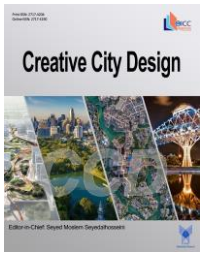

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Review Article

Explanation and Prioritization of the Components and Criteria Influencing the Formation of Active Ideation in the Architectural Design Process

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Abstract

Aims: Initial ideas are mental perceptions that help designers in the early stages of creative thinking. As the central core around which other considerations are organized, ideas play a vital role in initiating and guiding the design process. Hence, identifying the factors influencing idea formation has become a key focus in design research. Within this context, the active ideation approach suggests that ideas arise not merely from external information and analysis, but from the designer's internal cognitive structures, patterns, and prior knowledge of the design problem. Although various theories address active ideation, no comprehensive model yet explains this process. Therefore, this study aims to identify, screen, and prioritize the components affecting active idea generation in architectural design and to present a conceptual model.

Methodology: The study is applied and follows a mixed-methods design. In the qualitative phase, data were collected through meta-synthesis. Sixty-one studies were systematically reviewed and analyzed thematically with MAXQDA 2024. In the quantitative phase, components and criteria were evaluated using the Fuzzy Delphi method with twelve experts and weighted by the SIWEC technique.

Findings: The study identified 9 main dimensions, 35 components, and 178 criteria affecting active ideation in the architectural design process. Expert consensus was achieved at a threshold of 0.7. The most important dimensions were the designer's mental and perceptual structure, utilization of selective attention, and designer's intellectual backgrounds and thinking power. The highest-ranked components were designer's personal knowledge of the design subject, experiences, and value system. Key criteria included designer's insight and attitude, lived experience, attention to mental schemata, activation of personal knowledge, and attention to the external, functional, and emotional characteristics of personal knowledge.

Conclusion: Active ideation is conceptualized as a dynamic, multilayered system in which intrapersonal factors are central, while contextual and informational factors act as supportive elements for improving architectural design education and practice.

Keywords: Active ideation, Initial design idea, Architectural design process, Fuzzy Delphi, Meta-synthesis, SIWEC method.

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1. Introduction

Ideation has always been one of the main drivers of creativity and innovation in architecture. Although various philosophical perspectives have explained the origin of ideas in different ways, these viewpoints become particularly significant when their role in the activation of the designer's mind and the formation of initial ideas in architectural design is clarified. Accordingly, the focus of the present research is not the philosophical nature of ideas, but rather the identification of the mechanisms that contribute to idea generation within the design process. Many designers, contrary to common assumptions, do not begin their design process with the linear analysis of data.Instead, they seek a way to reduce and simplify a set of potential solutions and diverse objectives. For this purpose, they focus on a particular goal or a group of smaller goals, namely, initial ideas, which are regarded less as the product of rationality and a logical process, and more as values based on the personal views and judgments of the designe [1]. Dark refers to this initial idea as a "value judgment" a notion that, unlike logical analysis, originates from within the designer's mind and from their mental image of the problem. Therefore, the starting point of design emerges through an idea or a conception of a possible solution, which itself arises from the designer's mental structures, personal views, and judgments [2].

Recent scientometric studies in the Scopus and Web of Science databases indicate that despite the remarkable growth of data-driven approaches in architectural design and the AEC sector—such as Design-Driven Data (DDD) and big data analytics—the pathway through which such data are translated into the cognitive process of idea generation within the designer's mind remains unclear and unresolved. This issue has been reported as a fundamental gap in design research [3]. These studies emphasize that although data analysis in architecture and urban design has advanced significantly, its connection to design thinking and idea generation remains weak and incapable of explaining the mental and perceptual mechanisms involved in the formation of initial ideas.

On the other hand, one of the fundamental challenges in architectural design education is the accumulation of large amounts of information at the early stages of design from site and climate conditions to functional and social requirements which, due to its fragmented, analytical, and detail-oriented nature, is incapable of producing a coherent idea. A review of architectural design studio experiences shows that many students, even after extensive preliminary research, remain confused at the beginning of the design process and do not know where to start ideation. As a result, they either generate ideas unrelated to the design brief or, instead of relying on their own understanding of the problem, resort to imitating existing examples or prevailing design trends, including styles and fashions. This situation reveals a clear gap between preliminary studies and the idea generation process, thereby highlighting the critical importance of the ideation stage.

This theoretical gap also has direct implications for fields such as responsive environmental design and creativity in urban architecture. As long as the mechanisms underlying the formation of initial ideas remain unclear, it will not be possible to guide design toward responsive, meaningful spaces compatible with human experience. Ambiguity in ideation thus becomes a major obstacle to transforming environmental, social, and technological analyses into a developable architectural idea.

Based on design models and methods, two main approaches to idea generation can be identified. In the first approach, ideas are derived from project information and analytical processes; in other words, idea formation is the result of logical reasoning. In the second approach, ideas emerge not from induction and data analysis, but from the designer's mental structures and conceptual frameworks regarding the design problem. T. White (2007) refers to these two approaches as the passive and active methods of ideation, respectively [2]. Therefore, by focusing on active ideation and its underlying mechanisms, the present study is situated at the core of the identified scientific gap and seeks to provide a deeper understanding of the initiation of the design process.

Furthermore, a review of theoretical discussions reveals five primary sources influencing idea formation: cognitive resources, experiential resources, factors related to the design problem, resources associated with design skills and processes, and value-based and individual factors. Despite the breadth of these sources, there is still no comprehensive study that identifies and prioritizes these factors within a unified conceptual model of active ideation in architecture. Accordingly, the present study aims to identify, screen, and prioritize the components and criteria influencing active ideation and to present a comprehensive conceptual model based on research evidence and expert judgment. In this regard, the research answers the following two main questions:

1. What are the components and criteria influencing the formation of active ideation in the architectural design process, and what is the conceptual model derived from their explanation?
2. What is the prioritization and relative weight of these components and criteria?

Considering the complexity of the ideation process in architectural design, using hybrid approaches to extract and organize influential components is essential. Recent studies have also emphasized the importance of conceptual modeling and systematically explicating the ideation

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process [4, 5]. To achieve these objectives, the research was conducted in three stages. First, using a meta-synthesis approach based on the seven-step method of Barroso and Sandelowski (2007), 61 credible sources were systematically analyzed, and the components and criteria influencing active ideation were identified. These findings were then evaluated and screened by a panel of 12 experts using the Fuzzy Delphi method, leading to the development of the final active ideation model. Finally, the weighting and prioritization of the expert-approved components and criteria were determined using the SIWEC multi-criteria decision-making method.

2. Research method

The research method is applied in terms of purpose and mixed (qualitative and quantitative) in terms of approach. Data collection is conducted through the meta-synthesis method in the qualitative section and the Fuzzy Delphi technique and SIWEC weighting in the quantitative section.

Based on the nature of the proposed methodology, this study has been carried out in three stages. In the first stage, to compare, combine, and interpret qualitative studies on idea generation in the architectural design process, the meta-synthesis method was employed, and each piece of data was coded and analyzed using thematic analysis based on Braun and Clarke's (2006) method with the aid of MAXQDA 2024 software. In the second stage, to redesign, screen, and validate the findings of the meta-synthesis, the Fuzzy Delphi method was applied. In this stage, a questionnaire based on the qualitative findings of the study was prepared and distributed among experts. In the third stage, to determine the importance of each finding, the SIWEC weighting method was employed. Figure 1, illustrates the stages of the research process.

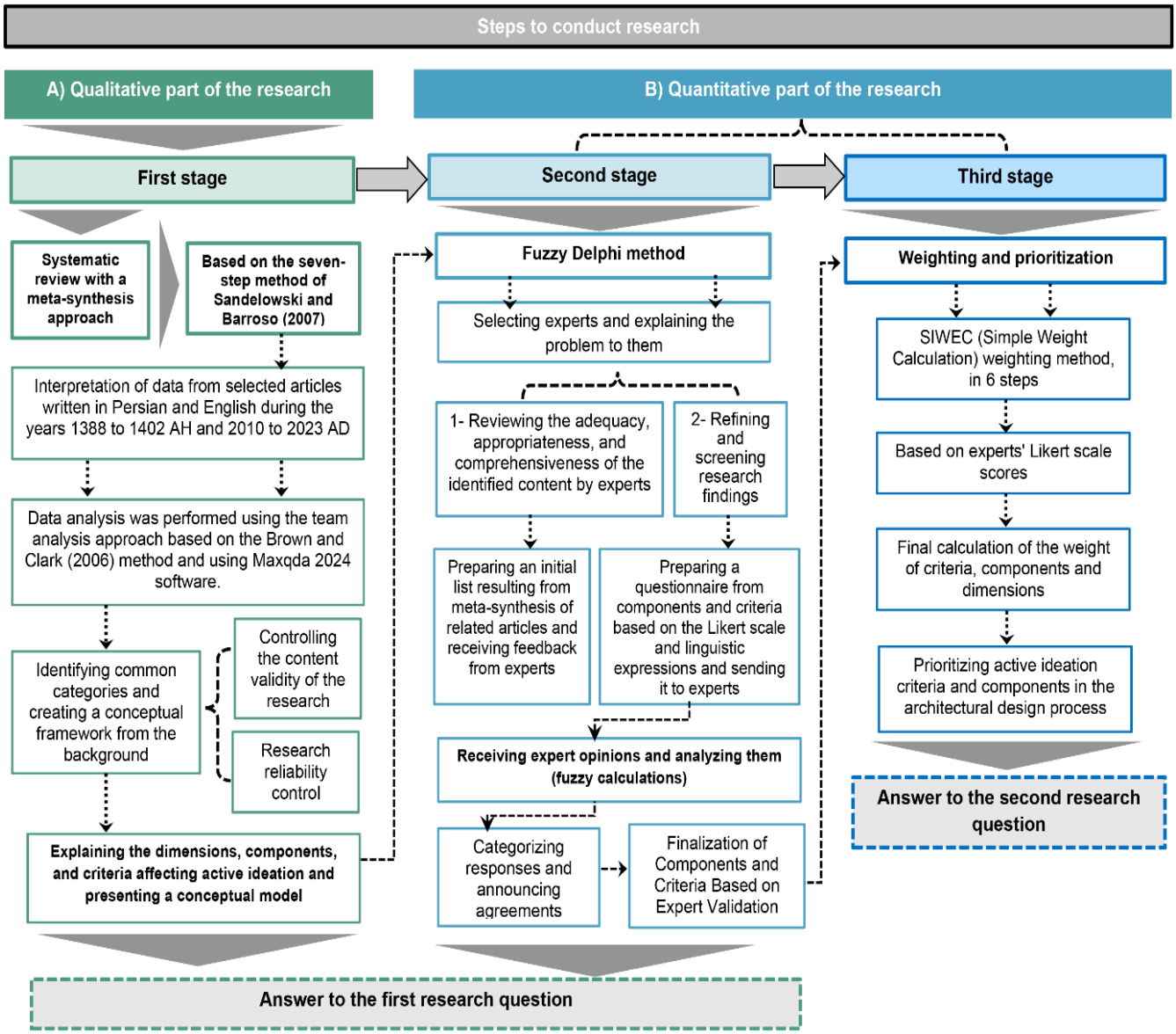

Figure 1. Research steps (Source: Authors)

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2.1. Stage One: Systematic Literature Review Using the Meta-synthesis Method

The meta-synthesis method is a relatively new approach in the field of qualitative research, and it refers to the quality of translating qualitative studies as well as the researcher's careful review and deep understanding [6]. This method is not simply a summary of similar research interpretations, but rather an integration of the interpretations of the main findings of selected studies to generate comprehensive and interpretive outcomes. The strength of the meta-synthesis method lies in its ability findings of selected studies to generate comprehensive and interpretive outcomes. The strength of the meta-synthesis method lies in its ability to identify complex categories and to develop a conceptual framework from the existing literature [7]. Therefore, the subject under consideration for meta-synthesis is selected from qualitative studies based on their relevance to the research question [7]. In line with the research methodology, and to identify the components and criteria influencing active idea generation, the seven-step method of Barroso and Sandelowski (2007) was employed (Figure 2). The various dimensions of the study will be explained in the framework of these seven steps.

2.1.1. *Step One: Formulating the Research Question*

The central question in meta-synthesis is a "what" question. Given that the meta-synthesis method in the present study is employed solely to address the first research question, the review process begins by posing the question: "What are the components and criteria influencing the formation of active ideation in the architectural design process, and what is the conceptual model derived from their explanation?" Subsequently, the study population, temporal scope, and data collection procedures of the meta-synthesis are described in detail.

2.1.2. *Step Two: Systematic Review of Literature*

For data collection in this research, secondary data in the form of past documents and records were used. The unit of analysis in this study consisted of full-text scientific and research articles derived from qualitative studies. These articles were selected from publications written in Persian and English between the years 2009–2023 (1388–1402 in the Iranian calendar and 2010–2023 in the Gregorian calendar) were considered. For a comprehensive and precise search of studies, various keywords such as "idea generation," "ideation," and their Persian equivalents were employed in domestic databases including Iranian Research Institute for Information Science and Technology (IRANDOC), Scientific Information Database (SID), Noor Specialized Journals Database, Magiran, Humanities Portal, Elmnet Persian Search Engine, as well as international databases such as Google Scholar, Scopus, ScienceDirect, and Springer. Table 1, presents the keywords used in this search.

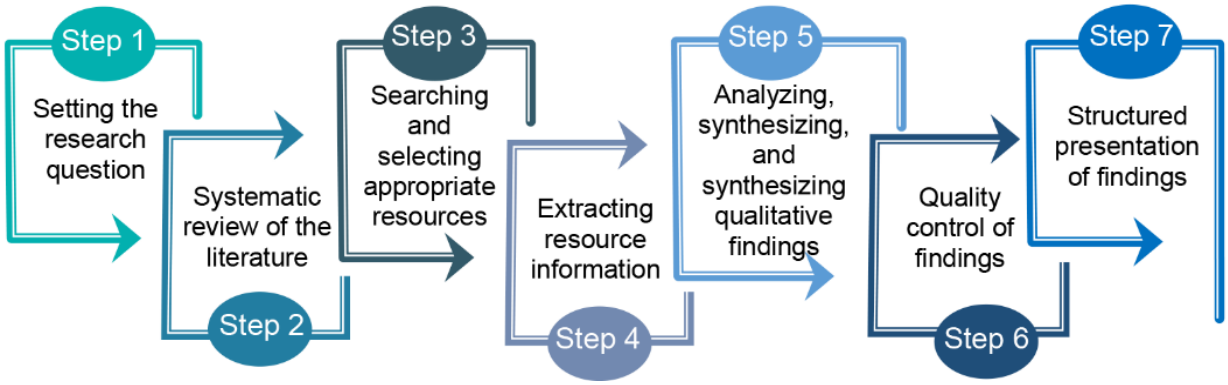

Figure 2. The seven-step metasynthesis method based on Sandelowski and Barroso's ideas [8]

Table 1. Keywords used in the search

Keywords used in the search	
Ideation- Finding ideas	Designer's tacit knowledge
Idea generation- ideation	Designers' learning style
Architectural design process	Creativity in design
Active ideation	Design Thinking
Primary design ideas	Design mind
Designer's mental structures of design problem	Solution-oriented design
Creative ideation	Framing the design problem
Primary design generators	Architectural design training

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2.1.3. *Step Three: Searching and Selecting Relevant Source*

The systematic search of sources was conducted in accordance with the PRISMA guidelines and by employing a Boolean search strategy. Initially, a set of primary keywords was extracted across two content areas: "ideation and the architectural design process" and "designer cognition and mental structures." These keywords were then purposefully combined using the AND, OR, and NOT operators to ensure the comprehensiveness, precision, and reproducibility of the search process. In the search process, various parameters such as title, abstract, content, and quality of related research were considered, and articles that did not fit the research question and objective were eliminated. On the other hand, the selected study set was reviewed several times. The sampling method was also determined purposefully, and the number of studies was determined based on the inclusion and exclusion criteria, as determined by the researchers. The inclusion criteria include:

1. all published scientific research articles in the field of interest.
2. all scientific research articles in the target period that are reviewed using appropriate qualitative methods such as interviews, observations, systematic reviews, library methods, etc., as well as quantitative scientific research articles, including survey, experimental, and correlational articles that have qualitative results and examine the subject of interest.
3. articles must have reported sufficient data and information related to the research objectives.
4. studies that have undergone a professional review process under the supervision of expert referees and have been fully published online or in whole. For this purpose, only scientific research articles were considered in the study.

