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Explaining the Role of Changing Components of the Problem on Increasing Creativity in the Field of Architecture Deign Competitiveness

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Abstract

Knowledge has long been in the field of human knowledge. In the evolutionary history of science, many theories and hypotheses have been proposed and proven. This category reflects the fundamental changes in the way of thinking in human knowledge. In the contemporary era, knowledge faces more complex issues. Therefore, achieving growth and production in any field using new methods based on future vision is one of the pillars of human knowledge. In the field of studies, the process of architectural design, the growth and development of creativity, that is, how the idea arises and develops in the mind. Creative results in the field of architecture can be the result of changing components of the problem according to recognizing the existing contradictions in the field of architectural design process. Since design process involves the emergence, evolution, metamorphosis of ideas, and formation of concepts, one of the topics in the design process is conceptual tradition. Conceptual tradition by changing the way of thinking, offers creative solutions to enhance the way of knowing and solving the optimal problem. The role of conceptual tradition in the development of the architectural design process is by changing the components of the design problem. On the other hand, competitiveness is the basis for the growth and enhancement of architectural design field. Therefore, achieving meaningful relationship between changing the components of the problem and competitiveness in architectural design, to increase

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creativity in the field of architectural design is a necessity of research. The research method has been "deductive reasoning" and using "analytic-descriptive" measures, with quantitative and qualitative approach. Questionnaire is used for field survey. To validate the data, standard evaluation tools and theories of Delphi expert community have been cited. Preliminary data extracted from the first stage in eight architectural projects eligible for research were evaluated through Delphi and related factors were extracted. Finally, using pls software and regression test based on the extracted data, the research hypotheses were proved.

Keywords: Tradition; Problem Components; Competitiveness; Creativity; Architectural Design

1. Introduction

The design process is to change the condition in the current situation. This change includes the emergence of insights, the evolution, transformation of ideas, and development of design concepts. The product of design, in the rationality paradigm, establishes the temporary products of the design process and is considered as the main part of knowledge and the knowledge is embodied in the design products. In knowledge or epistemology, emerging products are independent of design position. Procedural components are design problem-solving components or subsets defined at local scale for conceptual development while implementing conceptual ideas. The contextual components refer to the design problem for conceptualizing the link between steps at macro-scale design process. Creative cognition examines human creativity in relation to the cognitive processes that take place in the brain. This field focuses on the perception of how people think and what leads to a creative idea while thinking. It combines the principles of cognitive science, psychological studies, and brain cognition studies (studies based on imaging technology). In this regard, cognitive design, as a research field, examines the cognitive processes that occur in the brain while designing. There are several models that aim to understand how the architect thinks and designs, and to examine the relationship between the stages of thinking and the evolution of thought. Creativity means reaching unprecedented ideas that has worthiness of functionality and novelty of the product. In the present study, after controlling and coding the data, the data was extracted from the questionnaire and interview. Researcher-made measurement tools have been used for evaluation, and standard evaluation tools and theories of the Delphi expert community have been cited to validate the data measurement. Preliminary data extracted from the first phase in seven architectural projects eligible for research were evaluated through Delphi and related factors were extracted. Finally, using pls software and regression test based on the extracted data, the research hypotheses were proved.

Research questions

1. What is the effect of enhancing the position of the methods of changing the components of the problem on the competitiveness of the architectural design?

2. The transformation of the design problem can cause the increase in the competitiveness of the architectural design?

2. Research Method

Scientific research is a process that includes a set of steps and actions that have a systematic connection and relationship. The process of scientific research is a set of regular and continuous steps that makes scientific research possible from beginning to end. Generally, the process of

scientific research consists of five continuous stages, selection, analysis and explanation of the research problem, selection, design and description of working methods, data collection, classification, and analysis and interpretation of data and compilation of results. In the present study, the dimension of the problem was investigated. For this purpose, the literature and research background were studied and the variables were identified. After knowing the nature, dimensions and scope of the problem and the variables involved in the problem, the behavior of the variables was identified. After controlling and coding the data, data were extracted from the questionnaire and interview. Researcher-made measurement tools have been used for evaluation, and standard evaluation tools and theories of the Delphi expert community have been cited to validate the data measurement. Primary data extracted from the first phase in seven architectural projects eligible for research were evaluated through Delphi and related factors were extracted. Finally, using pls software and regression test based on the extracted data, the research hypotheses were proved (Fig 1).

