge undergraduate architectural designs, introducing the design of a commercial complex as a case study. The results of each stage are presented at the end of it.

Step one: identifying judgment factors

In this step, judgment factors will be identified.

A) Indices of process assessment include:

1. Imagination = imagination and forward-looking 2. Creativity = creativity and conceptualization at the right time (process-driven creativity) 3. Data analysis = understanding the data and the ability to analyze them 4. Adherence to the design method = using a proper style, method, and procedure and adherence to a definite design

process 5. A dynamic mind = a dynamic seeking mind in the design process 6. Implementation viewpoint = Considering the appropriate methods and procedures suitable for the profession 7. Oral presentation = timing method and oral presentation 8. Quality and quantity of correction meetings = the number of correction meetings and the quality of design development process and continuous attendance in the arranged events 9. Relationship between the aim and the concept = the relation between objectives of the design and theorization and design concepts 10. Progress = student’s progress during the design process 11. Balance between alternatives = a balanced presentation of longitudinal and cross-sectional alternatives (in terms of quantity and quality) 12. Falling less into traps[1]= falling less into design traps and early-escaping

B) The criteria of product evaluation include:

1. Attention to the agenda = Attention to the agenda, needs and requirements of the design 2. Attention to the context = attention to the design context, understanding the facilities, limitations, opportunities and threats of the context and the awareness of factors affecting the design formation (religious, climatic, cultural, etc.) 3. Technical knowledge = Observing the relation between technical knowledge and design 4. Structure and statics = considering structural and mechanical systems; consistency of the selected materials with the context, statics, form of design, concept, cost and maintenance 5. Backward-looking and forward-looking = looking at the history of architecture and the degree of flexibility, changeability and future of the design 6.The quality and quantity of final presentation = the clarity and fulfilment of project's demanded documents 7. Spatial function (plan) = legibility, proportion, geometry of the plan, and the beauty and efficiency of the spaces 8. Physical geometry (form) = geometrized stunning form 9. Creativity = Innovation and creativity in the design concept and the quality of its development (product-driven creativity)

True and rational judgment is only made whenl first, the judgment factors be rightly selected and then, the effectiveness of each factor be determined in proportion to its importance (Ahadi, 2018, p. 87). In the second step, weighting the judgment factors is taken into account. (See Figure 1)

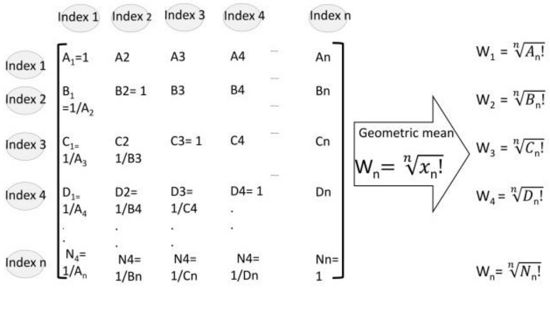

Fig 1. The weighting matrix of indices for process assessment

Step Two: weighting judgment factors

Given the dependency and the close relationship between judgment and the process of architectural training, each judgment factors is allocated weight, different priorities (Montgomery, 2002), and specific percentages to show the major and minor objectives of a training course (Utaberta & Hassanpour, 2012). In this paper, the matrix model of AHP is employed, which uses pairwise comparisons. Expert Choice 11 is used as a weight measurement device or a coefficient for each factor. (Figures 1 and 2) Weighting each of the stages and judgment factors is conducted by a survey of architectural design lecturers, in a way that when these matrices are presented to them, they are asked to put numbers[2] in the matrices using the pairwise comparison method.

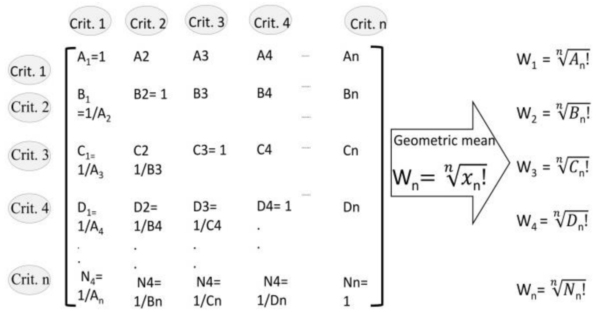

Fig 2. The weighting matrix of criteria for product evaluation

Judgment factors seem considerably different for different projects at different levels; thus, they can be applied to some cases (Güzelci & Şener, 2018; Hassid, 1962). As a result, the weight of each judgment factor will be different for the projects with different subjects in different academic semesters. In the example presented here (for judging undergraduate architectural designs with the subject of designing a commercial complex), the percentage weight of the process assessment indices and the product evaluation criteria, extracted from the interviews, were calculated. The results can be seen in Table 2 and 3.

