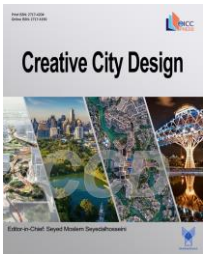

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Drawing a Scientific Map of Aesthetics Studies in Iranian Architecture and Urban Design Products from 2011 to 2021

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Original Research

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Abstract:

Aims: The concept of beauty is an essential aspect of architecture that has received significant attention from researchers and professionals in the field. However, the lack of a comprehensive understanding of this concept may lead to an incomplete understanding of beauty among researchers, architects, and clients. This deficiency can have far-reaching consequences, affecting management, policy-making, and even architectural education. Therefore, we focused on the educational aspect of the problem because we believe that identifying scientific similarities in this field will enable architects and urban planners to find a common language to talk about beauty more practically. The crucial step in compensating for this lack is to examine what architects and urban planners know about beauty and which definitions of aesthetics are studied in current scientific products. Scientometrics evaluations provide practical techniques for finding solutions to the mentioned questions. Hence, this study aims to draw a scientific map of aesthetics studies in architecture and urban design products in Iran from 2011 to 2021. This map will enable us to acquire a more precise picture of the way researchers and actors in the field of architecture and urban design think about beauty and its priorities.

Methodology: The study employed a mixed research method, with a focus on content analysis extracted from a systematic review that drew a scientific map based on a focus on beauty. Content analysis was accomplished in five steps: data gathering, categorizing, coding, analyzing, and interpretation by researchers. The evaluation of published studies by Iranian researchers in Scopus and Web of Science in the field of architecture and urban planning between 2011 and 2021 formed the basis of the study. We used the Prisma checklist to select 36 items between 358 studies. The software for data analysis used in this research was MAXQDA, UCINET and Excel.

Findings: The findings of the study revealed that most research has focused on the visual features of architectural and urban forms, with the aesthetics of residential facades and urban walls being the most studied. The co-word network analysis revealed that concepts such as sustainability, design, and visual features have led to the formation of the main framework in aesthetic studies.

Conclusion: the development of aesthetic research with attention to non-visual perceptions such as tactile and auditory perception in the environment, along with attention to the values existing in the cultural context of Iran, can compensate for the existing shortcomings in this area.

Keywords: Aesthetics, Architecture, Urban Planning, Beauty, Scientometrics

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1. Introduction

Beauty has been a fundamental concept since the inception of human civilizations, serving as a meaningful need [1]. The quality of beauty in architecture and urban planning has always been a concern for designers and builders, sometimes overshadowing other aspects of architectural construction and sometimes reinforcing them. Numerous studies have been conducted on the definitions of beauty from different perspectives of thinkers, who have often sought philosophical definitions of it. However, in Iran, there is a lack of comprehensive and upstream studies in the field of architecture and urban planning aesthetics, which has been neglected so far. The lack of a big picture of "beauty" among professionals and researchers in architecture will lead to an incomplete understanding of this concept that affects architecture and urban planning in Iran. This can be traced in the management and policy-making in both professional and research fields, and even in architectural education. The consequence of this issue has created confusion about aesthetic definitions and frameworks among decision-makers in Iran. Hence, an aesthetic crisis has appeared in the landscape of Iranian cities [2], which can be controlled and solved by creating a standard context for all participants in the building process.

As we mentioned, one of the aspects that we can intervene in this problem is architectural education. We focused on the educational aspect of the problem because we believe that identifying scientific similarities in this field will enable architects and urban planners to find a common language to talk about beauty more practically. The crucial step in compensating for this lack is to examine what architects and urban planners know about beauty and which definitions of aesthetics are studied in current scientific products. Scientometrics evaluations provide practical techniques for finding solutions to the mentioned questions. Studies show that activities related to the development of science, technology, and innovation such as scientometrics are the primary drivers of productivity and economic growth, which significantly contributes to economic development and the improvement of the living standards of societies. Based on this, governments and international organizations always use different methods and various dimensions to measure and evaluate science, technology, and innovation [3].

The practice of drawing scientific maps as a means of informing planners and research policymakers with scientometric information is a multifaceted process that encompasses a wide range of activities, orientations, and specialized studies [4]. Scientific maps, in the form of illustrated graphs, serve as a visual representation of the relationship between concepts, keywords, and authors' names in a field of science. The primary benefit of creating a scientific map is to achieve a quick and accurate visual understanding of the network of relationships between key elements in science. In evaluating the scientific output of researchers, the h-index h [5] has garnered significant attention from researchers due to its simplicity, ease of use, and numerous advantages over other methods. The h-index of a researcher includes the number of articles published, each of which has been cited at least h times [6].

This study aims to draw a scientific map of aesthetics studies in architecture and urban design products in Iran. This map will enable us to acquire a more precise picture of the way researchers and actors in the field of architecture and urban design think about beauty and its priorities. Such an image can lead to a genuine understanding of professionals' expectations and effective policy-making in various areas of profession, education, and research. To achieve this goal, scientometrics of "beauty" in the field of architecture and urban planning in Iran has been conducted by examining the scientific products indexed by researchers in the Scopus and Web of Science databases during the years 2011 to 2021. The significance of this study lies in its ability to illuminate existing research gaps in the field of aesthetics, which can clarify the path of future studies.

2. Research Questions

- What are the key concepts and scientific fields in the studies of Iranian researchers in aesthetics1 between 2010 and 2021, and what characteristics does the co-word network of these concepts emphasize?
- What are the most frequent aspects of aesthetics studies in terms of content, research method, and scientific centers between 2010 and 2021?