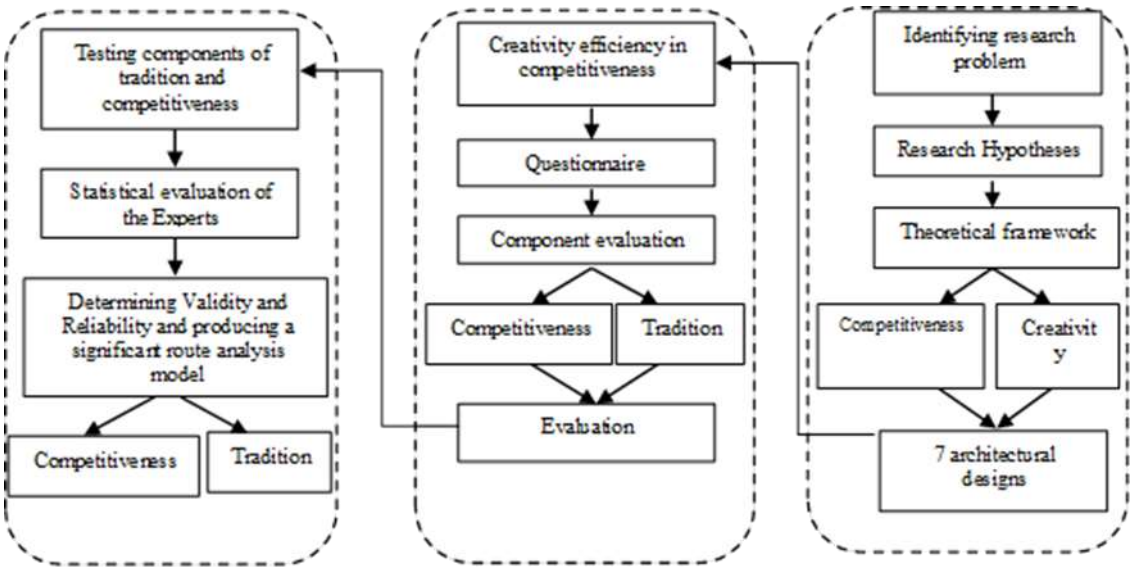

Fig 1 Proposed chart of research method (Source: Authors)

3. Research Background

Since 1960, many studies have been conducted to understand the design process (Table 2). Leaders of this movement include Christopher Jones, Christopher Alexander, John Lockman in the 1960s, and Horst Rattle and Henry Sanoff in the 1970s. Bruce Archer's 1963 series of articles in Design Magazine presented a new model for designing. He stated in these articles, that intuition and cognition are combined in the design process, and structuring this process, can be expressed scientifically. The processes that drive purposeful thought are the most complex cognitive processes that can be studied (Beaty et al., 2016: 85-97). The model that Archer proposes for design process is needed at different times and for different approaches: in the analysis stage, principal observations and inductive reasoning are needed, and in the creativity stage, subjective and deductive reasoning is needed (Fig 2).

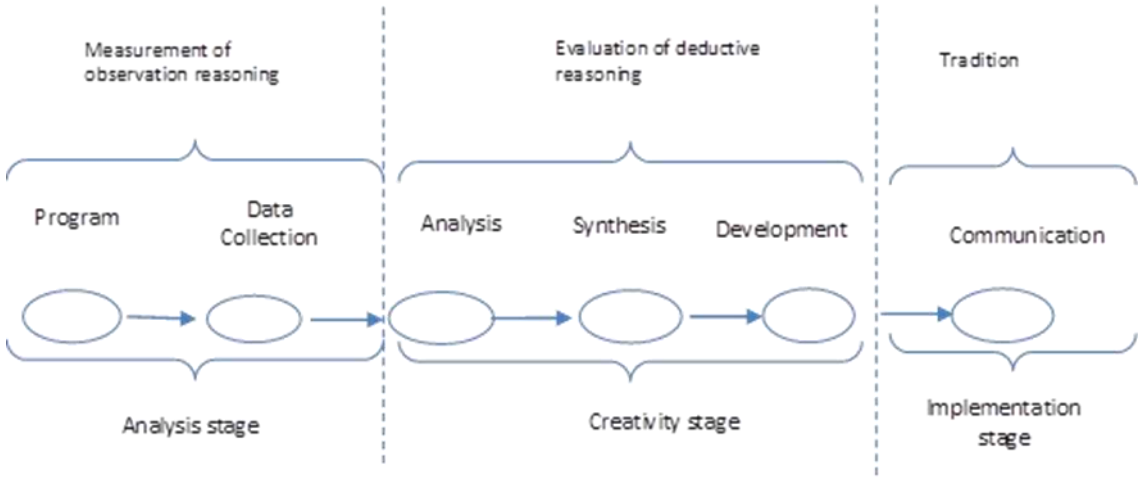

Fig 2 Bruce Acher's proposed chart (Source: El-Khouly, 2015: 34)

