RESEARCH BY DESIGN IN ARCHITECTURAL DESIGN EDUCATION

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ABSTRACT

RESEARCH BY DESIGN IN ARCHITECTURAL DESIGN EDUCATION

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Research by design refers to the design of architectural research as an integral part of architectural design processes. In 1980s, it emerged as a third way in design research that was dominated until then by the methods of natural sciences and humanities. With this new formulation of design research, a methodological and epistemological transformation occurs, leading to the integration of practical knowledge into architectural research. The primary epistemological question transforms from knowing what design is and knowing how to design to knowing what through the act of design. The integration of the act of design in research transforms the status of design in design research from being an object of inquiry to being a research approach.

In the literature on research by design, this transformation is often related with Donald Schön's conceptualization of "reflective practice." The main discussion of reflective practice is primarily methodological rather than epistemological. Although it provides methodological insights, it is not sufficient to constitute an epistemological basis for research by design. Thus, the epistemological basis of research by design has not yet been adequately defined. In this study, the notion of "reflective practice" is investigated in a broader context relating it to its sources in the concepts of "tacit knowledge" and "action research." A conceptual framework for research by design is constructed by relating these concepts with the

discussions on research by design and with practical philosophy, the implications of which has remained rather uninvestigated in this context. Aristotle's elaboration of knowledge generation in action and the concept of *phronēsis* (practical knowledge, prudence, or practical wisdom) constitute the underpinning of this conceptual framework.

The conceptual framework that is constructed on the basis of the key concepts in practical philosophy is discussed in the context of architectural design education. When architectural design education is formulated as a process of research by design within this framework, knowledge generated in the educational design processes promises not only to improve the particular educational context and architectural education but eventually to contribute to architectural knowledge.

Keywords: Research by design, reflective practice, knowing-how, tacit knowledge, action research, practical philosophy, practical knowledge (*phronēsis*), architectural design education.

ÖZ

MİMARİ TASARIM EĞİTİMİNDE TASARIM YOLUYLA ARAŞTIRMA

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Tasarım yoluyla araştırma, mimarlıkta araştırmanın mimari tasarım süreçlerinin ayrılmaz bir parçası olarak kurgulandığı bir araştırma yaklaşımıdır. Bu yaklaşım, o zamana kadar tasarım araştırmasında egemen olan doğa bilimleri ve beşeri bilimlerin yöntemlerinin yanında 1980'lerde üçüncü bir yol olarak ortaya çıkmıştır. Bu yaklaşımla birlikte, pratik bilginin mimarlıkta araştırmayla bütünleşmesi yolunda yöntemsel ve bilgi kuramsal bir dönüşüm gerçekleşmektedir. Temel epistemolojik tartışma, tasarımın ne olduğu ve tasarımın nasıl yapıldığını bilmekten tasarım eylemi aracılığıyla neyin bilinebileceğine dönüşmektedir. Tasarım eyleminin araştırmayla bütünleşmesi, tasarım eyleminin tasarım araştırmasındaki yerini araştırmanın nesnesi olmaktan bir araştırma yaklaşımı olmaya dönüştürmektedir.

Tasarım yoluyla araştırma literatüründe bu dönüşüm çoğunlukla Donald Schön'ün kavramsallaştırdığı "pratikte dönüşlü düşünme" ile ilişkilendirilmektedir. Pratikte dönüşlü düşünme kavramının ana tartışması bilgi kuramsal olmaktan çok yöntemseldir. Bu kavramsallaştırma yöntemsel açılımlar getirse de tasarım yoluyla araştırmaya bilgi kuramsal bir temel oluşturmakta yetersiz kalmaktadır. Bu nedenle tasarım yoluyla araştırmanın bilgi kuramsal temeli henüz tatmin edici bir şekilde tanımlanamamıştır. Bu çalışmada "pratikte dönüşlü düşünme" kavramı daha geniş bir bağlamda incelenerek bu kavrama kaynaklık eden "zımni (örtük) bilgi" ve "eylem araştırma" kavramlarıyla ilişkilendirilmektedir. Bu kavramlar

bu bağlamda gerektiği gibi tartışılmamış olan pratik felsefe aracılığıyla tasarım yoluyla araştırma tartışmaları ile ilişkilendirilerek, tasarım yoluyla araştırmaya temel oluşturacak bir kavramsal çerçeve oluşturulmaktadır. Aristo'nun eylem içinde bilgi üretimi tartışması ve sağgörü (*phronēsis*, pratik bilgi) kavramı bu kavramsal çerçevenin temelini oluşturmaktadır.

Pratik felsefenin temel kavramları üzerinde kurulan kavramsal çerçeve mimari tasarım eğitimi bağlamında tartışılmaktadır. Mimari tasarım eğitimi bu çerçevede bir tasarım yoluyla araştırma süreci olarak kurgulandığı zaman eğitimsel tasarım süreçlerinde üretilen bilgi sadece söz konusu eğitim ortamını ve genel olarak mimarlık eğitimini iyileştirmekle kalmaz, sonuç olarak mimarlık bilgisine katkıda bulunur.

Anahtar Kelimeler: Tasarım yoluyla araştırma, pratikte dönüşlü düşünme, yapabilme bilgisi, zımni (örtük) bilgi, eylem araştırması, pratik felsefe, sağgörü (*phronēsis*), mimari tasarım eğitimi.

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CHAPTER 1

INTRODUCTION

Design is an intellectual act, which involves degrees of knowing that are not always available to consciousness. When design becomes a reflective practice, knowledge generation is possible through the conceptualization of tacit knowing inherent in it.

This study aims to develop a conceptual framework on the possibility of generating knowledge through design processes. This framework is discussed within the context of architectural education. It is an investigation of the relations between research by design and architectural education as reflective practices.

1.1 Prologue: Design, Research and Knowledge

The notion of "research by design" refers to an ongoing discussion on the design of architectural research as an integral part of architectural design. This idea is also discussed under terms like "research through design" or "practice-based research." "Research by design" was introduced in a research program in Delft University of Technology in late 1990s and adopted in this study to refer to this specific kind of research. It is an appropriate term for the discussion as it helps relate research and design epistemologically and methodologically to denote a single intellectual activity.

The emergence of this discussion is closely related with the situation of design schools in universities. The relationship between science and design has been questioned and largely discussed. While being two seemingly distinct activities of intelligence, science and design coexist under the same regulatory matrix of academic research.

According to a conventional definition, while the scientist aims to understand the existing phenomena, the designer aims to create an object of use. While the activity of the scientist is an analytical one, the activity of the designer is a generative one.[1] The strategies of understanding the world differ from those of making. Therefore, a conceptual analysis is required for constructing a rigorous field for research conducted through design activity. This will help to define the position of design disciplines among scientific disciplines. It is necessary to formulate an epistemological basis in which reflection through design activity is possible so that it can become an act of knowing. This conceptual analysis inevitably should begin with the meanings of design, research (or scientific research), and knowledge.

The English word "design" is commonly used as a verb and a noun. Etymologically it is derived from the Latin verb "designare," which means to mark out, devise, *de-* meaning out and +*signare* meaning to mark.[2] Although, in modern use, "design" has several connotations as a verb or as a noun, these connotations mainly focus on the activity of planning or conceiving the form and structure of an object and the notion of intention in thinking.

> **de·sign, v. tr.** a. To conceive or fashion in the mind; invent … b. To formulate a *plan* for; devise … 2. To *plan out* in systematic, usually graphic form … 3. To *create or contrive* for *a particular purpose* or effect … 4. To have as a goal or *purpose; intend.* 5. To *create or execute* in an artistic or highly skilled manner. **v. intr.** 1. To *make or execute plans.* 2. To have a *goal or purpose* in mind. 3. To *create* designs. **n.** a. A drawing or sketch. b. A graphic representation, especially a detailed plan for construction or manufacture. 2. The *purposeful or inventive arrangement* of parts or details … 3. The art or practice of designing or making designs. 4. Something designed, especially a decorative or an artistic work. 5. An ornamental pattern. See Synonyms at figure. 6. A *basic scheme* or pattern that affects and controls function or development: … 7. A *plan; a project.* See Synonyms at *plan.* a. *A reasoned purpose; an intent* … b. *Deliberate intention* … 9. A secretive plot or scheme. Often used in the plural.[3]

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[1] The terms "analytical" and "generative" are borrowed from Linda Groat and David Wang and used in the same sense. See David Wang, "Design in Relation to Research," in *Architectural Research Methods*, ed. Linda Groat and David Wang (New York, NY: John Wiley and Sons, 2002), 99-131.

[2] Online Etymology Dictionary, November 2001, s.v. "design." [Internet: WWW], ADDRESS: http://www.etymonline.com/index.php?search=design&searchmode=none [ACCESSED: 3 November 2006].

[3] design. Dictionary.com. *The American Heritage Dictionary of the English Language, Fourth Edition* (Houghton Mifflin Company, 2004), [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/design [ACCESSED: 19 October 2006] (emphasis added).

When "design" is considered as a verb, the emphasis on creation is added to the notions of planning and intention. With its strong affiliation with the notion of intention, design means projection towards future.

Although it is commonly accepted as etymologically derived from Latin "de+signare," meaning to mark out, the Latin prefix "de-" generally indicates a reversal (as in deactivate, defrost etc.). Therefore, the word design acquires a connotation of cunning and deception as it indicates the reversal of marking out.[4] After discussing the meanings of "design" and the related words such as art and technology in several languages, Vilem Flusser, in *The Shape of Things: A Philosophy of Design* argues that the aim of the activity of design is "to deceive nature by means of technology" through the creation of artificial objects.[5] He also states that, according to a Platonic argument, to design is to transfer theoretically intelligible forms (Ideas) into the material world. According to Plato, during this transfer, artists and technicians betray and distort Ideas.[6] Although Flusser's interpretation of Plato's ideas on the work of artists and craftsmen is not directly related with the scope of this study, this discussion is crucial for unfolding a different dimension in the comprehension of the word "design." To be more precise, the relationship between ideas and the activity of making inherent in "design" is quite significant for understanding what design is.

Jonathan Hill, in his article titled "Hunting the Shadow – Immaterial Architecture," argues that the word "design" comes from the Italian word *disegno* which means drawing. According to Hill, "informed by neo-Platonist theories common in the Italian Renaissance, *disegno* implied a direct link between an idea and a thing."[7] Hill quotes Giorgio Vasari, who used the word *disegno* while defining the activity of painters, sculptors and architects as the activity design in the sixteenth century. According to Vasari, "design is not other than a visible expression and declaration of our inner conception and of that which others have imagined and given form to in their idea."[8]

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[4] Vilem Flusser, *The Shape of Things: A Philosophy of Design* (London: Reaktion, 1999), 17.

[5] Ibid, 19.

[6] Ibid, 18.

