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Explaining Evaluation Criteria for the Architectural Designs Presented to Government Bodies Usingthe AHP Technique*

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ABSTRACT

Evaluation of architectural designs is one of the main challenges of architecture. This challenge exists at all architectural levels both in academic and professional communities. Due to the lack of certain and formulated criteria for evaluating the designs, it is clear that objections will be made to the evaluation results which, consequently, confuse designers and contributors. Due to the presence of inherent differences between architecture discipline and other disciplines, there is no scientifically developed mechanism to evaluate architectural designs. Evaluation of architectural designs is generally based on personal tastes, implicit knowledge of the evaluators,and their previous experiences as well as the employers' expectations of the designs and their orders. Usingthe analytic hierarchy process (AHP), this research evaluates architectural designs presented to government bodies. This method converts complex issues to a hierarchy of their constituting factors to achieve an appropriate solution that is most proportionate to the intended goals and criteria. On this basis, in the first stage, library studies and questionnaires are used to obtain criteria for evaluating architectural designs presented to government bodies by experts of technical offices. Then, using the analytic hierarchy process (AHP), the criteria were pairwise compared and finally, their relative weights were calculated. In the end, the final score of each of the criteria was assigned toevaluate the designs. According to the findings, since the AHP technique is flexible, simple, and can simultaneously apply quantitative and qualitative criteria, it can be practically used in the evaluation of architectural designs in government bodies.

Keywords: Evaluation, Analytic Hierarchy Process (AHP), Government Bodies.

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1. INTRODUCTION

Evaluation of architectural designs constitutes one of the most common and transparent feedback methods in architecture (Rezaei-Ashtiani and Mahdavi-Nejad 2018). Designers' frustration with the non-transparency of evaluation methods is seen as a very critical factor in determining evaluation standards (Nangkula, Hassanpoor, and Arsyad 2013). Numerous studies have investigated the architectural design evaluation criteria, most of which have examined the subject of evaluation of the designs in academic environments. Despite the significance and necessity of these studies, the challenges facing the evaluation of the designs at professional bodies seem to be more sensitive. Considering the main role of evaluating architectural designs, if the type of evaluation and relevant tools are ambiguous, the possibility of personal tastes, knowingly and unknowingly, will derail the evaluation process. On the other hand, any evaluation process is based on the thinking that there is an outstanding example in the world of architecture that serves as the basis for the measurement of the quality and evaluation of the design. This basis may be totally physical or material, or be unmeasurable despite being physical (Otto 2005, 48). As Lawson put it, "because variables in architectural designs cannot be measured by one single criterion, the evaluation will turn out to be an unavoidable value". According to rules and criteria, simple reliance on quantitative indicators can disturb the final evaluation (Lawson 2005, 87). In the meantime, evaluation of the aesthetic aspects of the designs which constitute their qualitative features will subject them to evaluators' personal judgments and tastes; for this, aspects of designs can be evaluated using an already-developed mechanism to reduce the evaluators' personal tastes (Lang 2002, 107).

The researcher is an employee at the Directorate-General of Road and Urban Development of the province of Lorestan and has been serving in the technical area for around 14 years. This period of time was a good opportunity for him to get acquainted with the evaluation process of architectural designs presented to this office, as he learned about challenges and crises in this area. On the other hand, the following questions were raised:

- Which criteria are used to conduct the evaluation processes of the designs (public building designs)?
- Why were the contributors to the designs at the state bodies not satisfied with the final master designs? And why did they consider the selected designs as a result of evaluators' personal tastes, political rents, and reputation of consulting companies or contributing competitors?
- How can a mechanism be developed to select a good-for-all master design?

The questions raised which, somehow, pertain to the evaluation of the architectural designs, paved the way for the initial thinking behind this research. To do this research,the analytic hierarchy process (AHP) was used, because it can help convert complex issues into a hierarchy of their constituting factors in order to arrive at an appropriate solution that is most proportionate to the expectations in consideration. Accordingly, using library studies and questionnaires, criteria that were focused attention in the evaluation of architectural designs at government bodies were derived, and the AHP method was used to assign final scores and to calculate the importance coefficient of each criterion.