In the late 1970s, many research articles were written by scholars, including Jeffrey Bradbent and Omer Akin. Scientists from other disciplines have also been involved in helping to better understand design processes. Herbert Simon published his book entitled "Artifact Science", in 1969, and Donal Shon in 1983, with his book entitled, "The Reflective Specialist", made a great contribution to understand the education of design. Brian Lawson, William J. Mitchell have been contributed a lot in understanding better the design thinking and architectural design logic (Kowaltowski et al., 2010: 453-476). In 1984, Cross created a thematic division of design method and introduced the main representatives of each field. Thus, the goal of many studies was to "have control over the work process". Design structure problems have always been discussed by Christopher Jones, Peter Levine, Barry Poyner, Melvin Webber, Horst Rittel. In 2002, they reviewed three comprehensive papers on research contributions, theory, and design operations (Jeamsinkul et al, 2002: 134–155). Goldsmith is the convergent and divergent thinking "divergence of thinking that moves in divergent directions to include different aspects, leading to new ideas and solutions related to creativity", "Convergence thinking collects information focused on solving a problem", which is important in the system of thought and design reasoning. The processes that target the generated thought are the most complex cognitive processes that can be studied (Beaty et al, 2016: 87-95). Gick (1986) combined these and other problem-solving models (Greeno, 1987: 239–270) with a simplified model of the problem-solving process, including the processes of creating problem representation, solution search, implementation and supervision on solution. Prior to that, Maurice Asimo come up with a plan for the production cycle. This plan starts with the analysis of requirements and then studied, and then the initial and complete plan is presented. The next stage is the activities related to production, distribution and consumption. This method is the background of all product development methods (Julio et al., 2011: 1-18). LG March argues that he has separated himself from the linear representation of the design process which is based on the assumption that the problem depends on the solution and that inductive-inferential thinking is insufficient to produce cohesiveness in the design process. March followed the work of the philosopher Charles S. Pierce idea of abductive thinking, which is related to production, while induction and inference are related to research (analysis). In other words, "the inference proves that something must be there; induction shows that something is actually practical; and abductive suggests that what might be" (Pierce, quoted in Cross, 2021: 3-18). The representation of the

"March" design process is a cyclical model which begins with production (initial conditions and assumptions about the types of solutions to describe the concept of a design), continues with inference (predicts the efficiency of solutions), and experiences induction for a moment (show changes and corrections in the concept).

Table 1 Studies in the field of architectural design methodology (Source: Authors)

Year	Theories	Description
1933	Devi	Contemplation is as a certain kind of thinking
1966	Jones	Contemplation, combination, analysis
1963	Archer	Evidence and recognition
1964	Alexander	Note on figure composition
1969	Simon	Science of synthetics
1983	Shun	Reflective thinking
1984	Cross	Four pillar pattern
1986	Gig	Creation process, problem representation, problem solving composition
1990	Goldschmidt	Convergence and divergence thinking
1996	Maher	Parallel thinking between problem and solution
2003	Steinberg	Recognition quality in creative participation

4. Theoretical Foundation

4.1. Defining the Problem and related Approaches

Problem occurs when the current state of a thing is known and understood what is the desired state and goal state of that thing; but there is no understanding of how to go from the current state to the desired state, a problem actually arises, in fact solving a problem is a part of thinking. Problem solving is the most complex part of any thinking operation, which can be defined as an important cognitive approach that requires the integration and mastery of a series of basic and functional skills. The problem-solving process is expressed when a living entity or system does not know where to go from situation to another situation, what path should it take? This, in turn, is considered as part of the process of a larger problem, that finding and shaping the problem is a part of it (Goldschmidt and Weil, 1998).

4.2. Creative Thinking

From the point of view of cognitive psychology, creative thinking can be considered as a set of tendencies and abilities that lead a person to create new and innovative thoughts, ideas or imaginations. Creative action requires the emergence of a certain mental ability that depends on the mental processes, behavioral and personality characteristics of the creative person. Thinkers have expressed the aspects of creative thinking including fluency and fluidity, flexibility, originality or novelty, expansion, analysis, combination of organization, complexity, transformation and change (Seif, 1999: 45; Mirkamali, 1999: 100; Hosseini, 1998: 54).