[7] Jonathan Hill, "Hunting the Shadow – Immaterial Architecture," *Journal of Architecture*, Vol. 8 (Summer 2003): 165.

[8] Giorgio Vasari, *Vasari on Technique*, trans. L. S. Maclehose (New York, NY: Dover Publications Inc., 1960, first published as G. Vasari, *The Introduction to the Three Arts of Design, Architecture, Sculpture and Painting, prefixed to the Lives of the Most Excellent Painters, Sculptors and Architects,* 2nd Edition, 1568), 205.

Disegno is used in the Renaissance in order to define the activity of painters, sculptors and architects and to differentiate their work from the work of craftsmen. *Disegno* (drawing) is the primary activity of artists and architects since the Renaissance. Since the introduction of this word, the profession of architecture has evolved from being an activity of crafts into an activity of design. Crafts are bound to traditions while design is closely related with conception. What is significant in *disegno* is the word's denotation of a direct link between drawing and conception. An idea is constructed and presented through the activity of drawing.

In light of these definitions, the word "design" is used in this study as a verb which denotes the intellectual activity of intentionally generating a systematic scheme for the future production of an object that is expected to fulfill a certain purpose.

"Research" as an English verb and noun is etymologically derived from Old French word "recercher," which means seek out, search closely, *re-* as intensive prefix and +*cercher* means to seek for.[9] Although it is a word dating from late sixteenth century, meaning of scientific inquiry is linked to the word "research" in the mid seventeenth century. In modern use, it is associated with the notions of close inquiry and accurateness. It is mostly used to denote scholarly or scientific investigation of a subject.

> **re·search *n.*** 1. *Scholarly or scientific investigation* or inquiry. 2. *Close, careful study*. ***v. intr.*** To engage in or perform research. ***v. tr.*** 1. To study (something) thoroughly so as to present in a *detailed, accurate manner*. 2. To do research for.[10]
>
> **re-search – verb (used with object), verb (used without object)** to search or search for *again*.[11]

The Italian word *ricercar* (also spelled *ricercare*), which means to seek, shares the etymological roots with "research." *Ricercar* is also the name for a musical form prominent in the sixteenth and seventeenth centuries which is now known as fugue. It is based on explorations of a

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[9] Online Etymology Dictionary, November 2001, s.v. "research." [Internet: WWW], ADDRESS: http://www.etymonline.com/index.php?search=design&searchmode=none [ACCESSED: 3 November 2006].

[10] research. Dictionary.com. *The American Heritage Dictionary of the English Language, Fourth Edition* (Houghton Mifflin Company, 2004), [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/design [ACCESSED: 19 October 2006] (emphasis added).

[11] research. Dictionary.com. *Dictionary.com Unabridged (v. 1.01)*, Based on the Random House Unabridged Dictionary, Random House, Inc. 2006. [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/research [ACCESSED: 19 October 2006] (emphasis added).

single motive mostly carried on through the imitation of the initial motive.[12] As Douglas Hofstadter discusses in his *Gödel, Escher, Bach: an Eternal Golden Braid*, Johann Sebastian Bach's "Musical Offering" can be regarded as one of the best examples of *ricercar*. Bach had never written the canons in "Musical Offering" completely. It was developed on a theme that was played by King Frederick of Prussia at an evening when Frederick and Bach were together. Bach then developed this theme into various canons through some hints, and let the canons to be "discovered" by King Frederick.[13] *Ricercar* becomes a search for possibilities inherent in a single motive through playing. Furthermore, *ricercar* becomes a research on music through music.

While having an intensifying role, the prefix *re-* also denotes repetition in some definitions. In other words, the word "re-search" has a connotation of searching and searching again. Therefore besides the meaning of intensive investigation, "research" is related to preexisting knowledge to search for again.

In this study, "research" is used as a verb and a noun which denotes the activity of organized intensive investigation of a subject matter.

The noun "knowledge" is etymologically derived from the combination of the old English verb "cnawan" and the suffix +ledge. Although the roots of the suffix are obscure, it is claimed to be related with the suffix +*lock*, which means "action, process."[14] In modern English, it is used as the state of knowing and the product of a process of studying, learning, investigating, or understanding. As it is the noun form of the verb "to know," definitions of this verb is crucial for defining "knowledge."

Knowledge and the act of knowing are the subjects of a vast area of inquiry called epistemology, and they will be discussed thoroughly in this study. The dictionary definitions of "to know" and "knowledge" provide a ground on which the further discussion can be carried on. Literally, "knowing" is closely related with the knowing subject's judgment concerning the truth of a statement. It is also used for the acquaintance of practical abilities.

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[12] ricercare. Encyclopedia Britannica. 2007. *Encyclopedia Britannica Online,* [Internet: WWW], ADDRESS: http://www.britannica.com/eb/article-9063541/ricercare [ACCESSED: 4 February 2007]. Also Douglas R. Hofstadter, *Gödel, Escher, Bach: an Eternal Golden Braid* (New York, NY: Basic Boks, Inc., 1999), 7.

[13] Hofstadter, 3-8.

[14] Online Etymology Dictionary, November 2001, s.v. "knowledge." [Internet: WWW], ADDRESS: http://www.etymonline.com/index.php?search=design&searchmode=none [ACCESSED: 3 November 2006].

> **know v. v. tr.** 1. To perceive directly; grasp in the mind with clarity or certainty. 2. To *regard as true beyond doubt*. 3. To have *a practical understanding of*, as through experience; *be skilled in*. 4. To have fixed in the mind. 5. To have experience of. 6. To perceive as familiar; recognize. 7. To be acquainted with. 8. To be able to distinguish; recognize as distinct. 9. To discern the character or nature of. **v. intr.** 1. *To possess* knowledge, understanding, or information. 2. To be cognizant or *aware*.[15]

The noun "knowledge" is mainly used to denote the condition of knowing and the outcome of the process of knowing. In other words, it is both the noun form of the verb "to know" and the object of this verb, that is, what is known.

> **knowl·edge *n.*** 1. The *state or fact of knowing*. 2. Familiarity, *awareness*, or *understanding gained through experience or study*. 3. The sum or range of what has been *perceived, discovered, or learned*. 4. Learning; *erudition*. 5. Specific information about something.[16]

What is common to many of the dictionary definitions of "knowing" and "knowledge" is that "knowing" or gaining "knowledge" is a process. Although the sources of knowledge is a primary problem of epistemology since the beginnings of philosophy, it is evident that in common usage of the word, "knowing" is closely related with a process, whether it is understanding, experience, discovery, or simple perception.

In this study, the verb "to know" is used in its twofold meaning. Firstly, it is the justification of truth of a statement about something through other processes such as perception, awareness, understanding, investigation, learning, or experience. Secondly, it is the practical ability/skill to do something. In light of this understanding, the noun "knowledge" is used as the outcome of the process of knowing either in the form of justification of truth or in the form of ability to do something. In this context, "knowledge" is used in this study in its broadest sense to incorporate different forms of knowing processes.

Research by design is conceived as a form of knowing. As a knowledge generation process, it should be discussed in terms of the relationships between the activities of design, research, and knowing. In the context of this study, the different conceptions of these three terms

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[15] know. Dictionary.com. *The American Heritage Dictionary of the English Language, Fourth Edition* (Houghton Mifflin Company, 2004), [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/design [ACCESSED: 19 October 2006] (emphasis added).

[16] knowledge. Dictionary.com. *The American Heritage Dictionary of the English Language, Fourth Edition* (Houghton Mifflin Company, 2004), [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/design [ACCESSED: 19 October 2006] (emphasis added).

constitute a starting point for investigating the relationships between design, research, and knowledge.

When the common usages and definitions of the terms design, research and knowledge are considered, it can be seen that it is not necessary to approach each of them as a distinct activity with its own dynamics. The design activity includes not only the act of making but also conceptualization of this act. Research, on the other hand, has strong connotations with making. Therefore, it is crucial to explore common layer(s) of knowing among these activities.

1.2 Problem Definition

The aim of this study is to reconceptualize "research by design" and "research by design education" as forms of action research in architecture, by reconsidering the relations between knowledge, architectural knowledge, and architectural education.

The thesis starts from the conjecture that in research by design, which has evolved within the tradition of design research, the status of the act of design in design research has changed from being the object of inquiry to being a research approach. Firstly, this conversion raises methodological questions. The research processes and validation criteria need to be revised. Secondly, as a consequence of problems of research methodology, epistemological questions arise. The primary epistemological question shifts from *knowing what design is* and *knowing how to design* to *knowing what through the act of design*.

In the literature on research by design, these conjectures and questions are investigated by using the concepts that are elaborated in theories of action research. Among these theories, Donald Schön's conception of "reflective practice" has been strongly influential in the debate on research by design. Schön's discussion focuses on the formulation of "reflective practice" as a form of action research in professions rather than explaining the nature of knowledge that is inherent in practices. Therefore, although his formulation is influential in providing methodological insights, it is not sufficient for constructing an epistemological basis for research by design. It is argued in this study that the conceptual basis of research by design has not yet been adequately defined. The conceptual framework in this study starts from "reflective practice," but goes beyond it to investigate Schön's references in action research and tacit knowledge. Practical philosophy, which remains rather uninvestigated in research by design and action research, provides the epistemological clarification for developing a conceptual framework. Hans-Georg Gadamer's "philosophical hermeneutics" and the sources of his formulation in Aristotle's concept of *phronēsis* (prudence, moral practical

knowledge or practical wisdom) constitute the core of the conceptual basis of research by design. This conceptualization is then discussed within the context of architectural design education, which helps conjure up a learning environment based on knowledge generation through the act of design.

Although research by design approach in architectural research is relatively recent, the relationship between design and research has been discussed since the mid-twentieth century within the context of action research and design research. In order to understand the limits and definitions of research by design in terms of its capacity as a knowledge generating process, the evolution of this approach should be analyzed. Through this analysis it is possible to have a complete account of the approaches to the relationship between design and knowledge through decades. Through this investigation, it is also possible to understand the methodological and epistemological problems and possibilities that are brought forth with the consideration of design process as a knowledge generating process.

This study is an inquiry into research by design by highlighting the nature of knowledge that is generated through it. This issue has been discussed since the early 1990s and recently has begun to be considered as a form of knowing in the academic communities; and eventually research programs have been initiated. By its nature, research by design is a process of learning through making and its epistemological validity can be settled through rigorous experiences of knowledge generation through design. In this study, in light of the existing literature on the relationship of design and research, and epistemological clarifications on practical knowing, a framework for ways of knowing through design activity is constructed. Then, this framework is utilized to explain knowledge generation through architectural design education. To be more precise, it is an investigation of the ways of formulating the process of design education as research by design in which it is possible to contribute to architectural knowledge. Starting from an exploration of the literature on design research and relating it with theories of practical knowledge, it discusses the possibility of integrating action research to research by design in architectural education.