Exclusion criteria also included:

1. studies that did not report sufficient information on the objectives of this study,
2. studies that lacked an appropriate methodological model.
3. studies that lacked the necessary scientific qualities and were published in unreliable journals.

Accordingly, given the nature of the research, inclusion and exclusion criteria were defined at the levels of the title, abstract, and full text in order to delineate the scope of the study through the selection or elimination of articles. Subsequently, in order to assess and ensure the accuracy and methodological validity of the final articles selection, the Critical Appraisal Skills Programme (CASP) checklist was utilized.

This checklist assists researchers in determining the methodological rigor and relevance of qualitative studies. Based on the CASP checklist, each article was assessed using ten core criteria, including clarity of research aims, appropriateness of the methodology in relation to the research objectives, sampling strategy and participant selection, adequacy and quality of data, data collection procedures, transparency of the data analysis process, control of researcher bias (reflexivity), credibility and trustworthiness of the findings, value and applicability of the research outcomes, and clarity of reporting and article structure.

The logic of final source selection was as follows: each of the ten criteria was scored on a scale ranging from weak (1) to excellent (5).

Subsequently, each source was categorized into five quality levels based on the total score obtained: excellent (41–50), very good (31–40), good (21–30), moderate (10–20), and weak (0–10). Accordingly, sources with a score below 20 were excluded from the research process, while the remaining studies with an average minimum score of 26 and a maximum score of 45 were entered into the next step of the research (Table 2).

Table 2. A Sample of CASP total scores for selected research articles

Total	clarity of reporting and article structure	value and applicability of the research outcomes	credibility and trustworthiness of the findings	control of researcher bias (reflexivity)	transparency of the data analysis process	data collection procedures	adequacy and quality of data	sampling strategy and participant selection	appropriateness of the methodology in relation to the research objectives	clarity of research aims	CASP indicators / Author(s) name
44	5	5	4	3	5	5	4	4	4	5	Mahmoudi, Amir-Saeid; Bastani, Mahyar, 2018
29	4	4	3	1	3	2	3	2	3	4	Asgari, Ali; Fathi, Razieh, 2022
41	5	5	4	3	3	5	3	4	4	5	Gonçalves, Milene; Cardoso, Carlos; Schaub, Petra Badke, 2014
32	4	3	3	2	3	3	3	3	4	4	Talebi, Mehdi; Mousavi, Mirsaeid; Pushneh, Kamran, 2021

Ultimately, 61 sources were selected for data extraction. Figure 3 illustrates the PRISMA flow diagram for the systematic searching, screening, and selection of sources. In addition, the characteristics of the final 61 articles relevant to the research are presented in Table 3, where each article has been assigned a unique identification code.

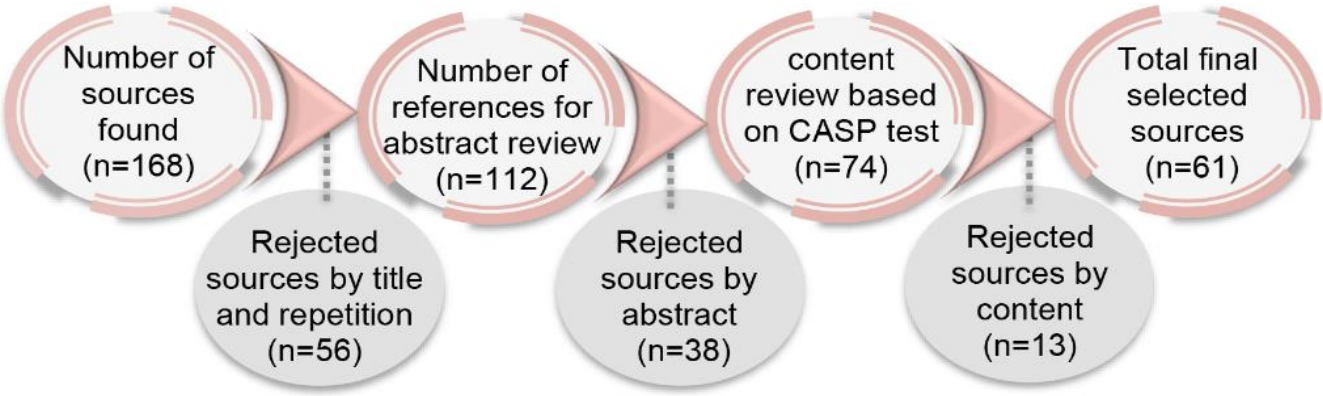

Figure 3. PRISMA flow diagram for the systematic searching, screening, and selection of sources

Table 3. Specifications and codes of selected articles

Code		Article Title	Author(s)	Year	Journal Title
Domestic Articles	A1	Examining the Components of Architectural Concept Formationin Teaching Architectural Design with A Background-Based Approach [9]	Nouri Makram, Amir; Janipour, Behrouz; Taghvaei, Vida	2023	Bagh-e Nazar Journal
	A2	Creative Optical Metamorphosis in Children's Picture Books: Based on SCAMPER's Idea Generation Model [10]	Zanjanbar, Amirhossein	2023	Rahpouyeh Visual Arts Quarterly
	A3	Analysis of Architectural students' Conceptual Sketches based on Systemic Thinking and Information Processing Styles in the Design Process [11]	Karavan, Farhad	2023	Hoviat Shahr
	A4	Generative Reading of Architectural Precedents and their use in the design process [12]	Karimi, Alireza; Javidinejad, Mehrdad; Habib, Sozan	2023	Islamic Art Quarterly
	A5	Examining the Role of Design Tools in Quality of Ideation and Presenting Architectural Designs [13]	Asgari, Ali; Fathi, Razieh	2022	Bagh-e Nazar Journal
	A6	The Role of Computer Aided Sketching Software (CAS) in Ideation Stages of Design [14]	Sharif, Hamidreza; Abdollahpour Rafiei, Negin	2022	Soffeh – Scientific Journal of Architecture & Urban Planning
	A7	From other spaces to non-places [15]	Panahi, Siamak; Taghi Shahbazi, Fariba	2022	Space and Place Studies Quarterly
	A8	Defamiliarization in Logotypes of Masoud Nejabati Based on Edward de Bono's Theory of Lateral Thinking [16]	Salki Khameneh, Siamak; Hojjati Saeedi, Monireh	2022	Rahpouyeh Visual Arts Quarterly
	A9	Evaluation of the undergraduate architecture course's educational program based on adaption to professional practice (with emphasis on schematic designs as one of the design phases) [17]	Goudini, Javad; Rezazadeh, Eshaq	2022	Educational Planning Studies Quarterly
	A10	Facilitating methods of entrepreneurial Idea generation: A literature review [18]	Ghafourian, Fatemeh-Sadat; Mohammadi, Ghanbar; Ahmadpour Daryani, Mahmoud; Yadollah Farsi, Jahangir	2022	Iranian Management Sciences Quarterly
	A11	Measuring the Creativity in the Formation of Initial Ideas Using Hand Drawing in the Architectural Design Process [19]	Aghayan, Shirin; Ghodousifar, Seyed Hadi; Eslami, Seyed Gholamreza	2022	Armanshahr Quarterly

Table 3. Specifications and codes of selected articles (Continued)

Code		Article Title	Author(s)	Year	Journal Title
Domestic Articles	A12	Application of artificial intelligence in form ideation of inhabitable architectural spaces with environmental psychology approach (Case study: Iranian-Islamic Future City Center) [20]	Pordel, Ali; Ziaebakhsh, Neda	2022	Memar-e Shahr Quarterly
	A13	Design Process: from Idea to Presentation, based on Reflective Thought and Learning Styles in Architecture Students [21]	Karavan, Farhad	2021	Soffeh – Scientific Journal of Architecture & Urban Planning
	A14	Sources of Architectural Ideation and the Contribution of Each in the Design Process of architects and Architecture Students (Case study: Architecture students of Shahid Beheshti University) [22]	Shariatrad, Farhad; Pourabrishami, Parisa	2021	Fine Arts – Architecture & Urban Planning
	A15	The Relationship between "Wisdom" and "Conceptuality" and its Effect on the Formation of Contemporary Architecture of Iran [23]	Golabchi, Mahmoud; Gholipour, Abdolreza	2021	Armanshahr Quarterly
	A16	Approach to dynamic design and creation of conceptual designs (Study in the lesson of second preliminary Architectural design) [24]	Motiee, Babak; Mehdi Zadeh Seraj, Fatemeh; Mirza Alipour, Forough	2021	Andishe-ye Memari (Architectural Thought) Biannual
	A17	An Analysis of the Effectiveness of Creativity Teaching Techniques on Architectural Design with emphasis on the process of idea-finding and idea-generation [25]	Talebi, Mehdi; Mousavi, Mirsaeid; Pushneh, Kamran	2021	Innovation and Creativity in the Humanities
	A18	Ideation Canvas: An Overview of Existing Canvases and Designing a Problem-Oriented Canvas [26]	Payandeh, Reza; Abdolhosseinzadeh, Mohammad	2021	Entrepreneurship Development Quarterly
	A19	Explaining Pattern-Based Reading in TeachingArchitectural History and Evaluating its Effectivenesson Architecture Students' Ideation and Insights [27]	Ghias, Hamid; Aminpour, Ahmad; Hamzehnejad, Mahdi	2021	Iranian Journal of Restoration and Architecture
	A20	Recognizing the Role of Idea and Concept in Understanding and Creation in Architecture Relying on the "Four Causes" [28]	Ashrafi, Nasim; Safdarian, Ghazal	2020	Islamic Architectural Research
	A21	Components of Ideation in designing process by semiotic approach with factor analysis in R [29]	Etemadipour, Marzieh; Mahdinezhad, Jamaleddin; Saleh Sedghpour, Bahram	2020	Andishe-ye Memari (Architectural Thought) Biannual
	A22	Improving Precedent-based architectural Design Ideation with Action research Methodology [30]	Alipour, Leila	2019	Fine Arts – Architecture & Urban Planning
	A23	A Crowdsourcing process for creative ideation of IRIB media productions [31]	Salavatian, Siavash; Khajekeian, Datis; Mashreghi, Mohsen	2019	Innovation and Creativity in the Humanities
	A24	Using TRIZ Functionality In Architectural Design Process [32]	Jabal Ameli, Mahsa; Mozaffar, Farhang; Karimi, Mahmoud; Ghasemi, Vahid	2019	Innovation and Creativity in the Humanities
	A25	Model of Process Critique of Contemporary Residential Works Based on the components: "Mission, Objectives, Functional Needs and Concepts [33]	Khasmafkan, Nezam-Erfan; Navidi Majd, Fereshteh; Fadavi Anbiaei, Babak	2019	Haft Hesar Environmental Studies Quarterly
	A26	Conceptualization Methods in the Design Process of Architecture [34]	Mahmoudi, Amir-Saeid; Bastani, Mahyar	2018	Fine Arts – Architecture & Urban Planning

Table 3. Specifications and codes of selected articles (Continued)

Code		Article Title	Author(s)	Year	Journal Title
Domestic Articles	A27	Presentation Analytical Framework of Manufacturing Production Process in Architecture, Objectification to Subjective Idea [35]	Niknam-Asl, Azin; Bazrafkan, Kaveh; Ali-Mohammadi, Parisa	2018	Urban and Rural Management
	A28	Active Experience Model in Architectural Education A Method to Gain Practical Knowledge through Design-Oriented Experience of Architectural Examples [36]	Mirjani, Hamid; Bazshenasi, Hamid	2018	Biannual of Iranian Architectural Studies
	A29	Architecture Narration: A Comparative Study on Narration in Architecture and Story [37]	Karimzadeh, Sepideh; Etesam, Iraj; Foroutan, Manouchehr; Doulati, Mohsen	2018	Kimia-ye Honar Quarterly
	A30	The true mapping from precedents in architectural ideation [38]	Alipour, Leila; Faizi, Mohsen; Mohammad Moradi, Asghar; Akrami, Gholamreza	2016	Fine Arts – Architecture & Urban Planning
	A31	Problem Framing: The Designer's Way of Tackling Design Problems [39]	Shariatrad, Farhad; Nadimi, Hamid	2016	Soffeh – Scientific Journal of Architecture & Urban Planning
	A32	The role of visual analogy in the design and ideation process in sculpture [40]	Esfahanizadeh, Alireza; Hessami, Mansour; Salehi, Soudabeh	2016	Biannual Journal of Visual and Applied Arts
	A33	Common Ideas in Fashion Design and Architecture Baced on the Approach of Genette's Intertextuality [41]	Kateb, Fatemeh; Khodi, Aldouz	2015	Biannual Journal of Visual and Applied Arts
	A34	Tacit Knowing and Primary Generators Reflections on the Role of Tacit Knowing in Formation of Primary Design Generators [42]	Kalami, Maryam; Nadimi, Hamid	2014	Soffeh – Scientific Journal of Architecture & Urban Planning
	A35	Concept in Architecture; A Necessity in Design Process and Challenges of its Education in Architecture Colleges [43]	Hadiyan, Mohammad; Pourmand, Hasan-Ali	2014	Applied Arts Quarterly
	A36	Ideation versus Idea Processing in Architectural Design Thinking [44]	Sharif, Hamidreza; Nadimi, Hamid	2013	Soffeh – Scientific Journal of Architecture & Urban Planning
	A37	Nurturing Design Ability of Novice Architecture Designers (Designing, Implementation and Testing a Constructivist Learning Environment) [45]	Talischi, Gholamreza; Izadi, Abbas-Ali; Aini-Far, Alireza	2012	Fine Arts – Architecture & Urban Planning
	A38	Rethinking the definition of the concept of "tissue degradation" based on spatial decay [46]	Golrokh, Shamin	2012	Soffeh Journal
	A39	Sources of Architectural Design Ideation A Reflection on the Ideation Process of Eight Iranian Professional Architects [47]	Nadimi, Hamid; Shariatrad, Farhad	2012	Fine Arts – Architecture & Urban Planning
	A40	A Framework for Revealing the Effects of Components Shaping Design Motifs in the Architectural Design Studio (Case Study: Master's Architecture Studio 2) [48]	Mandegari, Kazem; Nadimi, Hamid; Mahdavipour, Hossein; Davoudi, Somayeh	2011	Soffeh – Scientific Journal of Architecture & Urban Planning
	A41	Critical Thinking and Evaluation of Design Concept [49]	Sharif, Hamidreza	2011	Soffeh Journal
	A42	processors and generators in architectural disign process [50]	Ansari, Hamidreza	2009	Fine Arts – Architecture & Urban Planning
	A43	Designing kindergarten setting based on the relationship between creativity characters and some architectural ideas [51]	Noghrekhar, Abdolhamid; Farhang, Mozaffar; Saleh, Bahram; Shafaei, Minoo	2009	Educational Innovations

Table 3. Specifications and codes of selected articles (Continued)