3. Theoretical Foundations

Aesthetics in Architecture and Urban Planning

In the realm of architecture and urban planning, the study of aesthetics is a crucial aspect that requires an in-depth understanding of the fundamental concepts and theoretical foundations. To achieve this understanding, a systematic review of the resources on aesthetics is necessary, which involves extracting keywords and identifying the dominant theories and aspects in the field of aesthetic studies. The concept of "beauty" is a central theme in this regard, and its understanding is critical to comprehending

the aesthetic experience. According to the Dehkhoda Online Dictionary (2021), beauty signifies goodness, kindness, delicacy, and order and harmony in an object, which stimulates the intellect, imagination, and high desires of humans, creating pleasure and relaxation. However, this definition also highlights the subjective nature of beauty, which has been a topic of debate throughout history.

Philosophers such as Kant and German idealists view beauty as having a non-functional purpose and seek its benefits in beauty itself. In contrast, Edmund Burke was the first to point to the existence of physiological factors in the perception of beauty. He distinguishes between "beauty" and "sublimity" and acknowledges the existence of a physiological basis for creating the two feelings of "peace" and "pain" [5]. Furthermore, experimental researchers and neuroscientists consider beauty to be an objective experience and believe in a universal definition of beauty, attributing it to the natural selection and evolution of humans and nature [7]. A comprehensive view of the definitions of beauty in research resources requires an analysis of the theories of researchers in different scientific fields, which shows that there is no single definition of the aesthetic experience. Table 1 classifies the theories of various researchers and highlights the diversity of views on the concept of beauty.

Table 1. Key concepts of theories and definitions of beauty from theorists' points of view

Title of theory	Type of theory	Definition	Key factors	Source
Attitudinal	Objective	Beauty is perceived by the right hemisphere of the brain.	Hemispheres of the brain, sensory perceptions	Daniel Bennett [8]
Phylogenetic		Beauty is understood during brain evolution and based on emotional reactions.	Hindbrain, sensory perceptions	Paul D. MacLean [8]
Functional-Hierarchical		Beauty is perceived by the connection between the functions of different parts of the brain.	Activity of different brain parts, sensory perceptions	Alexander Romanovich Luria [8]
Universal		Beauty is instinctively understood in the same way all over the world.	Senses and human instincts	Christoph Redies [9]
Quality of choice		Beauty is an index to evaluate the quality of reproduction and survival.	The ability of reproduction	Evolutionary psychologists [10]
Gestalt	Subjective-Objective	Beauty is understood by the perception of visual generalities.	Organization of information, individual knowledge	Arnold Whittick [11]
Perceptual		Beauty is understood by recognizing emotional perceptions.	Individual interaction, personality traits	Jack L. Nasar [11]
Neuroscientific		Beauty is a combination of sensory and cognitive perceptions that are perceived depending on the type of stimulus.	Five senses, cognitive perceptions, knowledge, and individual culture	Semir Zeki [12]
Sublimity	Subjective	Beauty is a subjective concept and has no measurable physical appearance.	Thoughts	Edmund Burke [5]

The concept of beauty in Latin sources is often associated with the word "aesthetic," with its Greek root referring to the category of perception [13]. This definition closely aligns with the perception and description of an

individual's lived experience of the environment, making it particularly relevant to beauty in the surrounding environment and man-made objects. One theoretical framework used to describe how beauty is perceived is information theory. This theory is based on measuring the transmission of information from the environmental stimulus to the observer. According to this theory, the visual landscape can be conceptually divided into a network of equally sized squares, with each square sending perceptual messages to the observer until the image is understood. Once perception occurs, the human brain ceases to process additional information. Light, color, and their intensity are key variables in this process [11].

When applying this theory of perception to the aesthetic definitions of architecture and urban planning, it can be inferred that a building is considered beautiful when it provides sufficient perceptual information to the observer. According to Bense's definition of perceptual aesthetics, the higher the degree of order of a building observed, the lower the information content becomes. However, this does not imply that order is more understandable at a more complex level; on the contrary, complex order introduces ambiguity in perception. Based on this, beauty can be defined and measured by the ratio between complexity and order, a concept that Birkhoff defined as the result of dividing order by complexity [1].

4. Literature review

One of the areas that has been formed in recent decades based on scientific changes is the field of scientometrics. Today, scientometrics is the most common method for evaluating scientific activities and research management. Drawing scientific maps and co-word networks is one of the techniques used in scientometrics. The co-word network is the conceptual relationships between words in texts and documents that are used to form semantic relationships [15]. Scientometric research in the field of architecture and urban planning in Iran has rarely been done. However, four important studies were considered by the author before the start of this study. The first is a study that maps the scientific production of art and architecture researchers at the Islamic Azad University, which was conducted by searching the Web of Science database. This study examines the quantitative performance of the field of art and architecture from the beginning to 2018, which has evaluated 253 records. The findings showed that the first indexed scientific record of the Islamic Azad University in the field of art and architecture in the Web of Science database was related to 2008 and the highest scientific production was related to 2016 with 176 records. The results of the study indicate the unfavorable situation of the scientific production of the Islamic Azad University in the field of art and architecture in terms of quantity and quality, and so far it has played a very weak role in introducing Iranian art and architecture in the world so that only 0.35% of the Islamic Azad University's scientific production share goes to the field of art and architecture [16].

In a recent study, the scientific production of Iranian universities in the field of neuroarchitecture was analyzed. This involved a comprehensive review of articles authored by Iranian researchers in both Iranian and international sources spanning the years 2003 to 2020. The findings of this study revealed that the earliest research in this field dates back to 2012, with the highest number of published articles occurring in 2020. Notably, the "Iran University of Science and Technology" and "Shahid Rajaie Teacher Training University" emerged as the most prolific institutions in this area. The articles in this field were categorized into four distinct groups: "Aesthetics and Visual Preferences, Environmental Health and Well-being, Navigation and Orientation, and Phenomenology and Sensory Perception" [17].