[1] Traps here refer to design traps, which are of different types. When facing a trap, a novice designer struggles with a trivial problem and tries to solve it. However, an experienced designer solves the problem by adding some changes or replacing some issues. In such situations, novice designers are so involved with the problem that they forget the aim and main items of the design, or degrade them in terms of priority (Lawson, 2013, p. 297).

[2] In the pairwise comparison method, the numbers in the matrices will be between 1 and 9, or it will be a fraction number. To explain more, the person compares two items and if the first item (one of the rows) is highly important than the second item (one of the columns), then 7 is written in the allocated position. If the second item is highly important than the first item, then the interviewee writes 1/7.

Table 2. Calculating percentage weight of the process assessment indices

Lecturers of architectural design \ Indices of assessment	Index 1: Imagination	Index 2: Creativity	Index 3: Data Analysis	Index 4: Adherence to the design method	Index 5: A dynamic mind	Index 6: Implementation viewpoint	Index 7: Oral presentation	Index 8: Quality and quantity of correction meetings	Index 9: Relationship between the aim and the concept	Index 10: progress	Index 11: Balance between alternatives	Index 12: Falling less into traps
Dr. Hassan Staji	4.11	24.1	8.5	5.5	10	7.4	1.4	1.6	11.7	10.4	5.5	2.4
Dr. Hadi Baqeri Sabzevari	8.2	22.4	13.3	6.6	16.2	3.9	3.5	4.1	9.5	3.7	6.5	2.1
Dr. Mehdi Hamzenejad	13.5	10.8	16.3	3.5	8	4.5	8.3	10.7	4.4	6.6	5.9	7.4
Dr. Hassan Rezai	4.9	4.2	11.3	13.1	3.8	11.7	10	11.6	4.9	10.3	5.6	3.8
Dr. Yasser Zarei	11.6	23.2	4.2	5.5	8.9	2.7	3.6	8.4	7.8	6.1	2.1	15.9
Dr. Bahram Siavashpoor	4	27.9	10.9	7.7	9.4	13.7	1.9	4.2	13.7	3.1	2.1	1.6
Dr. khosro Sahhaf	40.9	6.1	12.4	5.7	9.4	1.7	2	4.1	4.9	4.9	5.1	2.7
Dr. Vahid Sadram	7.1	13.8	12	3.5	5	5.2	4.5	11.9	11.5	16.4	6.2	2.9
Dr. Jafar Taheri	5	8.5	12.6	10.4	9.8	4.3	4	11.1	14.7	7.7	8.6	3.2
Dr. Shahab Abbaszadeh	16.1	21.5	7.1	16.4	4.9	9.5	3	3.8	8.6	3.8	3.5	1.9
Eng. Abasalt Asgari	13.1	28.9	13.2	4.5	16.2	2.4	1.4	2.2	9.4	3.2	3.1	2.3
Dr. Sarah Farbod	7.9	7.2	7.8	3.1	8.2	5.9	5.6	8.5	11.8	17.4	2.5	14.1
Dr. Nasser Mohseni	2	19.7	6.8	8.4	12.7	2.1	3.9	5.5	15.3	16.7	3.3	3.7
Dr. Hamid Nadimi	18.9	16	3.5	3.4	18.8	3.6	3.3	4	7.8	6.5	6.7	7.7
Final percentage weight (- 0.38 Tolerance)	11.75	16.73	9.99	6.95	10.09	5.61	4.02	6.55	9.71	8.34	4.76	5.12