2. RESEARCH LITERATURE

In recent years, Analytic Hierarchy Process (AHP), as a multi-criteria decision-making analysis method, has been increasingly used to solve complex issues of the world. The tendency to developup-to-date decision models with greater abilities to support decision-making at a large spectrum of programs has been a concern of experts in architecture.

In a study entitled "Analytic Hierarchy Process (AHP) as an Assessment Approach for Architectural Design; Case study of Architectural Studio Design),TimuchinHurputlugil (2018) studied one of the architectural ateliers at the University of Çankayain Ankara, Turkey, and used methods of observation, investigation, and evaluation of data by means of the AHP, and surveys and interviews to conclude that the aforementioned method can offer comparable numerical results that could be measured and graded, and hence, be reported separately. This study determined the main criteria to be the performance, quality of construction, innovation and its impacts, presentation, and process and found that the participants changed each other's criteria. However, this approach helped identify the differences based on comparable evaluation and project ranking (Hurputlugil 2018).

In another study, Si et al. (2016) used the AHP technique to elicit and analyze methods to integrate green technology into buildings (Si et al. 2016). Also, Mulliner et al. (2016) used the AHP method to calculate and compare the costs of sustainable housing (Mulliner, Malys, and Maliene 2016). According to Sameh and Izadi, to evaluate the criteria, albeit in academic and educational domains, major indicators of the evaluation process in the architecture can be provided in the form of a diagram, where the design process and its product can be tested independently using subject-specific methods. In this model, evaluation is made of two stages; a) evaluation of the process through monitoring by the atelier's professors which is carried out based on a score, pre-determined indicators, and means, and b) evaluation of the design through control by the architectural design student which is achieved based on the existing criteria-led rankings (Sameh and Izadi 2014).

Boyer and Mitgangof the University of Hartford, U.S. did a study that aimed to prepare architecture students to enter the professional labor market and to evaluate the architecture design project. The project's main indicators were (1) awareness, (2) perception, and (3) ability (Mir-Riahi 2006). In another study entitled "A state of the art
survey & testbed of fuzzy AHP (FAHP) applications", Sylvain Kubler et al. (2017) analyzed 190 applied articles (from 2004 to 2016) that used the AHP method. The findings could be accessed on an online test and be used as a reference for the people who are willing to apply, reform, or expand the AHP method in different applications (Kubler et al. 2016).

Another study by SahikaOzdemir (2017) examined alternative evaluations of the store's shape grammar using the multi-criteria decision technique of AHP, which led to the prioritization of alternative programs using numerical methods in line with the experts' views. It was also found that the AHP method affected the evaluation of the shape grammar options. The alternative programs produced with other architectural design methods and using automatic cell computers as well as mixed methods can be evaluated by this method (Ozdemir and Ozdemir 2018).

In a study entitled "A State Of the Art Review of Analytical Hierarchy Process", Ashish Khaira (2018) did the data synchronization using the AHP in order to investigate and improve the works of various researchers in the applied programs. Research observations led to a table that gave applied area: which offers a broader area; criteria: indicators that are of use to the AHP, author: which shows the researcher's name, along with the year of publication, and decision-making approach: that shows if only AHP or a combination of which is applied (Khaira and Dwivedi 2018, 403). In their study entitled "Global weight of pre and post-occupancy parametersrof residential green buildins in Indian context", Pastagia and Macwan (2018) demonstrated that advisors of various Indian areas had provided their own responses based on a 72-item questionnaire. The global weight of the parameters was achieved by using the geometric mean, along with the AHP. Then, the study classified the advisors, individual selections, the site, regional priorities, and fast renewable materials as the most important parameters in the stage before the separation and operation. Also, waste dumping, performance, and quality of the air inside the building were described as the most important parameters in the stage after the operation (Pastagia and Macwan 2018).