In the field of scientometrics of beauty, a recent study has conducted a comprehensive bibliometric analysis and visualization of the scientific literature in this area from 1970 to 2018. The study utilized the Web of Science to search for articles with the title "Aesthetics", resulting in a total of 27159 articles, 45832 authors, and contributions from 123 countries, reflecting a growth of 2.10% over the specified period. These resources collectively received 21793 citations, averaging 8.02 citations per document. The analysis revealed distinct research areas within the literature on aesthetics, impacting research topics, productivity, and article quality [18]. In a separate study, researchers explored the typology and comparative comparison of research approaches in architectural aesthetics studies. Their evaluation of 81 studies indexed in Google Scholar from 1989 to 2017 highlighted the need for aesthetic research in architecture and urban planning to encompass various discourses, including biophilic, interactive, participatory, and evidence-based. The study emphasized the importance of deeply examining the human perceptual experience in the context of aesthetics in architecture [19].

5. Research Method

The current study has been conducted using a mixed method approach with priority given to the qualitative part. The research strategy in the qualitative section is content analysis, based on a systematic review, and in the quantitative section, statistical analysis and drawing a scientific map are used. Research data was extracted through electronic search in English-language citation sources using UCINET and EXCEL software. The research was conducted in five steps. Three steps were related to the research method, and the final two steps were referred to in the findings and results (Figure 1).

- Step One (Information Extraction Phase): In this step, the keywords related to the research objective were

extracted by studying the existing articles in the background. These keywords included the titles: "Beauty" and "Aesthetics" and their synonyms in English. The mentioned titles were searched in Scopus and Web of Science databases on September 23, 2021, and 358 sources were extracted (Figure 2). These resources were based on research conducted by Iranian researchers during the period (2011-2021). The main reason for selecting Scopus and Web of Science to extract studies was their bibliometric validation which provided opportunities to compare studies based on standard indexes [20,21]. Additionally, reviewing 10-year aesthetics studies gave us a comprehensive view of Iranian scientific products in the last decade which enabled us to identify potentials and challenges precisely. After an initial review that included removing non-English language resources, non-research articles, articles without full text, and those unrelated to architecture and urban planning, 80 research articles were selected for full-text study. Of these, 17 articles were duplicates and 27 were irrelevant to the research objective and excluded, leaving 36 articles for systematic review and content analysis. All these steps were performed based on the Prisma checklist which is a standard checklist for systematic review studies [22].

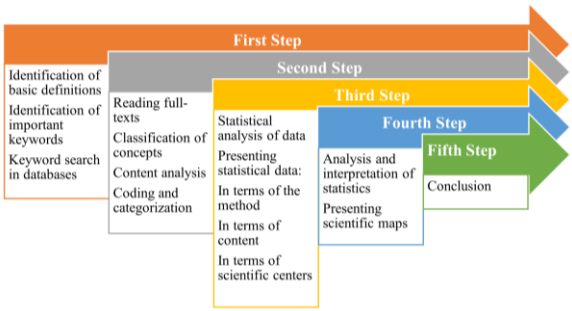

Figure 1. Description of five steps of current research

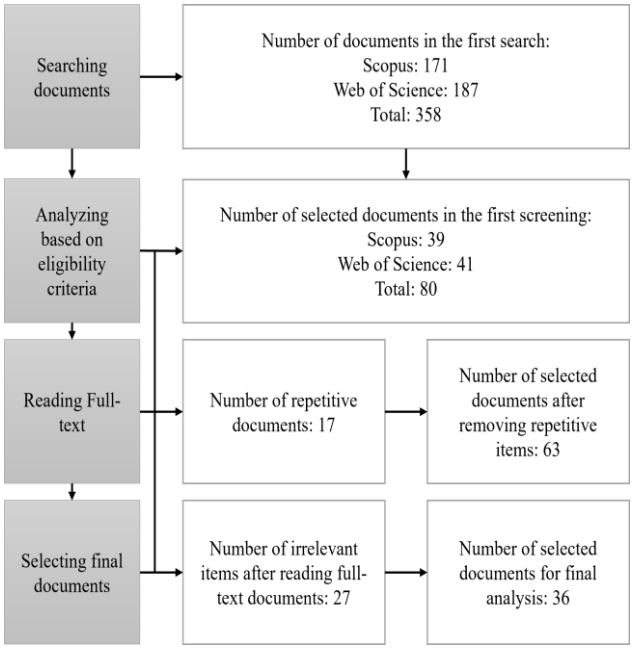

Figure 2. Process of article selection for systematic review

- Step Two (Content Analysis Phase): The qualitative part of the research involved extracting and analyzing various sections of the chosen articles. Content analysis was accomplished in five steps: data gathering, categorizing, coding, analyzing, and interpretation by researchers [23]. After data extraction from a systematic review, selected contents were categorized by researchers and coded with MAXQDA software. Our approach to coding and data analysis was based on descriptive and interpretive techniques. To approve the validation of this research, we collaborated with another researcher, who reviewed 30% of the studies, and his results had 92% similarity to our findings. The goal was to identify the primary factors studied by researchers through an analysis of the