1.3 Structure of the Dissertation

The elaboration of the methodological and epistemological issues in research by design and research by architectural design education requires a coherent and profound understanding of the knowledge generating processes embedded in the act of design. In this study, such comprehension is aimed to be developed through an analysis of the existing literature in light of a theory of practical knowledge.

In this respect, firstly, different conceptualizations of knowing processes are discussed in relation to architectural design and research. Secondly, the design research tradition and the evolution of research by design within this tradition are investigated through a review of the related literature. Thirdly, the influence of Schön's work is elaborated through developing necessary links to his conceptual references. Resting on these investigations, a framework for understanding the methodological and epistemological transformation that emerges with the advent of research by design is constructed. Finally, this framework is contextualized in architectural design education.

In Chapter 2, the relationship between knowing and architectural design is discussed. After a brief exploration of epistemological debates on knowing processes, conceptualization processes in architectural design are investigated. Firstly, the differences between theoretical knowledge (knowing-that) and practical knowledge (knowing-how) are discussed. In this context, the main concepts of practical philosophy are elaborated through a discussion of Gadamer's philosophical hermeneutics by relating it to his references in Aristotle's concept of *phronēsis*. Prior to an examination of scholarly research approaches in architecture, architectural thinking processes that are inherent in design activity are explored through the texts written by practicing architects. Different forms of conceptualization in the works of Le Corbusier and Rem Koolhaas are examined in order to reveal the nature of architectural thinking that is inherent in the activity of design. This investigation is crucial when it is considered that institutionalized research in architecture has emerged very recently when the history of architectural production is concerned. Finally, established research methods in architecture are investigated for understanding the context in which research by design would be defined.

This analysis yields to a concentration on design research and eventually research by design in Chapter 3. As research by design is considered to emerge as a "third way" to a duality of the approaches that are based on sciences and approaches that are based on humanities in design research, design research tradition is investigated in terms of this duality. Christopher Alexander's PhD dissertation is investigated for defining the characteristics of an approach to design research that is based on scientific methods while Peter Eisenman's PhD dissertation is examined for defining the characteristics of an approach that is influenced by the methods of humanities. The existing literature on research by design is discussed and interpreted in terms of the approaches, possibilities and boundaries of knowledge generation through the act of design. The literature review reveals that Schön's idea of "reflective practice" had an

impact on the discussions in design research tradition and paved the way for the definition of research by design.

In Chapter 4, Schön's conceptualization of "reflective practice" is investigated as it is the main reference for the discussion of the notion of research by design. It is assumed that the notion of "reflective practice" is not sufficient for defining the area of research by design for the reasons that have been stated above. Therefore, "reflective practice" is discussed in relation to its conceptual and methodological sources. In this respect, Michael Polanyi's formulation of "tacit knowledge" and the paradigm of action research are discussed.

Chapter 5 covers an attempt to develop a conceptual framework for research by design. It starts with the philosophical sources of research by design literature. Practical philosophy, which is discussed in the second chapter, is elaborated further with a focus on Aristotle's concept of *phronēsis* (prudence or practical wisdom). The epistemological and methodological transformation that accompanies the emergence of research by design is elaborated through an analysis based on the concept of *phronēsis*.

Chapter 6 discusses a possible approach to research by architectural design education based on the epistemological and methodological foundation developed in Chapter 5. Firstly, an overview of the evolution of modern architectural education is introduced with a focus on its educational tools. Different forms of knowledge generation by the varying roles of the actors in the studio are discussed through knowledge generating aspects of the design activity in the studio. These aspects are institutional background and personal background, design critic's role as a practitioner who reflects on his/her practice, and student's construction of meanings through his/her producing of a product.

Although the aim of this study is to contribute to the definition of research by design in architectural research, such an endeavor is contextualized through a search for ways of knowledge generation through design processes in architectural education. Therefore, in the scope of this study, the conceptual framework is constructed by considering knowledge generation through the activity of design as an integral part of learning.

1.4 Research by Design in Architecture: An Overview

David Wang, in the chapter titled "Design in Relation to Research" of the book *Architectural Research Methods*, which he edited in collaboration with Linda Groat, discusses the relationship

between design and research with an overview of the difficulties in this relationship and the possible ways of relating these two activities.[17] Wang's discussion of the relationship between design and research can be considered as a starting point for an overview of the evolution of this relationship. Furthermore, his account gives an overall view of the main points of discussion on research by design while presenting different paradigms in design research. As it is considered that research by design has evolved from within the tradition of design research, Wang's account is important.

Wang argues that there are two main difficulties in the relationship between design and research. Firstly, he points to the philosophical distinction between the "generative" activity of design and the "analytical" activity of research. Although he argues that the design process "cannot be fully captured by determinate descriptions," he states that "it is within the domain of reason."[18] Therefore, although there is a specific form of knowing inherent in the design activity, this kind of knowledge is not considered as scientific, because according to Wang scientific knowledge consists of tested, rule-based propositions. Secondly, he differentiates the notions of "design as research" and "research about the design process." Wang states that considering the "nonpropositional" activity of design under the "propositional" activity of research "raises logical difficulties." However, it is possible to investigate the process of design with some analytical tools. Therefore, he clearly differentiates design as research and research about the design process while he argues that they are "equally worthwhile" but they have "different functions."[19]

This epistemological difference between the two activities makes it worthwhile to search for ways in which the design activity itself becomes a tool for generating knowledge. If design and research can only coexist but never integrate, then a need for a research area emerges to redefine the situation of design disciplines in research institutions. However, this is only possible when the definition of research is transformed and broadened to a wider range than "scientific" research. This transformation can be possible with the clarification of the epistemological basis of research by design.

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[17] David Wang, "Design in Relation to Research," in *Architectural Research Methods*, ed. Linda Groat and David Wang (New York, NY: John Wiley and Sons, 2002), 99-131. This argument is further clarified in Chapter 2 of this study.

[18] Ibid, 105.

[19] Ibid, 105-107.

1.4.1 From Design Research to Research by Design

In terms of the evolution of research by design idea, the literature concerning design research can be divided into three periods. During the first period, the emphasis was on the demystification of the design process and most of the effort was on the establishment of the idea that research can be conducted on design. In this period, also an alternative approach to design research emerged. Benefitting from history and philosophy, several researchers began to develop theories of architectural design. The second period witnesses the emergence of the idea of "designerly ways of knowing," and inaugurates epistemological discussion on design disciplines. In the third period, governmental reports concerning research by design emerged, conferences held on the issue, research programs, and institutions that consider research by design as their educational policy were established. However, the area of research by design is still not well defined.

1.4.1.1 Beginnings of Design Research

The search for establishing design as a research field dates back to late 1960s, to the early days of design research. Alexander's work beginning with his 1964 book titled *Notes on the Synthesis of Form*, which is his PhD dissertation, is one of the most notable examples of this period.[20] Herbert Simon, in *The Sciences of the Artificial*, proposes "the science of design" as a field of research in the design disciplines.[21] Design as an interdisciplinary field could interrelate knowledge of arts, sciences, and technology.[22]

This understanding of the relationship between design and research gave way to research on design processes with the methods of scientific disciplines such as cognitive psychology and mathematics. Bill Hillier and Julianne Henson's *The Social Logic of Space* and Ömer Akın's *Psychology of Architectural Design* are two significant examples of this approach to architectural design research. Mostly, the focus was on the quantification of designer's acts in order to demystify the design process. Until 1980s design research was mainly conducted in this

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[20] Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964).

[21] Herbert Simon, *The Sciences of the Artificial* (Massachusetts, MA: The MIT Press, 1969).

[22] Maarit Makela, "Knowing through Making: The Role of the Artefact in Practice-Based Research," *Knowledge, Technology, and Policy*, Vol. 20, No. 3 (October 2007): 158.

direction and provided valuable insights concerning the design process that had been considered as a "black-box" until these investigations.[23]

In 1960s, simultaneously with quantitative studies, an alternative approach to design research emerged. Researchers focused on developing architectural theories resting on architectural history and philosophy. Eisenman's PhD dissertation titled *The Formal Basis of Modern Architecture* is an early example of this approach.[24] Among other significant examples of this approach to design research are Robert Venturi's *Complexity and Contradiction in Architecture* of 1966 and Aldo Rossi's *The Architecture of the City* of 1966. With their focus on history in order to develop a theoretical account of architectural design, researchers who developed this approach are influenced from the methods of humanities for investigating design.

Until 1980s, design research is considered within the duality of the approaches that are influenced by sciences and humanities that are described above.

1.4.1.2 Designerly Ways of Knowing

In the early 1980s, Schön's interest in practitioners' knowledge has introduced a fresh view to fields such as medicine, management, and design. His emphasis on "reflection-in-action" and "reflection-on-action" relates to a "reflective practice" in which the practitioner is able to generate knowledge and contribute to the knowledge of the field.[25]

Concurrently with Schön's work on "reflective practice," two journals began to be published in the early 1980s: *Design Studies* and *Design Issues*. *Design Studies* published a series of articles on this subject and the third article by Nigel Cross, which is titled "Designerly Ways of Knowing," has become one of influential essays on design research since then. The first essay of this series was written by Bruce Archer and it was followed by the second essay by Gerald Nadler. These two essays put forward the idea of a "third way" in design education. Cross dwells on this idea and discusses it by comparing the "third way" to sciences and humanities.[26] This marks the emergence of a conjecture that approaches and methodologies of natural and social sciences are not always sufficient for attaining knowledge in the design

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[23] Nigan Bayazıt, "Investigating Design: A Review of Forty Years of Design Research," *Design Issues*, Vol. 20, No. 1, (Winter 2004): 16-29.

[24] Peter Eisenman, *The Formal Basis of Modern Architecture* (Lars Muller Verlag, 2006).

[25] Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (London: Basic Books, 1991, first edition, 1983).

[26] Nigel Cross, "Designerly Ways of Knowing," *Design Studies*, Vol. 3, No. 4 (October 1982): 221-227.

disciplines. For the first time, the idea of design as a discipline with its own ways of knowing was emphasized. Cross has continued to elaborate on the idea of a "third way;" in his contributions to *Design Issues* in summer 1999 and summer 2001. A further development of his initial ideas can be traced in them.

The May 1979 issue of *Journal of Architectural Education* was dedicated to the relationship of design and research in architecture.[27] This issue included theoretical discussions on this relationship as well as documentation of research conducted in relation to design processes. It was quite unique when the understanding of design research in the period is considered; it signals a transformation in design research.

Throughout these flourishing ideas, design research has evolved from the "science of design," which opened a way for analysis of design activities and documentation of cognitive processes of the designer, to a search for a "designerly way of research," which places the act of design to the core of a process of inquiry. This approach to design research is eventually labeled as "research by design."

