Review Article GU J Sci, Part B, 13(2): 193-199 (2025)

Gazi University

Journal of Science

PART B: ART, HUMANITIES, DESIGN AND PLANNING

http://dergipark.gov.tr/gujsb

A Multi-Layered Examination of the Conceptual Role of Knowledge in Architectural Design

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Article Info

Received: 17/05/2025
Accepted: 10/06/2025

Keywords

Design process, Conceptualization, Knowledge

Abstract

The architectural design process embodies many uncertainties from the very first stage. Therefore, various studies have been conducted in different contexts. Within the scope of this study, it is aimed to examine the role of knowledge in the architectural design process in the context of conceptualization. In this context, the role of conceptualization in the architectural design process is mentioned in the context of knowledge. The act of design starts with the acquisition of knowledge. This knowledge is internalized when the acquired knowledge is interpreted and shaped according to the design problem. The information that is interpreted and used affects both the schemes produced in the first stage of design and the final product produced in line with the schemes. The acquired information is processed by making choices and associated with each other. After this process, which is called the information processing stage, new information is obtained by transforming the information. Concepts are produced by associating the information acquired in the design process and pre-existing information. Concepts are important in terms of expressing thoughts and diversifying ideas. Conceptualization continues from the first stage of design until the final product is produced. As a result, architectural design, conceptual process and information constitute three layers that are integrated with each other at every stage. This multi-layered system consists of a dynamic and interactive structure. In this study, the ways in which information is handled in the architectural design process and its role in the conceptual process are discussed in order to address the place and importance of the subject in design education.

1. INTRODUCTION

The architectural design process is a multi-layered phenomenon and this process can be difficult for designers to make sense of. In this study, it is aimed to make an examination in which the role of knowledge is examined in this complex process. In this process, which is discussed in the context of conceptualization, studies defending the view that design is not only intuitive but also a learnable action and can be explained through reason and science have been used.

Christian de Portzamparc (2010) [1], while explaining the process by which words become concepts, asks 'Can one think without language? The limits of language are directly proportional to the limits of the world of meaning. Therefore, the more words designers are guided to design thinking, the wider their imagination becomes. Conceptualization contributes to the architectural design process from a cognitive and pedagogical perspective, supporting a deep understanding of the process and the permanence of learning.

Since the early 20th century, knowledge has become an important research topic in different disciplines. Knowledge, types of knowledge, modes of transmission of knowledge, differences between types of knowledge have been focused on. In the field of architecture, the focus has been on design knowledge, types of design knowledge, and modes of transmission. Oxman (2004) stated that one of the most important forms of design knowledge is conceptual knowledge [2]. Conceptual knowledge is the basic material of design thinking and is very important for the development of design education.

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Architectural design, conceptual process and information constitute three layers that are integrated with each other at every stage. This multi-layered system consists of a dynamic and interactive structure. In this study, which was conducted to address the place and importance of the subject in design education, the ways in which information is handled in the architectural design process were examined and its role in the conceptual process was discussed.

2. COMPONENTS OF DESIGN KNOWLEDGE

Knowledge is in the totality of one's cognition system: Knowledge can exist with cognition systems. Objects, facts and events in the environment are perceived, interpreted using cognitive resources in memory, analyzed and synthesized, structured, and problems are solved with this knowledge when needed [3]. The knowledge process is generally defined as the relationship between a knowing subject and a known object, and different conceptions of knowledge theory have emerged throughout history. The conceptions that emphasize the object are called realistic (realism, materialism, naturalism), while the conceptions that emphasize the subject are called idealistic (idealism, rationalism, subjectivism) [4].

When we look at knowledge in the context of memory process, it is seen that they are used interchangeably. With reference to Ülgen (2004), 'declarative and procedural memory' [5] was used to explain declarative and procedural knowledge, and 'episodic and semantic memory' was used to explain episodic and semantic knowledge [6]. Neves and Anderson (1981), on the other hand, used the word knowledge, not memory, when analyzing knowledge based on the memory process. Under the name of 'Theory of Knowledge Compilation', he mentions three types of knowledge [7], [8]. One of these is encoded knowledge in a network of meaning, the second is procedural, and the third is compositional (integrating knowledge). In terms of process, these three types of knowledge are gradually realized in memory and complement each other. These three stages should be considered as a whole for the acquisition of knowledge. Similarly, Marx (1969) categorized knowledge as recall and recognition, reconstruction and reproduction [3]. Table 1 summarizes how different types of knowledge are addressed in different scientific disciplines.

