

**The Purpose and Content**  
The research attempts to define and classify the design capabilities of architects into a basic framework. This definition will be useful in understanding and determining the types and nature of impact introduced by digital and manual media used during architectural design process. The research consists of three parts. The First part reviews the main stages, tasks and activities of the architectural design process. The second part builds the proposed framework of design capabilities relating them to the specific tasks and activities conducted by the architect along the design process. The third part proposes some useful measures as to how to make use of the proposed framework in assessing the impacts of media on the design capabilities of architects.

### Assessment of the Impact of Digital-Manual Media Types on the Basic Design Capabilities of Architects: A Proposed Framework and Directive Measures

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#### Design Capabilities of Architects

Design capabilities are the indigenous ones; but rather, they are the ones which develop and improve through knowledge, and what accumulated in architects' minds and hands during architectural design studying and design practicing. Architects utilize these capabilities to perform various tasks of the design process, beginning with problem definition tasks such as drawing out design implications from the information (words, numbers and images) of the program and site, through concept articulation tasks that are summarized in analyzing, finding and extracting design concepts, and ending with form generation tasks that explore the creative leap from concept to form and its schematic development.

These capabilities can be defined and classified into five types: conceptualization capability, form giving, representation, decision-making, and knowledge building and retrieving capability. Although there is no arrangement or order of how architects use these capabilities during the phases of architectural design process, the features of a generalized portrait can be discovered. Within this portrait, architects move forth and back inside a reciprocal influences loop that connects between conceptualization, form giving and representation capabilities. The conceptualization capability has the main role that leads this loop. Meanwhile architects use a mixture of both decision-making and knowledge building and retrieving capabilities in order to guide the foregoing mental loop in selecting between the tentative proposals they have in mind for solving the given problem as a whole or in parts (figure 1). The mixture of both decision-making and knowledge building and retrieving capabilities are utilized in evaluation tasks, as the impact of these two capabilities can be distinguished within the evaluation phase of design process, or the repeated process of evaluation points –figure 2-.

The front-back movement inside capabilities' loop can be distinguished within various episodic moments of exploration, like the exploring moments for particular organizing principles that are usually followed by an evaluation of validation and appropriateness of these principles.

The conclusion of the evaluation leads to a straightforward procedure, or on other occasions, leads to a return to an earlier moment of thinking departure. During this evaluation that acts as a formal composition for the theme, architects use decision-making and knowledge building and retrieving capabilities as a compositional guide for other capabilities' results and outputs.

It can be described as the capability to set concepts /or conceptual frameworks that will guide the design process towards its final product. These concepts emerge by the given problem-atmosphere, and the interpretations of the architect of the problem and its surrounding conditions and circumstances. The concepts contract the problem and its context into a formal composition, and then expand it, within evaluation periods, between the proposals as given by the related design tasks, until the final product is reached.

Form giving capability of architects can be described as the capability to transform the conceptualized items into architectural items. In her words, it enables architects to express their concepts or conceptual frameworks to develop design scheme from providing previous conditions and site circumstances, through ready drawn sketches, drawings, models, and other means. The impact of this capability includes the illustration of its emergence based and tasks within the design process, or the repeated process of evaluation points –figure 2-.

Representation capability is the ability to describe the capability to comprehend architectural thoughts. It can be described as the capability to comprehend architectural thoughts through lines, areas, volumes, colors, etc. This capability being very strong links area, volume, color, etc., to evaluate what occur in mind, in correspondence with other capabilities' tasks. Architects draw a direct link between various tasks of the design process, and the representation task, and the design activities also are utilized inside these activities. This capability includes the ability to draw the required shapes and to display the type of media that is used during these activities. All the activities of this capability, sketching, drawing, are highly dependent on the representation capability, and vice versa. The impact of this capability includes the inclusion of media such as: Digital Sketching, Critiques, evaluation and selection capabilities.