4.3. Adequate understanding of the Thinking issues in Design

In general, understanding a subject has three general aspects. These three aspects include understanding of the subject, what is being understood or the same subject, and finally the scientific contemplation that connects the first two aspects. Regarding architectural design, the issue of design needs to be known and understood (Daneshgar Moghadam, 2009: 59). But in design

situations, the problem is rarely defined at the beginning of the work, but many experienced designers have considered the need for a clear problem to be necessary to start creative work (Lawson, 2005: 175). Therefore, starting the design process as a creative work, and in other words, creative problem solving by a designer, requires a sufficient understanding of the design problem, which goes back to the initial stage and preparation in the series of steps explained in the process of creativity and architectural criticism. In fact, creative understanding of the problem limitation is one of the most important capabilities of the designer, which provides the designer with sufficient understanding of the design problem in order to find the answers with a creative approach. The importance of creating motivation for creative thinking is undeniable in the architectural design process (Hojjat, 2002: 51).

4.4. Tradition

In the Oxford Encyclopedia, the word "Transformation", literal meaning is transformed and in art is the change from a simple form to a more complex form or, conversely, a change from a concrete form to an abstract form. One aspect of changing the components of a problem in order to achieve creativity is tradition. Tradition means change in the space of the problem. In concept design, the production of an idea or wide range of ideas is developmental and purposeful. The structure of thinking in the design process is how design actions and ideas relate to each other. Design movements (stage, action, creation) and structural units of design include argumentative movement; the "steps" of design change the position of the design relative to its predecessor (Goldschmidt, 1990: 291-298). In the process of change, two factors play a key role in its success. The two goals "diversity" and "flexibility" are core of any design program. The change in attitude towards the final product is based on the test of answers to design questions proposed by the designer (Sabri, 2014: 48). Conceptual tradition as a sub-branch of conceptual change, strategy of thinking is to provide a creative interaction of conceptual transformation for the development of architectural design process. The three main approaches to achieve conceptual tradition are to develop a way of knowing and acting on the findings of thinking (Table 2). To promote this approach, three factors of integration, structuralism and adaptability are proposed (Table 3). In the process of transformational critical movement, sudden mental insight is the stimulus response that occurs suddenly in the brain after an idea is ignited. This leads to the discovery of amazing phenomena in knowledge. There is a lot of debate about what constitutes the sudden mental insight. One of the arguments put forward is the emergence of sudden insights, a process of transformation in which creative insights are the result of rethinking (Weisberg and Alba, 1981: 169-192).

Table 2 Main factors of conceptual tradition (Source: Authors)

Table 3 Micro-factors related to conceptual tradition (Source: Authors)

Main and Sub Criteria													
Transparency		Fluidity		Minimum intervention in environment		Multiple layers		Interaction with public arena and creating space event		Re-defining the spatial structure		Change in program	
Visual continuity	Mass reduction	Dynamic movement	Integrated structure	Structure below ground	Blending with the building	In between space	Adaptability combination	Boundary reduction	Change in private to public aspects	Free space regulation	Adaptability with urban granulation	Re-defining program in favor	Community Acceptance

4.5. Competitiveness and Transformation of Components of the Problem

The competition environment in the architectural design process is constantly changing. Therefore, to meet the competitive needs, it is very important for the designer to use up-to-date strategies (Tan et al, 2011). This study implements a diamond model to analyze the competitive components in the architectural design process and determine the best strategies by the design, first of all, needs to recognize innovations in the field of design (Zhao et al, 2012). Therefore, in order to compete in architectural competitions, the designer must regularly ask questions at each stage and always seek answers to these questions: What are the criteria for the committee of jury about the innovations of the architectural design process to choose the best idea? Whether architectural innovation is one of the advantages of a design in the field of competitiveness? What innovations are needed to win architectural designs? What effect do architectural innovations have on decision making of the judges to select the design as the best design? Does originality in architectural design attracts the judges? The emergence of all these questions in the designer mind at every design stage, leads to a kind of creativity in his thoughts. Generally, innovation is defined as the successful introduction of a new thing or method. This approach leads to the visualization, illustration, combination of knowledge in the designing products, processes or services of new valuable things. With this simple definition, it can be said that innovation and creativity in a design is easily defined as the process of converting a creative idea into a valuable product (Dogan et al, 2013).

An old definition describes innovation as a gateway to a product's competitive advantage globally and internationally through the introduction of products, new services or unique services to the market. According to this definition, it can be seen that creating barriers to entry in the field of competitiveness leads to the provision of necessary resources (creative ideas) and consequently provides innovative development through resource learning. It is possible to add new items to these definitions in the literature, for example in the field of competitiveness in various fields of industrial and organizational design, innovation can be related to performance and growth by improving efficiency, increasing productivity, increasing quality, finding competitive position, market share, etc. (Altindag et al, 2010). In the design process, the designer gives an idea with the aim of solving the problem and arranges the criteria and norm with which the solution must conform. In guiding the process of reaching a solution to a problem or idea, the designer uses

various deductive methods such as finding similar, contradictory relationships, and rules of association with meanings such as proximity, similarities, similar factor and contrast. In this regard, "idea processing" means evaluating and selecting the most desirable solution to the problem. The Delphi Research Report provides a definition of critical thinking that has been agreed by 46 experts in philosophy, psychology, and education: Critical thinking is a purposeful and self-regulated judgment that leads to the interpretation, analysis, evaluation and inference, as well as the description of reflections on evidence, concepts, methodologies and criteria, and becomes the context on which judgment is based (Table 4). Critical thinking is a tool that is essential for research (Sharif and Nadimi, 2013: 22).

