DIGITAL MEDIA IMPACT ON THE KNOWLEDGE BUILDING AND RETRIEVING CAPABILITY OF ARCHITECTS[1]

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Abstract

The transition of architecture from the two dimensional nature to the three dimensional nature, which results from the use of digital media, generates deep inconformity between the traditional methods of architectural creation and the novel nature of architectural objects. Therefore, there is a need to look at how digital media can impact the design capabilities of architects. This research aims at identifying the impact of digital media on the Knowledge Building and Retrieving capability, through defining this capability and classifying the basic approaches of digital media used in the design process. Depending on both primary data (a global questionnaire) and secondary data (synthesis of the previous research), the results of this study have substantiated the observation that there has been positive impact of various media settings (manual and digital) on the Knowledge Building and Retrieving capability of architects.
Key words: *Manual/Digital Media, Design Capabilities of Architects, Knowledge Building and Retrieving Capability.*

1. Introduction

Media, the representational environments of architects' design thoughts, have an influential role in the way architects practice design, and consequently, in the way architects improve their design capabilities. Digital-media use in design process has been shifting from merely the illustration of what has been already made towards the exploration and the suggestion of what is being made.

2. Design capabilities of architects

The design capabilities of architects can be classified into five types: Conceptualization capability, Form Giving capability, Representation capability, Decision-Making capability, and Knowledge Building and Retrieving capability. Although there is no order of how architects use these design capabilities against various tasks of design process, the features of a generalized portrait can be discovered. Within this portrait, architects move forth and back inside a reciprocal-influence loop that connects between Conceptualization, Form Giving, and Representation capabilities. Meanwhile architects use a mixture of both Decision-Making and Knowledge Building and Retrieving capabilities in order to guide the foregoing mental loop in evaluating the tentative proposals they have in mind for solving the given problem or its sub-problems.

3. Knowledge building and retrieving capability

The Knowledge Building and Retrieving capability of architects is the ability to accumulate and retrieve knowledge based on architectural design experience, i.e. the use of architectural shapes and forms, media types, building materials, and structural systems. This capability helps architects make decisions, employ all their design process capabilities, and implement their own style within the design process. This capability encompasses having good understanding of the factors that affect designing, such as culture, weather, etc., and reflecting these factors in the final artifact.

It takes years of experience for an architect to precisely imagine how compositions and prepositions of both lines and forms (be it analog or digital) could be represented in reality. Design ideas,

1 The research is a part of the PhD thesis listed in the References.

also, need to be developed according to program requirements, construction practices, and field conditions, for example how to specify the dimensions of a corridor in a building, in order to achieve its functional objective and to fulfill the needs of users. Gaining these kinds of knowledge and experience is a main qualitative component in the Knowledge Building and Retrieving capability.

In design-problem solving, formalizing proper decisions requires clarity of the information needed in design. Therefore, the advanced background an architect has promotes the position within/by which decisions are formed and made. This illustrates how the combination of the Decision-Making capability and the Knowledge Building and Retrieving capability affects the design process and the other design capabilities.

Media help the Knowledge Building and Retrieving capability by offering the required information during design, in digital or analog format. The important role of this capability, performed during the design process, can be identified in these two characteristics:

1. Personal Style and Subjective Point of View: The main feature of the Knowledge Building and Retrieving capability is the personal style of designing, which may distinguish one architect from another. It is the subjective point of view of architects in solving any given problem. Moreover, the designer has heuristics, evolved from prior personal experiences, which serve the designer's purposes for more than a single project and thus become incorporated as a central part of that individual's design thinking [4]. This is evident in styles of famous architects where each one has certain patterns of design thinking, media use, and design process, which affect the final output. Thus, buildings belong to well-known architects can be identified according to form, design style, and media use.

2. Decision Background: The synergistic influence of the Decision-Making capability and the Knowledge Building and Retrieving capability can be identified during designing in how decisions can vary from one architect to another even in the same design situation, according to the background of the architect. Represented in architectural experience, the Knowledge Building and Retrieving capability has the basis of constructing design decisions. In addition, what seems promising in solving a design-problem comes to mind via this characteristic of the capability. For example, choosing between different routes in solving design-problem relies on the knowledge of these avenues provided to or acquired by the architect.

4. Media impact

Exploring positive or negative areas of impact, introduced by the various settings of media use, on the Knowledge Building and Retrieving capability of architects has been investigated through two methodologies:

1. Extracting the impact from synthesis of the previous research of related areas, which have been partially discussed in the last part of the research. This methodology overcomes obstacles resulting from the fact that some concepts of media use are not available for many architects to employ because of the cost (of the sophisticated software or hardware), or because of the relation to computer science (which requires a programming background to benefit from).

2. Assessing the impact by surveying a sample of experts and professional architects. The impact in this case is according to the visions of the respondents.

4.1. Extracted impact from the previous research

Accounts of creative architectural design often mention natural and artificial objects as sources of architectural form; studies of design method and process often identify visual analogy, metaphor, and visual reference as important activities in creative designing [2], [1], [7]. Architects, through the Knowledge Building and Retrieving capability, accumulate these kinds of knowledge in order to adapt and adopt in their design singularities as design situations demand. Media help architects perform this episode according to their styles of design thinking, where media use varies from one architect to another.

The use of digital media is certainly more fluid and flexible than the use of traditional media. Digital media allows methods with which knowledge can be captured, accumulated, and used over and over. Digital media, also, have memory whereas traditional media do not. Through the use of digital media, it is required from architects to think, decide, and design in a digital three-dimensional environment. Thus, using the programs of 3D modeling, image editing, and 3D manipulating is the most important component of the Representation capability and the Knowledge Building and Retrieving capability.