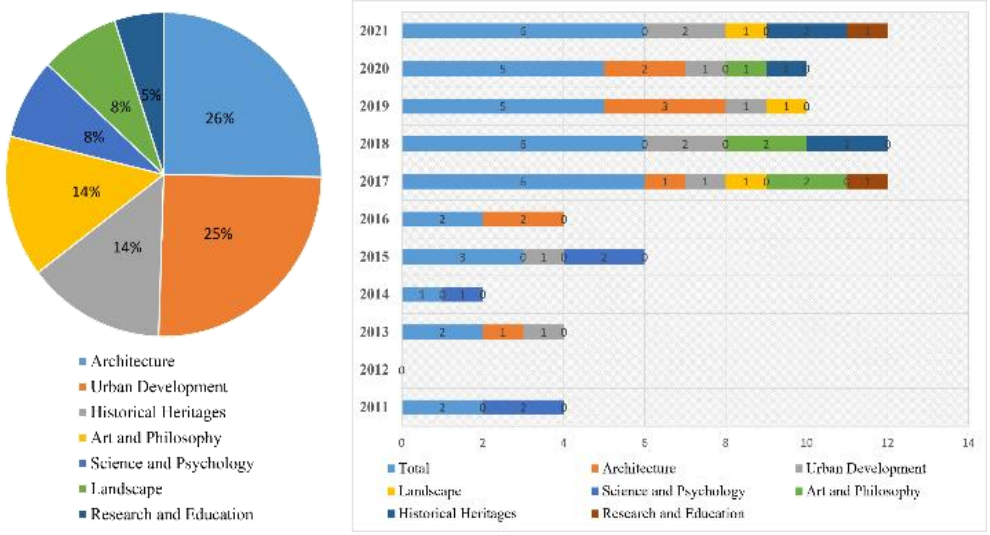

Figure 3. The trend of articles in aesthetic studies in architecture and urban planning between 2010 and 2021

- article content. Ultimately, seven key factors were identified, evaluated, and analyzed.
- Step Three (Review of the Quantity of Scientific Production): The quantitative section involved statistical evaluations based on the information gathered in the first step. These evaluations included examining the frequency of articles in different subject areas, tracking the growth of article publication over the last decade by subject, analyzing the frequency of research methods and tools, identifying repetitive keywords, and creating a co-word network. Statistical charts were created using Excel software and the co-word network was developed using UCINET software. In the fourth step, the goal was to create a qualitative and comprehensive overview of the research landscape in Iranian architecture and urban planning, specifically in aesthetics over a specific period.

6. Results and Discussion

Following data collection, the research proceeded in two key steps. Firstly, the data was statistically analyzed and investigated, reflecting the quantitative nature of this stage. Subsequently, the researchers delved into the underlying layers of the collected quantitative data in a qualitative step. We benefited from analytical-descriptive methods to mix qualitative and quantitative findings. In other words, we compared quantitative results and interpreted them as qualitative facts. This two-sided approach enabled us to achieve a comprehensive insight into our data and results. As a result, the analysis and discussion section are structured into two parts, each with a different nature, as detailed below:

Quantitative data analysis

To frame the subject of the research study, efforts were made to categorize the monitored studies from three perspectives: content, method, and the affiliation involved in producing the content. The following analysis is based on this classification. The thematic analysis of the reviewed resources revealed that the existing knowledge in the field of beauty is interconnected with seven major areas, including "architecture", "urban design & development", "cultural & historical heritage", "philosophy & art", "landscape", "environmental psychology", and "education & research". The highest amount of research (26%) focused on architecture, while the lowest amount (5%) was related to education and research (Figure 3). The trend of publishing articles in the field of beauty has been steadily increasing during the period under study, with over 70% of the articles published since 2017. It is anticipated that more articles on beauty in the field of architecture and urban planning will be published in the future. The analysis of the methods and tools used in the articles reveals three primary research approaches: qualitative, quantitative, and mixed methods. Qualitative research utilized "interpretive-analytical", "content analysis", "comparative analysis", and "Delphi strategies". Quantitative research involved "text and image questionnaires", as well as "eye movement recording strategies". Mixed methods, which were the least utilized, often began with a qualitative approach and concluded with quantitative evaluations, such as "content analysis and questionnaires", "interviews and questionnaires", and "sketches and interviews". Figure 4 illustrates the frequency of each research strategy, with 53% of the research being qualitative, and the remaining half divided between quantitative (36%) and mixed (11%) methods. Scientometrics data from each article, including keywords, journals, and affiliations, was extracted and organized in Excel. Persian equivalents of the keywords were also included in the tables.

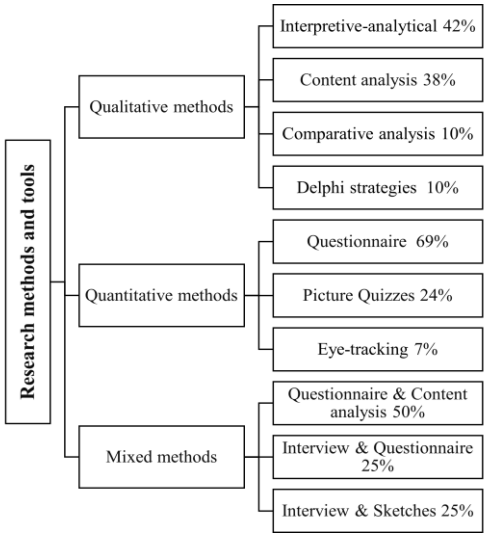

Figure 4. Frequency of research methods and tools in aesthetic studies in architecture and urban planning

Table 2 Frequency of keywords in aesthetic studies in architecture and urban planning

Rank	Frequent keywords	Number of repetitions
1	Aesthetics	23
2	Urban spaces	20
3	Design	14
4	Architecture	11
5	Environment	7
6	Development	7
7	Sustainability	6
8	Visual features	5
9	Art	5
10	Landscape	4

An evaluation of the keywords revealed that "aesthetics" was the most frequently used keyword, while "landscape" had the lowest repetition, and other words fell within the range of 4 to 23 repetitions (Table 2). In order to analyze the relationship between frequent keywords and create a scientific map, the data was inputted into the UCINET software as a symmetric matrix, resulting in the visualization of a co-word network (Figure 5). The size of each keyword in the network corresponds to its frequency, while the thickness of the lines between keywords reflects the strength of their connections in the articles. From the co-word network, it is evident that the connections between "aesthetics" and "architecture" and "urban space" with "design" are particularly strong. Additionally, "aesthetics" has the most references and strong connections to all other words. the scientific institutions' affiliations involved in this field were identified and ranked based on the number of articles they have published (Table 3). The University of Tehran and the Iran University of Science and Technology emerged as the top contributors, accounting for 27% of all research in the field of aesthetics in architecture and urban planning with 6 and 4 articles, respectively. These universities have collaborated with researchers from around the world, particularly from Spain and France. Additionally, they have published articles in collaboration with researchers from a diverse range of countries, including Germany, the USA, Australia, Estonia, Scotland, Slovakia, Italy, Turkey, Switzerland, Canada, Hungary, and Malaysia. Notably, 25% of the evaluated articles and 100% of the highly cited articles were published in collaboration with international researchers.

