Trends of Architectural Design Discussion: Design Process, Cognitive and Concept

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Received: 31 Jan 2024; **Revised:** 28 July 2024; **Accepted:** 19 Aug 2024; **Published:** 19 Sept 2024

Abstract

The aim of the paper is to review the trends in discussions related to the design process, design cognition, and design concepts. The method employed to identify these trends involved a thematic literature review of top journals in the Scopus database within the field of architecture and design cognition in 2023. After extensive filtering of journals and articles, the paper narrowed down its focus to one journal that met the criteria, namely Design Studies. Articles were limited to those dated from 2018 to 2023, resulting in a review of 34 articles. Three themes were identified in the articles reviewed, namely (i) Data-Informed Design Process; (ii) Sustainable, Inclusivity, and User Reflection; and (iii) Collaborative Ideation.

Keywords: Design process; Design cognitive; Design concept; Design Studies

1. Introduction

Architectural design is a dynamic and multifaceted field that combines artistic imagination and technical proficiency to shape the built environment. At the centre of this procedure is the design conceptual stage, a crucial phase in which ideas take shape, visions are constructed, and the first seedlings of architectural masterpieces are planted. The conceptual design phase lays the groundwork for the entire architectural process, influencing subsequent phases and ultimately dictating the success of the final built product.

Emerging technologies, such as parametric design tools, virtual reality, and computational design, have the potential to enhance creativity and innovation in architectural design. However, their adoption and integration into the design conceptual stage also has a drawback. Research can focus on exploring ways to overcome barriers and maximize the benefits of these technologies for creative exploration. Exploring strategies and techniques to foster and enhance creativity and innovation during the design conceptual stage could involve studying design thinking processes, brainstorming methods, and ideation techniques employed by architects to generate novel and impactful design concepts.

The design conceptual stage functions as a bridge between the client's desires, site-specific considerations, functional requirements, and the architect's creative vision throughout the architectural design process. During this stage, ideas are generated, investigated, and

refined, establishing the overall tone and direction for the entire project. With a comprehensive understanding of design principles, contextual factors, and technical expertise, architects embark on an exploration of discovery where innovation and problem-solving intertwine to produce designs that combine functionality, aesthetics, and sustainability harmoniously.

Within the design conceptual stage, architects employ various tools and techniques to communicate their ideas effectively. Sketches, drawings, models, and digital simulations become the language through which visions are articulated, enabling stakeholders to envision the possibilities that lie ahead. This stage is characterized by a fluid and iterative process, where ideas evolve, adapt, and respond to feedback, pushing the boundaries of architectural exploration.

Moreover, the design conceptual stage necessitates a deep understanding of the project's context, encompassing cultural, social, environmental, and economic factors. Architects carefully analyze site conditions, community needs, and regulatory requirements, aligning them with the aspirations of the client to create designs that are not only aesthetically compelling but also contextually responsive and sustainable.

As architectural design continues to evolve, driven by technological advances and shifting societal demands, it is crucial to examine the complexities of the conceptual design phase. By analyzing its processes and comprehending its significance, architects can improve their capacity to design innovative and significant architectural solutions.

The research problem highlighted and summarized within the 'design process' and cognition in architecture stems from the intricate interplay of creativity, subjectivity, multidimensional considerations, and the iterative nature of design. Addressing these challenges requires architects to develop advanced cognitive strategies, embrace adaptability, and continuously refine their cognitive processes to produce innovative and effective architectural designs. However, new knowledge and findings on this discussion can enhance the understanding and contribute to further research on the topic.

Thus, the purpose of this paper is to review the discussions trends related to the design process, design cognition, and design concepts. The study examines both the linear form, which is more tangible, and the cyclical form, which is intangible, as well as the cognitive domain. Both are essential for comprehending the necessary elements of a creative product that is distinctive and useful for consumers, society, and the environment. The paper was constructed with the question:

"What are the discussion of the design process and design cognition in the conceptual stage of architectural design?"

2. Methodology

The paper employs thematic literature reviews to identify and review top journals in architecture and cognitive, encompassing multidisciplinary backgrounds with an emphasis on cognitive and design. Architecture journals typically focus on the built environment and technologies, while cognitive is aligned with psychology. Despite the abundance of journals in architecture and cognitive, filtering keywords for the discussion topic led to the emergence of only one journal. The process of journal identification is elaborated upon in the Quantitative Results section.