Table 1. *Types of Information (Çam,2025 adapted from a doctoral thesis), [9]*

Source	**Types of Information**		
Marx (1969)	recall and recognation	reconstraction	reproduction
Kant (1994)	information obtained through the senses	information provided by the available data	
Klatzky (1980)	declarative	procedural memory	
Tulving (1983)	episodic	semantic	
Glover (1990)	encoded information	transactional information	composition (integrating knowledge)
Brew and Boud (1995)	personally identifiable information	person-dependent information	
Uluoğlu (2000)	reflective knowledge	Used in understanding facts	
	operative knowledge	Focuses on how things are	
	contemplative knowledge	Encourages deep thinking	

	directive knowledge	Leads to the next step
	associative knowledge	Helps to concretise thoughts through association
Akın, 1986 (transmitting Canbay Türkyılmaz, 2010)	descriptive information	processor information

Schön (1985) states that participants who experience the architectural design studio develop a design language in which they use descriptive and procedural knowledge together [10]. Describing the current state of the design and revealing the design decisions it contains refers to descriptive knowledge. Defining the transition from one design decision to another and the method followed in this process refers to procedural knowledge. Due to its transferable characteristic, procedural knowledge gives the student the ability to generalize and abstract in design. Schön (1985) states that individuals who have acquired good procedural knowledge of the design process can easily adapt this knowledge to other open-ended problem solutions [10].

Dorst and Dijkhuis (1995) discussed two paradigms for design methodology in their study, representing two different ways of looking at the world: positivism and structuralism [11]. The rational problem-solving paradigm and action-reflection paradigms are summarized in Figure 1.

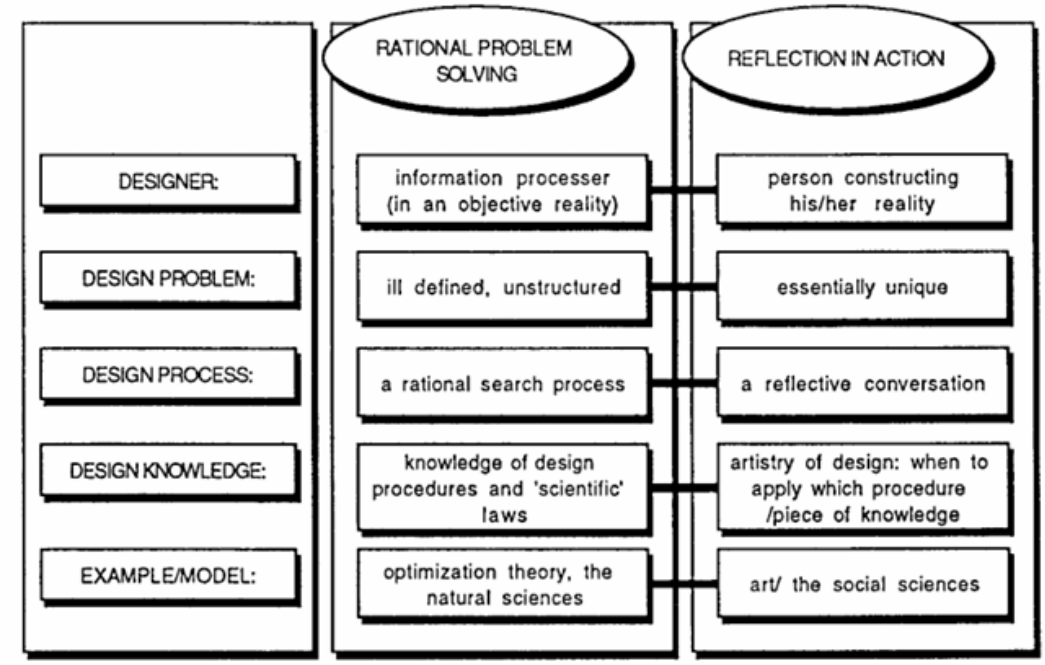

Figure 1. *The rational problem solving paradigm and the reflection-in-action paradigms summarized [11]*

Based on the definitions of knowledge, it is indisputably accepted that there is an inseparable link between knowledge and the design process due to the nature of architecture. Designers use different knowledge and information sets at every step of their design process. This knowledge consists of designers' past experiences, preferences and perceptions, as well as the experiences validated throughout the process and the sharing of related disciplinary practices, depending on the view that knowledge is gained through experience. In a classification made accordingly, the subjective sources of design knowledge are personal judgments, wishes and emotions. The objective sources of knowledge, on the other hand, consist of experimental facts, valid rules, classifications obtained through scientific methods that increase the estimation power of the person, as well as the facts produced by the designer's own

cognitive filter. The design process starts with the revision of the existing information contained in the objects, objectives and methods that form links with each other in the design process and the new information acquired with these subjective and objective sources of information and eventually turns into a product. For this reason, design knowledge is defined as a 'dynamic phenomenon' that enables the change of layers that develop throughout the design process [12].