In another study entitled "Factors affecting engineering contracts, provisions and manufacturing of electricity industry transmission projects", Mansoureh Sadat-Hosseini (2019) used the analytic hierarchy process to identify and prioritize the factors that affect the EPC contracts of power transmission projects; meanwhile she concluded that criteria of contractor's financial ability, estimation of the project's price and estimation of the project's duration had been assigned the highest weights as compared to other criteria (Hosseini and Lari 2019).

Hamid Reza Azamati et al. (2017) also conducted a study entitled "Analysisof the gap between the perceptions and preference of environmental security in neighborhood parks" to conclude that the minor gap pertained to the control of access, management, and maintenance, whereas the major gap pertained to monitoring which the users assigned the highest importance to (Azamati, Ghanbaran, and Jam 2017). Another research entitled "Prioritization of the pedesrain ways around HazaratMasoume Holy Shrine in Qom City", conducted by Mohammadian et al. (2016), explored the ways to prioritize the walkways around the Harem by using the popular views and those of visitors, field surveys as well as expert views (Mohammadian et al. 2016). FahimeAkbarian et al. (2017) also used the AHP method to locate office buildings in the city of Shahroud and compared the findings to introduce the site which enjoyed the highest level of desirability to set up an office building in the city (Akbarian, Jaamei, and Shoaei 2017).

3. THEORETICAL FOUNDATIONS

Architecture relates art to engineering; art is based on tastes, and if the technique of evaluation was based on the mentality or idea, it could have turned out to be different and caused conflicts. Thus, an appropriate system to integrate the two is needed (Nangku et al. 2013, 348), as a credible evaluation requires knowledge, skills, and process to resolve problems (Usman, Nangku, and Hassanpoor 2015).

This subject is important in that evaluation methods of these designs, described to be the key urban designs, warrant more research and investigation, because, as we know, designs are not evaluated by certain or pre-determined scores or criteria. To elucidate the subject, first, the concepts are defined and then relevant evaluation theories are addressed.

The term evaluation refers to the determination of values, significance, level, or conditions of a phenomenon and its review (Mohammadzaadeh, Hejazi, and Bazargan 2007). Lexically, evaluation is generally defined as "determining the value and judging" and specifically "determining the level of success of a program, product or a process to achieve the intended goals" (Mir Riahi 2006). For this, evaluation carries the concept of value and valuation. "Evaluation is defined to be a conscious judgment of the value of something for a certain goal based on a certain criterion" (Sharifi and Taleghani 2003, 28).

That said, using variables and indicators that are key to architectural designs' evaluation, the following describes what would be the criteria raised by the experts:

In the book "DevelopingYourDesignProcess,

Sixkeyconceptsforstudio", Albert Smith and Kendra Smith providethe stages inthe design process: having the idea, development of the idea, process of the selection, advancement of the idea, definition and narrowing-down and measurement (Smith and Smith 2015, 42). Tom Marcus and Tom Mayer have provided an image of design process and suggested: a set of decision-making processes, including analysis, combination, measurement, evaluation,and decision-making should be taken into account in some levels of the design process with greater details. Jane Darkey's Diagram includes production, speculation, and analysis, while Brian Lawson defines the design process to be the interaction between the problem and the solution through three activities of analysis, combination, and evaluation (Rezaei and Mahdavi-Nejad 2018, 309).

MarkWolf and Anthony Defesh conducted research at the School of Design and Artificial Environment at the Dutch University of Dolph, to introduce a value-led approach. Value for them indicated the following six basic concepts in this research:

1. Value: It refers to the description of the problem of design and a summary of the design from personal values and criteria perspective
2. Evaluation: Designers are encouraged to expand design criteria aiming to determine criteria of judgment over design
3. Design-evaluation relation: Designers are encouraged to analyze the relations between design and evaluation to understand the role of the criteria
4. Perception: It refers to the absorption and understanding of the data without relating them with other things
5. Measurement: Criteria selected by every designer should be critically analyzed
6. Design: Evaluation based on factors selected by the designers with the goal of improving their ability (Mir-Riahi 2010).