1.4.1.3 Research by Design

In the early 1990s, research by design began to evolve into an established area of research. In 1993, Christopher Frayling's article titled "Research in Art and Design" opened up a new way for redefining the relationship between design and research.

Frayling introduces a tripartite definition for research in art and design. According to him there are "research *into* art and design," "research *through* art and design," and "research *for* art and design." Research into art and design is based on the conventional understanding of design research conducted through the historical, sociological, or technical methods, where art and design becomes the object of the study. Research through art and design utilizes art and design as a tool of research and a tool for communicating the results. Finally, research for art and design, according to Frayling, is "research where the end product is an artefact - where the thinking is, so to speak, embodied in the artefact, where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or

[27] *Journal of Architectural Education*, Vol. 32, No. 4, *Search/Research* (May 1979).

iconic or imagistic communication."[28] Therefore, the design activity itself becomes a process of research.

Frayling's paper marks a turning point in the discussion on research by design. The discussion has now transformed from a diagnostic level to a level of proposing solutions. His tripartite division for the first time involves clues for an epistemological investigation towards a new understanding of design research.

From the beginning of 1990s until today, through conferences, reports and articles there is an attempt to define research by design as an academic area of research. During these discussions research programs are being established in schools of architecture. Besides extensive publication in journals like *Design Studies*, *Design Issues*, and *Journal of Architectural Education*, there are significant attempts of institutionalization. The research program titled "Architectural Intervention," which is organized by Delft University of Technology, the "Millennium Programme" of Scandinavian countries, and the educational programs of the Bartlett School of Architecture and "Design Research Lab" of Architectural Association in relation to regulating policies in England are significant examples of institutionalization of research by design.

Although it seems to be that research within design practice has been discussed since mid 1990s, it is evident that there is a search for establishing a defined field of research by design since the beginnings of design research in 1960s. The early research on design has been limited to understanding how designers work, and mostly such inquiry followed the approaches of sciences and humanities. Only after 1980s, with Schön's ideas on reflective practice it became possible to discuss the potentials of design acts in the process of attaining knowledge. Since then research on the definition of research by design has been constructed starting from Schön's framework and the tripartite understanding of design research as it has been introduced by Cross.

1.4.2 Practical Knowledge and Research by Design

The transformations in design research since 1960s until today are not limited to the discussions within the design disciplines. As this is a search for a new way of attaining knowledge, it has been strongly influenced by some theories of knowledge. One of the most

[28] Christopher Frayling, "Research in Art and Design," *Royal College of Art, London, Research Paper*, Vol. 1-1 (1993/4): 5.

influential of these epistemological formulations emerged with Schön's "reflective practice" in early 1980s and it transformed the discussions in design research. Schön reconsiders the concepts developed within "action research," which was first formulated by Kurt Lewin in late 1940s, and "tacit knowing" as it was formulated by Polanyi in 1950s in relation to epistemology of practices. Recent papers and reports discussing research by design or practice-based research often refer to the idea of "reflective practice" by relating it to Polanyi's "tacit knowing."

Action research is an established research approach in social sciences.[29] When it is considered within the tradition of practical knowledge and the necessary links are provided, its utilization as a methodological approach in design disciplines would find its right place. The investigation of "practical philosophy" as it is elaborated in Gadamer's "philosophical hermeneutics" with reference to Aristotle's concept of *phronēsis* would provide the necessary links for considering research by design in terms of practical knowledge.

The rediscovery of practical knowledge seems to provide authors with the epistemological tools to argue for the academic validity of knowledge attained through practice. After Schön introduced these notions to the discussions of design professionals, design research found the possibility of going beyond the limits of what can be done with appropriate scientific methods. In this sense, new ways of research may emerge within ways of designing. However, in this particular context, this epistemological framework has not been profoundly examined and understood yet. Although the terminology of Schön, Polanyi, Gadamer, and Aristotle have been utilized in particular contexts, the ideas of these philosophers have not yet fully exploited for developing an epistemological framework for research by design. For the establishment of a rigorous field of research by design, the ideas of these philosophers should be interpreted by focusing on their epistemological implications.

1.5 Research by Architectural Design Education

In light of the literature on research by design and the epistemological framework provided with practical philosophy, it is possible to investigate ways to formulate architectural design education as a process of research by design.

In its existing formulation, modern architectural education is considered to be a process of learning by doing. Furthermore, there are attempts to introduce the idea of research by design

[29] Chapter 4 addresses the characteristics of action research.

into undergraduate design education. However, there is still a need for an epistemological clarification and conceptualization of knowledge generated through the design process in the design studios.

This is crucial not only for immediate educational purposes but also for the improvement of the educational environment. The tacit knowledge of how to design is transmitted to the student during the process. Simultaneously the instructor develops himself/herself during the dialogue. Rigorous research and its results would inevitably improve this learning process. However, the main argument of research by design is that this kind of research would also contribute to architectural knowledge. Therefore, research by design in the studio context would contribute to educational knowledge and architectural knowledge through its specific dynamics such as the conversation between the instructor and the student, or a controlled number of design inputs, or the situation in which several students of architecture are designing for the same problem in the same environment, etc.

Besides the common characteristics of a studio environment, there are specific characteristics of each studio based on the school, its tradition, the studio objectives, the backgrounds of instructors, etc. While investigating ways of research by design in architectural design studios, knowing processes should be profoundly understood in relation to the backgrounds of the actors in the studio. Even though the actual research by design experience may be limited to some exercises, knowledge generated through these design processes would contribute to the education of the students, the reformulation of the educational context, knowledge on architectural education, and eventually architectural knowledge.

CHAPTER 2

KNOWLEDGE, ARCHITECTURAL DESIGN AND RESEARCH

This chapter is a discussion of the relationship between knowledge and architectural design. It begins with an overview of the main questions of epistemology. Through a differentiation of "knowing-how" and "knowing-that," it focuses on knowing processes for understanding knowledge generation in architectural research. This is followed by an account of the relationship between thinking and making in architecture. This section discusses the conceptualization of knowing-how in architectural design. Finally, an overview of the established methods and approaches to architectural research is introduced to discuss the generation of theoretical knowledge (knowing-that) in architecture.

As its scope is not theories of knowledge in general, this study benefits from epistemology in order to clarify concepts in architectural knowledge. For this purpose, *The Blackwell Guide to Epistemology* edited by John Greco and Ernest Sosa, which provides a comprehensive summary of the main questions of epistemology and the nature of knowledge.[30] The three main questions of epistemology that Greco and Sosa distinguish in their "Introduction" seem to be relevant for investigating knowing processes in an act of architectural design. What is [architectural] knowledge, what can we know [through the act of design], and how do we know what we do know [in an act of design]?[31] Besides these questions, Linda Zagzebski's discussion of the traditional definition of knowledge as "justified true belief" in her chapter titled "What is Knowledge?" provides insights for a discussion of the nature of architectural

[30] John Greco and Ernest Sosa (eds.), *The Blackwell Guide to Epistemology* (Oxford: Blackwell Publishers Ltd., 1999).

[31] John Greco, "Introduction: What is Epistemology?," in *The Blackwell Guide to Epistemology*, ed. John Greco and Ernest Sosa (Oxford: Blackwell Publishers Ltd., 1999), 1.

knowledge.[32] Tracing backwards in search for the emergence of the definition of knowledge as justified true belief, Immanuel Kant's theory of judgment and Plato's *Theaetetus* are examined with a focus on the differentiation of knowing-that and knowing-how.[33] The discussion concerning "knowing through making" in architecture acquires depth with the introduction of different modes of knowing elucidated in the philosophical hermeneutics of Gadamer, focusing on the concepts of practical knowledge and *phronēsis* first developed in the *Nichomachean Ethics* by Aristotle.[34]

The differentiation between knowing-that and knowing-how is carried on to the domain of architecture in two levels: architectural know-how and theoretical knowledge in architecture.

Two different modes of conceptualization of knowing-how are reviewed after a brief account of what has been understood as knowing-how in architectural design, from Vitruvius to Durand. Le Corbusier's *Towards a New Architecture* of 1927 is discussed in terms of its author's production of knowledge through his own experience as an architect in a period of transformation in architectural practice prior to the establishment of academic research in architecture.[35] Koolhaas and Bruce Mau's *S, M, L, XL* of 1995, on the other hand, was written in the midst of an established tradition of academic research in architecture; therefore although it bears similarities to Le Corbusier's work in terms of its content and its impact, it is inevitably a different mode of documentation.[36] Through a review of these two documents, it is possible to discuss the relationship between thinking and architectural practice.

Architectural research as an academic form of research begins in the second half of the twentieth century. Theoretical knowledge on architecture as it is understood in the scope of this study is discussed through the evolution of the academic research tradition in

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[32] Linda Zagzebski, "What is Knowledge?" in *The Blackwell Guide to Epistemology*, ed. John Greco and Ernest Sosa (Oxford: Blackwell Publishers Ltd., 1999), 92-113.

[33] Robert Hanna, "Kant's Theory of Judgment," in Stanford Encyclopedia of Philosophy, first published in 28.07.2004, [Internet: WWW], ADDRESS: http://plato.stanford.edu/entries/kant-judgment/ [ACCESSED: 22 December 2006]; Myles Burnyeat, *The Theaetetus of Plato*, with a translation of Plato's Theaetetus by M. J. Levett, revised by Myles Burnyeat (Indianapolis, IN: Hackett Publishing Company, 1990).

[34] Aristotle, *The Nicomachean Ethics*, trans. J. A. K. Thomson (London: Penguin Books Ltd., 1976, first published in 1953); Aristotle, *The Nicomachean Ethics,* with an English trans. by H. Rackham (Cambridge, MA: Harvard University Press, 1994, first published in 1926).

[35] Le Corbusier, *Towards a New Achitecture*, trans. Frederick Etchells (New York, NY: Praeger Publishers, 1970, first published by London: Architectural Press, 1927).

[36] Rem Koolhaas and Bruce Mau, *S, M, L, XL* (New York, NY: The Monacelli Press, 1998, first published in 1995).

architecture. The main research strategies in architectural research are discussed through an overview of Groat and Wang's reference book *Architectural Research Methods*.[37]

2.1 Knowing

Architecture became an established academic field with the institutionalization of architectural research. However, there is a species of knowledge that is not fully integrated with the established system of research in the discipline. Knowledge generated through the acts of architectural design, which is crucial for architectural practice, is mostly developed outside institutional research, without benefiting from the theoretical and methodological tools that academic research might offer.

In order to discuss the integration of knowledge generated through design into the established knowledge system of architectural research, the nature of this species of knowledge should be investigated and defined in relation to the existing knowledge system. Epistemological definitions that are provided by various theories of knowledge provide a starting point for such an investigation. The discussion is limited to the nature of architectural knowledge in general and knowledge generated through design in particular, therefore, the focus is on the definition of knowledge within this context.