3. THE FUNCTION OF KNOWLEDGE IN THE CONCEPTUAL PROCESS

In the memory of individuals, there is a network of meanings as a structural form. The individual develops new words in this form by interacting with stimuli from the environment. It creates a schema form on any subject. The individual develops new meanings to this form in the interaction process and perceives the field as a whole. There is a concept form and the individual classifies his/her knowledge with this form [13].

Gagne (1984) mentioned three different ways of generating, schematizing and conceptualizing knowledge [14]. The first of these is the placement of previously learned information on the relevant information (acquisition - accreations). The second is making sense of the new in the light of what has been learned before (Tuning). The third is the reconstruction of knowledge (reconstruction). With conceptualization, new information is encoded, formatted and stored in long-term memory, helping to retrieve this information after time has passed.

Due to the nature of architecture, knowledge and the design process are inextricably linked. Knowledge and knowledge sets are used in every step of the design process. While analyzing this process in which theoretical and practical design knowledge is acquired and this knowledge is transformed into a design model with creative interpretations, knowledge can be handled under the main headings of knowledge acquisition, knowledge processing and knowledge transformation. In this way, information sets consisting of the information selected as input from the infinite information space are produced and the ways of association and organization of these information sets are determined [9]. As shown in Figure 2, information clusters produced within the infinite information space are organized, linked, and transformed to obtain different information sets.

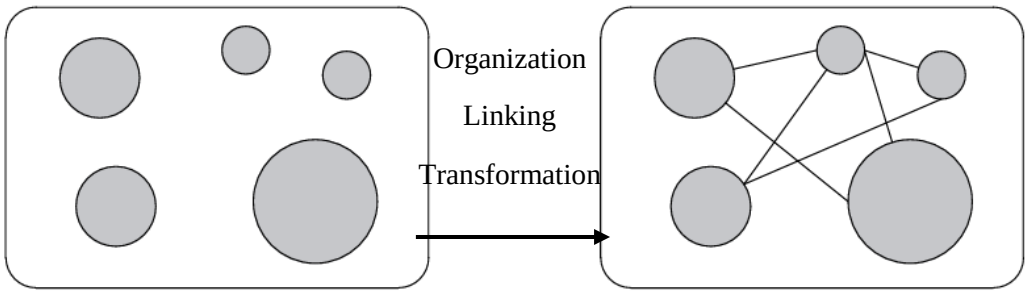

Figure 2. *Knowledge Sets and the Ways Knowledge Sets are Related*

Paker (2001) has considered knowledge, which is one of the inseparable basic components of the act of designing, in the dimensions of 'designer's cognitive interpretation/mental process and 'representation and expression of interpretation' [15]. The design process is the act of establishing interactive connections between these three dimensions, depending on the designer's cognitive style. There are two critical points in the context of knowledge in the architectural design process. The first one is the stage where designers decide which information or information sets from the infinite general information space they will accept as design information and take them as inputs to the design. The second stage is the stage where the selected information is processed and associated with each other in the process. The ways in which information and information sets are related within the infinite information space are shown in Figure 3.