For Hamid Nadimi, the division of the design features into quantitative and qualitative aspects can lead to relevant criteria. The quantitative aspect concerns such indicators as accessibility, climate and physical comfort as well as sustainability, for which common criteria can be developed. The other aspect is the qualitative aspect of the design that deals with architectural indicators and may not involve criteria. Here, experts of the field should be referred to and a common vision be sought (Nadimi 2010).

4. ANALYTIC HIERARCHY PROCESS (AHP)

The analytic hierarchy process (AHP) was first developed by Thomas L. Saaty in the 1970s. The AHP method can be used when decision-making faces multiple decision choices and criteria (Hadipour, Moosavi, and Najafi 2010). This method is, on the one hand, dependent on personal perceptions and experiences to form the hierarchy of a problem, and on the other hand, relates to the logic, perception and experiences to make decisions and provide a final evaluation. One advantage of this method is that it provides a structure or a framework for the group contribution to decision making and to problem solution (Mohammadi-Torkamani, Taher-Khani, and Fallahpour 2010). The first step in this method was to create a hierarchical structure of the intended problem where the goals, criteria and alternatives and their interrelationship were displayed. Later stages of this method included the calculation of the weights (importance coefficient), criteria and sub-criteria, if any, and calculation of the weights (importance coefficient) of alternatives, final score of the options, and an investigation of the logical consistency of the judgements (Zebardast 2001).

5. RESEARCH METHOD

As noted, one of the most important challenges to evaluate thedesigns werethe absence of certain and developed items and factors for evaluation. Other factors, of course, included employers' unspecialized interventions, political rents, obligation to use type designs in various climates and regions and the like, the study of which is beyond the scope of the research. The research methodology was applied in terms of goal as data were gathered via descriptive-analytical methods. This research used a field method and a questionnaire to gather data. The research samples consisted of 10 technical experts and professionals at government offices, including Directorate-General of Road and Urban Development, Bureau of School Equipment and Development, Municipality and Provincial Architectural Directorate. Also, the pairwise matrix questionnaire was used to prioritize the indicators via the AHP. There are various methods to investigate the validity of the questionnaire, as logical content validation was used. The logical method includes the following two techniques:

Face validity: As suggested by the name, it reveals the concrete validation of the questionnaire

Content validity: In this kind of validation, questions are measured and investigated quantitatively and qualitatively (Nayeb-Asl 2010).

After the factors were identified by the statistical research population, and also consideration of library studies conducted on criteria, the geometric mean technique was used to achieve a single value and to remove the effects of small and large values. In the end, via the AHP technique, the gathered questionnaires were completed and analyzed. In general, factors affected the evaluation can be dividedinto two parts of (1) factors resulting from employers' demands and expectations and (2) architectural design indicators. The first part includes the hierarchical structure, main goal or what is known as the "selection of the master architectural design", but the second part relates to

decision making criteria which is divided into two general parts of (1) employers' expectation indicators and (2) design's performance indicators, with each having sub-criteria (Yaghoubi 2017).

6. FINDINGS

Using library studies and questionnaires, general decision-making indicators for the evaluation of architectural designs of public buildings were extracted to be used as criteria for judgment and a framework for similar cases. Figure 1 illustrates factors affecting the selection of the design. For the criterion of "Employers' expectations and demands", the sub-criteria of "Compatibility with the project budget", "efficacy of the design and its execution", and "future development of the design" can be enumerated. To select these criteria, attempts were made to consider the most important factors intended by the employers. As for the second criterion "indicators of the design's performance", the sub-criteria of "form and volumetric composition, relations and circulations, as well as documentations and graphical presentation" can be introduced.