Code		Article Title	Author(s)	Year	Journal Title
	A44	Comprehending Design Problem in Architectural Education [52]	Daneshgar Moghadam, Golrokh	2009	Fine Arts – Architecture & Urban Planning
Foreign Articles	A45	Using text-to-image generation for architectural design ideation [53]	Paananen, Ville; Oppenlaender, Jonas; Visuri, Aku.	2023	Journal of Architectural Computing
	A46	Concept as the Activist of Creativity in Architectural Design: Exploring Factors Affecting Concept Formation Using the Structural Equation Model [54]	Onur, Beyza	2023	Periodica Polytechnica Architecture
	A47	Design Process and Ideation in Design Education: A Systematic Literature Review [55]	Novica, Dimas Rifqi; Wianto, Elizabeth; Campos, Susana Andrade	2023	Cogent Arts & Humanities
	A48	An exploratory study on design process in architecture: perspective of creativity [56]	Dash, Shanta Pragyan	2022	Creativity Studies
	A49	Educating for Design Ideas in Architecture Through Authentic Elements [57]	Ceylan, Salih; Soygenis, Sema	2022	Journal of Art & Design Education
	A50	The Cognitive Use of Prior Knowledge in Design Cognition: The Role of Types and Precedents in Architectural Design [58]	Urey, Zeynep Cigdem Uysal	2019	Journal of Contemporary Urban Affairs
	A51	Interplay of sketches and mental imagery in the design ideation stage of novice designers [59]	Tedjosaputro, Mia; Shih, Yi-Teng; Niblock, Chantelle; Pradel, Patrick	2019	The Design Journal
	A52	Concept evolution in architectural design: an octonary framework [60]	Eilouti, Buthayna	2018	Frontiers of Architectural Research
	A53	Designing principle-based stimuli for improving creativity during ideation [61]	Perez, Blake; Hilburn, Skyler; Wood, Kristin L	2018	Mechanical Engineering Science
	A54	A model for the process of idea generation [62]	Sarkar, Prabir; Chakrabarti, Amaresh	2017	The Design Journal
	A55	An interactive generative abstraction system for the archetype-based pre-ideation process (IGATY) [63]	Suh, Joori	2017	Design Science
	A56	Processing Beyond Design: A Case Study Examining Ideation for Design Education [64]	Orthel, Bryan; Day, Julia	2016	SAGE Open
	A57	Evidence-based design heuristics for idea generation [65]	Yilmaz, Seda; Daly, Shanna R; Seifert, Colleen M; Gonzalez, Richard	2016	Design Studies
	A58	Interview Study of Professional Designers' Ideation Approaches [66]	Laamanen, T; Hakkarainen, P	2015	The Design Journal
	A59	What inspires designers? Preferences on inspirational approaches during idea generation [67]	Gonçalves, Milene; Cardoso, Carlos; Schaub, Petra Badke	2014	Design Studies
	A60	Assessing creativity in design education: Analysis of creativity factors in the first-year design studio [68]	Demirkan, Halime; Afacan, Yasemin	2012	Design Studies
	A61	Understanding design ideation mechanisms through multilevel aligned empirical studies [69]	Neo Vargas, Hernandez; Shah, Jami J; Smith, Steven M.	2010	Design Studies

2.1.4. *Step Four: Extracting information from articles*

At this stage, the content of the selected articles was carefully reviewed, and the codes related to the keywords were extracted.

Using MAXQDA 2024 software, the initial coding process was carried out. Subsequently, similar codes were grouped to determine how to integrate and combine different codes for the formation of themes. From the selected articles, a total of 672 open codes were extracted. Due to the repetition of some codes across different articles, duplicate codes were removed, resulting in 483 open codes being retained for analysis. Table 4 presents an example of the extracted open codes along with their classification.

2.1.5. *Step Five: Analysis and Synthesis of Qualitative Findings*

For data analysis and coding, the thematic analysis approach based on the method of Braun and Clarke (2006), together with MAXQDA software, was applied. In this method, the initial codes are first identified, and then those with conceptual and semantic similarities are grouped into sub-themes (criteria).

In the next stage, these sub-themes are classified into broader and more related categories, forming main themes (components).

Finally, these central themes are organized into comprehensive overarching dimensions, such that all codes are arranged from general to specific within a semantic–structural spectrum (Figure 4).

Themes serve as the foundation for generating explanations, models, theories, or hypotheses [8]. According to Table 5 and based on the analyses performed in MAXQDA, the initial categorization extracts sub-themes (criteria); the broader categorization derives main themes (components); and the overarching dimensions are ultimately identified.

The results of this categorization, along with the frequency of their sources, are presented in Table 5.

Table 4. An example of initial codes extracted from articles along with their categories

Extracting primary codes from reviewed articles	Sub-theme	Ref. Code
Presence in the experience of that place/ Formation of the empirical attitude of human knowledge based on his sensory experiences/ Three factors of the design process to pay attention to past experiences of space or buildings: form, function, and time/ Experience of any spatial content along with a way of life, with a way of knowing, and with a way of presence/ Attention to patterns (the result and outcome of experiences and collective wisdom of the society)/ The designer's observations and experiences of space over consecutive years in the mind (experience of space with all its dimensions)/ The individual's experiences of signs, their meanings, and functions (physical phenomena in the mind as signs, causing a clear image to emerge, with spontaneous reproduction and combination)/	Designer's lived experience (physical experiences)	A47/A59/A27/A20/A19/A12/A55/
Movement based on mental and behavioral models derived from past experiences/ Personal experiences of the designer that influence the worldview/ Mutual influence of thinking and perception on each other in line with past experiences/ Reliance of the individual on his/her inner feelings and experiences and constant reference to thoughts and theories (objective or intuitive experience)/ Searching for reciprocity among past experiences based on our expectations/ Aesthetic experience of the individual throughout life/ Using the experiences of others and of course sharing one's own experiences with others/ Relating new concepts and knowledge to previous experiences/ Individual experiences of personalities/ Unconscious preferences and beliefs related to experienced instances/	Designer's lived experience (non-physical experiences)	A34/ A61/ A22/ A22/ A1/ A1/ A19/ A12/ A14/

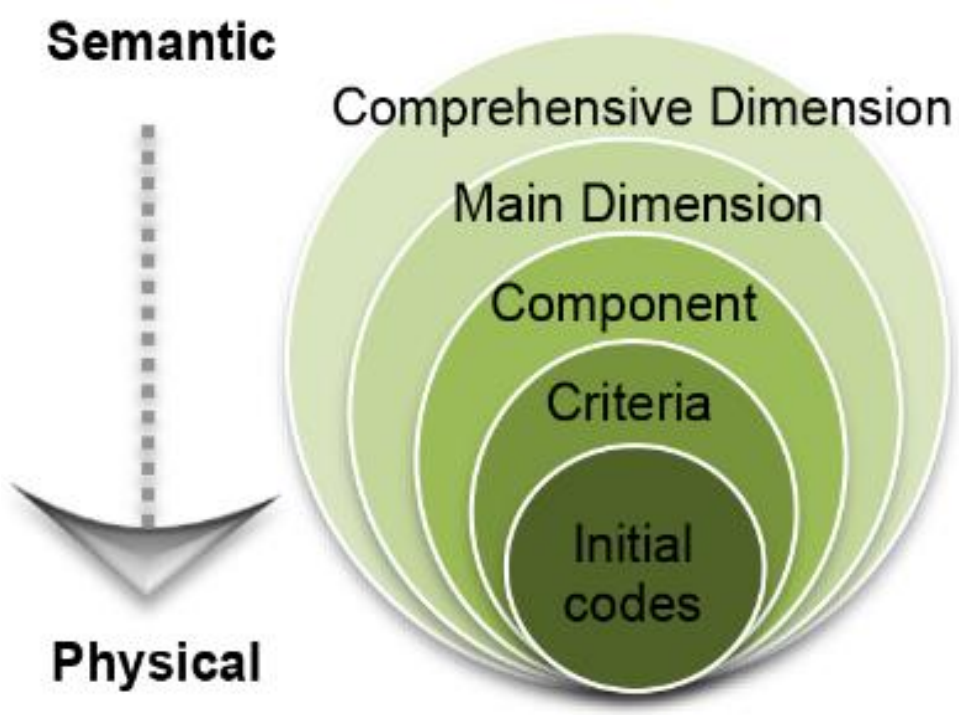

Figure 4. Algorithm of code categorization

Table 5. Complete categorization of codes into criteria, components, and dimensions

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
Intrapersonal origins in the context of the designer's mindset	Designer's mental and perceptual structure	Designer's value system	1. Designer's vision and attitude	A1/A34/A28/ A50/A20/A17/ A10/ A35/A20/A21/ A21/
			2. Personality traits	A19/A43/ A46/A3/A17/ A17/A21/
			3. Designer's psychological structure	A54/A58
			4. Designer's motivation and identity	A28/A34/ A53/A50/ A19
		Designer experiences	5. The designer's lived experience (physical and non-physical)	A47/A59/ A27/A20/A19 /A12/A55/A34/ A61/ A22/ A22/ A38/ A1/ A1/ A19/ A12/ A14/
			6. The designer's active experience (experiences recorded in the records)	A28/ A28/ A57/ A22/ A30/ A1/ A19/ A19/ A32/ A10/ A25/ A32/ A32/ A32/
			7. Attention to mental schemas	A28/A28/A28/ A28/ A36/ A36/ A32/ A32/ A32/
			8. Understanding the peak or maximum experience (inspiration), dreams and the unconscious mind	A36/ A59/ A59/A46/ A51/ A55/ A59/A20/ A1/ A26/ A43/ A36/ A15/ A58/ A59/ A58/
		How the designer perceives the environment	9. Level of perceptual ability and reading of the environment	A1/ A19/ A22/A19/
			10. Perceptual differences based on personality, gender, experiences, knowledge and values	A21/ A21/ A61/ A54/
			11. Level of creative understanding of the experienced environment	A17/ A48/
			12. Levels of perceived meaning of the environment in a representational and responsive manner	A20/ A20/ A34/ A34/ A14