2.1.1 Knowing-that and Knowing-how

Greco, in his "Introduction: What is Epistemology?," the introductory chapter for *The Blackwell Guide to Epistemology*, states that epistemological investigation rests on two main questions: "what is knowledge?" and "what can we know?" On the condition of accepting the possibility of knowing something, a third and probably the crucial question for this study arises: "how do we know what we do know?"[38]

According to Greco, the history of epistemology revolves around these questions.[39] For the purposes of this study, these questions deserve to be reconsidered in relation to architectural knowledge, through a simple answer to these questions, an answer that divides knowledge into direct and indirect forms.[40]

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[37] Groat and Wang, *Architectural Research Methods*, 2002.

[38] Greco, 1999, 1.

[39] Ibid, 1-2.

[40] The terminology of "direct" and "indirect" is borrowed from Zagzebski, 1999, 92.

Linda Zagzebski, in her article titled "What is Knowledge?" in *The Blackwell Guide to Epistemology*, argues that knowledge is a "state in which a person is in cognitive contact with reality. It is therefore a relation." She defines this relationship through "directness" where the form of knowledge is "direct" when we speak about "knowledge of things," and "indirect" when we speak of "knowledge about things." The former is defined by Zagzebski as "knowledge by acquaintance," while the latter is defined as "propositional knowledge." A direct form of knowledge is based on "experiential contact with the portion of reality known" whereas an indirect form of knowledge is based on "a true proposition about the world."[41] She clarifies this through an exemplary statement:

> Knowing Roger is an example of knowledge by acquaintance, while knowing *that* Roger is a philosopher is an example of propositional knowledge.[42]

This differentiation of direct and indirect forms of knowledge is related with all of the three main questions of epistemology as these forms affect the nature of knowledge, the nature of things that can be known, and the nature of the process of knowing. Although the emphasis may vary, it constitutes a significant part in the history of epistemology. Sometimes, philosophers treat these two forms of knowledge as equals; sometimes they try to "reduce one of these forms of knowledge to the other."[43]

The discussion on the direct and indirect forms of knowledge constitutes the basic epistemological question that this study rests on. In order to investigate the possibility of generating knowledge through design processes in an established system of academic research, it is crucial to discuss the position of design process, which is "experiential contact with reality," in relation to the academic research tradition, which is based on "true propositions about the world."

When a practical process is concerned, this duality between direct and indirect forms of knowing is closely related to the duality between *knowing-how* and *knowing-that*. In architecture, knowing-how is the direct form of knowing *of* design, construction, documentation, education, etc. Knowing-that is the indirect form of knowing where a true proposition *about* architecture is generated through reflection on the subject matter.

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[41] Ibid.

[42] Ibid.

[43] Ibid, 113 (endnote 1).

The literature concerning research by design benefits from Gilbert Ryle's differentiation of "knowing-that" and "knowing-how" in his *The Concept of Mind* of 1949.[44] Because of the smooth, daily language of the book, Ryle's differentiation is borrowed by the authors in other disciplines such as design and architecture. His account is one of the earliest and most insightful investigations in modern philosophy to reflect on the significance of knowing-how besides knowing-that. According to him,

> Theorists have been so preoccupied with the task of investigating the nature, the source and the credentials of the theories that we adopt that they have for the most part ignored the question what it is for someone to know how to perform tasks.[45]

Ryle argues that it is not enough to explain the process of acting well just by knowing the necessary information about the materials used, methods and procedures of an act. There is another form of knowing that is required to perform the task. He defines this latter form of knowing as "knowing-how" and states that it is not possible to develop propositions on this form of knowing or to share it.

> … we never speak of a person believing or opining *how*, and though it is proper to ask for the grounds or reasons for someone's acceptance of a proposition, this question cannot be asked of someone's skill at cards or prudence in investments.[46]

There are many examples of activities that involve degrees of knowing-how such as biking, swimming, plumbing, teaching, or designing etc. For example, a swimmer may explain the necessary conditions for swimming such as the principles of floating, or the movements of the body parts in order to move in the water, however, s/he would be in great difficulty in explaining how actually swimming occurs. This is the case in every human act of performing a task. In every intellectual act, there exist forms of knowing-how to accomplish the task at hand, whether it is a scientific inquiry, or it is a practical daily task.

Knowing-that (or indirect knowing, or propositional knowledge) is referred to as *theoretical knowledge* and it is the form of knowledge generated and documented through systematic research. Knowing-how (or direct knowing, or knowledge by acquaintance), on the other hand, is referred to as *practical knowledge* and it is generated through the practical processes of

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[44] Gilbert Ryle, "Knowing How and Knowing That," in *The Concept of Mind* (London: Hutchinson & Co. Ltd, 1969, first published in 1949), 25-61.

[45] Ibid, 28.

[46] Ibid.

the individuals and mostly remain undocumented. Knowledge by acquaintance does not denote only a familiarity with a practice; instead it is formed through reflection on this familiarity. Although it may be argued that generation of theoretical knowledge involves degrees of practical knowledge in terms of intuitional assumptions and procedures, and generation of practical knowledge involves degrees of theoretical knowledge in terms of having reliable facts to build upon, this differentiation of knowing-that and knowing-how is still valid on a higher level, which focuses on two distinct forms of knowledge generation.

Many philosophers dealing with epistemology focus on the indirect form of knowing-that since it is propositional knowledge that can be shared, transmitted and discussed. Although there are several definitions of propositional knowledge, its definition as "justified true belief" has been widely accepted since the Enlightenment and the advent of scientific thought.[47] The theory of knowledge as justified true belief is the dominant theory of knowledge in academic research tradition based on knowing-that. Prior to an attempt to integrate knowing-how within the architectural research, this definition of knowledge should be understood.

2.1.2 Knowledge as Justified True Belief

Although there are some objections questioning the sufficiency of justified true belief for the definition of knowledge since 1960s, this theory is widely accepted as the most plausible explanation for the nature of propositional knowledge.[48] According to this theory, to put it simply, knowledge requires three conditions of truth, belief, and justification. Firstly, if a proposition is not true, it cannot be known; secondly, if the knowing subject does not believe in a proposition, that proposition cannot be a proposition that s/he knows; and finally, in order to free this belief of the knowing subject from being merely accidental, there is a need of justification of the belief.[49]

The definition of the nature of knowledge as justified true belief is linked with scientific knowing in the Enlightenment. As scientific thought has become dominant in academic research, the definition of knowledge as justified true belief has turned out to be a dominant

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[47] Matthias Steup, "Epistemology," in Stanford Encyclopedia of Philosophy, first published in 14.12.2005, [Internet: WWW], ADDRESS: http://plato.stanford.edu/entries/epistemology/ [ACCESSED: 18 October 2007]; epistemology. Encyclopedia Britannica. 2006. *Encyclopedia Britannica Online,* [Internet: WWW], ADDRESS: http://www.britannica.com/eb/article-9106052/epistemology [ACCESSED: 20 October 2006].

[48] The most notable objection is called "Gettier counter-examples" first published in Edmund L. Gettier, "Is Justified True Belief Knowledge?" *Analysis* 23 (1963): 121-123.

[49] Steup, 2005.

theme in epistemology. In this sense, Kant's ideas on the relationship of justified true belief and scientific knowing are exemplary.

Robert Hanna, in his article "Kant's Theory of Judgment," summarizes Kant's ideas on the notion of justified true belief and scientific knowing:

> … truth is the agreement or correspondence of a judgment with its object, i.e., the actual existence of that which is precisely specified by the total propositional form-and-content of the judgment. Justified true belief, in turn, is "scientific knowing" (*Wissen*) (A820-822/B848-850) (9: 65-72), which connects epistemology in Kant's sense directly with his conception of a "science" (*Wissenschaft*) as a systematically unified body of cognitions based on *a priori* principles (A832-836/B860-864). … Kant holds that a belief constitutes scientific knowing if and only if the judgment underlying that belief is not only subjectively sufficient for believing but is also objectively sufficient for believing, and coherent with a suitably wide set of other beliefs (A60/B85), and *also* true, although it still remains fallible. … So for Kant a judgment counts as scientific knowing if and only if (1) the self-evident or clear-and-distinct character of the propositional content of that judgment necessitates the cognizer's belief in that proposition, (2) the belief is coherent with a suitably wide set of other beliefs, and (3) that proposition is also true.[50]

Kant relates justified true belief with the concepts of objectivity and fallibility, which are the two main notions of scientific thought. Moreover, he emphasizes the role of a sufficiently wide set of beliefs in which the justification for a belief can be situated. Through these statements Kant associates justified true belief, which is a largely accepted definition of knowledge, with scientific thought and method. Being one of the pioneers of the Enlightenment thought, Kant's ideas indicate how propositional knowledge together with scientific method became the dominant epistemology of the academic research tradition.

Two thousand years before Kant, the definition of knowledge as justified true belief was firstly suggested by Plato in his dialogue titled *Theaetetus* and it has preserved its significance through the centuries to this age. The significance of it lies in its thorough discussion on the nature of knowledge. Its threefold definition of truth, belief, and justification characterize the form of (indirect) propositional knowledge.

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[50] Hanna, 2004.

Plato's *Theaetetus* is a dialogue between Socrates and the young Theaetetus. Socrates, as in all dialogues of Plato, paves the way for Theaetetus to contemplate on the nature of knowledge through his questions and comments. In this endeavor, Theaetetus firstly comes up with the idea that knowledge is "perception," then he thinks that knowledge is "true judgment," and his third idea on knowledge is that it is "true judgment with an account."[51] In every attempt, Socrates questions Theaetetus' ideas and urges him to find a better definition. In the end, the third answer that Theaetetus provides is undoubtedly the most profound one; however, Plato leaves this dialogue as open ended with doubts on this final explanation. Since then, philosophers began from where Plato left off and constructed their arguments for the definition of propositional knowledge on the third answer of Theaetetus. "True judgment with an account" is the foundation of the dominant definition of knowledge as justified true belief.

Although Plato did not differentiate between direct and indirect forms of knowing, his ideas on the nature of knowledge contributed to the various definitions of indirect knowing throughout the history of epistemology. His successor Aristotle introduced a division of intellectual virtues in order to explain different forms of knowing. Aristotle's ideas constitute the basis for a practical philosophy that investigates direct forms of knowing besides indirect forms of knowing.

2.1.3 Practical Philosophy

Gadamer is one of the significant figures of the twentieth century continental philosophy with his elaboration on philosophical hermeneutics. Hermeneutics is understood as the science or art of understanding and interpreting texts. Building on the work of Heidegger, Gadamer goes beyond the notion of hermeneutics as a methodology for understanding texts. According to Richard Bernstein, for both Heidegger and Gadamer, "understanding is a primordial mode of being in the world".[52] As Gadamer put it in the introduction of *Truth and Method*, which was published in 1960:

> The understanding and the interpretation of texts is not merely a concern of science, but obviously belongs to human experience of the world in general. The

[51] Myles Burnyeat, "Introduction," in Myles Burnyeat, *The Theaetetus of Plato*, with a translation of Plato's Theaetetus by M. J. Levett, revised by Myles Burnyeat (Indianapolis, IN: Hackett Publishing Company, 1990), 2.