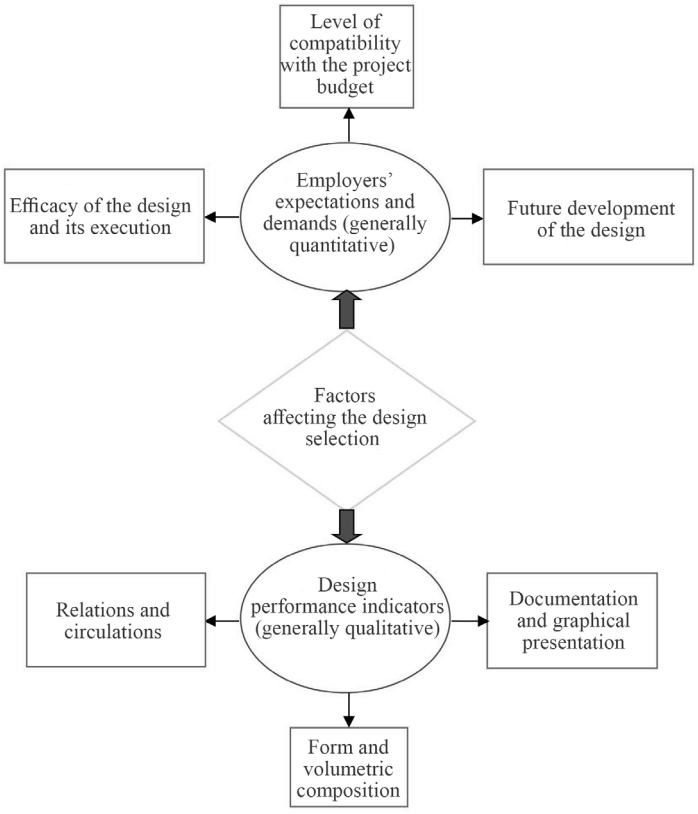

Fig. 1. Classification of Factors Affecting the Design Selection

In the next stage, using the criteria that were identified, experts were asked to give weights to these criteria which would hence reveal their impacts. Here, oral judgements were used to determine the general weights and prefer the criteria and convert them to quantitative values. This stage is, in fact, determined by the pairwise comparison of the criteria with each other and degree of importance of each criterion against the other. In practice, a matrix of effective above factors was formed which asked the evaluators to assign a score from 1-9 to each of the factors relative to the other factor in a pairwise comparison (Table 1).

Table 1. Valuation Scale

Quantitative Value	9	7	5	3	1
Qualitative Value	Extraordinarily Important	Strongly Important	Highly Important	Moderately Important	Equally Important
**(2,4,6,8) are used for items whose degree of importance isbetween the values lited in the table					

(Boustani, Rezaei, and Gohari-Fard 2014)

Later, the criteria were pairwise compared which helped determine their relative weights. Table 2 which gives technical expert data uses a geometric mean technique that is more accurate than other methods. For example, value 2 (in first line, fourth column) indicates the importance of the criterion of "future development of the design" relative to the criterion of "form and volumetric composition" was achieved following the separate statements of ten technical experts, and was modified by using the geometric mean technique.

$$\sqrt[10]{2 * \frac{1}{2} * 1 * 4 * ... * 2} = \sqrt[10]{1024} = 2$$

In the next step, using the geometric mean method to achieve the importance coefficient of the criteria, geometric mean of the matrices was calculated and then normalized (the nth root of the product of the numbers)

$$\sqrt[6]{1 * \frac{1}{2} * \frac{1}{3} * 2 * \frac{1}{2} * 5} = 0.97$$

$$\sqrt[6]{2 * 1 * \frac{1}{3} * 2 * \frac{1}{3} * 5} = 1.142$$

$$\sqrt[6]{3 * 3 * 1 * 3 * 3 * 7} = 2.876$$

$$\sqrt[6]{\frac{1}{2} * \frac{1}{2} * \frac{1}{3} * 1 * 1 * 5} = 0.864$$

$$\sqrt[6]{2 * 3 * \frac{1}{3} * 1 * 1 * 6} = 0.890$$

$$\sqrt[6]{\frac{1}{5} * \frac{1}{5} * \frac{1}{7} * \frac{1}{5} * \frac{1}{6} * 1} = 0.239$$

The sum of normalized numbers amounted to 6.981 which if each of the normalized matrices is divided by this number, the coefficient of the importance of the criteria were obtained (Table 2).