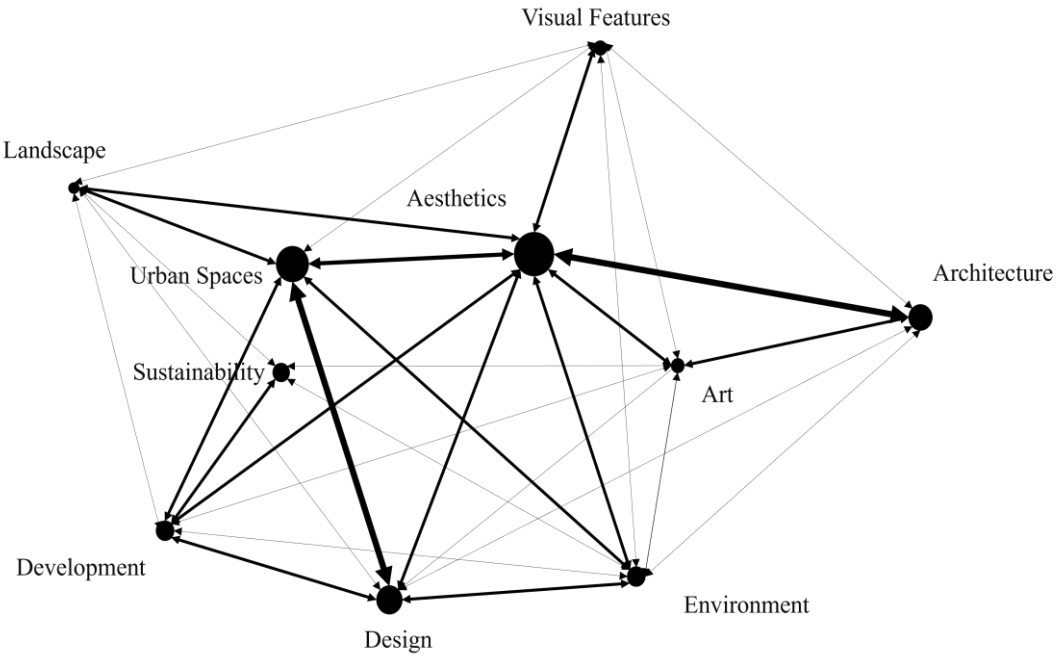

Figure 5. Co-word networks of aesthetic studies in architecture and urban planning

Table 3. Titles of journals with the largest number of articles in aesthetic studies in architecture and urban planning

Rank	Journal Name	Number of Articles	Country of Publication
1	Bagh-e Nazar	7	Iran
2	Advances in Environmental Biology	2	Jordan
3	Cities and Sustainable Societies	2	Netherlands

Table 4. Names of universities with the largest number of articles in aesthetic studies in architecture and urban planning

Rank	University and Institution Names (Affiliations)	Number of Articles
1	University of Tehran	6
2	University of Science and Technology of Iran	4
3	Shahid Beheshti University of Tehran	3
4	Shahid Rajaee Teacher Training University	3
5	Islamic Azad University of Tehran	3

After carefully reviewing the titles of selected articles, we have identified the top three journals in the field of aesthetics in architecture and urban planning (Table 4), considering at least two published articles from each journal. "Bagh-e Nazar" stands out with 7 articles in this field, making it the most prolific journal. This Iranian journal holds a quality grade of "B" from the Ministry of Science, Research and Technology and is owned by the Nazar Research Institute of Art, Architecture and Urban Planning. The articles in "Bagh-e Nazar" are published in Persian and English and are indexed in the Web of Science citation database [14].

Qualitative data analysis

In this part, the findings from the content analysis of the published articles can be categorized into two sections: quantitative and qualitative. Within the qualitative segment, seven components that the articles have explored were identified and assessed through content analysis. Table 5 showcases the most significant areas of research, including "architecture", "urban design and development", "landscape", "environmental psychology", "art and philosophy", "cultural and historical heritage", and "education", based on the purpose, result, method, and research tool. This table illustrates the research purpose, the researcher's accomplishments, as well as the methods and tools utilized in each study. The information in Table 5 is organized by theme and chronology. Following the content analysis and identification of the predominant components surrounding the concept of beauty, a detailed description of each component was attempted based on the data analysis.