Table 3. Calculating the percentage weight of the product evaluation criteria

Lecturers of architectural design \ Evaluation criteria	Criterion 1: Attention to the agenda	Criterion 2: Attention to the context	Criterion 3: Technical knowledge	Criterion 4: Structure and statics	Criterion 5: Backward-looking and forward-looking	Criterion 6: The quality and quantity of final presentation	Criterion 7: Spatial function (plan(	Criterion 8: Physical geometry (form)	Criterion 9: Creativity
Dr. Hassan Staji	9.8	8.9	7.1	5	5	18.9	11.1	16.4	18.9
Dr. Hadi Baqeri Sabzevari	2.1	15.6	7	5.1	28.8	3.6	5.3	6.8	25.6
Dr. Mehdi Hamzenejad	24.7	11.2	5	4.3	5.3	6.5	20.8	7.5	14.8
Dr. Hassan Rezai	32.8	4	3.5	3.4	2.3	23.5	12.2	12.1	6
Dr. Yasser Zarei	12	6	3.4	4	6.5	12.2	13.2	11.2	31.5
Dr. Bahram Siavashpoor	17.6	4.8	10.2	10.2	4.5	2.6	14.4	14.4	21.4
Dr. khosro Sahhaf	8.8	24.1	4.1	3.4	7.3	6	10.1	14.7	21.6
Dr. Vahid Sadram	7.1	13.2	3.9	12.2	4.5	6.6	19.5	18	14.9
Dr. Jafar Taheri	13.9	17.4	13.5	13.3	5.2	2.4	16	10.4	7.9
Dr. Shahab Abbaszadeh	3	6.5	13.7	10.4	7.9	3	16.6	21.3	17.5
Eng. Abasalt Asgari	30.6	8.7	8.8	6.6	1.6	1.7	8.1	12	21.9
Dr. Sarah Farbod	9.4	9.4	3.5	5.7	7.9	18.6	11.2	11.2	23.2
Dr. Nasser Mohseni	6.5	15.6	3.3	2.2	3.6	13.8	14.4	11.3	29.3
Dr. Hamid Nadimi	11.1	12.2	16.8	3.9	4.9	7.8	16.6	10.5	16.2
Final percentage weight (-0.04 Tolerance)	13.46	11.25	7.41	6.40	6.80	9.08	13.53	12.70	19.33

According to the interview conducted with each of the interviewees, numbers were obtained as percentage weight for each index and criterion. For example, it was revealed that Dr. Staji scores only 11.4% to the imagination index, while he puts creativity a bit higher with 24.1 per cent.

4.1.3. Step three: weighting judgment stages

Since each of these two stages (the process assessment stage and the product evaluation stage) may have the same or different weights, then the weight of each one should be determined. This task was carried out by conducting a survey of lecturers and experts. To do this, a 2 × 2 matrix was prepared. (Figure 3) They were asked to fill in the relevant number. The matrix will calculate the weight of each one. In addition, because of the sensitivity of the subject and the accuracy of the results, they were asked to state what score (out of 20) they would give to the process assessment stage and how much would go for the product evaluation stage. These numbers and the numbers from the following matrix were recorded in Table 4.

After recording numbers in the matrix and scoring them out of 20, the weighting of each stage is measured, and eventually, the final weight of both stages will be reached. This stage was also carried out for judging undergraduate architectural designs with the subject of designing a commercial complex and the results were recorded in Table 4.

According to the results of Table 4, which shows the approximate weight of process 46% and the weight of product 54%, it can be concluded that the design process and the design product reflect almost the same weight and importance.

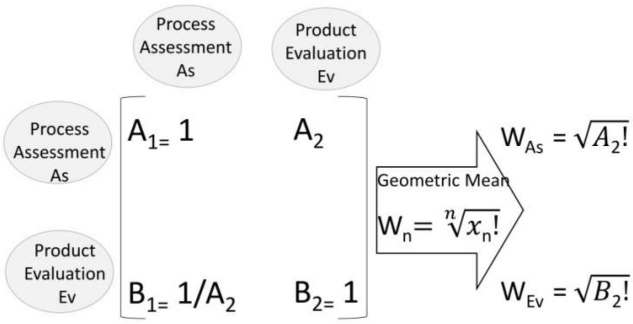

Fig 3. Weighting matrix of process and product stages of judgment

Table 4. Calculating the percentage weight of the process assessment and the product evaluation stages