Table 2. Pairwise Comparison of the Sub-criteria by Calculating the Geometric Mean

Criteria	Future Development of the Design	Compatibility with the Design Project	Efficacy of the Design and Its Execution	Form and Volumetric Composition	Relations and Circulation	Documentation and Graphical Presentation
Future Development of the Design	1	1.2	1.3	2	1.2	5
Compatibility with the Design Project	2	1	1.3	2	1.3	5
Efficacy of the Design and Its Execution	3	3	1	3	3	7
Form and Volumetric Composition	1.2	1.2	1.3	1	1	5
Relations and Circulation	2	3	1.3	1	1	6
Documentation and Graphical Presentation	1.5	1.5	1.7	1.5	1.6	1
Relative Weight	0.13	0.15	0.38	0.11	0.20	0.03

To validate the procedure, the sum of the relative weights must equal 1 which was met in this research; thus, the weight results can be trusted.

(0.13 +0.15 +0.38 +0.11 +0.20 +0.03) = 1

It is evident that technical experts can independently create a pairwise matrix like that of Table 2 and finally use geometric mean to make a decision between the tables and matrices of all experts.

6.1. System's Consistency

It is possible to calculate the consistency rate and make judgments over the acceptance and rejection of the decision. Inconsistency rate of up to 0.1 is acceptable (Momeni and Ahmadpour 2015). In the present research, the consistency rate calculated in all pairwise comparisons is less the 0.1; thus, the decisions are consistent and acceptable.

7. DISCUSSION AND CONCLUSION

Evaluation of architectural designs are challenges that face architects and designers of this profession. Lack of criteria and factors to investigate the importance of each of these challenges constitutes the main barriers, with designers and contributors expressing their objection following the announcement of the evaluation of the design results. In public offices, key and large-scale projects which are usually considered publicare subjected to the evaluation process, and a master design will be made available for execution after being selected and introduced by the evaluators. It is evident that the improper evaluation of and inconsistency of the master design with the predetermined factors could leave considerably negative impacts.

According to Table 2, on would suggest that the

criterion of "efficacy and development of the design" is more important than others, while the criterion of "documentations and graphical presentation" is assigned lesser weights than others. Thus, in architectural designs which are evaluated in government bodies, these factors and their priorities are considered in line with their relative weights, and they seem to be provided as sample designs in educational environments when evaluating other designs; these factors and relevant weights may also undergo changes and even be substituted for which does not suggest their general rejection or acceptance for the evaluation process in all domains.

Research findings revealed that the analytic hierarchy process (AHP) can be usefully applied to investigate and evaluate the architectural designs. In view of this, most architectural issues have a quantitative and a qualitative aspect; concurrent use of these two aspects in this method will make it a useful and valuable tool to analyze architectural issues. The interesting point in this method is the quality of weighting of the criteria through pairwise comparison which should be accurately performed in line with realities. Evaluators' use of pairwise comparison and conduct of separate comparisons, followed by making decision in this regard, will help extract reliable results, and hence givethem weights. In the end, when this method is used in architectural designevaluations, options and items are respectively selected, as the option which enjoys the highest relation with the criteria explained in the first stage will be selected as the best option and the master design. Considering the efficacy of this method for the evaluation of architectural designs of public buildings at government bodies, this method is widely regarded as a systematic and practical method. Criteria proposed in this research are taken from the researcher's interviews with the experts and specialists at technical offices who are working at government officers. In sum, not all evaluation processes may be expected to meet all the requirements of anevaluation process; however, the use of the AHP technique can reduce the different tastes of the evaluators and remove the current challenges.