[52] Richard J. Bernstein, *Beyond Objectivism and Relativism: Science, Hermeneutics, and Praxis* (Philadelphia: University of Pennsylvania Press, 1983), 34.

> hermeneutic phenomenon is basically not a problem of method at all. It is not concerned with a method of understanding by means of which texts are subjected to scientific investigation like all other objects of experience. It is not concerned primarily with amassing verified knowledge, such as would satisfy the methodological ideal of science – yet it too is concerned with knowledge and with truth.[53]

Gadamer begins his investigation with "a critique of aesthetic consciousness" through an analysis of the experience of art. With this critique he relates hermeneutics to "the totality of our experience of world".[54] For defending "the experience of truth that comes to us through the work of art against the aesthetic theory that lets itself be restricted to a scientific conception of truth," it becomes necessary to inquire into an understanding of the whole of our experience in the world.[55] Gadamer's hermeneutics emerges as a framework for such an understanding, which resists to "the universal claim of scientific method."[56]

At this point, it is crucial to introduce the difference between the Anglo-American and the German points of view on the nature of social sciences as it is pointed out by Bernstein. In the Anglo-American tradition, disciplines are categorized in three groups; which are natural sciences, social sciences, and humanities. However, in the German tradition, disciplines are grouped as "Naturwissenschaften" (natural sciences) and "Geisteswissenschaften" (humanities or moral sciences).[57] The main difference is in the conception of social sciences. According to Bernstein,

> In the main tradition of Anglo-American thought – at least until recently – the overwhelming bias has been to think of the social sciences as *natural sciences* concerning individuals in their social relations. The assumption has been that the social sciences differ in a degree and not in kind from the natural sciences and that ideally the methods and standards appropriate to the natural sciences can be extended by analogy to the social sciences. But in the German tradition there has

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[53] Hans-Georg Gadamer, *Truth and Method*, trans. by William Glen-Doepel, trans. revised by Joel Weinsheimer and Donald G. Marshall from *Wahrheit und Methode* (London: Continuum Books, 2006, first published in 1975), xx.

[54] Ibid, xxii.

[55] Ibid.

[56] Ibid, xxi. By "scientific method," Gadamer refers to the positivistic understanding of science.

[57] Bernstein, 1983, 35.

> been a much greater tendency to think of the social disciplines as forms of *Geisteswissenschaften* sharing essential characteristics with the humanistic disciplines.[58]

This difference in the perception of intellectual disciplines between Anglo-American and continental thought, which Bernstein points out, is a consequence of the acceptance of different forms of knowing in the continent. According to Bernstein's argument, Anglo-American thought is constructed on a single form of knowing, which is the objective, scientific, theoretical, indirect knowing appropriate for the natural sciences. Whereas, continental thought, particularly the German tradition, acknowledges different forms of knowing for different subjects.

This cultural difference is also evident in the usage of the verb "to know" in English and in continental languages such as German and French. Harry Hillman Chartrand provides an extensive investigation in the meanings and etymology of the verb in his PhD dissertation titled *Ideological Evolution: The Competitiveness of Nations in a Global Knowledge-Based Economy*.[59] For the purposes of this study, Chartrand's investigation is significant for his comparison of the inclusive English verb "to know" with some verbs in German or French. Different verbs in German and French express some particular meanings covered by "to know" in English. Two common usages of the verb "to know" are expressed by two different verbs in German and in French. Knowing may refer to "knowing by the mind" and is actually rooted in the old English "wit." This meaning is expressed by "wissen" in German and by "savoir" in French. Another common usage may refer to "being acquainted with" and it is expressed by "kennen" in German and "connaitre" in French.[60] This second usage is used for denoting knowing a person or having learned or acquainted an activity. Used with the meaning of "to know" as "to be acquainted with," the verb has similar connotations with the meaning of the verb "can." Actually the verb "can" has the same roots with "to know" – the old English *cnáw*. There is a knowing inherent in the ability of doing or making something, in the sense that learning ability or attaining the knowledge of ability.[61] However, although this meaning of "to know" continued to be expressed in different verbs in German and in French, it is

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[58] Ibid.

[59] Harry Hillman Chartrand, "Ideological Evolution: The Competitiveness of Nations in a Global Knowledge-Based Economy" (PhD diss., University of Saskatchewan, 2006); also published as Harry Hillman Chartrand, *The Competitiveness of Nations in a Global Knowledge-Based Economy – Ideological Evolution* (VDM Verlag Dr Muller, 2007).

[60] Chartrand, 2006, 122.

[61] Ibid, 121.

absorbed in "to know" in English and only in the mid nineteenth century the verb has been altered with a suffix to be transformed into "know-how" in order to denote "technical expertise."[62]

Having one verb in English to denote all forms of knowing when combined with the domination of the indirect form of theoretical knowing with the definition of justified true belief in the investigation of the nature of knowing seems to be one of the significant causes why Anglo-American thought has developed with a preference in the methods and approaches of natural sciences for attaining the truth. However, it may be argued that, having different verbs for different forms of knowing, continental thought has preserved an approach that is open to alternative ways of attaining truth. With the verb "kennen," doing and knowing are considered as integral to each other in German thought. The noun "Erkenntnis" that was derived from the verb "kennen" is very crucial because this noun refers to knowledge, cognition, perception, and realization. Therefore, the work of Gadamer with his emphasis on "application" in philosophical hermeneutics becomes a cornerstone in any discussion on practical knowledge or knowing by doing.

Bernstein argues that the three moments of the hermeneutic approach, understanding, interpretation, and application, which were distinguished in earlier tradition of hermeneutics, are not essentially separated in Gadamer's account of hermeneutics. He states that, for Gadamer, "every act of understanding involves interpretation, and all interpretation involves application."[63] Gadamer explains the significance of application in the process of understanding through Aristotle's analysis of *phronēsis* (prudence or practical wisdom). Bernstein argues that Gadamer's aim is not to propose a return to Aristotle. Gadamer discusses Aristotle's practical philosophy to benefit from his "insights about practical reason" and to situate hermeneutics as "the heir of this tradition of practical philosophy."[64]

Practice, for Gadamer, has been misinterpreted in the last two centuries. It has been understood as utilization of scientific knowledge for the accomplishment of particular tasks. He states that, "in all debates of the last century practice was understood as application of

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[62] Online Etymology Dictionary, November 2001, s.v. "know." [Internet: WWW], ADDRESS: http://www.etymonline.com/index.php?search=design&searchmode=none [ACCESSED: 3 November, 2006].

[63] Bernstein, 1983, 38.

[64] Ibid, 39-40.

science to technical tasks."[65] For Gadamer, "application or appropriation in the act of understanding" is essential for our being in the world. This approach to knowing places action or practice to a primary level instead of considering them as application of theoretical knowledge.

Gadamer refers to Aristotle's ethical concept of *phronēsis* (prudence, practical wisdom, or moral practical knowledge) in order to elaborate on the significance of application in hermeneutics, and eventually in social sciences.

> Obviously this is not what we mean by knowing in the realm of science. Thus the distinction that Aristotle makes between moral knowledge (phronesis) and theoretical knowledge (episteme) is a simple one, especially when we remember that science, for the Greeks, is represented by the model of mathematics, a knowledge of what is unchangeable, a knowledge that depends on proof and that can therefore be learned by anybody. A hermeneutics of the human sciences certainly has nothing to learn from mathematical as distinguished from moral knowledge. The human sciences stand closer to moral knowledge than to that kind of "theoretical" knowledge. They are "moral sciences." Their object is man and what he knows of himself. But he knows himself as an acting being, and this kind of knowledge of himself does not seek to establish what is. An active being, rather, is concerned with what is not always the same but can also be different. In it he can discover the point at which he has to act. The purpose of his knowledge is to govern his action.[66]

The relevance of Aristotle's moral knowledge is discussed in three points in *Truth and Method*. Firstly, Gadamer discusses *phronēsis* in relation to Aristotle's concept of *technē* (technical skill) and introduces differences between them in terms of attitude. While a craftsman having technical skill is primarily aiming to produce what s/he is making, a person who is aiming to act right in the conditions of a specific situation does this with his moral knowledge. Gadamer argues that moral knowledge cannot be attained like technical skill but it is attained in a particular situation in which the person is acting with moral consciousness.[67] Secondly, he discusses the relationship between means and ends in relation to the distinction moral knowledge and technical skill. While technical skill requires particular means to achieve a particular end, moral knowledge is concerned with the personal deliberation on the means

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[65] Ibid, 39, quoting Hans-Georg Gadamer, "Hermeneutics and Social Science," *Cultural Hermeneutics* 2 (1975), 312.

[66] Gadamer, 2006, 312.

[67] Ibid, 315-318.

and the end. Similar to what he argues in the previous point, "moral knowledge can never be knowable in advance in the manner of knowledge that can be taught." It is attained with the application, with act itself.[68] In the third point, Gadamer discusses the relationship of moral knowledge and understanding. According to him, with reference to Aristotle, "beside phronesis, the virtue of thoughtful reflection, stands understanding." Moreover, "understanding is a modification of the virtue of moral knowledge." The person who is in the process of understanding a particular situation is not "apart" from the situation, he cannot remain "unaffected" by it.[69]

With this discussion, Gadamer transfers Aristotle's discussion of virtues in his ethical treatise, the *Nicomachean Ethics*, to the realm of philosophical hermeneutics. He claims that Aristotle's analysis offers in fact "a model of the problems in hermeneutics."[70] In doing so, Gadamer relates the roots of practical philosophy to Aristotle. In order to apprehend Gadamer's interpretation of Aristotle's ethical treatise and his application of these ideas into hermeneutics, the original ideas of Aristotle should be outlined.

The sixth book of Aristotle's *Nicomachean Ethics* is devoted to "the intellectual virtues," which, together with "virtues of the character," constitutes the "virtues of the soul."[71] Aristotle classifies five intellectual virtues; "Art or technical skill (*technē*), Scientific Knowledge (*epistēmē*), Prudence (*phronēsis*), Wisdom (*sophia*), and Intelligence (*nous*)" that are related either to our Scientific or Calculative faculty.[72] Scientific Faculty deals with invariables, whereas Calculative Faculty deals with variables, as it is a deliberation. Scientific knowledge is the knowledge of invariables, of the objects that exist of necessity, resting on the first principles; it is theoretical knowledge. Art is the knowledge of "making," bringing something to existence; it is technical knowledge. Prudence is the knowledge of "doing," choosing the right means for action (*prāxis*). Intelligence is the quality that enables us to derive the first principles that can never be reached by Science. Finally, Wisdom is a "combination of Intelligence and Scientific Knowledge," it is the most superior mode of knowledge.[73]

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[68] Ibid, 318-319.

