

quired have been collected through the survey and review of written and electronic documents. Theories of scholars and researchers such as Donald Schön, Bryan Lawson and Paul Laseau in this field have been analyzed in order to identify the characteristics of visual thinking via reviewing the literature related to two topics of design thinking and visual thinking. Finally, the four indicators - dialogism, exploration, management of multiple ideas and reflection process— have been identified as influential factors in the process of visual thinking.

Dialogism enables the designer towards interlocution and interaction with himself on one hand and negotiation with the design team on the other. Exploration paves the way for the unexpected discovery of new solutions. Management of multiple ideas prepares the conditions for the discovery of all ideas and the discovery of hidden relationships between them until they reach the creative and appropriate ideas. The reflection process plays a role in the development of the design process and conducts it in the right direction both during design layout and re-reading during the entire path of the thinking cycle.

Having identified visual thinking features and following problem recognition through stages zero to five of the thinking process of design, the research reveals the function and key role of visual thinking.

Visual thinking, as it has now become a crucial part of the conceptualization phase and has led to the discovery of various, creative solutions, is similar to the whole process of design thinking from the beginning to the end. Organizing and categorizing problem data and visualizing all stages of the project and their internal details has an important function which results in the development of guiding maps for the designer, the design team, and also facilitates the achievement of a satisfactory solution and result.

Keywords: Visual Thinking, Design Thinking, Drawing, Visualization.

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Examining the Characteristics of Visual Thinking & their Function in the Design Thinking Process

Abstract:

Although design thinking plays a fundamental role in all disciplines involved with design such as fashion design, graphic design, urban design and industrial design, however, it is a process that is not limited to such activities and its application benefits many other fields such as engineering, managerial, and entrepreneurial areas. The process of design thinking focuses on problem recognition, understanding and resolution and in this process, "Visual Thinking" is one of the main and most important stages. Visual thinking can include a cycle of imagination, discovering ideas and their visualization and in the process of design thinking, designers go through the visual thinking process over and over again until they reach the desired outcome and find solution to the problem. Although visual thinking is a term that emerged in the twentieth century, many historical evidences suggests that the stages of visualization of thoughts are not specific to contemporary era, because many artists such as Leonardo da Vinci have left us their thoughts and the outcome of their searches on their sketches and pictorial notes, and the review of these notes reveals their way of thinking.

The process of visual thinking can be divided into different stages. The beginning or zero is the stage of problem formation, in which the basic requirement that the design process needs to address and resolve is defined and shared with the design team.

Next step is problem recognition and in order to understand the different aspects of the issue, the designer begins studying. In the second stage, design thinking process enters the field of idea-finding; thus, the designer begins to design, draw and sketch and through visualization, s/he detects and records various solutions. Then, in the third stage, from among the proposed ideas and paths, s/he selects the most suitable idea for expansion and enters the fourth stage, which is the implementation of the solution achieved. Eventually, in the final stage, the implemented solution is examined and evaluated and its feedback determined.

In the initial stages, in order to better understand the problem and its different dimensions, the designers use visualization and visual thinking and imagine the whole path of design thinking. When focusing in the second phase, which is the stage of thinking through the creation of drawing and sketches, the designer finds solutions and ideas through inner dialogue with his drawings.

This study intends to identify the process of visual thinking and its features, as well as to identify its function in the design thinking process. The research process has been formed based on this question that "What are the influential indicators of visual thinking in design thinking?".

The present research is applied in terms of purpose and is descriptive-analytic in terms of method. Information and data re-

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