Table 5. Evaluation and content analysis of selected articles for systematic review

Approach of the Research	Research Objective	Reference	Result	Research Method and Tools
Architecture	Evaluating the role of symmetry in residential facades on viewers' preference	[25]	Positive impact of "mirror symmetry" on increasing audience preference and the impact of artistic expertise in this regard	Quantitative - eye tracking
	Introducing the areas of delicacy in the Iranian dome	[28]	Defining delicacy as an aesthetic characteristic of the dome and classifying it into five levels: geometry, shape, structure, materials, details	Qualitative - comparative and analytical
	Evaluating the aesthetic preferences of residential facades between architects and non-architects	[26]	Introducing the feature of "pleasantness" as the most important indicator of facade preference by architects, introducing the "classical style" as the most important indicator of facade preference by non-architects	Quantitative - questionnaire
	Evaluating the aesthetics of the Tajolmolk Dome structure in Isfahan	[27]	Discovering the "golden proportions" in the facade, cross-sectional area, and opening of the dome	Qualitative - interpretive
	Extracting the factors affecting the increase in the quality of residential public space	[59]	Identifying the factor of "security" as the main factor affecting the improvement of space quality in comparison with the factors: of health and safety, aesthetics, social-cultural interactions, and national-local identity	Qualitative - Delphi
	Investigating the origin of taste in architecture	[31]	Emphasizing the priority of objective perception of beauty in the formation of taste over subjective perception of beauty	Qualitative - interpretive
	Identifying the factors affecting the design of a music center in Sari City	[30]	Placing the factor of aesthetics among the multiple factors affecting architectural design	Quantitative - questionnaire

Approach of the Research	Research Objective	Reference	Result	Research Method and Tools
Urban Design and Urban Development	Studying the relationship between form beauty and function in bionic architecture	[29]	Introducing a new methodology using the principles shaping form and function inspired by nature	Qualitative - analytical comparative
	Studying the impact of architectural expertise on aesthetic preference	[33]	Similarity of preference in both groups in evaluating the aesthetic features of the facade	Quantitative - questionnaire
	Evaluating the preferableness of three types of urban skylines: natural, traditional, modern	[60]	Aesthetic preference of "natural and traditional urban skyline" over modern by test participants	Quantitative - visual questionnaire
	Evaluating the impact of art indicators on the preferableness of the urban environment	[34]	Identifying the factor of "visual attractiveness" as a criterion affecting the individual's aesthetic perception	Mixed - interview and questionnaire
	Examining the aesthetics of the urban walls of Sanandaj	[38]	Discovering the defects of the urban walls in Sanandaj from a visual aesthetic point of view and providing solutions	Qualitative - visual network evaluation
	Modeling the Iranian garden in shaping green spaces of Shiraz	[41]	Identifying beauty as an effective feature in the Iranian garden, the superiority of the security criterion and sense of place to physical beauty	Quantitative - questionnaire
	Evaluating the livability of the two cities of Tehran and Tartu	[35]	The attractiveness of a city is affected by the factors: proportion and scale of spaces, amount of private green space, street character, public green space, diversity of building form, composition of buildings from different periods, and social and perceived liveliness.	Quantitative - questionnaire
	Extracting the factors affecting the development of a sustainable city	[36]	Identifying three factors: ecological balance, aesthetic balance, and social balance, and the superiority of aesthetic balance over the other two factors in sustainable city development	Mixed - content analysis and questionnaire
	The effect of night lighting in public squares	[40]	Aesthetic preference for night lighting patterns with uniform and bright characteristics over non-uniform and dim	Quantitative - visual questionnaire
	Examining the quality of high-traffic streets in Tehran	[39]	The low degree of aesthetic level in the three studied streets (Keshavarz, Enghelab, Fatemi) and defining solutions	Quantitative - hierarchical analysis, questionnaire

Approach of the Research	Research Objective	Reference	Result	Research Method and Tools
Landscape	Introducing the features of ideal city design based on the definitions of sustainability	[37]	Emphasis on the factor of "diversity of sensory experiences and use of natural elements" in increasing environmental attractiveness	Qualitative - content analysis
	The role of rivers as a natural landscape in the city of Tehran	[49]	Conditions lower than the standard level and lack of attention to rivers and streams as corridors of sight and natural landscape in Tehran	Qualitative - content analysis
	Investigating the role of the aesthetic elements of the Iranian garden based on John Dewey's validation theory	[57]	Identifying the element "water" as the main factor shaping the beauty of the garden in different periods	Qualitative - interpretive
Environmental Psychology	Evaluation of new approaches to landscape aesthetics	[56]	Extraction of three major approaches to landscape aesthetics, including phenomenological, psychological, ecological	Qualitative - content analysis
	Introducing a questionnaire to evaluate the quality indicators of the residential environment	[54]	Definition of environmental aesthetical index among 19 environmental quality indicators and its evaluation between different cultures	Quantitative - survey questionnaire
	Evaluating the effect of the park environment beauty on women's sports activity	[32]	Identifying the greatest impact of light and color on increasing women's sports activity among the aesthetic factors of the environment (light and color, harmony, form and shape, environment and space)	Quantitative - questionnaire
	The effect of the natural landscape of highways on people's preference in Tehran	[55]	The aesthetic superiority of the natural landscape over the man-made landscape from people's point of view, the preference for diverse landscapes over uniform landscape	Quantitative - visual questionnaire
Art and Philosophy	A study of contemporary aesthetics based on Roger Poyot's theory	[61]	Emphasizing the role of "symbolism" as an indicator of contemporary aesthetics in art and architecture	Qualitative - content analysis
	Redefining beauty based on the concept of intertextuality in architecture and painting	[47]	Analyzing case studies of intertextuality in architecture and painting in the postmodern period	Qualitative - descriptive and interpretive