[69] Ibid, 319-320.

[70] Ibid, 320-321.

[71] Aristotle, 1994, 327.

[72] Ibid, 331-333. The interpretation of Aristotle's text is a result of a cross reading of Rackham's translation with Thomson's translation.

[73] Aristotle, 1994, 333-343.

Within this classification Aristotle introduces a specific kind of knowledge for the apprehension of human actions. Prudence or Practical Wisdom is a species of knowledge that cannot be attained through scientific, artistic, or speculative virtues of the human mind; it has its own realm. Prudence is certainly the knowledge of variables that are closely related with *choices*. The difference between making and doing, together with the significance of choices in human actions are the main concepts related with Prudence.

Aristotle proposes a very clear distinction between making and doing. For him, there are *things made* and *actions done*. The aim of making is to produce the end product while the aim of doing is the act of doing itself. The aim in doing is undoubtedly doing well. Doing well begins with the cause of the action, which is defined as *choice* by Aristotle. "The cause of choice is desire and reasoning directed to some end."[74] Practical thinking, according to Aristotle, is "the attainment of truth in regard to action" and "the attainment of truth corresponding to right desire."[75]

This classification of intellectual virtues by Aristotle is remarkable because of his introduction of different modes of knowing other than propositional knowledge. If Plato's definition of justified true belief is related with what Aristotle calls Scientific Knowledge (*epistēmē*), then it is not referring to other virtues such as Technical Skill (*technē*) and Prudence (*phronēsis*). By introducing Prudence or Practical Wisdom, and defining it as the governing virtue of human actions, Aristotle lays the foundations of practical philosophy, which emphasizes the role of knowing-how besides knowing-that. Although the majority of the philosophers in the history of epistemology deals with the problems of propositional knowledge, there exists a tradition – of which Aristotle marks the beginning – that investigates the nature of knowing-how. This tradition of practical philosophy inspired the work of Gadamer in his elucidation of understanding, the methodology of action research, Polanyi's epistemology of tacit knowledge, and Schön's conceptualization of reflective practice in the twentieth century. With its framework based on knowing-how generated through human actions, "research by design" can only be defined in relation to practical philosophy and can be explained through reconciliation with the established academic research tradition based on propositional knowledge.

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[74] Ibid, 329.

[75] Ibid.

2.2 Architectural Thinking

It can be argued that architectural knowledge has been transmitted via the relationship between masters and apprentices accompanied with the study of existing buildings until the establishment of modern institutions of architectural education. The written treatises can be considered as compilations of their authors' knowledge gained through the methods stated above. Vitruvius' *De architectura* (The Ten Books on Architecture) of the first century BC and Leon Battista Alberti's *De re aedificatoria* (Ten Books on Architecture) of ca. 1450, which is built upon the Vitruvian treatise, are the two main texts of reference for architectural knowledge in the western tradition until the establishment of institutions such as École des Beaux-Arts and École Polytechnique in the late eighteenth and early nineteenth centuries. With the emergence of such institutions, theoretical work began to be varied, focusing on various subjects, such as Jacques-Francois Blondel's *Cours d'architecture* (Architecture Course) which was completed in 1777 and Jean-Nicholas-Louis Durand's *Precis des lecons d'architecture données à l'ecole polythechnique* (Precis of the Lectures on Architecture) of 1805. On the other hand, practicing architects began to publish their ideas based on their practice. Claude Nicholas Ledoux's *L'Architecture considérée sous le rapport de l'art, des mœurs et de la legislation* (Architecture Considered with respect to Art, Customs, and Legislation) of 1804 and Eugene-Emmanuel Viollet-Le-Duc's *Entretiens sur l'architecture* (Discourses on Architecture) of 1872 are two early examples of such publications.

As architectural education and architectural research became established through the twentieth century, academic publications began to be specialized in particular subjects related with architecture such as history, theory, criticism, building technologies, or architectural education. In the mid-twentieth century, first PhD dissertations on architecture began to emerge and architectural research has been established as an academic research area.

In the twentieth century, also the practicing architects published extensively in order to share their ideas on architecture through their projects, following the path of Ledoux and Viollet-le-Duc. Being situated outside the institutional research, even if they utilize knowledge and methods of academic research, the foundations for their discussions are mostly based on their own knowledge of making architecture. Because of this motivation, although their work can be considered influential in architectural knowledge, these texts cannot be considered as a documentation of knowing-that. These are attempts of conceptualization of their authors' knowing-how.

Among these publishing architects, two of them are exemplary for the purposes of this study; Le Corbusier and Koolhaas. Their most influential books deserve to be analyzed with a focus on their reflection on their own way of making architecture. Le Corbusier's *Towards a New Architecture* of 1927[76] and Koolhaas and Mau's *S, M, L, XL* of 1995[77] demonstrate two different modes of documentation of know-how in two different periods of the twentieth century. The selection of these architects and their books is not related with the quality of their architecture. Both of them can be accepted as influential among the architectural discourse of the period in which they were written. However, neither of them is the product of a scholarly research of any kind. These books are chosen in order to exemplify different attitudes in documentation of knowing-how, and they require an investigation focusing on their authors' attempts to conceptualize their design processes.

Le Corbusier's *Towards a New Architecture* is a manifestation of his ideal on the transformation of architectural production, whereas Koolhaas and Mau's *S, M, L, XL* manifests Koolhaas' conceptual framework that he constructs through his projects in a certain period of his career.

Le Corbusier's influence in modern architecture cannot be related only to his building production. His intellectual production includes all forms of communication for the emanation of his ideas. His discursive book, *Towards a New Architecture*, stands as one of the most significant agents of the coherent body of intellectual and built work of Le Corbusier. The book, which was published in 1923 under its original title *Vers une architecture*, is a collection of essays that Le Corbusier wrote in the journal *L'Esprit Nouveau* in late 1910s and early 1920s. The essays are organized in order to form a coherent argument that is concluded with his idea of "architecture or revolution" – a proposition for the changing state of architecture.

The ideas that Le Corbusier discusses are not proposed in his writings for the first time. These ideas on the changing world and transformation of architecture as a response to these changes were being discussed for at least a century prior to Le Corbusier. Recently, Gürhan Tümer, in his article titled "Öncü Le Corbusier'nin Öncüleri (The Forerunners of Le

[76] Le Corbusier, 1970.

[77] Koolhaas and Mau, 1995.

Corbusier, the Pioneer),"[78] discusses the precursors of the ideas that Le Corbusier brilliantly formulates in *Towards a New Architecture*, mostly referring to Peter Collins' *Changing Ideals in Modern Architecture* and Michel Ragon's *Historie de l'architecture et de l'urbanisme moderns* besides his own analysis with respect to topics such as "the definition of architecture," "pilotis," "liners, airplanes and buildings," or "biological analogy." While constructing similarities between Le Corbusier's ideas and the ideas of architects from the eighteenth and nineteenth centuries such as Viollet-le-Duc and August Perret, Tümer concludes by arguing that "Le Corbusier transformed sparks of ideas that were developed by others into a flaming fire."[79]

Therefore, it can be stated that the impact of *Towards a New Architecture* is not simply resulting from the freshness of the ideas inherent in it. Le Corbusier's virtuosity lies in his creativity in bringing together ideas that were developed prior to his time, relating them with each other and blending them with his own ideas related to architecture. The key instrument he utilizes in this process is his own architecture, his buildings. In achieving this, Le Corbusier thinks architecturally in order to argue for a new architecture in a changing society. Ideas that he proposes are supported by images from his projects with detailed explanatory captions. This way of developing an argument inevitably creates a notable impact on his colleagues as he is conceptualizing important ideas in a form of communication that is specific to the discipline of architecture. Le Corbusier's captions for the images of his own projects are crucial for the development of an idea besides the main body of text. Thus, it is necessary to exemplify some of the captions and examine them. The captions that he provides for images of buildings from history, engineering structures, automobiles, airplanes, or liners also present his unique way of observation and analysis, therefore, he thinks architecturally not only in the design processes but also in his daily observations.

One of the captions explains the plan of the Acropolis in Athens. Le Corbusier states that:

> The apparent lack of order in the plan could only deceive the unlearned. The balance of the parts is in no way a paltry one. It is determined by the famous landscape which stretches from the Piraeus to Mount Pentelicus. The scheme was designed to be seen from a distance: the axes follow the valley and the false right angles are contrived with the skill of a first-rate stage manager. The Acropolis set on its rock

[78] Gürhan Tümer, "Öncü Le Corbusier'nin Öncüleri (The Pioneers of Le Corbusier, the Pioneer)," *Arredamento Mimarlık* 207 (November 2007): 111-115.

[79] Ibid, 115.

and on its sustaining walls, seen from afar appears as one solid block. The buildings are massed together in accordance with the incidence of their varying plans.[80]

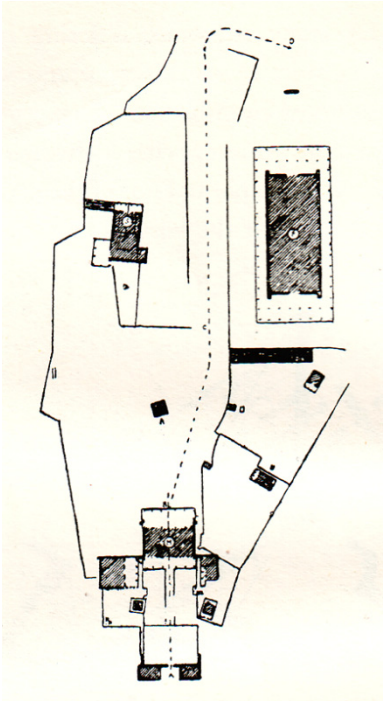

Figure 2.1. The Acropolis, Athens. In Le Corbusier, trans. Frederick Etchells, *Towards a New Architecture* (New York, NY: Praeger Publishers, 1970, first published London: Architectural Press, 1927), 50.

The image with the caption above is placed under the subtitle "Plan" in the chapter titled "Three Reminders to Architects." This observation of the site plan of the Acropolis not only supports the main text, but it becomes an essential element for the development of Le Corbusier's idea of "plan as the generator." His architectural way of observation and interpretation differs from a historical approach; he tries to understand the design principles of the building complex. Besides the architectural precedents, the captions for the images of industrial objects such as liners, airplanes and automobiles are also written in a similar mode revealing the design principles that governed the emergence of such objects. This mode of interpretation stands as the basis of Le Corbusier's proposals for architectural design in the context of the early twentieth century.