Decision-making capability. It allows architects during the design process to understand, specify and decide how the designed forms and shapes are suitable and fit for the required functions and needs. Architects also can make decisions about the choice of materials and the choice of the type of model. In some, it gives the chance to determine what architectually feasible it is done or not. And as a result, this capability includes the ability to make decisions about the choice of the type of model, the choice of the type of media that is used during these activities. All the activities of this capability, sketching, drawing, are highly dependent on the representation capability, and vice versa. The impact of this capability includes the inclusion of media such as: Digital Sketching, Critiques, evaluation and selection capabilities.

Knowledge building and retrieving capability. It is the ability to accumulate and retrieve knowledge and information that are used during the design process. It is also, the capability that appears to be different in whether or not architects have access to the Internet, or not. Architects use this capability to collect and store information that is used during their design process capabilities, and apply, and utilize their own style within the design process.

#### Directive Measures of the Proposed Framework: the Media Role

Media Role  
Media are the representational environments of architects' design thoughts. They play a direct role in the process of architectural design. Moreover, the various processes of architectural design are influenced by the media that are used during the design process. The practice design (and, also on the process's output) the visual thinking cycle that leads the architect to the final product. The visual thinking cycle that leads the architect to the final product is: The mixture of both decision-making and knowledge building and retrieving capabilities are utilized in evaluation tasks, as the impact of these two capabilities can be distinguished within the evaluation phase of design process, or the repeated process of evaluation points –figure 2-.

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# ASSESSMENT OF THE IMPACT OF DIGITAL-MANUAL MEDIA TYPES ON THE BASIC DESIGN CAPABILITIES OF ARCHITECTS: A PROPOSED FRAMEWORK AND DIRECTIVE MEASURES

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## 1- The Purpose and Content

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## 2- Design Capabilities of Architects

Design capabilities are not the indigenous ones; but rather, they are the ones which develop and improve through knowledge, and what accumulated in architects' minds and hands during architectural design studying and design practicing. Architects utilize these capabilities to perform various tasks of the design process, beginning with problem definition tasks such as drawing out design implications from the information (words, numbers and images) of the program and site, through concept articulation tasks that are summarized in analyzing, finding and extracting design concepts, and ending with form generation tasks that explore the creative leap from concept to form and its schematic development.

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Although there is no arrangement or order of how architects use these capabilities during the phases of architectural design process, the features of a generalized portrait can be discovered. Within this portrait, architects move forth and back inside a reciprocal influences loop that connects between conceptualization, form giving and representation capabilities. The conceptualization capability has the main role that leads this loop. Meanwhile architects use a mixture of both decision-making and knowledge building and retrieving capabilities in order to guide the foregoing mental loop in selecting between the tentative proposals they have in mind for solving the given problem as a whole or in parts (figure 1). The mixture of both decision-making and knowledge building and retrieving capabilities are utilized in evaluation tasks, as the impact of these two capabilities can be distinguished within the evaluation phase of design process, or the repeated process of evaluation points –figure 2-.

The front-back movement inside capabilities' loop can be distinguished within various episodic moments of exploration, like the exploring moments for particular organizing principles that are usually followed by an evaluation of validation and appropriateness of these principles. The conclusion of the evaluation leads to a straightforward procedure, or on other occasions, leads to a return to an earlier moment of thinking departure. During this evaluation that acts as a formal composition for the theme, architects use decision-making and knowledge building and retrieving capabilities as a compositional guide for other capabilities' results and outputs

### a- Conceptualization Capability

Conceptualization capability of architects can be described as the capability to set concepts /or conceptual frameworks that will guide the design process towards its final product, emerged by the given problem-atmosphere, and the interpretations of the architect of the

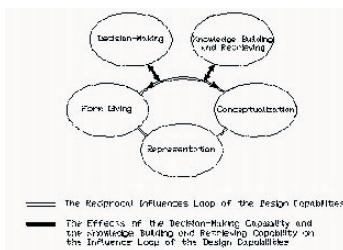


Fig 1 - The Relation between Design Capabilities of Architects

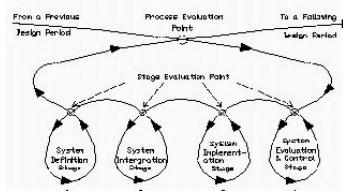


Fig 2- Evaluation Points and Overlapping of Design Phases

problem itself and its surrounding conditions and circumstances. These concepts construct the interpretation of design problem and vice versa; designers move back and forth, within evaluation periods, between the problem as given and the tentative proposals they explore and develop in mind.