Approach of the Research	Research Objective	Reference	Result	Research Method and Tools
Cultural and Historical Heritage	Definition of modern and post-modern beauty from Jacques Lacan's point of view	[48]	Emphasizing the non-universal definition of beauty based on Lacan's point of view and pointing to the influence of culture in this field	Qualitative - interpretive
	Comparing music and architecture from an aesthetic point of view	[50]	The resemblance of music and architecture in aesthetical criteria such as proportions, symmetry, rhythm, repetition, and atmosphere	Qualitative - interpretive
	The resemblance between calligraphy and architecture	[51]	Identifying the aesthetic similarities of Nastaliq style and architecture: balance and symmetry, golden ratio, skyline, repetition, modular geometry	Qualitative - interpretive
	Identifying effective factors in the revival and preservation of Qajar historical schools	[45]	The influence of environmental beauty in the revival of historical schools with factors such as: "Proportions, the presence of a yard, a favorable view, and a sense of place"	Qualitative (Delphi) - questionnaire
	Introducing the meanings experienced from the historical site of Saadabad Palace	[42]	Identifying the "beauty" as one of the meanings experienced by the visitors in Saadabad Palace	Mixed - photography and interviews
	Identifying indicators of semantic stability of international cultural heritage	[43]	Introducing "beauty" as one of the indicators of visual quality, effective in promoting semantic stability	Qualitative - content analysis and case study
	Identification of aesthetic features in the historical context of Isfahan	[44]	Extracting subjective aesthetic features into four categories, including integration, context, diversity and complexity, and effectiveness	Quantitative-questionnaire
	Introducing a method to evaluate the color variation of the Naqshe Jahan Square historical facades	[46]	The combination of the main colors of the walls harmonic with background colors to create qualities such as diversity and visual richness, legibility, and emphasis on index points and thresholds	Mixed - content analysis and statistical analysis
Education and Research	Typology of research approaches in the field of aesthetics	[20]	Emphasis on "aesthetic experience" as an indicator of contemporary definitions of beauty and paying attention to the role of "perception" in this category	Qualitative-content analysis
	Evaluating the impact of designers' goals in comparative design	[58]	Introducing "aesthetics" as one of the goals involved in architectural design and identifying it as an inhibiting factor in presenting new analogical ideas	Qualitative-interpretive

Architecture: Research in the field of architectural aesthetics has traditionally focused on the physical and formal aspects of buildings. Some studies have examined the aesthetic qualities of residential building facades, considering design style and color [24,25]. while others have focused on the structural and geometric proportions of important domes in Iranian architecture [26,27]. Additionally, research on the form of buildings has been conducted within this form-based approach [28-30]. Some studies have also considered the factor of expertise, which explores how studying art and architecture can influence individuals' aesthetic tastes [31,32,25]. This factor is an important consideration in understanding the relative perception of beauty among different people.

Urban Planning: While there have been detailed studies in the field of architectural aesthetics, research in the field of urban planning aesthetics has typically been more generalized. Many studies seeking to understand the factors that contribute to the desirability of urban spaces have simply identified beauty as a factor without providing concrete examples of what constitutes beauty in the city [33];[34];[35];[36]. However, some studies have delved deeper, identifying specific factors that contribute to the beauty of the city and measuring their impact. These factors include skyline, artistic elements, lighting patterns, and the incorporation of natural elements and green space [37]; Parsamanesh et al. 2021; [38]; [39]. Additionally, a few studies have explored patterns derived from cultural contexts, such as the Iranian garden, to examine the relationship between people's aesthetic preferences and objective criteria[40].

Cultural and Historical Heritage: Research in cultural and historical heritage has highlighted the importance of cultural sustainability. Preserving and enhancing the beauty of historic buildings has been identified as a key factor in maintaining their cultural sustainability [41,42]. Other studies have explored various factors that contribute to the improvement of the beauty of historical buildings, including objective elements such as proportions, the presence of a courtyard, desirable views, and a sense of belonging, as well as subjective elements such as integrity, psychological impact, diversity, and complexity [43,44]. Additionally, there has been a focus on the role of color in historical sites and methods for evaluating and integrating it, which can be applied at both urban and architectural levels [45].

Art and Philosophy: Research in the field of art and philosophy often focuses on comparative and analogical studies based on the author's analyses and interpretations. This can include comparing the philosophical theories of prominent Western thinkers such as Lacan or Poyot with theories related to beauty [46-48]. Other studies explore the relationship between Islamic arts and architecture and urban planning from an aesthetic perspective, including music and calligraphy, with an emphasis on common proportions and geometric structures [49,50]. The final set of studies in this category focuses on the design process in architecture. These studies explore the relationship between aesthetic theories and design, highlighting their influence on architectural outcomes. In essence, aesthetics is understood as the intersection of philosophy and art [51,52].

Environmental Psychology: The concept of perception in the environment is a key focus in environmental psychology research. In a recent study aimed at identifying indicators for assessing the quality of the environment from the perspective of residents, beauty was highlighted as one of the 19 factors mentioned by the residents [53]. Other studies in this field have also delved into measuring people's preferences for environmental experiences, with factors such as light, color, and diversity of environmental structures emerging as significant influencers in increasing people's preference and activity in the environment [41,54].

Landscape: In landscape studies, new approaches to landscape aesthetics have been identified, resulting in the recognition of three major approaches: the phenomenological approach, the psychological approach, and the ecological approach [55]. Other research has delved into the role of natural elements like water at both macro and micro levels and its connection to landscape beauty. Macro-level studies have focused on river valleys as natural landscapes in Tehran, introducing criteria that impact the aesthetic enhancement of these landscapes [48]. Meanwhile, at the micro level, the water element has been highlighted as the most influential factor in shaping the structure of the Iranian garden, significantly impacting the landscape's attractiveness [56].

Education and Research: Research in the field of beauty education is limited, with a small number of articles available. One study sought to categorize research approaches in aesthetics, highlighting the aesthetic experience as a key component of modern beauty definitions and emphasizing the importance of "perception" in this context [19]. Another study identified the extensive focus on aesthetic aspects in architectural design as a hindrance to the development of innovative ideas within the realm of comparative education [57].