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Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)		Ref. Code
Intrapersonal origins in the context of the designer's mindset	Designer's mental and perceptual structure	Designer's personal knowledge of the design subject	13.	Activation of personal knowledge without regard to "attitudes", "criteria" and "critical ideas"	A34/ A15/ A20/ A35/ A40/A40/ A34/ A34/A34/A34/ A31/
			14.	Attention to the apparent, functional and emotional characteristics of personal knowledge	A34/ A31/
			15.	The degree of experience of instances at tangible and intangible levels of personal knowledge	A34/ A34/ A31/ A54/
		Designer's mental images and qualities	16.	Mental perceptions of the subject of the project	A46/ A60/ A28/ A51/ A43/
			17.	Using effective images of myths of life in culture	A55/ A55/A58/
			18.	Controlling factors of "body", "scale" and "function of space" on the formation of mental images	A21/
			19.	The impact of temporal, human and spatial components on the mental image	A21/A21/ A21/ A34/ A46/A21/ A58/
		Designer's imagination	20.	Designer's desires and desires	A51/ A51/ A59/ A59/
			21.	Attention to the inner voice	A46/
			22.	Attitude towards impossible solutions	Expert opinions
			23.	Simple and unrealistic perception of the physical environment in the mind	A57/ A61/
			24.	Attention to the knowledge and wisdom gained from deep knowledge and understanding of the problem	A61/A58/
			25.	Simultaneous attitude towards the past and the future	A59/A50/
			26.	Creating spatial visualization	A61/ A51/ A17/A52/
			27.	Sometimes vague and usually visual	A51/ A51/ A61/ A61/
			28.	Shaping mental images	Expert opinions
		Imagination of the designer	29.	Connecting with the unconscious	A56/ A56/
			30.	Turning to inner forces	A61/
			31.	Creating things that do not exist, have never been and will not be	A46/
			32.	Organizing thoughts and creating new ideas	Expert opinions
	Intellectual fields and the power of design thinking	Designer's level of mastery of creative and strategic thinking	Impact of creative thinking aspects	33. Ease of using information in the design (fluency and mental)	A36/ A17/
				34. Ability to overcome intellectual obstacles (flexibility)	A36/A17/ A23/
				35. Intelligent and unusual response of the designer (originality and novelty)	A36/ A30/ A17/
				36. Attention to detail, variety in the use of ideas, questions and answers, etc. (expansion and development)	A36/
				37. Breaking down symbolic structures (analysis and decomposition)	A22/ A36/A40/
				38. Putting together elements under specific laws (composition)	A36/ A17/ A32/ A10/ A24/
				39. Organizing and transforming designs, their functions and uses	A36/
				40. Tendency to delve into complex and hidden design	Expert opinions
				41. Unique transformation and transformation with features such as adaptation, enlargement, reduction, substitution, rearrangement, reversal, combination, subtraction and addition	A19/ A36/ A33/ A23/ A19/ A32/ A29/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)		Criteria (Sub-themes)	Ref. Code
Intrapersonal origins in the context of the designer's mindset	Intellectual fields and the power of design thinking	Designer's level of mastery of creative and strategic thinking	Paying attention to the criteria for the idea being creative	42. Simple	A23/
				43. Flexible with the ability to apply in multiple contexts	A22/
				44. Appropriate drawing and presentation	A48/ A53/
				45. Familiar and familiar	A17/
				46. Strong and expressive	A46/
				47. Fresh, original and clever	A35/ A36/
				48. The ability to challenge the subject and make meaning	Expert opinions
			Paying attention to effective creativity models	49. Wallace Creativity: Preparation (attention to the problem and self-awareness), latency (previous learning, beliefs, mental and unconscious perceptions), enlightenment (inspiration or self-awareness and discovery of the idea), proof (testing the solution)	A11/
				50. Hybrid creativity and using familiar ideas to generate new ideas	A17/
				51. Exploratory creativity by exploring structured concepts	A17/ A46/
			Irrefutable information in the mind of a creative person	52. Historical architectural background	A19/
				53. Examples of similar projects by other architects	A19/ A46
				54. Mental images of early examples of buildings or spaces during travel and throughout life	A19/
				55. Ability to relate and connect topics based on the mental processes, behavioral and personality characteristics of the creative individual	A23/ A36/
				56. Ability to accurately define the problem and propose an initial design hypothesis	A16/ A35
				57. Integrate creativity with existing knowledge	Expert opinions
				58. Sensitivity to problems, deficiencies, bottlenecks and inconsistencies	A17/ A58
			Emergence of creative insights	59. Incremental Creative Insights	A11/ A53
				60. Sudden creative insights and unexpected discoveries	A11/ A53
			Moving based on the steps of creative production	61. Clarifying the goal (communication operations related to the goal)	A22/
				62. Creating a solution (problem-solving suggestions and ideas regarding the subject of the plan)	A36/ A22/
				63. Analyzing (questions and answers related to the solution area)	A36/ A22/
				64. Gradual evolution (positive and negative evolution related to the solution area)	A22/
				65. Decision-making (decisions for and against an idea and solution)	A22/ A17
				66. Control (control and instrumentalization of an idea)	A22/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
Intrapersonal origins in the context of the designer's mindset	Intellectual fields and the power of design thinking	Critical thinking and critical thinking	67. Form logical inferences and develop precise and logical arguments	A41/
			68. Analyze, critique, and support ideas based on inductive and deductive reasoning and cognitive statements with clear conviction	A41/
			69. Evaluate causes to understand their meaning	A52/
			70. Have a critical view, often with criticism and negative judgment of one's own design	A47/ A46/
			71. Evaluate and judge the designer's idea using the mental model of the judgers (critical)	A41/ A22/
		Communicative thinking and the ability to recognize similarities, differences, and contradictions	72. Recognizing a relationship based on similarity through analogy	A22/ A60/
			73. Anomaly means an unforeseen deviation from a pattern or rule	A22/
			74. Recognizing the incompatibility of two or more incompatible ideas through expressing differences	A22/ A52/
			75. Recognizing concepts in opposite directions through contrast	A22/ A60/
		Deductive thinking and visual analogy	76. Attributing the visual information captured to similar images in the mind	A22/ A22/
			77. Acting on the basis of similar previous situations with the new situation	A22/ A32/ A4/ A30/
			78. Analogy as a systematic relationship between two situations "source analog" representing the old situation and "target analog" representing the new situation	A32/
			79. The existence of solutions first in the form of words or visual images in the designer's mind	Expert opinions
			80. Recognizing and being able to use visual analogies based on surface similarity, structural similarity or goal-based similarity	A32/A32/
		Reflective thinking	81. Purposeful thinking on action	Expert opinions
			82. Understanding and attention, continuous and active scrutiny of each idea with deep and critical thinking	Expert opinions
		Lateral thinking	83. Creating new patterns by reconstructing old ones	A7/ A54/ A46/
			84. Changing the way information is organized in the mind	A7/
			85. Seeing from a different perspective	A8/ A61/
			86. Freeing yourself from old ideas and inspiring new ones	A8/ A7/
		Interactive thinking	87. Emphasis on identifying and developing one's inherent and innate talents	A35/ A54/
			88. Simultaneous attention to all effective and influential factors of architecture, without any priority or delay	A35/ A35/ A59/
			89. Dealing with design based on individual taste and simultaneous attention to all design issues	A35/
		Content thinking	90. Unconscious design	A45/
			91. Depends on information gathered from the environment and over time in the individual's mind.	A34/ A26/ A31/
		Designer learning style	92. Divergent or pluralistic or horizontal learning style with different and unique suggestions for the problem (design mind model)	A52/ A52/ A52/ A22/ A22/ A22/ A11/ A11/ A11/ A35/ A35/ A35/ A31/
			93. Convergent or vertical learning style with examining different solutions and finding the right solution	A47/ A47/ A41/ A41/ A41/ A22/ A35/
			94. Control of convergent and divergent thinking with the relative dominance of divergent over convergent thinking for a creative design process	A11/A52/A11 /A11/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
			95. Constructivism of learning with active and personal construction of knowledge and reconstruction of previous experience	A28/ A34/ A31/ A31/ A34/ A34/ A31/ A31/ A37/ A37/ A37/ A37 /A37/A34/ A34/A31/ A34/
Intrapersonal origins in the context of the designer's mindset	Taking advantage of selective attention	Effect of motivation on attention	96. The factor that strengthens and guides behavior	A28/
			97. The individual and mental characteristics of the person receiving the information related to the motivating factor	A28/ A19/
			98. Needs with deeper emotions, increased attention and motivation for a newer solution	A28/
			99. Establishing meaningful relationships between the experiencer's mental schema and the variables in the context of the experience	A28/ A30/
		External factors affecting attention	100. Perceive the amount of sensory energy and salience of information from the environment	A19/
			101. Pay attention to the wide range of behavioral, symbolic, and semantic patterns prominent in examples and experiences	A19/ A59/
			102. How to select by prioritizing one or more factors in your design	A35/
	How the designer understands the subject of the design (in the proactive approach)	Objective knowledge	103. Seeking to know how phenomena exist in space	A61/ A57/ A48/
			104. Understanding the factors that shape architecture while analyzing its intellectual roots	A9/ A26/
			105. Efforts to identify the specific qualities of the work	A19/ A22/
		Knowledge based on insight	106. Seeing phenomena with the inner eye	A58/ A58
			107. A "dynamic" view of history (and not a static view with an antiquarian approach)	A19/
			108. Recognizing and reading space and the effect of architecture depends on how psychological issues relate to personal human, temporal, and environmental characteristics	A21/ A21/
		Mental and perceptual cognition	109. Identifying the dominant idea in how to look at the subject and understand it	A8/ A53/ A57/
			110. Understanding mental events such as thoughts, beliefs, expectations, capabilities, and self-concept	A10/ A40/
			111. The designer's level of mastery of theoretical foundations	A21/ A58/
			112. The designer's level of mastery of his/her own imagination, creativity, and experiences	A45/ A54/
Extrapersonal origins in the context of the designer's mindset	Explicit knowledge of the subject matter of the project	Technical information and requirements affecting the design	113. Knowledge of the conceptual, visual, communicative and practical elements of the design	A47/
			114. Importance of design objectives	A31 / A58
			115. Attention to functional requirements, needs (human factors, employer, users) and design conditions	A25
			116. Design issues such as performance, organization, context	A25/ A47
			117. How to establish a relationship between the project and the social and cultural context of the city	A47/
			118. Identification, prediction and estimation of the design in environmental, ecological, natural context and climatic, economic and political conditions	A58/ A35
			119. Construction capabilities and facilities	A32/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
Extrapersonal origins in the context of the designer's mindset	Explicit knowledge of the subject matter of the project	Scientific wisdom (theoretical knowledge)	120. Complete understanding of the theoretical foundations of your design	Expert opinions
			121. Entering interdisciplinary areas to ensure the design is responsive	Expert opinions
			122. Paying attention to behavioral science patterns and collective myths in design	A55/
			123. The impact of deep understanding of social structure, culture, and time standards to understand people's perspectives	A49/ A56
			124. Open-mindedness while paying attention to collective experiences	A15/A55/A59
			125. Proposing new ideas and methods even without prior testing	A15/
			126. Understanding historical data and historical knowledge	A19/ A25
			127. Paying attention to the activity pattern and biological needs of contemporary humans	A25/
			128. Examining the subject of idea generation from multiple perspectives, such as cognitive perspective, behavioral perspective, process perspective, resource perspective, and functional perspective	A10/
	The type and method of effective information collection and processing	Experimental and conceptual information	129. Information about the perception and feeling of the environment	A39/ A46/
			130. Data are usually behaviors, perceptions, feelings and actions, and memories	A22/ A54/
			131. The type of information obtained through the senses from the outside world	A35/ A46/ A53/
			132. Useful and creatively stimulating information	A53/ A60/ A48/
			133. General knowledge about important topics and physical ideas related to solutions	A59/
		Test information	134. Evaluating the phenomenon and correct and incorrect assumptions and issues related to them.	A47/ A52/
			135. Evaluating previous solutions and making decisions based on these evaluations and generalizing information.	A17/ A19/
		Visual information	136. Attention to information from visual experience	Expert opinions
			137. The basic basis of information processing and storage	Expert opinions
		Effective information gathering	138. Gathering information on the three main components of the designer, the design location, and the design subject	A40/ A40/
			139. "Describing" the experienced work, an attempt to "make sense" of it through the interaction of the designer, experts, and other specialists	A41/ A41/
		How to process information for recall and retrieval	140. Committing information to memory and encoding it (encoding information)	A19/ A41/
			141. Increasing the ability to recall and retrieve information by establishing a kind of link and connection between new information and information that has already been learned and stored	A19/
			142. Determining the meaningfulness of information based on a sense of need or the existence of existing mental schemas	A19/
			143. Using similarities as organizing principles, leading to the readability of the data set	A52/ A61/
			144. Searching to discover patterns in existing information	A36/
			145. Similarities with previous topics lead to their relationship with past experiences	A50/ A61/ A19/
			146. Converting data into information and then knowledge with the help of the mind	A19/ A19/ A61/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
Extrapersonal origins in the context of the designer's mindset	Identity and sense of place experienced in the designer	The impact of place identity on individual experience	147. The impact of the three elements of place including relationship, identity and history and consequently the meaning and mental image of humans	A7/ A7/ A14/
			148. Purposeful external field (study of place as an object, separate from the person experiencing the place)	A38/ A7/
			149. Implicit external field (place is merely a place for some kind of activity)	A38/ A7/
			150. Existential internal field (sense of attachment and comfort in place and the deepest type of experience of place)	A38/ A7/ A31/
			151. Indirect internal field (engagement (deeply second-hand) with place through painting and story, etc.	A38/ A7/A51/
			152. Empathetic internal field (effort to deeply understand the place)	A38/ A7/ A40/
			153. Behavioral internal field (careful and calculated attention to the appearance of the place)	A38/ A7/
		The basis of the sense of place in the individual's experience	154. Creating unconscious experiences inside and outside	A7/ A12/
			155. Sense of place, associating events and experiences or even characteristics about oneself in the past (connecting the present to the past)	A38/ A38/
			156. Imagining the role and feeling for the place in the mind, based on one's experiences of signs, meanings, functions and characters	A12/ A58/
			157. Attention to the poetic aspects of place	A40/
			158. The increasing growth of imaginary and illusory references, in one's knowledge and experience of a place	A7/ A51/
	Factors related to the design problem (in line with the proactive approach)	Third generation design method (theme–testing approach)	159. Relying on the designer's mental structure	A1/ A31/ A26/
			160. Based on "generate - guess - analyze"	A35/ A42/
			161. The designers' thought process is more "answer-oriented" than "problem-oriented".	A1/ A54/
			162. Guessing the designer's proposed answers by structuring the problem and relying on past experiences	A1/ A26/ A34/
			163. Seeing only a series of problems in solving the problem	A1/
			164. Not drowning in information and instead seeking to design based on a frame or framework	A1/ A31/
		How to approach the design issue	165. The designer's expression of his/her own perception of the environment and the problem and analysis of the causes and consequences of the problem	A18/ A44/ A61/
			166. The designer's description of the problem, audience and domain (including the geographical conditions of the problem and its audience)	A18/ A46/
			167. Use of the method of change (how to improve the problem)	A18/ A44/
			168. Discovery and abstraction of the main rules and structure, both in the new situation of the problem and in dealing with examples and experiences	A19/ A42/
			169. Acceptance of challenges to solve the problem	A17/ A58/ A60/
			170. Analysis based on description and comparison and sometimes prediction	A41/
			171. Reframing the architectural problem and redefining the situation through an exploratory process	A11/ A31/
			172. Retrieval and recall of various knowledge and concepts related to the design situation, including the subject and context of the design	A34/ A31/ A39/ A47/

Table 5. Complete categorization of codes into criteria, components, and dimensions (Continued)

Comprehensive dimension	Main dimension	Components (Main themes)	Criteria (Sub-themes)	Ref. Code
Extrapersonal origins in the context of the designer's mindset	Education and training of designers (In the proactive approach)	How instructors pay attention to design students	173. The instructor's attention to the designers' mental reserves	A34/ A1/
			174. Attention to the student's active role in acquiring or discovering knowledge in the teaching method	Expert opinions
			175. Efforts to identify and maintain the actual abilities of designers	A35/
			176. Strengthening the sense of "self-confidence" in designers in all stages of design and creativity	A35/ A35/ A60/
			177. Creating a sense of self-sufficiency in novice designers	A35/ A35/
		The type of training instructors provide to design students	178. Education based on the process of guessing-analyzing or hypothesizing and searching for solutions	A42/ A36/
			179. Attention to the constructivist approach in the theory of constructivism of learning (of particular importance for the mental world of students)	Expert opinions
			180. Discovery learning guided by more knowledgeable people, the best type of knowledge for students	A28/ A48/ A57/
			181. Ideology: combining and changing ideas with other ideas	A36/ A47/
		Factors affecting student development	182. Educational and family conditions	A47/
			183. Environmental factors and social context and behavior	A16/ A21/ A21/ A10/
			184. Cultural, historical factors and religious characteristics of society	A16/ A21/ A10/

2.1.6. *Step Six: Quality Control of Findings*

Examining content validity from the perspective of experts is one of the standard methods in qualitative studies and tool development, helping the researcher to ensure the appropriateness and comprehensiveness of the identified components and concepts [70]. Accordingly, to assess the content validity of the extracted components and criteria, the preliminary list obtained from the meta-synthesis of related articles was provided to 12 experts in the research domain. The purpose of this stage was to examine the adequacy, relevance, and comprehensiveness of the identified content by specialists. After reviewing the practical components and criteria, the experts noted items that, in their opinion, were necessary to cover the subject entirely. Subsequently, the researcher incorporated the feedback into the list in the form of new codes and themes, which included 15 new criteria and two components, thus enriching the initial list presented in Table 5. This process enhanced the comprehensiveness and alignment of the study with expert perspectives. Moreover, to evaluate reliability based on Cohen's Kappa coefficient [70] which measures the degree of agreement between coders of content or data, with values ranging from –1 to +1, where values closer to +1 indicate stronger and more valid agreement, while values closer to –1 and below zero indicate weak, insignificant, or no agreement the results presented in Table 6 demonstrate that the calculated Cohen's Kappa coefficient between the two evaluators was 0.84, with a significance level below 0.05.

Based on the interpretation of Kappa values, this indicates an excellent and very high level of agreement between the two evaluators; thus, the coding was reliable, and the data possess sufficient validity for further analysis.

Table 6. Kappa coefficient between two raters

Symmetric Measures					
		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	0.841	0.066	10.339	0.000

2.1.7. *Step Seven: Presentation of Findings (Conceptual Model Design)*

Based on the study of 61 reputable scientific and research articles as a selected statistical sample, 483 initial codes were extracted. After the analyses, these codes were placed in 184 sub-themes as criteria. Then, according to the commonalities in these themes, they were again divided into 35 main themes as components and 9 main dimensions, which were also divided into two comprehensive dimensions, including intrapersonal origins and extrapersonal origins in the context of the designer's mentality. The intrapersonal dimension represents the factors that consciously or unconsciously affect active ideation from within the designer. In fact, the efficiency and quality of active ideation depend more on this dimension. The four intrapersonal factors are: the designer's mental and perceptual structure, the designer's intellectual background and thinking power, the use of selective attention, and the designer's way of understanding the design subject.

The extrinsic dimension of the designer's mindset also refers to factors that, from outside the individual's mindset, intentionally or unintentionally, affect active ideation. These factors include explicit knowledge of the design topic, the type and method of effective information collection and processing, the identity and sense of place experienced by the designer, factors related to the design problem, and the factor of designers' education and training in line with the active ideation approach.

The results of the meta-synthesis regarding the answer to the first research question, namely, "What are the components and criteria influencing the formation of active idea generation?" is drawn in the form of a conceptual model based on the output diagram from the Maxqda software (Figure 5).

2.2. Stage two: fuzzy delphi method

The Fuzzy Delphi method is a systematic approach designed to collect and harmonize the informed judgments of a group of experts regarding a specific question or topic. This method is grounded in the principles of fuzzy logic calculations and fuzzy inference systems, and it seeks to represent expert opinions more accurately through the use of fuzzy numbers and fuzzification processes [71]. Accordingly, the present study employs the Fuzzy Delphi method to confirm the level of importance and to screen the identified components and criteria.

Initially, a questionnaire comprising 184 criteria influencing active idea generation in the architectural design process was developed. Given the specialized nature of the questionnaire and the need to ensure conceptual clarity and adequacy prior to expert evaluation, a preliminary pilot test was conducted with the participation of two expert faculty members.

Since the purpose of the pilot test was to assess the clarity of the items and the feasibility of responding to the questionnaire, the involvement of a small group of specialists was considered sufficient in accordance with methodological recommendations for the pilot phase [72]. Accordingly, the initial version of the questionnaire was reviewed and revised in terms of conceptual clarity, structural coherence, and response feasibility (a sample of this questionnaire is presented in Appendix A). Subsequently, the revised questionnaire was submitted to a panel of architectural experts for specialized evaluation. The expert panel was selected from faculty members of three universities in the field of architecture using purposeful sampling.

The aim of this sampling strategy was to select individuals with the highest level of expertise, professional experience, and educational background related to the architectural design process and the concept of active idea generation. The sample size was determined as 12 experts, in line with methodological recommendations for the Fuzzy Delphi method, which suggest that a panel of 10 to 15 experts is sufficient to achieve stable consensus [71]. Therefore, the selected panel size is considered scientifically and methodologically appropriate.

All members of the expert panel held a PhD in Architecture and possessed at least 10 years of teaching experience and professional practice in the field. In addition, each expert had a minimum of five years of teaching experience in undergraduate architectural design studios and at least two of the following criteria (although most experts satisfied all conditions):

1. Experience in teaching theoretical courses related to architecture.
2. Academic and research familiarity with architectural design processes and the factors influencing idea formation (including active ideation, Creativity in design, cognitive and theoretical issues in design methodologies).
3. Teaching experience across all five levels of undergraduate architectural design studios.
4. Having Concurrent experience in educational and research activities, alongside active professional practice in architecture.

Subsequently, in order to determine the relevance of the identified criteria to the main subject of the study and to screen them, the final questionnaire comprising 184 criteria influencing active ideation in the architectural design process was administered to the expert panel. In this questionnaire, the linguistic variables presented in Table 7 were used to express the importance of each criterion.