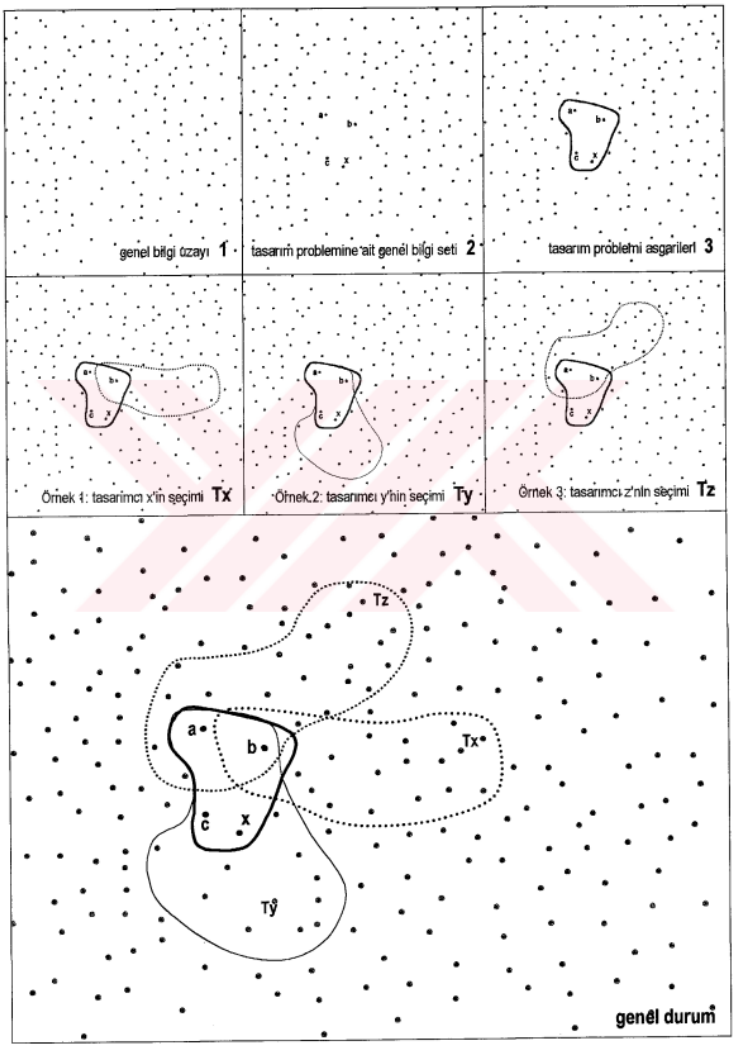

Figure 3. *Knowledge Sets and the Ways Knowledge Sets are Related [15]*

In his research, Gardner evaluates the child's mental development by dividing it into qualitatively different stages while reaching the logical and conceptual maturity stage [16]. As a result of the evaluation of the child's cognitive expressions and graphics in the first stage of mental development, he examined the metaphorical language used between the visual reality and the perspectival expressions used in the drawings and stated that the same rules applied by drawing are applied in the management of mental operations and tried to obtain data on the development of logical thinking. According to Golomb (1993), who conducted a similar research, one of the data obtained is that the graphic expressions made by the child can be considered as a printout of his/her mental image and conceptual structure [17]. At this point, a similarity can be drawn between this method, which deals with the study of the child's mental development, and the development process of a student's ability to describe the thought process at the beginning of architectural design education. In the first stage of his/her education, the student transfers his/her thoughts into graphic expressions with the symbols already present in his/her memory, while with the knowledge and experience he/she gains during his/her education, he/she can reach the ability to use more advanced and complex symbols.

4. MULTILAYERED KNOWLEDGE-CONCEPT-DESIGN

This knowledge is internalized by interpreting and shaping the acquired knowledge according to the design problem. The information interpreted and used affects both the schemes produced in the first stage of design and the final product produced in line with the schemes. The acquired information is processed

by making choices and associated with each other. After this process, which is called the information processing stage, new information is obtained by transforming the information [9].

In the design process, concepts are produced by associating the acquired knowledge and pre-existing knowledge. Concepts are important in terms of expressing thoughts and diversifying ideas. The more concepts and information sets are produced, the diversity of the design, the readability of the process and the integrity of the transformation of abstract ideas into concrete products are enriched in direct proportion. Conceptualization continues from the first stage of design until the final product is produced.

The forms of association of information sets produced with concepts are organized and transformed into design products. In order to transform the objectives in the form of abstract and conceptual definitions into a design, it is necessary to apply a design language that transforms abstract concepts into architectural concepts [18]. Starting from the first stage of the design process, designers produce their knowledge based on different approaches according to their own problem definitions. Thus, a design space consisting of different information sets is formed. Each designer creates his/her own design space.

As a result, the architectural design process is a dynamic phenomenon formed by the interrelation of knowledge, conceptualization and design process. In the first layer, the knowledge layer, information is acquired, problems are defined, and the foundations of the design process are formed. In the conceptualization layer, concepts are developed and knowledge sets are produced as a result of the information acquired. With the transfer to design layer, formal decisions are taken by determining the forms of association of these information clusters. Ideas are concretized. These three layers are in a cyclical relationship that allows for feedback.

5. CONCLUSION

It should include the conclusion of the article. Due to the nature of architecture, there is an inseparable link between knowledge and the design process. Designers use different information and information sets at every step of their design process. The diversity and organization of this information is directly related to the way the designer conceptualizes the abstract ideas produced throughout the process. The fact that the design process proceeds in an integrated manner with conceptualization enables meaningful learning to take place by linking the existing knowledge of designers with the knowledge sets they produce. In addition, it also supports designers to adapt to different problems and gain multiple perspectives.

In the knowledge-based conceptual process understanding in architectural design, information clusters are created with the information selected as input from the infinite information space, and the ways of relating and organizing these clusters are determined. In this way, unique results shaped by the experiences of each designer can be obtained. This approach contributes to formulating problems and generating alternative solutions to different design problems.

As a result, information has been handled in various contexts in different disciplines. In this study, the way it is handled in the architectural design process is examined and its role in the conceptual process is discussed. The information obtained in the design process and the way of conceptualizing and expressing the information sets produced contribute to the concretization of abstract ideas in the minds of students in architectural design education. This design approach is thought to contribute to the process of developing new thinking strategies by integrating it into different design problems in different design disciplines.

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