7. Conclusion

The comprehensive exploration of "beauty" studies in the scientific works of Iranian researchers in English-language databases has sought to map the trajectory of this significant issue in the realm of research. Through a systematic review of selected research in this field, concepts and information have been derived. Subsequently, statistical analyses have been conducted to quantify and illustrate the results of the research. The following central results of the research have been

identified:

1. Studies in the field of aesthetics have been categorized into seven fundamental areas ("architecture", "urban design & development", "landscape", "environmental psychology", "art & philosophy", "cultural & historical heritage", and "education & research"), reflecting researchers' efforts to approach the subject from various disciplinary perspectives and employing a layered approach to the phenomenon. These findings show that architecture and urban design, unlike other engineering fields, are more relative subjects and correlate with humanistic aspects. Hence, a great part of studies in this field has been accomplished in interdisciplinary subjects. This fact demonstrates all seven areas are related to each other and future studies will be defined in the intersection of them.
2. Architectural research has predominantly focused on the concept of aesthetics from a physical and form-oriented perspective, particularly emphasizing visual aspects such as the building facade. This emphasis may be attributed to the influence of the Beaux-Arts teachings prevalent in the architectural educational space of Iran. Moreover, this finding shows that studies in Iran neglect non-visual aspects of aesthetics in architecture and urban design. Recent international scientific activities in this field have, however, tried to focus on multi-sensory aspects of aesthetics and explore haptic perception effects in the built environment. This lack of literature in Iran can change into an opportunity for researchers and lead to achieving a comprehensive scientific context in aesthetics.
3. Urban perspectives have adopted a more holistic and macro-oriented approach to aesthetics, aiming to interpret aesthetics as a component of urban space desirability. This approach may be influenced by the difference in scale between urban and architectural issues. For instance, how one building can be perceived differently in architectural and urban aspects is a potentially uninvestigated subject in current literature. Hence, this crucial aspect and its differences can be investigated in complementary studies considering the Iranian context.
4. Studies related to cultural and historical heritage have identified beauty as a factor affecting cultural sustainability. Although studies have concentrated on the phenomenological aspects of this subject in Iran, there is a considerable lack of biological studies, which are capable of demonstrating more measurable features about human experience.
5. Research in the realms of art and philosophy has primarily revolved around comparative studies in the theoretical domain, including comparisons of the ideas of contemporary thinkers and Muslim scholars. Nevertheless, we believe that art and philosophy are upstream zones of other subjects in architecture and urban design and should be considered in all studies in these fields because artistic and philosophic approaches always reveal the ideology of a research study and affect the whole of the findings.
6. Environmental psychology perspectives have underscored the perception of the environment and evaluated environmental quality based on residents' viewpoints. Many studies in this field have benefited from questionnaires to find out how people think about built environments. On the other hand, human perception occurs in two conscious and unconscious aspects, but questionnaires have examined the conscious aspect by asking participants, so future studies in Iran should concentrate on the unconscious aspects of human perception and reveal covered facts in this field.
7. Studies in the field of landscape have identified three major narratives in the study of aesthetics: the phenomenological approach, the psychological approach, and the ecological approach. The last one has been investigated lower than others in Iran, while, urban landscapes in Iranian megacities have numerous ecological issues and need to be paid more attention in studies.
8. In education and research, the study of aesthetics has been presented as a limiting factor, with an emphasis on the aesthetic aspects of architectural design being introduced as an obstacle to the emergence of creative ideas from the perspective of comparative education. On the other hand, Semir Zeki has indicated that aesthetics in architecture and urban design is not a luxury but a necessity [12]. Therefore, learning aesthetic meanings, concepts, features, and principles seem crucial in education, which should be indicated in studies in this field.

These findings underscore the increasing emphasis on the study of aesthetics in architecture and urban planning over the past decade, with more than 70% of the articles produced in this field being published in the last 5 years. Moreover, international collaborations have emerged as a crucial factor in the citation growth of articles over time. It is suggested that there are unexplored research areas in quantitative studies, as more than half of the articles are based on qualitative research methods and tools. Lastly, most studies have focused on the formal and physical aspects of buildings through visual sensory perceptions.

Overly formal approaches in architecture can lead to a focus on visual appeal at the expense of other sensory experiences, as Pallasmaa has highlighted [58]. By considering the auditory and tactile senses, architects can gain a deeper understanding of how occupants perceive and interact with a building. Individual experiences of beauty are shaped not only by the five senses but also by

personal knowledge and cultural background. Unfortunately, urban planning studies in Iran have overlooked the cultural and historical aesthetic values unique to the country. To address this gap, we propose solutions for each research area related to aesthetics, as outlined in Table 6, to ensure these values are not only preserved but also interpreted and celebrated in contemporary architecture.

Table 6. Introduction of problems and solutions in different research areas in the field of aesthetics

Research Area	Problems	Solutions
Architecture	Focusing on the formal and physical aspects of beauty and overemphasis on visual perception, neglecting the impact of education and culture on the results of aesthetic studies	Expanding studies based on the five senses, such as auditory and tactile perception, considering the aesthetic knowledge and culture in studies
Urban Design & Development	Holistic approach in aesthetic research without considering objective examples	Expanding aesthetic studies in the dimensions of the city with an emphasis on objective variables
Cultural and Historical Heritage	Disregarding the meaning-oriented perceptual model in the revival of historical places in studies related to beauty	Introducing a semantic framework in the revival of historical buildings and sites to value and preserve meanings
Art and Philosophy	Focusing on subjective aesthetic research, without entering into objective discussions	Conducting interdisciplinary comparative research based on artistic examples
Environmental Psychology	Relying mainly on data collected by asking the audience	Using indirect methods in cognitive assessments to receive people's unconscious responses to the concept of beauty
Landscape	Lack of ecological research in the natural landscape of Iran and reliance on imported models	Conducting interdisciplinary research in landscape with ecologists to achieve a comprehensive understanding of natural landscape design patterns
Education and Research	Lack of a suitable research platform in the field of creativity and its relationship with aesthetics in education	Creating research grants for researchers in the field of architectural education to increase the production of applied scientific knowledge

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