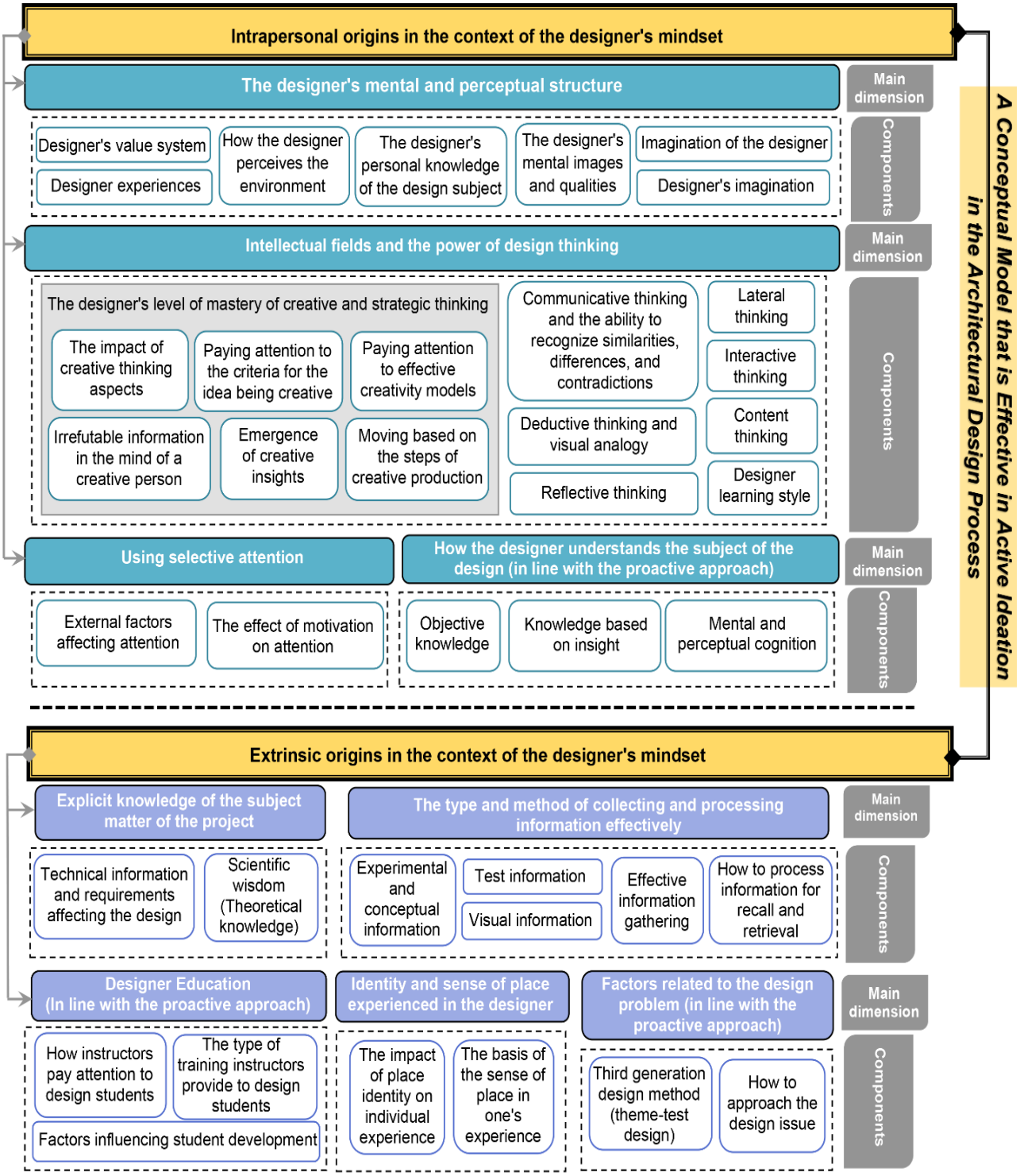

Figure 5. Conceptual model influencing active ideation in the architectural design process derived from meta-synthesis

Table 7. Linguistic expressions and fuzzy directional numbers

Linguistic expressions and triangular fuzzy numbers equivalent to a five-point Likert scale				
Very little	Little	Average	High	Very High
(0,0,0.25)	(0,0.25,0.5)	(0.25,0.5,0.75)	(0.5,0.75,1)	(0.75,1,1)

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In the present study, triangular fuzzy numbers based on a five-point Likert scale (1–5) were employed, and a threshold value of 0.7 considered an appropriate criterion for consensus [73] was adopted for the screening process. The elimination of these criteria does not imply their theoretical rejection; rather, it reflects a lack of sufficient consensus among experts regarding their level of importance within the framework of the active ideation model.

To fuzzify numbers, first, based on the Likert scale, 1 to 5 are converted into fuzzy numbers, then based on Eqs. (1) and (2), the fuzzy mean of the scores is obtained, and then it is converted into a definite number by the fuzzy mean formula (The results of all fuzzification calculations in the Delphi stage are presented in Appendix B). For example, for criterion number 1 (designer's insight and attitude), the fuzzy Delphi calculations are as follows: (0) experts gave very low scores, (0) experts gave low scores, (0) experts gave medium scores, (0) experts gave high scores, and (12) experts gave very high scores. Therefore, the fuzzy score (Eq. 1) and the non-fuzzy or definite score (Eq. 2) are as follows:

$$\begin{aligned} &Fuzzy\ score\ = \\ &0 \times (0,0,0.25) + 0 \times (0,0.25,0.5) \\ &+ 0 \times (0.25,0.5,0.75) + 0 \times (0.5,0.75,1) \\ &+ 12 \times (0.75,1,1)/12 = (0.75,1,1) \end{aligned} \quad (1)$$

$$\begin{aligned} &Deterministic\ score\ = \\ &0.75 + 1 + 1/3 = 0.917 \end{aligned} \quad (2)$$

The results from the end of the fuzzy Delphi stage show that the six research criteria include; Appropriate drawing and presentation, the designer's mastery of their imagination, creativity, and experiences, sometimes vague and usually visual, general familiarity with essential topics and physical ideas related to solutions, converting data into information and then knowledge with the help of the mind, seeing only a series of problems in solving the problem, were not approved by the experts and were eliminated because they obtained a fuzzy mean of less than 0.7.

2.3. Stage Three: Weighting and Prioritization the SIWEC (Simple Weight Calculation)

Due to the characteristics of the dataset used in this study namely, a list of 178 criteria extracted through meta-synthesis and refined during the fuzzy Delphi stage the SIWEC (Simple Weight Calculation) method was selected as the weighting technique. This method is a novel approach within multi-criteria decision-making (MCDM), proposed by Pouska et al. (2024), and has been specifically developed for the analysis of large-scale sets of criteria [74].

The SIWEC method offers three key advantages over conventional MCDM methods such as AHP, ANP, and even more recent approaches such as the Best–Worst Method (BWM) [74]:

1. The SIWEC method does not require pairwise comparisons; therefore, it is scalable for large sets of criteria such as the 178 criteria considered in the present study and prevents the severe computational challenges and the associated errors commonly encountered in methods such as AHP/ANP.
2. it reduces the cognitive burden on experts and lowers the likelihood of judgmental inconsistency;
3. it converts the numerical outputs of the fuzzy Delphi method into final weights directly, without any additional transformations and with minimal computational steps.

For these reasons, SIWEC exhibits a natural compatibility with fuzzy Delphi results in terms of both computational logic and data processing, enabling the direct use of defuzzified scores.

This integration (Fuzzy Delphi → SIWEC) constitutes a methodological innovation and has been employed in the present study to enhance the efficiency and scalability of the analysis.

Given the very large number of criteria, the application of methods such as AHP or ANP is practically infeasible, and methods such as BWM also require numerous and time-consuming comparisons, whereas SIWEC is capable of extracting weights in a stable, rapid, and non-complex manner.

At this stage, in order to determine weights and establish priorities using the SIWEC multi-criteria decision-making method, the data analysis was conducted at three levels: criteria, components, and main dimensions.

First, the Likert-scale scores provided by the experts during the fuzzy Delphi stage were used as direct inputs to the SIWEC method to calculate the final weights and rankings of the criteria.

Subsequently, by aggregating the weights of the criteria within each component, the weights and rankings of the components were calculated; finally, the weights and rankings of the main dimensions were obtained using the same procedure.

The results of the weighting and prioritization of the dimensions and components affecting the formation of active ideation are presented in Table 8, while the results of the weighting and prioritization of their criteria are presented in Appendix B.

Table 8. Weighting and prioritization of the dimensions and components affecting the formation of active ideation

Main Dimension	Weight of Main Dimension	Dimension priority	Components		Weight of Components	Component priority
Designer's mental and perceptual structure	0.12613	1	Designer's value system		0.03349	3
			Designer experiences		0.03352	2
			How the designer perceives the environment		0.03229	4
			Designer's personal knowledge of the design subject		0.03413	1
			Designer's mental images and qualities		0.03213	5
			Designer's imagination		0.03164	6
			Imagination of the designer		0.03118	7
Intellectual backgrounds and the power of design thinking	0.11126	3	The designer's level of mastery of creative and strategic thinking	The impact of creative thinking aspects	0.03001	10
				Paying attention to the criteria for the idea being creative		
				Paying attention to effective creativity models		
				Irrefutable information in the mind of a creative person		
				Emergence of creative insight		
				Moving based on the steps of creative production		
			Critical thinking and critical thinking		0.02860	13
			Communicative thinking and the ability to recognize similarities, differences, and contradictions		0.02950	12
			Deductive thinking and visual analogy		0.02960	11
			Reflective thinking		0.02785	15
			Lateral thinking		0.02804	14
			Interactive thinking		0.02781	16
			Content thinking		0.02758	17
			Designer learning style		0.02742	18
Taking advantage of selective attention	0.12207	2	The effect of motivation on attention		0.03056	8
			External factors affecting attention		0.03007	9
How the designer understands the subject of the design (in the proactive approach)	0.11001	4	Objective knowledge		0.02716	21
			Knowledge based on insight		0.02738	19
			Mental and perceptual cognition		0.02719	20
Explicit knowledge of the subject matter of the project	0.10345	9	Technical information and requirements affecting the design		0.02622	35
			Scientific wisdom (theoretical knowledge)		0.02637	34
The type and method of effective information collection and processing	0.10366	8	Experimental and conceptual information		0.02648	31
			Test information		0.02646	32
			Visual information		0.02661	29
			Effective information gathering		0.02641	33
			How to process information for recall and retrieval		0.02657	30
Identity and sense of place experienced in the designer	0.10668	7	Impact of place identity on individual experience		0.02667	28
			Basis of the sense of place in the individual's experience		0.02669	27
Factors related to the design issue in line with the proactive approach	0.10892	5	Third generation design method (theme-test design)		0.02703	22
			How to approach the design issue		0.02689	23
Education and training of designers in line with a proactive approach	0.10781	6	How instructors pay attention to design students		0.02689	24
			Type of training instructors provide to design students		0.02680	25
			Factors affecting student development		0.02675	26

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The result of weighting and prioritization regarding the second research question, namely “How is the prioritization of these components and criteria determined?”, are presented in Tables 8 and Appendix B. and the designer's intellectual backgrounds and thinking power dimension with a weight of 0.11126 are the most important and have been assigned priorities 1 to 3. After that, and in order, other dimensions including the designer's way of knowing the design subject in an active approach, factors related to the design problem in line with an active approach, the education and training of designers in an active approach, the designer's identity and sense of place, the type and method of effective collection and processing of information and explicit knowledge of the design subject are prioritized. Also, the importance and final weight of the dimension-losing components and the criteria of each component were identified using the above-mentioned method. The results of prioritizing the components show that the designer's personal knowledge component of the design subject with a weight of 0.03413, the designer's experiences component with a weight of 0.03352, and the designer's value system component with a weight of 0.03349 were assigned priority one to three, respectively, and had the most significant impact on the active idea-finding process in the design process. By comparing the results of prioritizing the components in each dimension, it can be said that in the dimension of the designer's mental and perceptual structure, the designer's personal knowledge component of the design subject with a weight of 0.03413; in the dimension of utilizing selective attention, the component of the influence of the motivation factor on attention with a weight of 0.03056; In the dimension of intellectual fields and thinking power of the designer, the component of the designer's mastery of creative and strategic thinking with a weight of 0.03001; in the dimension of the designer's knowledge of the design subject, the component of mental and perceptual cognition with a weight of 0.02719; in the dimension of factors related to the design problem, the component of the third generation design method (theme-test design) with a weight of 0.02703; in the dimension of education and training of designers in an active approach, the component of the way instructors pay attention to design students with a weight of 0.02689; in the dimension of identity and sense of place experienced by the designer, the component of the basis of the sense of place in the individual's experience with a weight of 0.02669; in the dimension of the type and method of effective collection and processing of information, the component of visual information with a weight of 0.02661; And finally, in the dimension of explicit knowledge of the design topic, the component of scientific wisdom (theoretical knowledge) with a weight of 0.02637 will have the most significant impact on active ideation.

The final results of weighting and prioritization of the main dimensions indicate that the designer's mental and perceptual structure dimension, with a weight of 0.12613, the selective attention dimension with a weight of 0.12207, Also, the criteria of designer's insight and attitude, designer's lived experience (physical and non-physical), attention to mental schemas, activation of implicit knowledge without regard to "attitudes", "criteria" and "critical ideas", attention to the external, functional and emotional characteristics of tacit knowledge, the amount of experience of instances at tangible and intangible levels of implicit knowledge, with a weight of 0.00673, have been assigned priority one among the effective criteria.

3. Discussion

The primary aim of the present study was to explicate and prioritize the components and criteria influencing the formation of active ideation within the architectural design process. Accordingly, the overall research framework was developed through both qualitative and quantitative phases. The study commenced with a systematic search and review of keywords across 61 valid and peer-reviewed scientific research articles, followed by their evaluation and classification. Based on the stages of meta-synthesis and through a thematic analysis approach, various topics were extracted, resulting in the identification and categorization of 483 initial codes. The codes and concepts derived through the meta-synthesis method were finalized by examining content validity from the perspectives of 12 experts, all of whom were university faculty members in the field of architecture. Expert feedback led to the addition of 15 criteria and two new components to the initial meta-synthesis list presented in Table 5. Subsequently, after identifying and organizing the dimensions, components, and criteria derived from the research background, a questionnaire was developed based on Table 5 within the quantitative phase and structured in accordance with the fuzzy Delphi method. This questionnaire was designed to screen, validate, and finalize the research criteria, enabling a detailed and item-by-item examination of the acceptance or rejection of each criterion. After conducting the fuzzy Delphi process and excluding six criteria from the initial list, a total of 178 influential criteria were ultimately approved by the experts. These 178 criteria are organized into 35 components, 9 main dimensions and 2 comprehensive dimension. The final model is presented in Figure 5. Subsequently, expert judgments were employed to determine the weights and priorities of the results using the SIWEC multi-criteria decision-making method.

The findings of this study indicate that the principal dimensions under the first overarching category, titled “Intrapersonal origins in the context of the designer's

mindset", received the highest priority from the experts. In light of the definition of the active ideation method the initial design idea is a thought, goal, and structuring factor that arises from the designer's mental structures and patterns these dimensions constitute the core aspects of active ideation. Moreover, the high weights assigned to the three main dimensions of "Designer's mental and perceptual structure", "Taking advantage of selective attention" and "Intellectual fields and the power of design thinking" clearly demonstrate that active ideation is fundamentally a perceptual–cognitive act. Among these, the Designer's mental and perceptual structure plays the most significant role in the formation of active ideation.

