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## RESEARCH ARTICLE

# Concept evolution in architectural design: an octonary framework

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**KEYWORDS**

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concept generation;  
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idea concretization;  
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tion;  
concept consolida-  
tion;  
design management

**Abstract**

A framework that integrates the fragmented elements of concept derivation, processing, and translation is developed and discussed. This framework aims to consolidate the divergent components of design conception into a comprehensive system that facilitates design conceptualization, initiation, and integration of various concept evolution phases, components, layers, and aspects. Accordingly, the framework describes a comprehensive approach based on a series of alternating divergence/convergence cycles. Subsequently, the approach encompasses a concept evolution process, derivation methods, aggregation/segregation technique, translation channels, and development layers. Each of the major divergent phases of the framework consists of eight parts. Furthermore, the skills and tasks associated with framework implementation are mapped into the main processing phases. The scope of this study is architectural design in higher education and practice. To demonstrate its applicability, the framework is implemented and illustrated by a case study. Reflections about its implementation and limitations are reported and discussed.

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## 1. Related works

A careful review of the existing literature in concept processing reveals multiple domains of research (Fig. 1). These domains include various definitions of concept, associations between concept and design, relations

between concept generation and creativity, and concept processing issues. The first three domains tend to address the “what” questions, whereas concept processing is concerned with the “how” aspects of conceptualization. It entails areas, such as concept generation processes, methods of generation, derivation techniques, and concept selection, evaluation, translation, and development.

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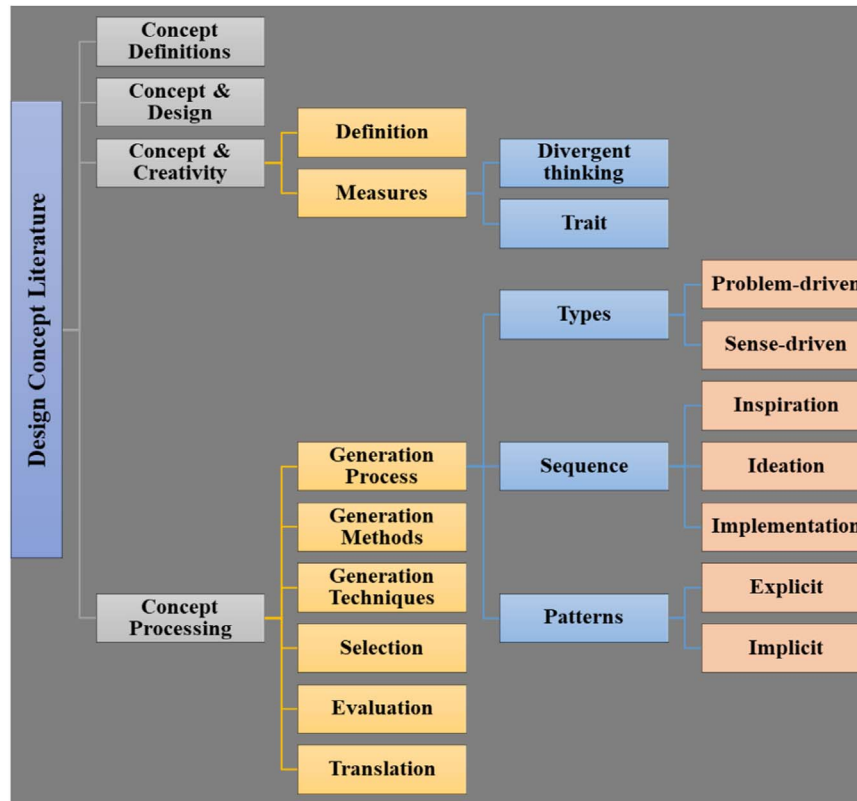


Figure 1 Main topics of concept issues in the design-related literature.

### 1.1. Concept definitions

Numerous definitions of “concept” can be found in the design-related literature. They cover a wide range of meanings, such as idea, notion, scheme, plan, system, figure, symbol, prototype, paradigm, abstract object, mental representation, description, solution, proposal, and parti. Among these definitions, concept is defined as “the figure of an object, along with other representations, such as attributes or functions of the object, which existed, is existing, or might exist in the human mind, as well as in the real world” (Taura and Nagai, 2013, 13). Concept also refers to the mental representation that the brain uses to denote a class of symbols that are inferred from the physical material (Carey, 2009; Murphy, 2002). In this study, concept is defined as “the mental map or the inner blueprint that assigns meanings, links components, enhances creativity, and guides the design process to produce a design product.”

### 1.2. Concept and design

Concept is often associated with design, which also has a wide spectrum of definitions. One of concepts views design activity as “a process, executed by an agent, for the purpose of generating a specification of an object based on: the environment in which the object will exist, the goals ascribed to the object, the desired structural and behavioral properties of the object (requirements), a given set of component types (primitives), and constraints that limit the acceptable solutions” (Ralph and Wand, 2009, 125). In this definition, the agent uses concepts as vehicles for

connecting the design primitives to their environment to generate a specification that accomplishes the ascribed goals. As such, concept represents a bridge between the process and solution. The linkage between design and concept is also addressed by Smith and Smith (2014), where they associated design activity with concept formulation by their interpretation of the various aspects of design process and idea generation in design. According to this interpretation, they described design as a nonlinear process that moves forward and backward between the various forms of knowledge and experiences to imagine a future product. Within this viewpoint, concept can be considered as an embodiment of knowledge that helps imagine a future product.

### 1.3. Concept and creativity

Concept is often associated with creativity. For example, Taura and Nagai (2013, 17) described design creativity as the degree to which an ideal is conceptualized. In this context, they discussed two types of creativity. The first is related to the process of designing, whereas the second is related to the products that represent the outcomes of the first (Taura and Nagai, 2013, 11). Similarly, in terms of linking the process and the product, Sternberg and Lubart (1999) described creativity as the *ability* to produce work with *novelty* and *appropriateness*. In this description, “ability” can be associated with the process, whereas “novelty” is further related to the product. Sternberg and Lubart (1999, 15) bridged both sides and defined concept generation as a process of composing a desirable concept

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