Table 4 Critical thinking skills according to the American Philosophical Society (Facione, 1994)

Form	**Description**
Interpretation	Understanding and expressing the meaning or validate the experience of the situations, data
Analysis	Recognizing the optimal inferential relationship between statement
Evaluation	Recognizing the statement validity
Inference	Identify and strengthen the factors necessary to achieve reasonable results
Explanation	Individual ability to express the results of his or her argument firmly and coherently
Self-regulation	Self-conscious monitoring of cognitive activities

5. Field Data Analysis

5.1. Process of work to be examined in the Field of Competitiveness

The research content is from the literature of the subject and is summarized by the point of view of the judges to vote the proposed architectural design and analyzed in the field of creativity and competitiveness. After ensuring the validity of the questionnaire, in order to increase the logical validity of the research tool, the structural validity of the measurement tool (questionnaire) was assessed by evaluating the criteria and matching the research objectives. Using a coherent action plan that was introduced in the framework of the step-by-step process of research methodology, the authors have reviewed and classified the information with the findings of the measurement model for theoretical evaluation of the research and importance of components affecting the creativity, competitiveness of architectural design, significance and relationship between these components were tested to determine the two-way relationship between them. It should be noted that to measure the impact of creativity on the competitiveness of architectural design, seven effects of architectural design in the architectural community have been evaluated (Table 5).

Table 5 Criteria for measuring the impact of creativity on design competitiveness

	Name of work	**Valuation criteria**	**Compiled sub-factors**
1	Tehran justice Association	Continuity of Iranian architecture	Transparency
2	Mellat Cinema	Creating a new order	Fluidity
3	Science and Technology Library	Stability	Minimal intervention in the environment
4	Noor Mobin School	Redefining the spatial organization	Multilayers and variability
5	Palace Museum garden	Expanding the urban public arena	Interaction with the public space and create an event space

6	Sahel Sepehr office building	Urban granulation	Redefining the spatial structure
7	Hashtgerd Engineering Department	Action between city and building	Schedule change

5.2. Assessing the Validity of the Questionnaire with Delphi Technique

In this section, the Delphi technique is used to identify and confirm the indicators. To do this, the questionnaire is distributed in three stages among five experts and in the last stage, if the difference in standard deviation of each index is less than 1, the repetitions can be terminated. The result of this test can be seen in (Table 6). In the first stage of Delphi, according to the table above, it is clear that the average of all indicators has been reported greater than 3 and therefore remains in the research. According to the opinions of experts in the second round, it was concluded that all the approved indicators in the first stage are acceptable (average greater than 3) and therefore remains in the study. According to the opinions of experts in the third round, it was concluded that all the identified indicators are acceptable and the average of all indicators is greater than 3.

The last round of Delphi: In this section, in order to determine the consensus using the Delphi method among experts, the Kendall coordination coefficient is used. The Kendall coordination coefficient indicates that individuals who have ranked multiple categories according to their importance have used similar criteria to judge the importance of each category and agreed. If there is a consensus among the members, the Kendall coordination coefficient is greater than 0.7 and if there is no consensus, this number is lesser than 0.5. Because Kendall's coefficient for members' responses for indicators in the third round reflects a strong and, in some cases, very strong consensus among panel members, and given that in the second round Delphi the results showed that very little difference from the results of the third round, therefore, Delphi rounds were stopped and the final indicators were confirmed.

Table 6 Delphi technique results in three stages (Source: Authors)

Index number	**First Delphi**		**Second Delphi**		**Third Delphi**		**Kendall coefficient**
	Average	Standard deviation	Average	Standard deviation	Average	Standard deviation	
Visual continuity	5.00	0.000	5.00	0.000	4.80	0.447	0.74
Mass reduction	4.80	0.447	5.00	0.000	4.60	0.548	0.78
Kinetic dynamics	4.80	0.447	5.00	0.000	5.00	0.000	0.72
Integrated structure	5.00	0.000	5.00	0.000	5.00	0.000	0.82
Building inside the ground	5.00	0.000	4.80	0.447	4.80	0.447	0.81
Blending building with environment	5.00	0.000	4.60	0.548	5.00	0.000	0.79
Intermediate space	4.80	0.447	5.00	0.000	4.80	0.447	0.73
Adaptability combination	4.80	0.447	4.60	0.548	4.40	0.548	0.88
Reduce the border	4.80	0.447	5.00	0.000	4.80	0.447	0.91
Transform private into public nature	5.00	0.000	4.60	0.548	4.40	0.548	0.76
Free spatial regulation	4.80	0.447	4.60	0.548	4.80	0.447	0.73