Thematic literature reviews involve systematically analyzing and synthesizing existing literature to identify common themes or patterns across multiple studies (Goddard et al., 2023). These reviews aim to provide a comprehensive overview of a particular topic by examining how different sources address key issues or concepts. The process typically includes defining research questions, searching for relevant articles, extracting data, categorizing findings into themes, and drawing conclusions based on the synthesized information. Thematic literature reviews help in identifying gaps in current knowledge, highlighting trends, and offering insights for future research or practical applications.

3. Quantitative Results

Scopus was used to identify journal sources. During the inspection of the top journals, three field criteria were checked: 'Architecture', 'General Decision Sciences', and 'Experimental and Cognitive Psychology'. Initially, a total of 431 journals were listed, but this number was reduced to 397 when limited to the journal type of source. From the top 50 journals, only 21 were selected based on the suitability of the topic. These selected journals are listed in Table 1.

Table 1: Identifying source of journal

No.	Source title	Cite Score	Highest percentile	2019-22 Citations	2019-22 Documents	% Cited	Articles with search string	2nd filter
1	Trends in Cognitive Sciences	30.4	99.0% 1/152 Experimental and Cognitive Psychology	8537	281	91	0	-
2	Nature Human Behaviour	26.5	99.0% 2/302 Social Psychology	16248	614	81	0	-
3	Decision Making: Applications in Management and Engineering	17.1	96.0% 2/40 General Decision Sciences	1641	96	81	0	-
4	Cognitive Systems Research	13.1	98.0% 3/152 Experimental and Cognitive Psychology	3952	301	88	6	3
5	Behavior Research Methods	11.2	98.0% 7/440 Arts and Humanities (miscellaneous)	7832	699	84	5	5

continued

6	Emotion Review	10.8	98.0% 9/440 Arts and Humanities (miscellaneous)	1121	104	79	0	-
7	Open Mind	9.4	99.0% 10/1078 Linguistics and Language	141	15	87	0	-
8	Design Studies	8.8	99.0% 1/170 Architecture	1228	140	86	496	391
9	Developments in the Built Environment	8.7	99.0% 2/170 Architecture	840	97	73	16	1
10	Journal of Building Engineering	8.3	98.0% 3/170 Architecture	38856	4680	83	464	95
11	Political Psychology	8.3	99.0% 2/762 Philosophy	2304	276	82	0	-
12	Topics in Cognitive Science	8.2	98.0% 13/1078 Linguistics and Language	1666	202	90	1	1
13	Evolution and Human Behavior	7.9	96.0% 15/440 Arts and Humanities (miscellaneous)	1644	209	86	0	-
14	Journal of Experimental Psychology: General	7.5	92.0% 12/152 Experimental and Cognitive Psychology	4016	532	80	0	-
15	International Journal of Construction Management	7.1	97.0% 4/170 Architecture	3252	456	89	15	9
16	Research in Engineering Design - Theory, Applications, and Concurrent Engineering	7	96.0% 6/170 Architecture	658	94	80	22	21
17	Social Cognitive and Affective Neuroscience	6.8	90.0% 15/152 Experimental and Cognitive Psychology	2980	437	88	0	-
18	Cognitive Psychology	6.5	97.0% 26/1078 Linguistics and Language	712	110	81	2	?

continued

19	Cognition	6.3	97.0% 22/1001 Language and Linguistics	7192	1143	82	0	-
20	Construction Innovation	6	94.0% 10/170 Architecture	1002	167	85	90	19
21	Journal of Applied Research in Memory and Cognition	5.8	83.0% 25/152 Experimental and Cognitive Psychology	1003	173	72	0	-

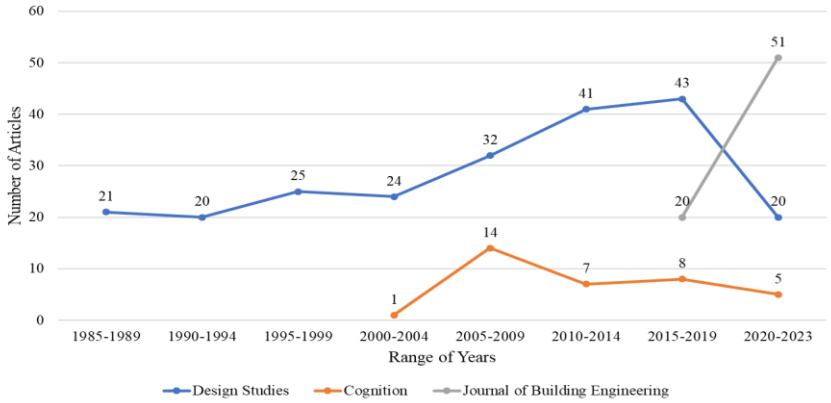
Source: Compiled by author from Scopus.