This finding is consistent with prior theoretical literature, including Darke's perspective, Lawson's views, and cognitive studies addressing the role of schemas particularly where the initial idea is emphasized as the outcome of retrieving cognitive structures rather than a direct extension of external information. Furthermore, the decisive role of selective attention indicates that designers filter stimuli and activate only those data that align with their mental structures and design objectives. This result Confirms both the theory of "attentional selection in creativity" and the hypothesis of "cognitive direction in idea generation". However, the crucial point is through what mechanisms mental and perceptual structures influence active ideation. Based on the research findings, this influence is exerted primarily through "the designer's personal knowledge of the design subject", "the designer's experiences", and "the designer's value system", ranked respectively as priorities one through three. The findings confirm that the mere accumulation of analytical information about the design problem, by itself, lacks the capacity to generate integrated ideas. Such information leads to ideation only when it is assimilated into the designer's cognitive structure and actively processed. Additionally, the considerable weight assigned to criteria such as "attention to mental schemas", "activation of personal knowledge independent of critical attitudes", and "lived experience" indicates that a substantial portion of active ideation occurs at the level of implicit and unconscious cognition. In this process, designers retrieve and activate their mental patterns without direct reliance on logical analysis, allowing initial insights to emerge. This mechanism corresponds to what is described in creativity literature as the moment of insight.

Accordingly, through the influence of the aforementioned components and criteria on the ideation process, designers predominantly rely on their personal and experiential perceptions of space rather than imitation or replication of other designs. Through a sense of presence within space, they generate ideas that are more appropriate and of higher quality. Also, in design education, students relying on the three components of their personal knowledge, experiences, and values can more fluidly arrive at and develop an initial idea. Through practice and repetition, this approach becomes internalized, providing a foundation for ideation and the initiation of design across all projects. That is to say, within the design studio, with the guidance of the instructor, a framework is established that, while cultivating interest in and confidence toward personal and experiential knowledge, encourages students to attend to the architectural dimensions and aspects of their personal knowledge, identify them, and bring them to a level of self-awareness. To this end, exercises are employed whose primary objective is to stimulate, activate, and ultimately uncover and articulate these three components and their associated criteria. Such exercises confront students with questions that connect them to events, experiences, and consequently to experienced spaces. In fact, the key aim of these three components is to orient the student's mind toward architectural examples and experienced spaces, to recover the student's image and perception of those spaces based on memories and experiences, and to pay attention to some of the architectural features related to them. Accordingly, exercises should be designed in a manner that:

- engages the student's mind with their personal experiences and perceptions of previously experienced spaces.
- brings forward architectural aspects of personal knowledge and perception based on the student's preferences.

Exercises with themes such as "*My room window*", "*My school was like this I wish*", "*My best classroom*", and similar topics are among the exercises related to the component of discovering personal knowledge and the designer's experiences concerning the subject of home and school. In these exercises, the titles are formulated so that the student's mind is unconsciously directed toward experienced spaces and their characteristics, thereby activating the associated personal knowledge. Moreover, creating an appropriate context for expressing personal knowledge, experiences, and values within the design studio necessitates the development of skills in representational methods such as storytelling, metaphor, and the production of sketches and diagrams. Narrating stories drawn from past experiences and events related to architecture using a simple and personal language enhances the student's ability to articulate personal knowledge and unconscious related to the design subject and its various dimensions. Through the application of these tools, students are asked to initiate their work with a narrative of experienced spaces and their physical, functional, and emotional aspects. This process enables the discovery and interaction of perception, while

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simultaneously creating a foundation for attention to architectural considerations. Within such narratives, students introduce characters, places, or objects, or construct situations in which events unfold through characters interacting with objects within spaces. In other words, students describe users engaged in activities that help reveal both the nature and qualities of architectural space. Consequently, storytelling presents specific episodes within a space and articulates the complex relationships between individuals, space, and formal, functional, and emotional characteristics in a clear and accessible manner. This process enables students to select, identify, and extract their preferences, beliefs, and personal perceptions of the design subject, as well as its unique features thereby forming the basis for the emergence of initial ideas. On the other hand, active idea generation about the use of architectural examples, rather than analyzing and examining architectural examples, establishes personal interpretations and experiential readings of these examples gained through direct experience as the foundation and starting point of the design process. Accordingly, a shift in the student's perspective toward architectural examples, and an emphasis on space and the events, occurrences, and emotions associated with it arising from the individual's active presence within those spaces rather than the analysis of examples through passive study, constitutes another key outcome of this model.

Accordingly, it appears that a crucial factor in implementing the three top components of the proposed model within universities is the effective and reciprocal interaction between the design instructor and the student. Through such effective interaction, students develop self-reliance and gain confidence in their accumulated knowledge, perceptions, and capabilities. By retrieving and applying these resources, they ultimately achieve appropriate personal development. Only within the context of this relationship can the discovery and expression of students' internalized personal knowledge, experiences, and values be fully realized.

Therefore, the resulting model can serve as a valuable guide for both architectural education and professional practice. In the educational domain, instructors can expand students' cognitive frameworks by designing exercises that focus on creative thinking, analogical thinking, and critical thinking. Additionally, rather than relying solely on purely analytical assignments, third-generation design methods (theme–testing approach) can be employed. These methods actively engage students in the processes of guessing and testing ideas.

Through the use of targeted and guided case studies, instructors can teach students how to focus on the key and meaningful characteristics of the design problem (selective attention), instead of collecting scattered pieces of information, and how to integrate this information with their personal experiences and knowledge. Encouraging students to revisit and critically reflect on their personal experiences of spaces and places (sense of place), and to use these experiences as a rich source for ideation, alongside instructors' efforts to identify and sustain students' latent abilities, will also be effective in fostering a sense of self-confidence throughout all stages of design and creativity through active ideation.

4. Conclusion

This study was conducted with the aim of identifying and prioritizing the components and criteria influencing active ideation in the architectural design process, resulting in the extraction of a model comprising nine main dimensions, 35 components, and 178 criteria.

In response to the first research question, the findings indicate that active ideation is a multidimensional phenomenon whose realization cannot be achieved solely through the presence of external information (extrapersonal factors). Rather, it is the manner in which such information is processed, interpreted, and integrated by the designer's cognitive and mental system (intrapersonal factors) that leads to the generation of ideas. This holistic perspective constitutes the primary innovation of the present study when compared to previous research that has focused on only a single dimension of ideation. In response to the second research question, it can be stated that the three dimensions of "Designer's mental and perceptual structure", "Taking advantage of selective attention" and "Intellectual fields and the power of design thinking" play the most significant role in activating initial ideas.

In addition, the three components of the "the designer's personal knowledge of the design subject", "the designer's experiences", and "the designer's value system", along with the three criteria of "attention to mental schemas", "activation of personal knowledge independent of critical attitudes", and "lived experience" , were identified as the most important origins of active ideation. The prioritization results of the components and criteria indicate the precedence of internal and cognitive dimensions over external variables and project-related information.

In other words, active ideation proceeds from the inside outward, not from the outside inward. External information becomes influential only when it is integrated into the designer's mental structure; such information alone does not generate ideas but functions as a stimulus that activates certain parts of the designer's mind. What is obtained through scientific studies, analyses, and evaluations of the

design context and subject pertains to the stage after the idea has been generated, at which point it must be developed, refined, and transformed into a concept.

Ultimately, it can be concluded that the nine dimensions identified in the active ideation model constitute a multi-layered and hierarchical system that begins with the designer's innermost cognitive mechanisms and extends to environmental and external factors. The three dimensions of the designer's mental and perceptual structure, Taking advantage of selectiveattention, and Intellectual fields and the power of design thinking form the core of active ideation, as they determine how the designer perceives, filters, and interprets the world and activates meaningful elements from a vast array of data for the emergence of ideas. Following this core, the dimensions related to the designer's understanding of the design subject, design issue–related factors, and designer education and training serve regulatory and reinforcing roles, structuring the active ideation process. At the outermost layer, experienced identity and sense of place, methods of effective information collection and processing, and explicit knowledge of the design subject function as nourishing resources that provide the experiential, environmental, and informational raw materials required for processing in the inner layers. The interaction of these three levels inner (cognitive), middle (regulatory and structuring), and outer (informational and environmental input) explains the complete mechanism of active ideation and demonstrates that idea generation is not a linear process but rather the outcome of the dynamic interaction with coordination of these nine dimensions. Therefore, it is expected that the proposed final model can be directly applied to improving designers' ideation processes as well as architectural design education, and can provide a theoretical foundation for the development of tools to assess the ideation process.

5. Limitations and Future Research

Although efforts were made in this study to minimize bias by defining clear inclusion and exclusion criteria, the qualitative nature of the research and the final selection of sources based on researchers' judgments do not entirely eliminate the possibility of bias. Moreover, reliance on published Persian and English-language scientific and research articles resulted in the exclusion of other sources such as books, conference papers, and articles in other languages. In addition, although the expert panel consisted of 12 participants falling within the recommended range for fuzzy Delphi studies and considered sufficient for achieving stable consensus any limited expert sample may not fully capture the diversity of viewpoints, which is an inherent limitation of the Delphi method. With respect to the weighting method, although SIWEC was selected due to its scalability and direct compatibility with fuzzy Delphi scores, it is a relatively novel approach and therefore requires further analysis and replication across diverse contexts and samples. Future research can compare SIWEC with conventional multi-criteria decision-making (MCDM) methods to clarify the scope and robustness of its applicability. Despite these limitations, the present study contributes to bridging the gap between theory and practice in architectural education and professional practice by presenting a comprehensive conceptual model of the factors influencing active ideation. It also provides a suitable foundation for the development of practical strategies in design education. In this regard, a subsequent article by the authors will specifically focus on extracting practical strategies aligned with each component of the active ideation model. Furthermore, future research is recommended to focus on empirical validation of the model in architectural design studios and evaluation of its impact on the quality of initial ideas, conducting comparative studies across different groups (such as novice students and professional designers) to identify cognitive differences in active ideation, developing and testing measurement instruments to assess the extent to which active ideation is employed based on the components and criteria of the proposed model; and extending the model by integrating findings from cognitive neuroscience and eye-tracking studies to achieve a deeper understanding of the roles of attention and memory in the active ideation process.

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Authors Contribution

Authors have contributed equally in preparing and writing the manuscript.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Conflict of interests

The author declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] Darke J. The primary generator and the design process. Design Studies. 1979;1(1):36–44. Available from: https://doi.org/10.1016/0142-694X(79)90027-9

[2] Kalami M. Tacit knowledge and primary design generators. Ph.D. Dissertation, Shahid Beheshti University, Tehran, Iran; 2014.

[3] Quiñones-Gómez JC, Mor E, Chacón J. Data-driven design in the design process: A systematic literature review on challenges and opportunities. International Journal of Human–Computer Interaction. 2024;41(4):2227–2252. https://doi.org/10.1080/10447318.2024.2318060

[4] Kaedi Cholandim H, Kalantari Khalilabad H, Momeni K. Methods of Designing and Creating Concepts in Architecture and Problems in Implementation. Creative City Design. 2024;7(4):34–51. Available from: https://oiccpress.com/crcd/article/download/8181/9146

[5] Mokari N, Zabihi H, Panahi S. Presenting a Conceptual Design Model Based on Critical Regionalism after the Victory of Islamic Revolution of Iran. Creative City Design. 2024;7(3):84–96. Doi: 10.71619/crcd 2024 8178. Available from: https://oiccpress.com/crcd/article/download/8178/9143/21759

[6] Sohrabzadeh M, Rezvani Z. A meta-analysis of the causes and consequences of slum-dwelling: A review of articles published between 2009–2019. Urban Sociological Studies. 2021;39(4):1–28. Available from: https://sanad.iau.ir/en/Journal/urb/Article/1015802

[7] Zimmer L. Qualitative meta-synthesis: a question of dialoguing with texts. Journal of Advanced Nursing. 2006;53(3):311–318. Available from: https://doi.org/10.1111/j.1365-2648.2006.03721.x

[8] Sandelowski M, Barroso J. Handbook for Synthesizing Qualitative Research. New York: Springer Publishing Company; 2007.

[9] Noori Mokaram A, Janipour B, Taghvaei V. Examining the components of architectural concept formation in teaching architectural design with a background-based approach. The Monthly Scientific Journal of Bagh-e Nazar. 2023;20(120):29–42. Available from: https://www.bagh-sj.com/article_170104.html

[10] Zanjanbar AH. Creative Optical Metamorphosis in Children's Picture Books: Based on SCAMPER's Idea Generation Model. Rahpooye Honar-Ha-Ye Tajassomi. 2023;6(2):61–75. Available from: https://rahpooye.soore.ac.ir/article_707127.html

[11] Karvan F. Analysis of Architectural Students' Conceptual Sketches Based on Systemic Thinking and Information Processing Styles in the Design Process. Hoviatshahr. 2023;17(3):99–110. Available from: https://sanad.iau.ir/Journal/hoviatshahr/Article/795246

[12] Karimi A, Javidinejad M, Habib S. Generative Reading of Architectural Precedents and Their Use in the Design Process. Islamic Art Studies. 2023;19(48):623–635. Available from: https://www.sysislamicartjournal.ir/article_139864.html

[13] Asgari A, Fathi R. Examining the role of design tools in quality of ideation and presenting architectural designs. The Monthly Scientific Journal of Bagh-e Nazar. 2022;19(113):87–104. Available from: https://www.bagh-sj.com/article_153674.html

[14] Sharif HR, Abdolahpoor Rafiei N. The Role of Computer Aided Sketching Software (CAS) in Ideation Stages of Design. Soffeh. 2022;32(3):19–30. Available from: https://soffeh.sbu.ac.ir/article_101878.html

[15] Panahi S, Taghi Shahbazi F. From Other Spaces to Non-Places. Journal of Space and Place Studies. 2022;1(1):63–74. Available from: https://journals.iau.ir/article_697435.html

[16] Saleki Khameneh S, Hojjati Saeidi M. Defamiliarization in Logotypes of Masoud Nejabati Based on Edward de Bono's Theory of Lateral Thinking. Rahpooye Honar-Ha-Ye Tajassomi. 2023;5(4):65–73. Available from: https://rahpooye.soore.ac.ir/article_701619.html

[17] Goudini J, Rezazadeh E. Evaluation of the Undergraduate Architecture Course's Educational Program Based on Adaption to Professional Practice (With Emphasis on Schematic Designs as One of the Design Phases). Journal of Educational Planning Studies. 2022;11(22):103–115. Available from: https://eps.journals.umz.ac.ir/article_4208.html

[18] Ghafourian FS, Mohammadi Elyasi Q, Ahmadpur Dariani M, Yadollahi Farsi J. Facilitating Methods of Entrepreneurial Idea Generation: A Literature Review. Iranian Journal of Management Sciences. 2022;17(67):47–74. Available from: https://journal.iams.ir/article_383.html

[19] Aghayan S, Ghoddusifar SH, Eslami SG. Measuring the creativity in the formation of initial ideas using hand drawing in the architectural design process. Armanshahr Architecture & Urban Development. 2022;15(39):1–15. Available from:

https://www.armanshahrjournal.com/article_158084.html

[20] Pordel, Pordel A, Ziaebakhsh N. Application of Artificial Intelligence in Form Ideation of Inhabitable Architectural Spaces with Environmental Psychology Approach (Case Study: Iranian-Islamic Future City Center). Quarterly Journal of Architect City. 2022;1(4):38–52. Available from: https://journals.iau.ir/article_700245.html

[21] Karvan F. Design process: from idea to presentation, based on reflective thought and learning styles in architecture students. Soffeh. 2021;31(2):23–38. Available from: https://soffeh.sbu.ac.ir/article_101138.html

[22] Shariatrad F, Pourabrishami P. Sources of architectural ideation and the contribution of each in the design process of architects and architecture students (Case study: Architecture students of Shahid Beheshti University). Journal of Fine Arts: Architecture & Urban Planning. 2021;26(1):69–77. Available from: https://jfaup.ut.ac.ir/article_85532.html

[23] Golabchi M, Gholipour A. The Relationship Between 'Wisdom' and 'Conceptuality' and Its Effect on the Formation of Contemporary Architecture of Iran. Armanshahr Architecture & Urban Development. 2021;14(34):168–157. Available from: https://www.armanshahrjournal.com/article_131919.html