Adaptation to urban granulation	5.00	0.000	4.80	0.447	5.00	0.000	0.74
Redefine the program in favor of the city	5.00	0.000	4.80	0.447	5.00	0.000	0.77
Social acceptance	5.00	0.000	4.80	0.447	4.80	0.447	0.78

5.3. Evaluating the Descriptive Statistics of Competitiveness Questionnaire Indicators

In this section, descriptive statistics of questionnaire indicators including number, standard deviation, minimum value and maximum value and mean are examined (Table 7).

Table 7 Descriptive statistics of the questionnaire questions (Source: Authors)

Indicators	**Standard deviation**	**Average**	**Maximum amount**	**Minimum amount**	**Number**
Visual continuity	0.504	4.23	5	3	30
Mass reduction	0.548	3.90	5	3	30
Kinetic dynamics	0.263	4.00	5	3	30
Integrated structure	0.681	3.87	5	3	30
Building inside the ground	0.615	3.63	5	3	30
Blending building with environment	0.604	3.69	5	3	29
Intermediate space	0.662	3.90	5	3	30
Adaptability combination	0.521	3.73	5	3	30
Reduce the border	0.621	3.60	5	3	30
Transform private into public nature	0.484	3.80	5	3	30
Free spatial regulation	0.490	3.63	4	3	30
Adaptation to urban granulation	0.740	3.93	5	3	30
Redefine the program in favor of the city	0.636	3.76	5	3	29
Social acceptance	0.583	3.73	5	3	30

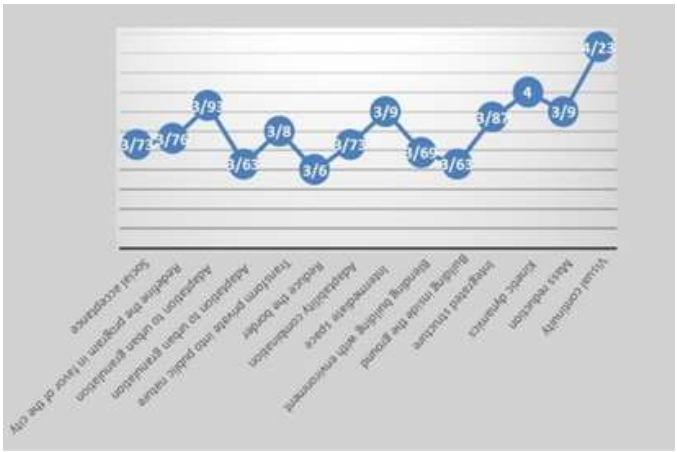

Fig 3 Average competitiveness indicators (Source: Authors)

5.4. Evaluate the Reliability of the Questionnaires

In this section, the reliability of the questionnaires has been examined using Cronbach's alpha. Given that Cronbach's alpha coefficient has been reported to be greater than 0.7, it is concluded that the questionnaires have the necessary reliability (Table 8).

Table 8 Cronbach's alpha to evaluate the reliability of the questionnaires (Source: Authors)

Total Statistics Item					
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Total Item Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Continuity	35.32	44.152	.345	.580	.828
Reduction	34.39	42.173	.340	.521	.831
Dynamic	34.96	47.073	.002	.568	.845
Structure	34.43	38.772	.594	.679	.811
Building	34.39	38.766	.736	.674	.802
Blending	34.50	43.593	.283	.664	.833
Space	34.50	39.074	.535	.711	.816
Combination	33.79	41.138	.537	.721	.816
Decrease	34.32	41.115	.526	.609	.817
Nature	34.14	39.164	.621	.732	.809
Arranged	34.18	41.115	.552	.801	.816
Adaptation	35.07	42.439	.409	.712	.825
Redefining	34.75	41.380	.510	.855	.818
Acceptance	34.57	41.587	.461	.779	.821

Based on the model obtained from research hypotheses tested, it has been examined the acceptance or rejection of relationships. To accept or reject the relationships, the significance coefficient (t-statistic) has been used, if the t-statistic is greater than 1.96 or lesser than -1.96 (5% error level), the hypothesis is accepted and a significant relationship has been obtained between the two hidden variables.