The 'Trends in Cognitive Sciences' journal is the first journal source attempted. In 2022, the journal ranked first in three fields: Psychology (Experimental and Cognitive Psychology), Neuroscience (Cognitive Neuroscience), and Psychology (Neuropsychology and Physiological Psychology). However, out of 2,997 articles in the journal, keywords such as 'design concept', 'design process', 'conceptual stage', or even 'architectural design' yielded zero results. The search string used was:

SRCTITLE ("Trends in Cognitive Sciences") AND TITLE-ABS-KEY ("design concept" OR "concept* stage" OR "design process*" OR "architectur* design")*

The same process was used for all 21 journals by applying the search string [SOURCE OF JOURNAL] AND TITLE-ABS-KEY ("design concept*" OR "concept* stage" OR "design process*" OR "architectur* design"). The search identified 10 journals that yielded results related to the search string. All 10 journals were then selected for a second round of filtering to provide more detailed information pertaining to the topic of the paper. These 10 journals were searched using the string [SOURCE OF JOURNAL] AND TITLE-ABS-KEY ("design concept*" OR "concept* stage" OR "design process*"), with the keyword "architectur* design" omitted. The keyword "architecture design" was omitted in the second filtering stage as it is a basic term in architecture journals. It was initially used in the first filtering to identify potential articles in general psychology (non-architectural) journals. Three journals with the highest number of papers related to the topic were selected for further investigation in this paper. Limiting the selection to only three top journals allowed for focused analysis and understanding of the direction of the concepts summarized. The finalized and selected journals, along with the respective number of related articles, are Design Studies (391), Cognition (121), and Journal of Building Engineering (95). Figure 1 demonstrates the number of articles from the three journals, along with the additional keyword 'concept' in the search string, spanning from 1990 to 2023.

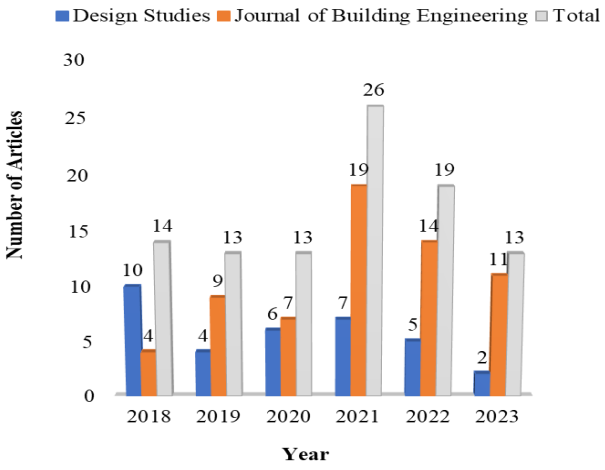
Journal of Contemporary Issues and Thought
ISSN 2232-0032/ e-ISSN 0128-0481/ Vol 14, Issue 2, 2024 (50-60)
Doi: https://doi.org/10.37134/jcit.vol14.2.6.2024



Sources: Data from Scopus, compiled and illustrated by author.

Figure 1: Number of articles based on range of years (1990 to 2023) from selected journals (Design Studies, Cognition and Journal of Building Engineering)

The articles in the Design Studies journal were too numerous to export and study. The search string was refined specifically for this journal due to its primary focus on design process and cognition. An additional keyword with its Boolean ("AND "architecture*") was added to focus on the architectural process rather than the general design process or other fields. This refinement resulted in reduced numbers respectively to Design Studies (226), Cognition (35), and Journal of Building Engineering (71). However, it was later discovered that the source title 'Cognition' did not refer to a single journal but to several journals containing the keyword 'cognition'. These included Cognition and Instruction, Cognition, Technology and Work, Design Computing and Cognition, and various proceeding titles. Consequently, the search string for the 'cognition' source title was rewritten with its actual journal ID, resulting in zero results related to design process and architecture. Thus, the Cognition journal was omitted from the selection. The paper focuses on articles from the past five years discussing the process of the conceptual design stage, studying papers dated from 2018 to 2023. The total number of articles for both the Journal of Design Studies and the Journal of Building Engineering are shown in Figure 2.