Stages of process assessment and product evaluation / Lecturers of architectural design	Process assessment 1 (AHP)	Process assessment out of 20	Product evaluation 1 (AHP)	Product evaluation out of 20
Dr. Hassan Staji	5.12	32.5	87.5	67.5
Dr. Hadi Baqeri Sabzevari	20	20	80	80
Dr. Mehdi Hamzenejad	25	30	75	70
Dr. Hassan Rezai	16.7	25	83.3	75
Dr. Yasser Zarei	83.3	60	16.7	40
Dr. Bahram Siavashpoor	25	40	75	60
Dr. khosro Sahhaf	50	50	50	50
Dr. Vahid Sadram	50	50	50	50
Dr. Jafar Taheri	50	40	50	60
Dr. Shahab Abbaszadeh	80	55	20	45
Eng. Abasalt Asgari	87.5	75	12.5	25
Dr. Sarah Farbod	75	55	25	45
Dr. Nasser Mohseni	16.7	32.5	83.3	67.5
Dr. Hamid Nadimi	50	50	50	50
Initial mean of each stage	45.83	45.83	54.16	54.16
Final percentage weight (-0.01 Tolerance)	45.83		54.16	

5. DISCUSSION

The methods of education and assessment are transmitting from pioneer universities and faculties to **other departments and universities without any** consideration to the destination country. This issue can be common and insignificant in science and related fields, but in art and architecture that the heritage and environment influence the conducting design process, it is questionable to follow the imported models (Utaberta, Hassanpour, Zaharim, & Spalie, 2012).

Given the point above, in this paper, the JAAD model is proposed to judge academic architectural designs, which is not limited to a specific geography. It is a flexible method and can be adapted and employed in each geographical location.

Some lecturers in the schools of architecture in different regions may reduce or add to the number of factors in this model or even replace them with other factors. On the other hand, in accordance with the subject of design and the academic semester, lecturers can consider weights based on their own insight or their colleagues', so that they can judge differently. Moreover, it is possible to use other models instead of AHP, such as ANP, etc., or other software such as Super Decision for weighting.

Architectural values and factors, judgment indices and criteria change over time (Houck, 2016); the JAAD model has been presented for the judgment of undergraduate projects with the subject of designing a commercial complex as a case study in Iranian universities. Having said that, all factors of both stages of judgment, including the percentage weight of each stage, are prioritized based on their percentage weight, which are explained here:

criterion of creativity = 10.26% index of creativity = 7.82% criterion of spatial function = 7.56% criterion of attention to the agenda = 7.56% criterion of physical geometry = 7.02% criterion of attention to the context = 5.94% index of imagination = 5.52% criterion of the quality and quantity of final presentation = 4.86% index of a dynamic mind = 4.60% index of data analysis = 4.60% index of relationship between the aim and the concept = 4.60% criterion of technical knowledge = 3.78% criterion of backward-looking and forward-looking = 3.78% index of progress = 3.68% criterion of structure and statics = 3.24% index of adherence to the design method = 3.22% index of quality and quantity of correction meetings = 2.76% index of implementation viewpoint = 2.76% index of falling less into traps = 2.30% index of balance between alternatives = 2.30% index of oral presentation = 1.84%

As it can be seen in the chart above, each of the indices and criteria for judging undergraduate architectural designs with the subject of designing a commercial complex has a certain weight. It is suggested that these weights be taken into account both in the process of judgment by lecturers and in the design process and presenting the product by students.

In the process assessment stage, "creativity" index has the highest weight, while "oral presentation" index has the lowest one. Additionally, in the product evaluation stage, the "creativity" criterion has the highest and the "structure and statics" criterion has the lowest weight. Likewise, the "creativity" index and criterion have the highest weight. It can be concluded that in architectural training of a commercial complex design, creativity and its development is of utmost importance and should be given special attention. It is worth mentioning that the stages of "process assessment" and "product evaluation" have almost the same weights. However, the authors of this paper believe that the stage of process assessment in architectural training is more important and it should be given more attention, because a proper product entails a proper training and design process. If the design process does not run smoothly, then the outcome will rarely be favorable and even cheating might be possible by some students in addition to the fact that justice in judgment might also be questioned.

6. CONCLUSION

Having reviewed the literature about judgment in this paper, a model was achieved for judging academic architectural designs, which was called the JAAD model. In addition, this model was examined for judging the designs of undergraduate students with the subject of designing a commercial complex. Interviewing lecturers of architectural design working in several universities in order to weight indices, criteria, and judging steps as well as analyzing the data in Expert Choice 11, a prototype was obtained, which enables architectural design lecturers to judge undergraduate designs with the subject of designing a commercial complex.