Table 9 Examining the relationship between hypotheses

Relation	Standard coefficient	t-statistic	Relationship status
Competitiveness on changing components of the problem	0.511	11.609	significant
Transforming the issue into competitiveness	0.340	4.575	Significant
Changing program components to increase	0.423	8.846	significant

creativity			

Competitiveness has a significant effect of 51.1% on changing the components of the problem with a significant value of 11.609. Changing the components of the problem has a significant effect of 42.3% on increasing creativity with 8.846 as significant value. Transformation of the problem has a significant effect of 34% on competitiveness with 4.575 as significant value.

6. Conclusion

In the proposed research framework, promoting creativity with the aim of evaluating performance from the perspective of competitiveness has been studied as the main goal in evaluating and critique and judging architectural designs. Therefore, after identifying the theoretical framework and formulating the components of creativity and competitiveness, the two-way relationship between these components has been investigated. Experimental findings of the research show that there is a significant impact among the concepts in the theoretical framework. According to the confirmation of the research model and the relationship concepts, it can be judged that the empirical evidence confirms the factors. The theoretical framework of the research, with the solution of increasing creativity in the field of making an architectural design more competitive in the early stages of the design process, seeks to increase the efficiency and effectiveness of the design and ultimately win the competition in the facing wide range of intellectual needs of judges and critics.

The synergistic between the components of creativity and competitiveness, creates a common vision and comprehensive understanding of creative problem solving in the design set and makes it possible to provide optimal solutions at different layers of design (components factor of creativity). Assessing the views of critics and judges of the statistical groups of this study (architectural plans and critical view of judges in determining the effectiveness of plans), confirms the partnership that provides intelligent solutions and modifying the project physical structures to improve the competitiveness of the project. Evaluating and critique an architectural design based on the components of creativity, will lead to increased awareness and commitment in the designer for making optimal decisions. On the other hand, the competitiveness of the design, in addition to the increasing efficiency, by creating satisfaction from critical thinking, leads to the proper formation of the design collection identity and improve its quality (components factor of competitiveness) and this issue makes the design last longer than before. In the present article, with a descriptive-analytic perspective, the two-way relationship between creativity and competitiveness of the architectural design to create an interaction between two approaches in solving the creative problem, logical relationship between form and their components has been investigated. Accordingly, first the process of architectural design and the ideas affecting it were examined from the perspective of creative problem solving and competitiveness. Then, how these thoughts affect the architectural design process with sufficient understanding of the issue of thinking in design was evaluated and the periodic process to achieve a creative product was determined by the creative thinking of an architect during the design process.