[24] Motiei B, Mehdizadeh Saradj F, Mirzaalipour F. Approach to Dynamic Design and Creation of Conceptual Designs (Study in the Lesson of Second Preliminary Architectural Design). Journal of Architectural Thought. 2021;5(9):215–231. Available from: https://at.journals.ikiu.ac.ir/article_2192.html

[25] Talebi M, Moosavi S, Poshneh K. An Analysis of the Effectiveness of Creativity Teaching Techniques on Architectural Design with Emphasis on the Process of Idea-Finding and Idea-Generation. Journal of Innovation and Creativity in Human Science. 2021;11(2):71–100. Available from: https://sanad.iau.ir/en/Journal/ichs/Article/930487

[26] Payandeh R, Abdolhosseinzadeh M. Ideation Canvas: An Overview of Existing Canvases and Designing a Problem-Oriented Canvas. Journal of Entrepreneurship Development. 2021;14(4):581–598. Available from: https://jed.ut.ac.ir/article_86017.html?lang=en

[27] Ghiyas H, Aminpour A, Hamzenejad M. Explaining Pattern-Based Reading in Teaching Architectural History and Evaluating Its Effectiveness on Architecture Students' Ideation and Insights. Scientific Journal of Iranian Restoration and Architecture. 2021;11(26):19–34. Available from: https://mmi.aui.ac.ir/article-1-1048-en.html

[28] Ashrafi N, Safdarian G. Recognizing the Role of Idea and Concept in Understanding and Creation in Architecture Relying on the 'Four Causes'. JRIA. 2020;8(3):39–50. Available from: https://jria.iust.ac.ir/article-1-1352-fa.html

[29] Etemadiour M, Mahdinejad J, Saleh Sedghpour B. Components of ideation in designing process by semiotic approach with factor analysis in R. Journal of Architectural Thought. 2020;4(8):1–11. Available from: https://at.journals.ikiu.ac.ir/article_2043.html

[30] Alipour L. Improving Precedent-Based Architectural Design Ideation with Action Research Methodology. Journal of Fine Arts: Architecture & Urban Planning. 2019;24(3):47–60. Available from: https://jfaup.ut.ac.ir/article_73541.html?lang=en

[31] Salavatian S, Khajekeian D, Mashreqi M. A Crowdsourcing Process for Creative Ideation of IRIB Media Productions. Journal of Innovation and Creativity in Human Science. 2019;9(3):189–230. Available from: https://sanad.iau.ir/en/Journal/ichs/Article/930125

[32] Jabalameli M, Mozafar F, Ghasemi V, Karimi M. Using TRIZ Functionality in Architectural Design Process. Journal of Fine Arts: Architecture & Urban Planning. 2019;23(3):83–94. Available from: https://jfaup.ut.ac.ir/article_71849.html?lang=en

[33] Khasmafkan Nezam E, Navidi Majd F, Fadavi Anbiaei B. Model of Process Critique of Contemporary Residential Works Based on the Components: 'Mission, Objectives, Functional Needs and Concepts'. Haft Hesar Journal of Environmental Studies. 2019;7(27):67–80. Available from: https://hafthesar.iauh.ac.ir/article-1-670-fa.html

[34] Mahmoodi AS, Bastani M. Conceptualization methods in the design process of architecture. . 2018;23(1):5–18. Available from: https://jfaup.ut.ac.ir/article_67904.html

[35] Niknam Asl SA, Bazrafkan K, Alimohammadi P. Presentation Analytical Framework of Manufacturing Production Process in Architecture, Objectification to Subjective Idea. Urban and Rural Management. 2018;17(51):21–38. Available from: https://ijurm.imo.org.ir/article-1-2233-fa.html

[36] Mirjany H, Nadimi H. Active Experience Model in Architectural Education: A Method to Gain Practical Knowledge Through Design-Oriented Experience of

Architectural Examples. Journal of Iranian Architecture Studies. 2018;7(14):5–20. Available from: https://jias.kashanu.ac.ir/article_111806.html?lang=fa

[37] Karimzadeh S, Etesam I, Foroutan M, Dolati M. Architecture Narration: A Comparative Study on Narration in Architecture and Story. Kimiya-ye-Honar. 2018;7(28):93–107. Available from: https://kimiahonar.ir/article-1-1387-en.html

[38] Alipour L, Faizi M, MohammadMoradi A, Akrami G. The true mapping from precedents in architectural ideation. Journal of Fine Arts: Architecture & Urban Planning. 2016;21(3):81–90. Available from: https://jfaup.ut.ac.ir/article_61104.html

[39] Shariatrad F, Nadimi H. Problem Framing: The Designer's Way of Tackling Design Problems. Soffeh. 2016;26(3):5–24. Available from: https://soffeh.sbu.ac.ir/article_100321.html

[40] Esfahani Zadeh A, Hessami M, Salehi S. The Role of Visual Analogy in the Design and Ideation Process in Sculpture. Journal of Visual and Applied Arts. 2016;9(17):37–52. Available from: https://vaa.journal.art.ac.ir/article_313.html

[41] Kateb F, Khodi O. Common Ideas in Fashion Design and Architecture Based on the Approach of Genette's Intertextuality. Journal of Visual and Applied Arts. 2015;8(15):107–127. Available from: https://vaa.journal.art.ac.ir/article_227.html

[42] Kalami M, Nadimi H. Tacit Knowing and Primary Generators: Reflections on the Role of Tacit Knowing in Formation of Primary Design Generators. Soffeh. 2014;24(1):19–32. Available from: https://soffeh.sbu.ac.ir/article_100222.html

[43] Hadiyan M, Pourmand HA. Concept in Architecture; A Necessity in Design Process and Challenges of Its Education in Architecture Colleges. Journal of Applied Arts. 2014;3(4):73–80. Available from: https://aaj.semnan.ac.ir/article_381.html?lang=en

[44] Sharif HR, Nadimi H. Ideation versus idea processing in architectural design thinking. Soffeh. 2013;23(3):19–26. Available from: https://soffeh.sbu.ac.ir/article_100209.html

[45] Talischi G, Izadi A, Einifar A. Nurturing Design Ability of Novice Architecture Designers (Designing, Implementation and Testing a Constructivist Learning Environment). Journal of Fine Arts: Architecture & Urban Planning. 2012;17(4):1–18. Available from: https://jfaup.ut.ac.ir/article_36362.html

[46] Golrokh S. Rethinking the Definition of the Concept of 'Tissue Degradation' Based on Spatial Decay. Soffeh. 2012;22(2):79–94. Available from: https://soffeh.sbu.ac.ir/article_100153.html

[47] Nadimi H, Shariat Rad F. Sources of Architectural Design Ideation A Reflection on the Ideation Process of Eight Iranian Professional Architects. Journal of Fine Arts: Architecture & Urban Planning. 2012;17(2):5–14. Available from: https://jfaup.ut.ac.ir/article_30155.html

[48] Mandegari K, Nadimi H, Mahdavipoor H, Davoodi S. A Framework for Revealing the Effects of Components Shaping Design Motifs in the Architectural Design Studio (Case Study: Master's Architecture Studio 2). Soffeh. 2012;21(2):43–52. Available from: https://soffeh.sbu.ac.ir/article_100351.html

[49] Sharif H. Critical Thinking and Evaluation of Design Concept. Soffeh. 2011;21(2), 53–64. Available from: https://soffeh.sbu.ac.ir/article_100353.html

[50] Ansari H. Processors and Generators in Architectural Design Process. Journal of Fine Arts: Architecture & Urban Planning. 2009;1(39):5–14. Available from: https://jfaup.ut.ac.ir/article_68315.html

[51] Noghrehkar A, Mozaffar F, Saleh Sedgh B, Shafaee M. Designing Kindergarten Setting Based on the Relationship Between Creativity Characters and Some Architectural Ideas. Journal of Educational Innovations. 2009;8(4):39–59. Available from: https://noavaryedu.oerp.ir/article_78910.html

[52] Daneshgar Moghaddam G. Comprehending Design Problem in Architectural Education. Journal of Fine Arts: Architecture & Urban Planning. 2009;14(1):59–68. Available from: https://jhz.ut.ac.ir/article_27949.html

[53] Paananen V, Oppenlaender J, Visuri A. Using Text-to-Image Generation for Architectural Design Ideation. International Journal of Architectural Computing. 2023;22(3):458–474. Available from: https://doi.org/10.1177/14780771231222783

[54] Onur B. Concept as the Activist of Creativity in Architectural Design: Exploring Factors Affecting Concept Formation Using the Structural Equation Model. Periodica Polytechnica Architecture. 2023;53(3):220–231. Available from: https://doi.org/10.3311/PPar.19143

[55] Novica DR, Wianto E, Andrade Campos S. Drawing and Ideation Process in Design Education: A Systematic Literature Review. Cogent Arts & Humanities. 2023;10(1). Available from: https://doi.org/10.1080/23311983.2023.2219487

[56] Dash SP. An Exploratory Study on Design Process in Architecture: Perspective of Creativity. Creativity Studies. 2022;14(2):346–361. Available from: https://doi.org/10.3846/cs.2021.12989

[57] Ceylan S, Soygenis S. Improving Architecture Students' Design Skills: A Studio Experience. International Journal of Art & Design Education. 2022;41(2):431–446. Available from: https://doi.org/10.1111/jade.12401

[58] Urey ZCU. The Cognitive Use of Prior Knowledge in Design Cognition: The Role of Types and Precedents in Architectural Design. Journal of Contemporary Urban Affairs. 2019;3(3):39–50. Available from: https://doi.org/10.25034/ijcua.2019.v3n3-4

[59] Tedjosaputro MA, Sutrisna M, Coates P. Interplay of Sketches and Mental Imagery in the Design Ideation Stage of Novice Designers. The Design Journal. 2017;20(1):444–456. Available from: https://doi.org/10.1080/14606925.2018.1395655

[60] Eilouti B. Concept Evolution in Architectural Design: An Octonary Framework. Frontiers of Architectural Research. 2018;7(2):180–196. Available from: https://doi.org/10.1016/j.foar.2018.01.003

[61] Perez B, Smith A, Johnson M. Designing Principle-Based Stimuli for Improving Creativity During Ideation. Journal of Mechanical Engineering Science. 2019;233(14):4880–4892. Available from: https://doi.org/10.1177/0954406218809117

[62] Sarkar P, Chakrabarti A. A Model for the Process of Idea Generation. The Design Journal. 2017;20(2):239–257. Available from: https://doi.org/10.1080/14606925.2017.1272244

[63] Suh J. An Interactive Generative Abstraction System for the Archetype-Based Pre-Ideation Process (IGATY). Design Science. 2017;3:e9,1–30. Available from: https://doi.org/10.1017/dsj.2017.9

[64] Orthel BD, Day JK. Processing Beyond Drawing: A Case Study Exploring Ideation for Teaching Design. Sage Open. 2016;6(3):346–361. Available from: https://doi.org/10.1177/2158244016663285

[65] Yilmaz Orthel BD, Day JK. Processing Beyond Drawing: A Case Study Exploring Ideation for Teaching Design. Sage Open. 2016;6(3):346–361. Available from: https://doi.org/10.1016/j.destud.2016.05.001

[66] Laamanen T, Hakkarainen P. Interview study of professional designers' ideation approaches. The Design Journal. 2015;17(2):194–217. Available from: https://doi.org/10.2752/175630614X13915240575988

[67] Gonçalves M, Cardoso C, Badke-Schaub P. What Inspires Designers? Preferences on Inspirational Approaches During Idea Generation. Design Studies. 2014;35(1):29–53. Available from: https://doi.org/10.1016/j.destud.2013.09.001

[68] Demirkan H, Afacan Y. Assessing Creativity in Design Education: Analysis of Creativity Factors in the First-Year Design Studio. . 2012;33(3):262–278. Available from: https://doi.org/10.1016/j.destud.2011.11.005

[69] Vargas Hernandez N, Shah J, Smith S. Understanding Design Ideation Mechanisms Through Multilevel Aligned Empirical Studies. Design Studies. 2010;31(4):382–410. Available from: https://doi.org/10.1016/j.destud.2010.04.001

[70] Kirk J, Miller ML. Reliability and Validity in Qualitative Research. Beverly Hills, CA: Sage; 1986.

[71] Hsu C, Sandford BA. The Delphi technique: Making sense of consensus. Practical Assessment, Research & Evaluation. 2007;12(10):1–8. Available from: https://doi.org/10.7275/pdz9-th90

[72] DeVellis RF. Scale Development: Theory and Applications (4th ed.). Los Angeles, CA: SAGE Publications; 2017.

[73] Habibi A, Jahantigh F, Sarafrazi A. Fuzzy Delphi Technique for Forecasting and Screening Items. Asian Journal of Research in Business Economics and Management. 2015;5(2):130–143. Available from: https://doi.org/10.5958/2249-7307.2015.00036.5

[74] Puška A, Nedeljković M, Pamučar D, Božanić D, Simić V. Application of the new simple weight calculation (SIWEC) method in the case study in the sales channels of agricultural products. MethodsX. 2024;13:1–8. Available from: https://doi.org/10.1016/j.mex.2024.102413

Appendices

Appendix A. *Fuzzy Delphi Questionnaire (Screening and Validation Stage)*

Dear Professor,
With kind regards,
This questionnaire has been developed within the framework of a scientific research study aimed at identifying, screening, and prioritizing the criteria influencing the formation of "active ideation" in the architectural design process. The presented criteria have been extracted through a systematic review of the research literature using the meta-synthesis method. The purpose of this stage is to obtain an expert evaluation of the level of importance of each criterion from the perspective of architectural experts. Therefore, your accurate and thoughtful completion of this questionnaire will make a significant contribution to the clarity and scientific rigor of the research. This questionnaire is intended solely for research purposes, and all responses will be treated as confidential.
Thank you very much for your time and cooperation.

Respondent Information:
Gender:
☐ Male ☐ Female
Highest Academic Degree Age :
☐ Under 30
☐ 30–35
☐ 35–40
☐ Over 40
Years of teaching and professional experience in architecture:
☐ 10–15 years
☐ 15–20 years
☐ Over 20 years
Years of teaching experience in undergraduate "Architectural Design" courses:
☐ 5–10 years
☐ 10–15 years
☐ Over 15 years

Assessment of Criteria:
You are kindly requested to evaluate the extent to which each of the following statements influences the formation of "Active Ideation in the Architectural Design Process", based on the five-point scale provided.

Appendix A. A Sample of the Fuzzy Delphi Questionnaire

Row	Statements Related to the Formation of Initial Ideas within Active Ideation	Level of Importance				
		Very Low	Low	Moderate	High	Very High
1	The designer's attitude and worldview play a determining role in the formation of initial design ideas.					
2	The designer's personality traits influence their mental orientation in active ideation.					
3	The designer's psychological structure (emotional, cognitive, and motivational) affects the formation of initial ideas.					
4	The designer's motivation and identity directly influence the quality of initial ideas.					
5	The designer's lived experiences (physical and non-physical) constitute an effective source for the formation of initial ideas.					