Sources: Data from Scopus, compiled and illustrated by author.

Figure 2: Number of articles with "Design Concept*" OR "Concept* Stage" OR "Design Process*" AND "Process*" AND "Architectur*"in the current 5 years of two top journals

However, upon closer examination of the articles, it was found that the articles from the Journal of Building Engineering did not focus on the cognition area. Therefore, the journal was also omitted. The paper ultimately focuses on studying the design process and concept in the Design Studies journal over the past five years. It was identified that between 2018 and 2023, there were 34 papers resulting from the search string. These 34 papers were reviewed based on their abstracts, and analysed to 3 main themes.

4. Qualitative Results

There were 3 themes identified in the articles reviewed. The themes identified are (i) Data-Informed Design Process; (ii) Sustainable, Inclusivity and User Reflection; and (iii) Collaborative Ideation.

Data-Informed Design Process

Understanding the intricate processes that motivate creative endeavors is a subject of extensive research in the field of design. Architects and designers engage in a dynamic interplay of multiple cognitive aspects that collectively influence their approach to formulating and refining concepts. This complex landscape includes elements such as generative thinking, analytical reasoning, ideation, and the use of sophisticated tools such as parametric modeling.

With a foundation in these cognitive dimensions, designers are able to navigate a world of possibilities and construct aesthetic and functional solutions. The interaction between tentativeness, generative thinking, and analytical thinking is a crucial aspect of design cognition (Chandrasegaran et al., 2023). The creative process is frequently tentative, with designers traversing diverse thought pathways to generate original concepts. Divergent thinking and ideation also play crucial roles, providing designers with a spectrum of individualized design processes (Lee and Ostwald, 2022). Framing, rationale, goal, procedure, and mindset are frequently used to classify the complexities of design processes (Daalhuizen and Cash, 2021). Similar to a creative symphony, this systematic approach assists designers in orchestrating their ideas coherently. In the modern environment, the impact of technology on design processes cannot be ignored. Innovative paradigms are provided by parametric modeling tools (Stals et al., 2021). These instruments enable the creation of intricate designs that reflect the complexity of the actual world. In addition, the concept generation process is a confluence of divergent and convergent thinking, both of which navigate the terrain of creativity simultaneously (Milovanovic et al., 2021). This dynamic interaction culminates in the conception of ideas, which are then evaluated against a background of eight distinct archetypes (Gonçalves and Cash, 2021).

Visual representations are an additional pillar of design cognition. From sketching to analytic diagrams, designers employ a spectrum of visualizations to guide their cognitive and collaborative actions, resulting in well-informed decisions (Bresciani, 2019). When combined with drawings, design thinking serves as a catalyst for innovative solutions grounded in user-centric perspectives (Lloyd, 2019).

As tools for investigating problem-solution dynamics, precedents introduce a semi-objective element of interpretation through discourse and narrative (Umney and Lloyd,

2018). They stimulate conversations, allowing for reframing and disclosing deeper levels of design comprehension.

In the complex realm of design cognition, the combination of generative thinking, ideation, analytical reasoning, and technological instruments results in a symphony of originality. Architects and designers navigate this terrain with the intention of producing resonant and impactful designs. The interaction of these cognitive dimensions, assisted by tools and methods, generates a rich tapestry of solutions that shape the built environment and affect human experiences. As the world of design continues to evolve, the investigation of these cognitive aspects promises to open up new creative and innovative spheres.

Sustainable, Inclusivity & User Reflection

The dynamic field of design encompasses considerably more than the construction of aesthetically appealing structures. It is intricately interwoven with considerations that go beyond form and function. In this endeavour, designers engage with multiple dimensions, including sustainable futures and embracing the complexities of human diversity. They envision, design, and form with a purpose that transcends the present, taking into consideration the inherent complexities of design and its far-reaching effects.

Design, at its core, reflects the values and aspirations of society. Engaging in the politics of sustainable futures is not a choice, but a requirement (Palmieri et al., 2021). It involves an awareness of the ecological impact, social equity, and long-term effects of design decisions. Frequently, controversies elicit a critique that reveals the underlying issues and challenges prevalent norms (Luck, 2018a). This process places an emphasis on recognising and respecting human differences (Bianchin and Heylighen, 2018). When inclusiveness is woven into design, it becomes a tool for embracing diversity and ensuring that solutions meet the requirements of all.