REFERENCES

- Akbarian, Fahime, Ahmad Jamei, and Hamidreza Shoaei. 2016. Application of AHP Hierarchical Analysis Process in Optimal Location of Office Buildings in the city of Shahrood (New Building Technologies Training and Research Center Building of Semnan Province). *Specialized Scientific Quarterly of Green Architecture* 9(3): 29-40. http://ensani.ir/fa/article/378450
- Azemati, Hamidreza, Abdol-Hamid Ghanbaran, and Fatemeh Jam. 2016. Assessment of the gap between the perception and preference of the component of environmental security in neighborhood parks (case example: Tehran SabonPozkhaneh neighborhood parks). *Scientific-Research Journal of the Scientific Association of Architecture and Urban Designning of Iran* 14(8): 5-16. https://www.isau.ir/article_62061.html
- Bostani, Hamidreza, Hossein Rezaei Dolatabadi, and Mostafa Goharifar. 2013. Scenario-based regional designning using analytic hierarchical process. *Journal of Geography and Urban-Regional Designning* 4(11): 67-84. https://gaij.usb.ac.ir/article_1543.html
- Ghodsipour, Seyyed Hassan. 2018. *Debates in multi-criteria decision making*. Tehran: Amir Kabir University Press.
- Hadipour, Hadi, Nematollah Mousavi, and Baha al-din Najafi. 2018. Assessment of sustainability indicators for the preservation of agriculture technology. *Agricultural Economics Research Journal* 12(3): 41-72. https://elmnet.ir/article/2098060-19402
- Hosseini, Mansourehsadat and Mansour AminiLari. 2018. Factors affecting engineering, provision and construction contracts in electricity industry transmission projects. *Iranian Energy Scientific Quarterly* 22(4): 153-180. http://ensani.ir/fa/article/432132
- Hurputlugil, Timuchin. 2018. Analytic Hierarchy process (AHP) as an Assessment Approach for Architectural Design: case study of Architectural Design studi. *International Journal of Architecture & Planning* 6(2): 217-245. https://iconarp.ktun.edu.tr/index.php/iconarp/article/view/190
- Khaira, A., and R. K. Dwivedi. 2018. A State Of the Art Review of Analytical Hierarchy Process. *Materials Today Proceedings* 5 (2018). 4029-4035. https://www.sciencedirect.com/science/article/pii/S221478531732936X
- Kubler, Sylvain, Jérémy Robert, William Derigent, Alexandre Voisin, and Yves Le Traon. 2016. A state of the art survey & testbed of fuzzy AHP (FAHP) applications. *Expert systems with applications* 65: 398-422. https://www.sciencedirect.com/science/article/abs/pii/S0957417416304638
- Lang, Jon T. 2001. *Creating architectural theory, the role of behavioral sciences in environmental design*. Trans. AlirezaAinifar. Tehran: University of Tehran.
- Lawson, Bryan. 2014. *How designers think: the designing processdemistified*. Trans. Hamid Nadimi. Tehran: ShahidBeheshti University.
- Mohammadi Turkmani, Hojat, Alireza Taherkhani, and Sadjad Fallahpour. (2018). Assessment of the ecological potential of Miane city for the ecotourism development using geographic information system. *Applied Research Journal of Geographical Sciences* 55(19): 215-232. http://ensani.ir/fa/article/403726
- Mohammedian Mosammam, Hassan, Mozafar Sarafi, Jamileh Tawakoliniya, and Alisghar Issa-lou. (2015). Prioritization of the pedestrian ways around the Hazrat Masoumeh holy Shrine in Qom city. *Bip-Quarterly Journals of Landscape Research* 5(3): 47-94. http://ensani.ir/fa/article/358846
- Mohammadzadeh, Saeid, Yusof Hejazi, and Abbas Bazargan. 2016. Model for quality guarantee in Iran's higher education system: the views of the members of the Department of Agriculture and Natural Resources. *Research and Designing Quarterly in Higher Education* 13(3): 85-107. https://www.sid.ir/fa/Journal/ViewPaper.aspx?ID=67099
- Momeni Hilali, Hadi, and Amir Ahmadpour. 2014. Assessment of operation systems for the sustainability of agricultural activities in Mazandaran province. *Journal of Economics and Agricultural Development* 2(29): 192-203. http://ensani.ir/fa/article/343644
- Mirriahi, Saeid. 2015. Judging architectural design and its consequences. *Soffeh* 15(42): 86-97. https://www.sid.ir/fa/journal/ViewPaper.aspx?id=64844
- Mirriahi, Saeid. 2018. Assessment of design skills in architecture education. *Soffeh* 19(49): 61-68. https://soffeh.sbu.ac.ir/article_100099_6b9249e1b22849c148e06dc3de4e839b.pdf
- Mulliner, Emma, Naglis Malys, and Vida Maliene. 2016. comparative analysis of MCDM Methods for the Assessment of Sustainable Housing Affordability. *Omega* 59: 146-156. https://www.sciencedirect.com/science/article/abs/pii/S0305048315001243
- Nayeb Asl, Seyyed Ramin. 2019. Providing an optimal model of customer relationship management in Keshavarzi Bank by improving the financial situation and profitability using the hierarchical analysis technique. *Accounting and Management Perspective Quarterly* 3(25): 33-45. http://ensani.ir/fa/article/429690
- Nadimi, Hamid. 2019. Assessment of architectural designs. *Soffeh* 20(50): 19-9. https://soffeh.sbu.ac.ir/article_100387_6b18d02eccfa6ce9c17154a12fa0efba.pdf