### b- Form Giving Capability

Form giving capability of architects can be described as the capability to transfer and convey their conceptual frameworks into architectural forms. In other words, it is the capability which enables architects to express their concepts /or conceptual frameworks into actual formal architectural propositions and compositions so as to develop a design scheme from prevailing program conditions and site circumstances, to the final delineation.

The illustrations of emergence bases and tasks of this capability draw a satisfactory image of utilizing form giving capability and its role.

### c- Representation Capability

Representation capability of architects can be described as the capability to compose their thoughts in representative ways through lines, areas, volumes, colors, etc. This capability, being used by architects for presentation, exploration, and evaluation of what occur in their minds during design process, is interdependent with other capabilities' tasks. Architects draw to construct concepts or to explore problem definition, as drawing not only connects between various design activities but also is utilized inside these activities. Therefore, different scales and levels of precision reveal different qualities of solutions and influence the emerging of concepts and conceptual developments.

This capability includes free hand sketching, two and three dimensional drawing, physical modeling, and coloring capabilities, regardless of the type of media - be analog or digital - that is used during these activities. All the activities of representation capability, including drawing, are learned processes, not in-born talent, achieved through confidence and knowledge building, motivation, practice, and application.

### d- Decision-Making Capability

Decision-making capability allows architects during the design process to understand, specify and decide how the designed forms and shapes are suitable and apt for the required functions and needs; whatever types these designing forms and shapes are in (two or three dimensional drawings, or physical models).

In sense, it gives architects the image to determine what architecturally fits or does not, and to judge the appropriateness of both functioning and ordering of formal design elements. It leads /or causes the occurrence of the abandoning and backtracking periods of particular approaches and organizing principles, so that it acts as the most influential capability on the design process capabilities loop. It includes many activities such as: logical thinking, criticism, evaluation and selection capabilities.

### e- Knowledge Building and Retrieving Capability

Knowledge building and retrieving capability of architects is the ability to accumulate and retrieve knowledge based on the developing experience of the use of architectural shapes and forms, building materials and structural systems. It is, also, the capability that appears to be the differential in whether or not architects have underlying wide design-scope. It is the background that helps architects make decisions, deploy all their design process capabilities, and apply /and utilize their own style within the design process.

## 3- Directive Measures of the Proposed Framework: the Media Role

Media are the representational environments of architects' design thoughts. They play a direct role into the process of architectural design. Moreover, the media processes and methods that architects employ have essential impact on the way that architects practice design (and, also on the process' output).

### a- Media Role

The visual thinking cycles of architects, which lead the process of design are characterized and marked by particular media types and sequences [Farouque, 1984; Herbert, 1993]. The various methods of representations during the process of design are media – environments - wherein architects' minds and bodies fully engage and explore the issues of architecture. Media are beyond of being just tools and techniques to compose architectural thoughts and making [Delaura, 1997, p. 76; Herbert, 1994, p. 133-135; McCullough, 1996, p. 62-64, ch.7; Smulevich, 1997, p. 148; Bermudez and King, 1998].

In sense, using different media type in an architectural design process, even by one architect, affects the final product of this process. This is a result of the paths that each media technique represents and produces. Marx states that the shapes created by the students using digital media, are much more complex and dynamic [Marx, 1998].

### b- Media Capabilities

Designers deploy their media capabilities in a sequence or series against the many tasks of design process. During each evaluation period of the design process, employing media marks and characterizes a design decision-making cycle within that phase.

The improving alterations of the methods of media have a direct and essential impact in the way architecture is conceived, developed and communicated [Ataman, 1997, p. 4-6; Bermudez and King, 1998; Herbert, 1994, p. 133-138]. And as a result, this leads to improve architects' repertoires - palettes of tools and techniques -. These repertoires are continually grown, developed and evolved as architects increasingly learn by practicing design and conservatively gain experiences of media use during the process of design [Bermudez and King, 1998; Kellett, 1996].