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Appendix A. A Sample of the Fuzzy Delphi Questionnaire (Continued)

Row	Statements Related to the Formation of Initial Ideas within Active Ideation	Level of Importance				
		Very Low	Low	Moderate	High	Very High
6	The designer's active experiences through studying and engaging with architectural works and precedents influence the generation of initial design ideas.					
7	During active ideation, the designer relies on prior mental schemas and patterns.					
8	Peak experiences (inspirations), dreams, and the designer's unconscious play a role in shaping initial ideas.					
9	The designer's ability in spatial perception and environmental reading influences the formation of design ideas.					
10	The designer's perception of the environment—shaped by personality, gender, experiences, and personal values—affects the process of active ideation.					
11	The designer's creative understanding of experienced environments functions as a source for generating initial ideas.					
12	The levels of meaning perceived by the designer from the environment—both representational (appearance characteristics and referential meanings) and responsive (emotional reactions, evaluative judgments, and prescriptive perceptions)—influence idea formation					

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Appendix B. *Weighting and prioritization of criteria along with the results of fuzzy calculations in the Fuzzy Delphi method*

Appendix B. Weighting and prioritization of criteria along with the results of fuzzy calculations in the Fuzzy Delphi method

Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria	Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria
	Fuzzy average	Non-fuzzy average	Status				Fuzzy average	Non-fuzzy average	Status		
Cr-1	(0.75,1,1)	0.917	✓	0.00673	1	Cr-93	(0.458,0.708,0.938)	0.701	✓	0.00511	167
Cr-2	(0.708,0.958,1)	0.889	✓	0.00652	3	Cr-94	(0.479,0.729,0.938)	0.715	✓	0.00530	116
Cr-3	(0.708,0.958,1)	0.889	✓	0.00651	6	Cr-95	(0.479,0.729,0.938)	0.715	✓	0.00531	110
Cr-4	(0.729,0.979,1)	0.903	✓	0.0063	2	Cr-96	(0.479,0.729,0.917)	0.708	✓	0.00523	143
Cr-5	(0.75,1,1)	0.917	✓	0.00673	1	Cr-97	(0.458,0.708,0.938)	0.701	✓	0.00515	166
Cr-6	(0.708,0.958,1)	0.889	✓	0.00647	8	Cr-98	(0.479,0.729,0.938)	0.715	✓	0.00527	129
Cr-7	(0.75,1,1)	0.917	✓	0.00673	1	Cr-99	(0.479,0.729,0.938)	0.715	✓	0.00527	132
Cr-8	(0.708,0.958,1)	0.889	✓	0.00651	5	Cr-100	(0.479,0.729,0.938)	0.715	✓	0.00523	145
Cr-9	(0.688,0.938,1)	0.875	✓	0.00639	13	Cr-101	(0.5,0.729,0.896)	0.708	✓	0.00516	164
Cr-10	(0.646,0.896,0.979)	0.840	✓	0.00616	29	Cr-102	(0.458,0.708,0.958)	0.708	✓	0.00516	162
Cr-11	(0.688,0.938,1)	0.875	✓	0.00633	17	Cr-103	(0.458,0.708,0.938)	0.701	✓	0.00520	153
Cr-12	(0.646,0.896,0.979)	0.840	✓	0.00610	34	Cr-104	(0.479,0.729,0.896)	0.701	✓	0.00522	148
Cr-13	(0.75,1,1)	0.917	✓	0.00673	1	Cr-105	(0.479,0.729,0.917)	0.708	✓	0.00523	144
Cr-14	(0.75,1,1)	0.917	✓	0.00673	1	Cr-106	(0.5,0.729,0.896)	0.708	✓	0.00516	164
Cr-15	(0.75,1,1)	0.917	✓	0.00673	1	Cr-107	(0.479,0.729,0.938)	0.715	✓	0.00529	118
Cr-16	(0.688,0.938,1)	0.875	✓	0.00639	12	Cr-108	(0.479,0.729,0.958)	0.722	✓	0.00531	111
Cr-17	(0.646,0.896,0.979)	0.840	✓	0.00617	28	Cr-109	(0.479,0.729,0.917)	0.708	✓	0.00518	157
Cr-18	(0.688,0.938,1)	0.875	✓	0.00636	16	Cr-110	(0.479,0.729,0.938)	0.715	✓	0.00528	126
Cr-19	(0.688,0.938,1)	0.875	✓	0.00638	14	Cr-111	(0.458,0.708,0.938)	0.701	✓	0.00520	153
Cr-20	(0.688,0.938,1)	0.875	✓	0.00641	10	Cr-112	(0.25,0.5,0.75)	0.500	Reject	-	-
Cr-21	(0.646,0.896,0.979)	0.840	✓	0.00618	26	Cr-113	(0.646,0.896,0.979)	0.840	✓	0.00615	32
Cr-22	(0.646,0.896,0.979)	0.840	✓	0.00619	24	Cr-114	(0.667,0.917,1)	0.861	✓	0.00626	21
Cr-23	(0.604,0.854,0.958)	0.806	✓	0.00589	44	Cr-115	(0.667,0.917,1)	0.861	✓	0.00627	19
Cr-24	(0.688,0.938,1)	0.875	✓	0.00636	15	Cr-116	(0.5,0.75,0.938)	0.729	✓	0.00535	99
Cr-25	(0.646,0.896,0.979)	0.840	✓	0.00613	33	Cr-117	(0.667,0.917,1)	0.861	✓	0.00627	20
Cr-26	(0.563,0.813,0.938)	0.771	✓	0.00577	45	Cr-118	(0.5,0.75,0.958)	0.736	✓	0.00532	106
Cr-27	(0.271,0.521,0.771)	0.521	Reject	-	-	Cr-119	(0.5,0.729,0.896)	0.708	✓	0.00519	155
Cr-28	(0.646,0.896,0.979)	0.840	✓	0.00619	23	Cr-120	(0.5,0.729,0.896)	0.708	✓	0.00517	158
Cr-29	(0.646,0.896,0.979)	0.840	✓	0.00617	27	Cr-121	(0.479,0.729,0.896)	0.701	✓	0.00521	150
Cr-30	(0.604,0.854,0.958)	0.806	✓	0.00590	42	Cr-122	(0.5,0.75,0.938)	0.729	✓	0.00532	105
Cr-31	(0.563,0.813,0.938)	0.771	✓	0.00566	50	Cr-123	(0.5,0.75,0.917)	0.722	✓	0.00531	113
Cr-32	(0.646,0.896,0.979)	0.840	✓	0.00619	25	Cr-124	(0.542,0.792,0.958)	0.764	✓	0.00560	56
Cr-33	(0.5,0.75,0.958)	0.736	✓	0.00534	100	Cr-125	(0.5,0.729,0.917)	0.715	✓	0.00517	161
Cr-34	(0.542,0.792,1)	0.778	✓	0.00563	53	Cr-126	(0.479,0.729,0.896)	0.701	✓	0.00518	156
Cr-35	(0.5,0.75,0.958)	0.736	✓	0.00536	88	Cr-127	(0.5,0.75,0.917)	0.722	✓	0.00528	122
Cr-36	(0.521,0.771,0.979)	0.757	✓	0.00550	63	Cr-128	(0.521,0.771,0.958)	0.750	✓	0.00546	66
Cr-37	(0.542,0.792,1)	0.778	✓	0.00566	51	Cr-129	(0.479,0.729,0.958)	0.722	✓	0.00525	138
Cr-38	(0.5,0.75,1)	0.750	✓	0.00538	84	Cr-130	(0.479,0.729,0.958)	0.722	✓	0.00525	137

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Appendix B. Weighting and prioritization of criteria along with the results of fuzzy calculations in the Fuzzy Delphi method (Continued)

Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria	Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria
	Fuzzy average	Non-fuzzy average	Status				Fuzzy average	Non-fuzzy average	Status		
Cr-39	(0.479,0.729,0.938)	0.715	✓	0.00529	119	Cr-131	(0.542,0.792,0.958)	0.764	✓	0.00558	58
Cr-40	(0.563,0.813,1)	0.792	✓	0.00573	47	Cr-132	(0.5,0.75,0.938)	0.729	✓	0.00537	86
Cr-41	(0.542,0.792,0.979)	0.771	✓	0.00559	57	Cr-133	(0.417,0.667,0.917)	0.667	Reject	-	-
Cr-42	(0.458,0.708,0.938)	0.701	✓	0.00517	159	Cr-134	(0.604,0.854,0.958)	0.806	✓	0.00589	43
Cr-43	(0.5,0.75,0.958)	0.736	✓	0.00536	92	Cr-135	(0.625,0.875,0.979)	0.826	✓	0.00599	37
Cr-44	(0.333,0.583,0.792)	0.569	Reject	-	-	Cr-136	(0.563,0.813,0.938)	0.771	✓	0.00570	48
Cr-45	(0.5,0.75,0.958)	0.736	✓	0.00536	93	Cr-137	(0.5,0.75,0.917)	0.722	✓	0.0535	97
Cr-46	(0.458,0.708,0.938)	0.701	✓	0.00517	160	Cr-138	(0.521,0.771,0.958)	0.750	✓	0.00543	74
Cr-47	(0.5,0.75,0.917)	0.722	✓	0.00534	102	Cr-139	(0.479,0.729,0.917)	0.708	✓	0.00521	151
Cr-48	(0.5,0.75,0.958)	0.736	✓	0.00538	83	Cr-140	(0.479,0.729,0.896)	0.701	✓	0.00526	135
Cr-49	(0.479,0.729,0.938)	0.715	✓	0.00531	112	Cr-141	(0.604,0.854,1)	0.819	✓	0.00590	41
Cr-50	(0.5,0.75,0.938)	0.729	✓	0.00542	77	Cr-142	(0.646,0.896,1)	0.847	✓	0.00620	22
Cr-51	(0.5,0.75,0.938)	0.729	✓	0.00545	68	Cr-143	(0.625,0.875,0.979)	0.826	✓	0.00600	36
Cr-52	(0.479,0.729,0.938)	0.715	✓	0.00532	109	Cr-144	(0.542,0.792,0.958)	0.764	✓	0.00557	60
Cr-53	(0.479,0.729,0.958)	0.722	✓	0.00529	117	Cr-145	(0.646,0.896,0.979)	0.840	✓	0.00615	30
Cr-54	(0.5,0.75,0.917)	0.722	✓	0.00536	94	Cr-146	(0.333,0.583,0.792)	0.569	Reject	-	-
Cr-55	(0.521,0.771,0.917)	0.736	✓	0.00552	61	Cr-147	(0.5,0.75,0.917)	0.722	✓	0.00539	82
Cr-56	(0.5,0.75,0.917)	0.722	✓	0.00540	79	Cr-148	(0.625,0.875,1)	0.833	✓	0.00605	35
Cr-57	(0.5,0.75,0.917)	0.722	✓	0.00536	91	Cr-149	(0.563,0.792,0.917)	0.757	✓	0.00557	59
Cr-58	(0.479,0.729,0.938)	0.715	✓	0.00528	124	Cr-150	(0.708,0.958,1)	0.889	✓	0.00649	7
Cr-59	(0.5,0.75,0.938)	0.729	✓	0.00541	78	Cr-151	(0.708,0.958,1)	0.889	✓	0.00649	7
Cr-60	(0.5,0.75,0.917)	0.722	✓	0.00536	90	Cr-152	(0.646,0.896,1)	0.847	✓	0.00620	22
Cr-61	(0.542,0.771,0.875)	0.729	✓	0.00543	73	Cr-153	(0.479,0.729,0.917)	0.708	✓	0.00562	136
Cr-62	(0.5,0.75,0.938)	0.729	✓	0.00540	81	Cr-154	(0.708,0.958,1)	0.889	✓	0.00651	4
Cr-63	(0.5,0.75,0.917)	0.722	✓	0.00536	95	Cr-155	(0.646,0.896,0.958)	0.833	✓	0.00615	31
Cr-64	(0.5,0.75,0.938)	0.729	✓	0.00537	87	Cr-156	(0.688,0.938,1)	0.875	✓	0.00639	11
Cr-65	(0.5,0.75,0.917)	0.722	✓	0.00542	76	Cr-157	(0.688,0.938,1)	0.875	✓	0.00641	9
Cr-66	(0.5,0.75,0.917)	0.722	✓	0.00535	96	Cr-158	(0.667,0.917,1)	0.861	✓	0.00630	18
Cr-67	(0.479,0.729,0.917)	0.708	✓	0.00527	133	Cr-159	(0.479,0.729,0.917)	0.708	✓	0.00527	130
Cr-68	(0.479,0.729,0.938)	0.715	✓	0.00528	128	Cr-160	(0.5,0.75,0.917)	0.722	✓	0.00542	75
Cr-69	(0.479,0.729,0.938)	0.715	✓	0.00533	104	Cr-161	(0.542,0.792,0.958)	0.764	✓	0.00561	55
Cr-70	(0.479,0.729,0.958)	0.722	✓	0.00531	114	Cr-162	(0.521,0.771,0.917)	0.736	✓	0.00546	67
Cr-71	(0.479,0.729,0.958)	0.722	✓	0.00522	147	Cr-163	(0.396,0.646,0.813)	0.618	Reject	-	-
Cr-72	(0.479,0.729,0.979)	0.729	✓	0.00528	127	Cr-164	(0.479,0.729,0.917)	0.708	✓	0.00524	140
Cr-73	(0.479,0.729,0.938)	0.715	✓	0.00529	121	Cr-165	(0.521,0.771,0.938)	0.743	✓	0.00543	70
Cr-74	(0.479,0.729,0.938)	0.715	✓	0.00532	107	Cr-166	(0.563,0.813,0.938)	0.771	✓	0.00563	52
Cr-75	(0.5,0.75,0.917)	0.722	✓	0.00538	85	Cr-167	(0.479,0.729,0.917)	0.771	✓	0.00522	146
Cr-76	(0.479,0.729,0.958)	0.722	✓	0.00532	108	Cr-168	(0.563,0.813,0.958)	0.778	✓	0.00568	49
Cr-77	(0.479,0.729,0.938)	0.715	✓	0.00529	121	Cr-169	(0.479,0.729,0.917)	0.708	✓	0.00524	141
Cr-78	(0.5,0.75,0.896)	0.715	✓	0.00543	71	Cr-170	(0.5,0.75,0.938)	0.729	✓	0.00534	101
Cr-79	(0.479,0.729,0.917)	0.708	✓	0.00527	131	Cr-171	(0.604,0.854,0.958)	0.806	✓	0.00592	40

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Appendix B. Weighting and prioritization of criteria along with the results of fuzzy calculations in the Fuzzy Delphi method (Continued)

Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria	Criteria code	Fuzzy Delphi results			Weight of Criteria (SIWEC)	Priority of criteria
	Fuzzy average	Non-fuzzy average	Status				Fuzzy average	Non-fuzzy average	Status		
Cr-80	(0.5,0.75,0.938)	0.729	✓	0.00544	69	Cr-172	(0.521,0.771,0.958)	0.750	✓	0.00551	62
Cr-81	(0.479,0.729,0.938)	0.715	✓	0.00528	123	Cr-173	(0.563,0.813,0.938)	0.771	✓	0.00576	46
Cr-82	(0.479,0.729,0.958)	0.722	✓	0.00528	125	Cr-174	(0.479,0.729,0.896)	0.701	✓	0.00533	103
Cr-83	(0.479,0.729,0.938)	0.715	✓	0.00529	120	Cr-175	(0.479,0.729,0.917)	0.708	✓	0.00527	134
Cr-84	(0.479,0.729,0.938)	0.715	✓	0.00521	152	Cr-176	(0.521,0.771,0.938)	0.743	✓	0.00547	65
Cr-85	(0.5,0.75,0.917)	0.722	✓	0.00543	72	Cr-177	(0.5,0.75,0.958)	0.736	✓	0.00535	98
Cr-86	(0.5,0.729,0.896)	0.708	✓	0.00515	165	Cr-178	(0.5,0.75,0.896)	0.715	✓	0.00547	64
Cr-87	(0.479,0.729,0.938)	0.715	✓	0.00531	115	Cr-179	(0.542,0.792,0.958)	0.764	✓	0.00562	54
Cr-88	(0.479,0.729,0.917)	0.708	✓	0.00524	142	Cr-180	(0.5,0.75,0.917)	0.722	✓	0.00536	89
Cr-89	(0.479,0.729,0.938)	0.715	✓	0.00520	154	Cr-181	(0.604,0.854,0.938)	0.799	✓	0.00595	39
Cr-90	(0.479,0.729,0.938)	0.708	✓	0.00516	163	Cr-182	(0.5,0.75,0.917)	0.722	✓	0.00540	80
Cr-91	(0.479,0.729,0.938)	0.715	✓	0.00525	139	Cr-183	(0.479,0.729,0.896)	0.701	✓	0.00521	149
Cr-92	(0.458,0.708,0.958)	0.708	✓	0.00516	163	Cr-184	(0.604,0.854,0.979)	0.813	✓	0.00597	38

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