- Otto, Wayne. 2014. *Architecture and critical thinking. Trans*. Amina AnjamShoa'. 2014. Tehran: Academy of Art
- Ozdemir, Sahika, Yavuz Ozdemir. 2018. Prioritizing store plan alternatives produced with shape grammar using multi-criteria decision – making techniques. *Environment and Planning B: Urban Analitics and City Science* 45(4): 751-771. https://journals.sagepub.com/doi/10.1177026581351668656 6/
- Pastagia, Digant, and Joel E. M. Macwan. (2018). Global Weights of Pre and Post Occupancy Parameters for Residential Green Buildins in Indian Context. *GRD journals, Global Research and Development Journal for Engineering/ A Challenge to Technological Development*: 11-19. https://www.grdjournals.com/article?paper_id=GRDCF010002
- Sameh, Reza., and Abbasali Izadi. 2013. Evaluationmechanism of design in architectural education, proposing a model for process assessment and design evaluation in the interaction between professor and student. *Journal of the Scientific Association of Architecture and Urban Designing of Iran* 5(8): 1-13. https://www.isau.ir/article_61988.html
- Sharifi, Hasan Pasha, and Narges Taleghani. 2012. *Research methods in educational and behavioral sciences*. Tehran: Rushd Publications.
- Si, Jin., Ljiljana Marjanovic-Halburd, Fuzhan Nasiri, and Sarah Bell. 2016. Assessment of Building-Integrated Green Technologies: A Review And case Study on Applications of Multi-criteria Decision Making (MCDM) Method. *Sustainable cities and society* 27: 106-115. https://www.sciencedirect.com/science/article/abs/pii/S2210670716301238.
- Smith, Albert C., and Kendra Schank Smith. 2015. *Developing Your Design Process, Six key concepts for studio*. New York: Routledge.
- Usman, Ims, Nangkula Utaberta, and Badiossadat Hassanpoor. 2015. Redefining Critique as an Assessment Tools In Architecture Design Studio. *Selected Topics in Energy, Environment, Sustainable Development and Lanscaping*: 359-364. https://moam.info/queue/redefining-critique-methods-as-an-assessment-tools-in-wseasus_59cf51051723dd89f13c55a5.html
- Utaberta, Nangkula, Badiossadat Hassanpoor, and Mohd. Arsyad Bahar. 2013. An Evaluation of Criteria-Based Assessment and Grading in Architecture Design. *Research Journal of Applied Sciences, Engineering and Technology* 5(2): 346-352. http://i-rep.emu.edu.tr:8080/jspui/bitstream/111291/3168//v5352-346-.pdf
- Yaghoubi, Aliakbar. 2016. Providing a mechanism using scientific decision-making methods for assessment of architectural competitions. The fifth national conference of applied research in civil engineering, architecture and urban management. Tehran: KhwajaNaseeruddinToosi University of Technology. https://www.academia.edu/37796519
- Zebardast, Esfandiar. 2001. Application of analytic hierarchical process in urban and regional designing. *Fine Arts Magazine* (10): 13-21. http://ensani.ir/fa/article/13793

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