Imagining the future is an integral component of design. It explores the essence of user experiences, going beyond mere aesthetics. Designers structure their creative processes to envisage future situations that resonate with the aspirations of stakeholders (Kempenaar and van den Brink, 2018).

This intricate orchestration is motivated by a profound comprehension of user dynamics. Designers understand that the user is not a static entity, but rather a construct that evolves through the deconstruction and reconstruction of user information (Oygür, 2018). This manipulation of knowledge enables designers to align their creations with the precise requirements and desires of users.

Creativity, purpose, and responsibility are intricately interwoven in the world of design. From the politics of sustainability to the celebration of human diversity, designers find themselves at the nexus of societal goals and innovative opportunities. Controversies serve as stepping stones for criticism, allowing designers to refine their approaches and produce meaningful solutions. Through these processes, the envisioned future takes form, propelled by the participation of stakeholders and an empathic comprehension of the fluid nature of users. The ever-evolving and self-reflective world of design is about more than just structures; it is about fostering a better destiny through thoughtful and inclusive creation.

Collaborative Ideation

Design is a realm of limitless imagination and intricate processes that influence our world. From spatial concepts to collaborative dynamics, every component is essential to the creative process. This journey requires not only the materialisation of ideas, but also the coordination of minds, perspectives, and values. This article explores the various dimensions of design, from creativity to collaboration, and how they converge to give birth to innovation.

Spatial reasoning is the cornerstone of design, where ideas take form on the imagination's canvas (Nisha, 2022). This cognitive ballet enables designers to transcend physical limitations and generate visionary ideas. Reflection-on-action functions as a guidepost, allowing designers to learn from past decisions and iteratively improve (Tessier, 2022). Listening is more than a physical act in the realm of design; it is a means of knowing (Monache et al., 2022). It is about comprehending the unsaid, the nuances, and the emotions that motivate design decisions.

The essence of design is communication - the capacity to effectively convey decisions and solutions (Krishnakumar et al., 2022). Collaboratively researching and co-creating designs results in a collaborative symphony in which diverse minds contribute to the reconfiguration of habitation patterns (Palmieri et al., 2021).

Design is resilient in the face of ambiguity, describing obstacles and responding effectively across disciplines (Dyer et al., 2021). Communication design, the discipline of visually and contextually conveying meaning, is essential for bridging the gap between ideas and comprehension (Laing and Apperley, 2020).

The beauty of design emerges through collaboration between professions, where visual elements are mobilised to create shared visions (Comi et al., 2019; Hanrahan et al., 2019). When values are framed and discussions are structured to facilitate diverse perspectives, the discourse is enriched (Lloyd and Oak, 2018). Design transcends the physical by entering the domain of service, where strategies foster community collaboration (Baek et al., 2018).

Inviting participation in the design of future environments is an art that stimulates learning and improvisation by engaging people at various dimensions (Luck, 2018b). Analogical design adds depth to this voyage by providing new perspectives via the construction of useful analogies (Töre Yargın et al., 2018). However, design is not only about the end result; it is also about the voyage. Participants interpret their experiences, sparking situated learning and positive outcomes (Lundmark, 2018).

The world of design is a web intricately woven by imagination, collaboration, and communication. It is a realm in which reflection brings spatial concepts to life, and where listening is the key to comprehension. Design is resilient in the face of unpredictability, shattering barriers and encouraging effective responses. Coordination, feedback, and involvement allow for the expression of values and ideas. As designers create, they not only influence environments, but also experiences, emotions, and a better future.

5. Conclusion and Recommendations

The interplay of generative thinking, ideation, analytical reasoning, and technology creates a symphony of originality in the complex landscape of design cognition. This domain is traversed by architects and designers to create influential designs. This interaction, aided by

techniques and instruments, weaves a variety of solutions that influence our environment and human interactions.

Exploring these cognitive dimensions promises to unleash new creative realms as the design industry evolves. Creativity, purpose, and responsibility converge in design, where designers reconcile societal goals with innovation, from sustainability to diversity. Controversies serve as catalysts, refining strategies for effective solutions. This dynamic propels an envisioned future by engaging stakeholders and empathising with users. The self-reflective nature of design transcends structures and fosters a brighter future. The world of design is a complex tapestry of imagination, collaboration, and communication. Here, reflection animates spatial concepts, while listening enables comprehension. Design that is resistant to ambiguity eliminates barriers to effective responses. Coordination, feedback, and participation facilitate the communication of values and ideas. In shaping environments, designers shape feelings, experiences, and a more promising future.

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