Architects continuously develop their ways of media use in order to improve their tools of design. The right tool at the right time for the right job means reducing representation redundancy and enhancing representation appropriateness during design [6], [8]. A prominent part of the Knowledge Building and Retrieving capability, therefore, is the fluency in different types of media.

Within some concepts of digital media used in form generation, the computer under the influence of certain contextual parameters can introduce a set of forms from which the architect chooses responding to her/his creative intents. Architects, in such cases, should be aware of not giving formalism the priority over main functions of architecture (such as: environmental, social, or structural). Emphasizing such functions in design needs a good command and a high level of the Knowledge Building and Retrieving capability.

The Knowledge Building and Retrieving capability has an important role for each architect to achieve her/his own style/s in architectural design thinking. By the same token, the use of media (analog and digital) corresponds with the vision and experience of architect. This use, consequently, is basically employed within the architect's division of labor. The components of the Knowledge Building and Retrieving capability (Personal Style and Subjective Point of View, and Decision

Background) are shaped and developed according to the media approach/s used by the architect.

4.2. Extracted impact from surveying architects

The Questionnaire

A questionnaire was conducted (during the period from June 2002 to April 2003) to assess the impact of various digital and manual media settings on the Knowledge Building and Retrieving capability of architects. An invitation of participation was electronically sent to the members of the conferences of: ACADIA, eCAADe, CAADRIA, and SIGraDi. Also, an invitation was sent to the professors and the students of M. Sc. and Ph.D. in Arizona State University "U.S.A.", University of Sydney "Australia", and ASCAAD "Arabic Society of Computer Aided Architectural Design". The total number of replies was 56. Few respondents preferred not to assess all various uses, concentrating only on what they use.

The sample encompasses both practical and theoretical views of those who are practicing, teaching and researching in the subject matter: 1) 35.72 percent of participants are architects who are pursuing either Master's or Doctoral degrees in architecture; 2) 16.07 percent of the sample are professional architects, e.g. CAD managers, etc.; and 3) 48.21 percent of participants are faculty members involved in teaching and research (Lecturers, Associate Professors, and Professors). Other important characteristics of respondents, such as the period of computer use and self-assessment of computer use are summarized in "Table 1".

Table 1: Characteristic of respondents: period and self-assessment of computer use [5]

Characteristics of Respondents		Number of Respondents	Percentage of Respondents
Number of Years of Computer Use	Less than 5 years	17	30.36%
	5-10 years	11	19.64%
	10-15 years	16	28.57%
	15-20 years	5	8.93%
	More than 20 years	7	12.5%
Self Assess-ment of Computer Use	Low User	1	1.79%
	Below Average User	4	7.14%
	Average User	0	0%
	Above Average User	32	57.14%
	Intensive User	19	33.93%

Results of the Questionnaire

Architects were asked to assess the impact of their use of various media settings on their Knowledge Building and Retrieving capability. "Table 2" and "Figure 1" summarize the results of the survey in a comparative way.

Table 2: Comparison of the impact of various digital and manual media settings on the knowledge building and retrieving capability of architects [5]

Media Settings / Impact Level	Fully Manual Media Setting	One-Way Interactive Media Setting	Multiple Interactive Media Setting	Fully Digital Media Setting
Very High Impact	0.0%	12.5%	14.29%	57.14%
High Impact	41.82%	12.5%	57.13%	28.57%
Medium Impact	0.0%	25.0%	14.29%	0.0%
Little Impact	58.18%	37.5%	0.0%	0.0%
No Impact	0.0%	12.5%	14.29%	14.29%

- The Impact of Fully Manual Media Setting: The results show that there is a controversy between the respondents regarding the impact of this kind of media setting on the Knowledge Building and Retrieving capability. However, the results refer to the decrease in impact of fully manual media use on the Knowledge Building and Retrieving capability, as this impact was more dominant in the past.
- The Impact of One-Way Interactive Media Setting: The results indicate that half of the respondents find that there is no impact of this kind of media use on the Knowledge Building and Retrieving capability.
- The Impact of Multiple Media Interactive Setting: The results show that over seventy percent of the respondents find that the use of multiple interactive media has very positive impact on the Knowledge Building and Retrieving capability.
- The Impact of Fully Digital Media Setting: The results refer to the highly positive impact of the use of fully digital media on the Knowledge Building and Retrieving capability.

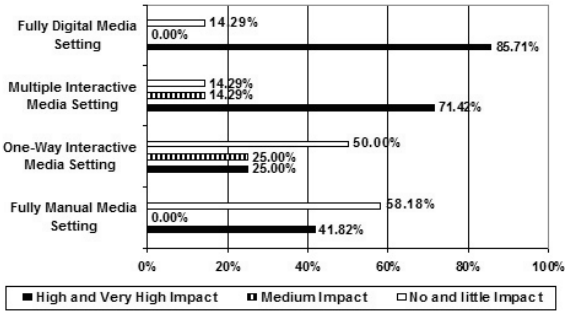

Figure 1: Comparison of the Impact of Various Digital and Manual Media Settings on the Knowledge Building and Retrieving Capability of Architects [5]

5. Conclusion

– The research has concluded that the components of the Knowledge Building and Retrieving capability (Personal Style and Subjective Point of View, and Decision Background) are developed according to the architect's style of both media use and design thinking.

– From the results of the questionnaire, the major trend, which represents the high and very high impact of various uses of media on the Knowledge Building and Retrieving capability of

the respondents, is significantly high towards the use of fully digital media. This result from the questionnaire conforms to the synthesis of previous research regarding the powerful role of digital media in enhancing the knowledge Building and Retrieving capability, in general, and the position by/within which architects access and employ design knowledge, in specific.

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