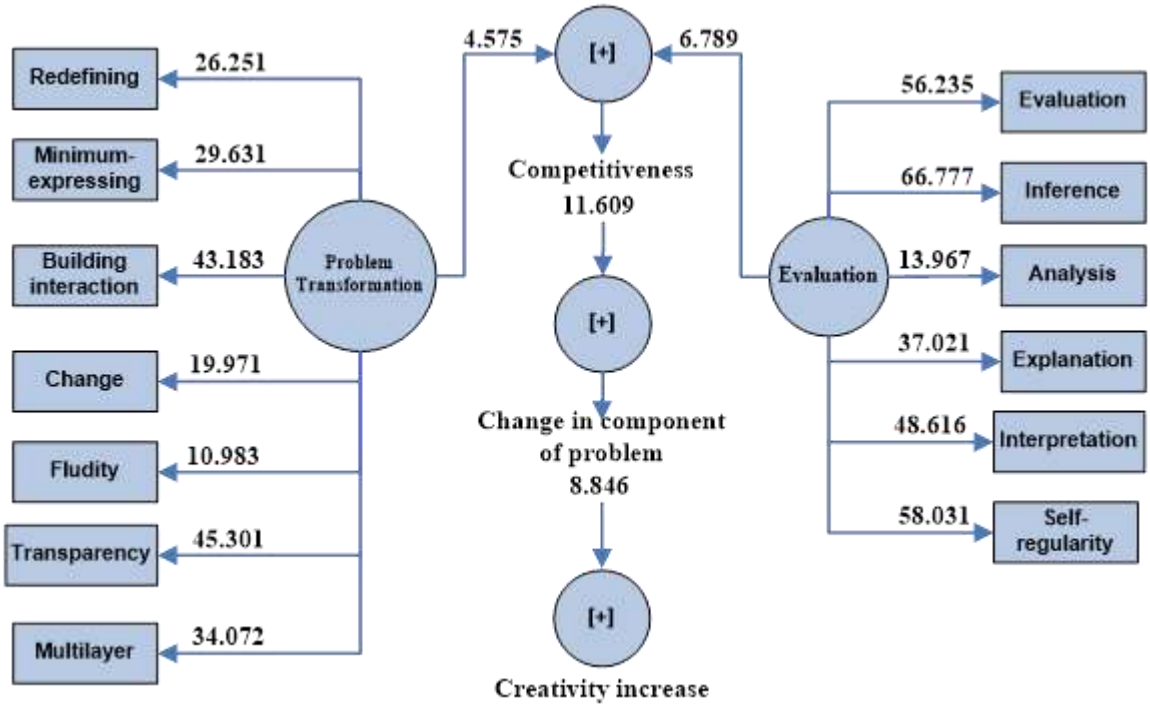

Fig 4 Research model based on path analysis in a significant state

References

Altindag, E., Zehir, C., & Zafer Acar, A. (2010). Learning, entrepreneurship and innovation orientations in Turkish family -owned firms. *EMAJ: Emerging Markets Journal, 1*.

Beaty, R. E., Benedek, M., Silvia, P. J., & Schacter, D. L. (2016). Creative cognition and brain network dynamics. *Trends in cognitive sciences, 20*(2), 87-95.

Cross, N. (2021). *Engineering design methods: strategies for product design*. John Wiley & Sons.

Daneshgar Moghadam, G. (2009). Understanding the problem of design in Architecture education, a study of the components affecting sufficient understanding of the problem of design as a beginning point for the beginners. *Journal of Fine Arts, 37*(1), 59-68.

Doğan, H., Nebioğlu, O., Aydın, O., & Doğan, I. (2013). Architectural innovations are competitive advantage for hotels in tourism industry? What customers, managers and employees think about it?. *Procedia-social and behavioral sciences, 99*, 701-710.

El-Khouly, T. A. I. (2015). *Creative discovery in architectural design processes: an empirical study of procedural and contextual components* (Doctoral dissertation, UCL (University College London)).

Facione, P.A. (1994). *Are College Students Disposed to Think?* Millbrae, CA: The California Academic Press. ERIC Document ED368311.

Goldschmidt, G. (1990) Linkography: assessing design productivity. In Cyberbetics and System'90, *Proceedings of the Tenth European Meeting on Cybernetics and Systems Research* (pp. 291-298). World Scientific.

Goldschmidt, G. (1995). The designer as a team of one. *Design Studies, 16*(2), 189-209.

Goldschmidt, G., & Weil, M. (1997). Contents and Structure in Design Reasoning. *Design Issues, 14*(3), 85 -100.

Greeno, J. G. (1978). Natures of problem-solving abilities. *Handbook of learning and cognitive processes, 5*, 239-270.

Hojjat, I. (2002). Speech on time: A new look on methods of teaching Architecture in Iran. *Journal of Fine Arts, 2*(1), 50-58.

Hosseini, A. S. (1998). What is creativity and what is the role of school in its development? *Journal of Psychology and Educational Sciences, 0*(1-4), 52-73.

Jeamsinkul, C., Boztepe, S., Poggenpohl, S., & Lim, Y. K. (2002). Annotated theory and practice in design list. *Visible Language, 36*(2), 210.

Júlio Carlos de Souza van der Linden, André Pedroso de Lacerda, and João Pedro Ornaghi de Aguiar, (2011). *The evolution of design methods*, See discussions, stats, and author profiles for this publication.

Kowaltowski, D. C., Bianchi, G., & De Paiva, V. T. (2010). Methods that may stimulate creativity and their use in architectural design education. *International Journal of Technology and Design Education 20*(4), 453-476.

Lawson, B. (2005). *How designers think: De-ambiguity of the design process* (Nadimi, H. Trans.). Tehran: Shahid Beheshti University Publisher.

Mirkamali, M. (1999). *Human Relations in School*. Yastroon Publishing, Tehran.

Sabri, S. (2014). *Transformation in Design: The Design Process with Myth, Imagination and Design Mind*, Shahid Beheshti University.

Seif, A. A. (1999). *Educational psychology, psychology of learning and education.* Second Edition, Tehran: Agah Publication.

Sharif, H., & Nadimi, H. (2013). Idea Finding and Idea Processing in Architectural Design Thinking. *Sefeh, 62,* 19-26.

Tan, Y., Shen, L., & Yao, H. (2011). Sustainable construction practice and contractors' competitiveness: A preliminary study. *Habitat international, 35*(2), 225 -230.

Weisberg, R. W., & Alba, J. W. (1981). An examination of the alleged role of "fixation" in the solution of several "insight" problems. *Journal of experimental psychology: general, 110*(2), 169-192.

Zhao, Z. Y., Zuo, J., Zillante, G., & Zha.o, X. J. (2012). Foreign architectural and engineering design firms' competitiveness and strategies in China: A diamond model study. *Habitat International, 36*(3), 362-370.