Furthermore, students who are aware of this model can align their performance with it to experience a more purposive and effective design as well as measuring their own status. In this case, it seems that the distance between the performance of students to provide a final product and the lecturers' factors will be reduced. Students' dissatisfaction with the marks will be lower and ultimately, the weaknesses and strengths of students, lecturers, and the training process will be revealed. Therefore, this will allow applicable strategies to be taken to promote students' academic and professional skills.

Figure 4 illustrates the process of reaching the JAAD model, signifying the point that in order to judge academic architectural designs with different subjects, at different grades and in different universities, it is possible to follow such a process to obtain the prototype and then pass the judgment.

The mechanism and the judgment process of this model should be carefully explored in the future.

To judge architectural designs with different subjects and at different grades and academic semesters, new pieces of research seem to be required.

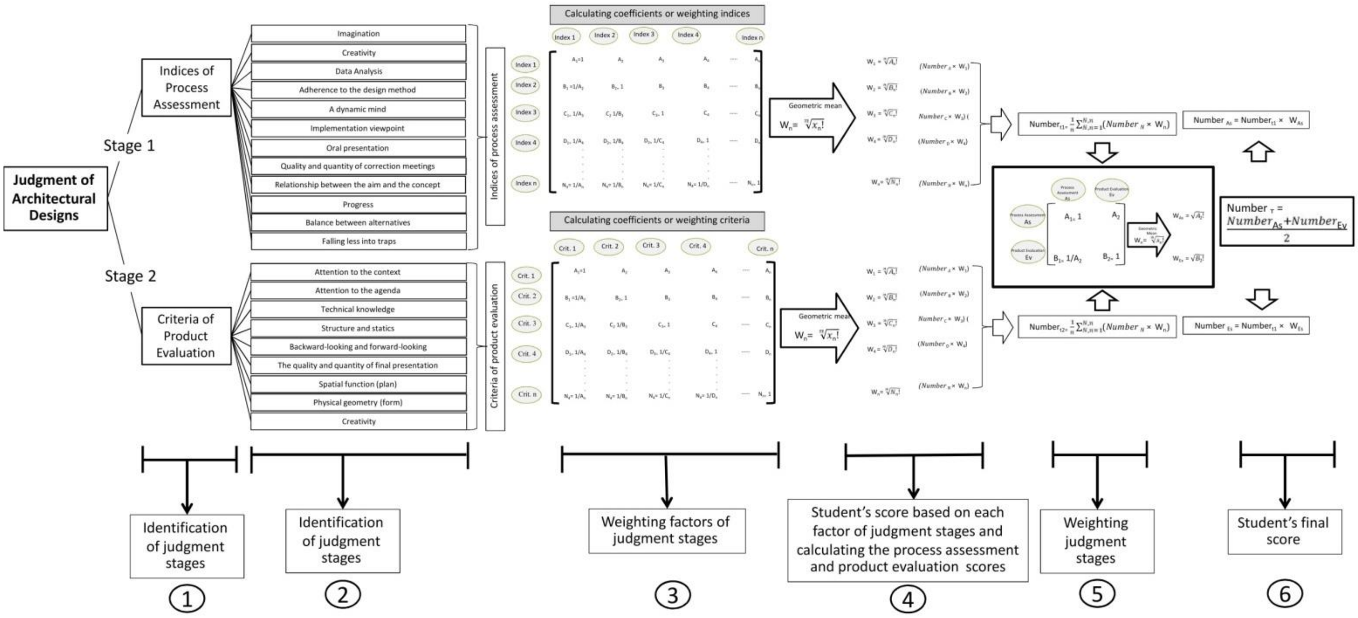

Fig 4. The JAAD model in an overall view

It is suggested that the proposed prototype be implemented in the architectural studios and the results of this implementation should be investigated and compared to the current situation.

The present research is limited to the judgment of designs in the architectural studios of the university. In case of judging design dissertations of undergraduates or postgraduates, architectural competitions, and so on, other scholarly works might be required.

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AUTHOR (S) BIOSKETCHES

M. R. Haidari ., *Master of Architecture, Faculty of Architecture and Urbanism, Hakim Sabzevari University, Tohid Town, Sabzevar, Iran*
Email: mohammadreza_haidari@yahoo.com

V. Sadram ., *Assistant Professor, Faculty of Architecture and Urbanism, Hakim Sabzevari University, Tohid Town, Sabzevar, Iran*
Email: v.sadram@hsu.ac.ir

, Sabzevar, Iran
Email*: v.sadram@hsu.ac.ir*

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