In the same manner, the captions for the images of Le Corbusier's own projects reveal his self-reflective attitude for the construction of an argument that manifests the emergence of a

[80] Le Corbusier, 1970, 50.

new architecture. The caption defining the properties of mass-production artisans' dwellings that he designed in collaboration with Pierre Jeanneret in 1924 is exemplary to Le Corbusier's attitude of manifesting an idea through tangible elements of his architectural projects.

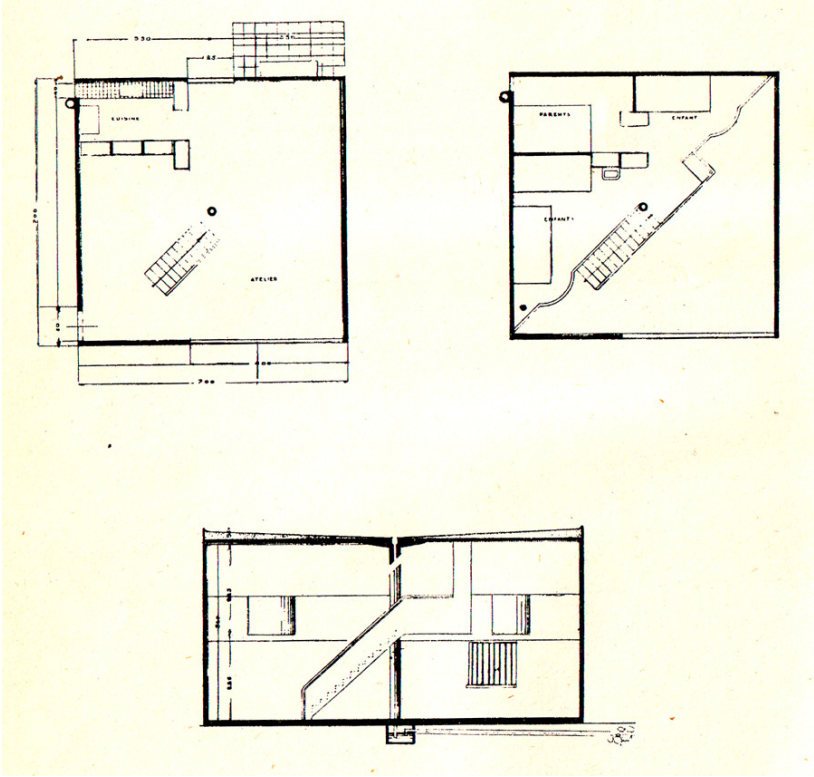

Figure 2.2. Floor plans and section of Mass-production Artisans' Dwellings designed by Le Corbusier and Pierre Jeanneret in 1924. In Le Corbusier, trans. Frederick Etchells, *Towards a New Architecture* (New York, NY: Praeger Publishers, 1970, first published London: Architectural Press, 1927), 236.

> The problem was that of housing artisans in a large and well-lit workshop; of lowering costs by the elimination as far as possible of partitions and doors, and by the reduction in the normal wall surfaces and heights of rooms – this by a little architectural management. The houses are built round a single hollow column of reinforced concrete. The walls are of compressed straw sheets (which have good insulating properties) rendered on the outside by 1½" [~4 cm] cement rendering thrown under pressure by a "cement-gun," and plastered inside. There are only two doors to a house. The loft or upper floor, on the diagonal, allows the ceiling to be developed to its full extent (21 feet X 21 feet) [~640 cm X ~640 cm]; the walls also are displayed to their full dimensions, and, moreover, the use of the diagonal creates

an *unexpected* dimension: this little house, 21 feet square [~41 m^2], gives along the diagonal the effect of a dimension of 30 feet [~915 cm] in length.[81]

Captions such as the one above serve as an integral part of the main text in which Le Corbusier promotes an alternative way of approaching to architecture in relation to the conditions of the economic, social and technological transformations. These captions are not merely identifying a project, but they act as the architectural counterpart of the main argument. In the exemplary text above, Le Corbusier begins by defining the problem at hand. The lack of problem definition in architecture when compared to products of engineering is a continuing theme throughout *Towards a New Architecture*. Then he continues by stating the architectural solutions that he proposes for the solution of the problems of mass-produced artisans' dwellings. These proposed solutions are both in terms of design and construction. When he states that the space is organized diagonally in a square, he relates this decision with the need for spaciousness that he defined in the problem in the beginning. Similarly, technical details such as hollow reinforced concrete column and the materials used in the walls are carefully thought and chosen in relation with the problem of lowering the costs in order to reach the goal of mass-producing the proposed artisans' dwellings.

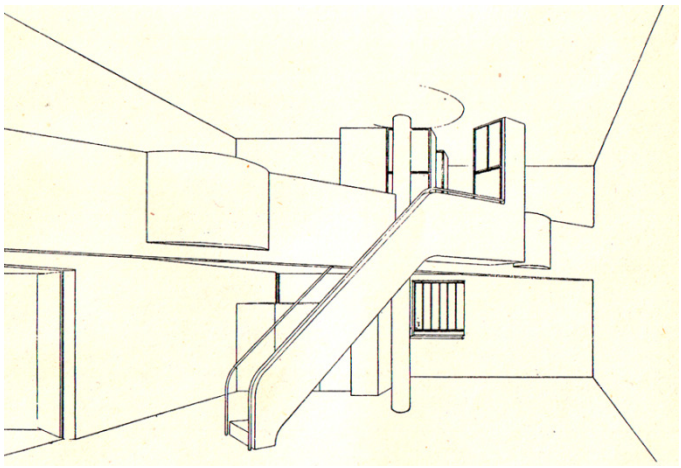

Figure 2.3. Interior perspective view of Mass-production Artisans' Dwellings designed by Le Corbusier and Pierre Jeanneret in 1924. In Le Corbusier, trans. Frederick Etchells, *Towards a New Architecture* (New York, NY: Praeger Publishers, 1970, first published London: Architectural Press, 1927), 237.

Le Corbusier might have been inspired by the ideas that are being discussed for decades while planning the outline of his intellectual masterpiece. However, he constructs the whole argument around his own observations and his own projects. He shares his own way of

[81] Ibid, 237.

designing in order to show that it is possible to design buildings in an alternative way which is in coherence with the new developments. He delineates an architectural ideal through his self reflection on his own architecture.

Almost sixty years after the first publication of Le Corbusier's *Towards a New Architecture*, another text, which eventually became similarly influential on architectural practice, was published in 1995. Koolhaas and Mau's *S, M, L, XL* is a massive 1345 page book about the state of architecture at the end of the twentieth century. It is composed of Koolhaas' writings on various subjects related with architecture and projects by Koolhaas' office, the Office for Metropolitan Architecture (OMA). Mau is responsible for the design of the book. While Koolhaas undertakes the content of the book, Mau deals with the form of it. Therefore, in this study, while referring to the texts and projects in the book Koolhaas is referred as the author.

In contrast to *Towards a New Architecture*, *S, M, L, XL* is not a coherent argument on an idea; rather, it is a collection of architectural projects from a particular practice and concepts related to these projects. The only theme for organizing the projects and texts is scale, namely *Small, Medium, Large, Extra Large*. This is an appropriate approach when Koolhaas' ideas on the condition of architecture in the late twentieth century are considered.

> Ostensibly involved in "shaping" the world, for their thoughts to be mobilized architects depend on the provocations of others – clients, individual or institutional. Therefore, incoherence, or more precisely, randomness, is the underlying structure of all architects' careers: they are confronted with an arbitrary sequence of demands, with parameters they did not establish, in countries they hardly know, about issues they are only dimly aware of, expected to deal with problems that have proved intractable to brains vastly superior to their own. Architecture is by definition a *chaotic adventure.*
>
> Coherence imposed on an architect's work is either cosmetic or the result of self-censorship. S, M, L, XL organizes architectural material according to size; there is no connective tissue. Writings are embedded between projects not as cement but as autonomous episodes. Contradictions are not avoided. The book can be read in any way.[82]

[82] Koolhaas and Mau, 1998, xix.

S, M, L, XL contains texts in which Koolhaas presents his ideas concerning several issues concerning "the condition of architecture" in the day it was written.[83] Especially in the articles "Bigness, or the problem of Large," and "The Generic City" he creatively defines two significant urban conditions which are characteristic in contemporary urban environment.[84] The concepts of "bigness" and "generic city" are discussed with primary reference to Koolhaas since the publication of *S, M, L, XL*.

The majority of the book is composed of projects undertaken by OMA between 1972 and 1994. For the purposes of this study, Koolhaas' contemplations on his own projects deserve investigation rather than his articles that are exemplified above. Two projects that fall under the category of *small* exemplify Koolhaas' approach to his practice in terms of the above definition of architecture as a "chaotic adventure" in the economical and social conditions of the late twentieth century.

The section titled "±13,000 Points: Nexus World Housing, Fukuoka, Japan, 1991" analyzes the design process of OMA's Nexus World Housing project in Japan. Koolhaas approaches the project in terms of the possibilities and problems emerging with the globalization of the architectural practice. The initial questions are related with the condition of a Dutch architect designing in Japan and according to Koolhaas all the process seems to be dominated by these questions.

> Dilemma of European architect building in Japan: Should the project be "as Western as possible"? Is it just another export like a van Gogh, a Mercedes, or a Vuitton bag? Or should it reflect the fact that it exists in Japan?[85]

This section is organized according to its content, the majority of it is composed of small images from the popular culture of Japan accompanied by notes describing the OMA's encounter with Japanese life style and working habits on the left page while images from the finished building are on the right page. This is followed by the plans and sections of the project.

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[83] Ibid, back cover. Koolhaas states that "this accumulation of words and images illuminates the condition of architecture today – its splendors and miseries – exploring and revealing the corrosive impact of politics, context, the economy, globalization – the world."

[84] Rem Koolhaas, "Bigness or the problem of the Large," in Koolhaas and Mau, 1998, 494-517; Rem Koolhaas, "The Generic City," Koolhaas and Mau, 1998, 1238-1264.

[85] Koolhaas and Mau, 1998, 80.

Figure 2.4. Two pages from "±13,000 Points: Nexus World Housing, Fukuoka, Japan, 1991." In Rem Koolhaas and Bruce Mau, *S, M, L, XL* (New York, NY: The Monacelli Press, 1998, first published in 1995), 108-109.

In the case of Villa Dall'Ava, it is the legal and economical issues that shape the time period of design and construction, therefore the relationship between the architect and the client. The process begins with a letter from the client asking for OMA to design a house for their family. Initial problems arise with clients' wishes; they want a glass house with a swimming pool on the roof, and the program of the house is too large for the site. Then, the neighbors become anxious about the house and the dispute evolves into a legal case. During this process, economical problems occur in the choice of the contractor. As a result, the process develops into a lengthy one, however, this longer than normal process has also its positive aspects. According to Koolhaas:

> The long wait was bad in some ways, but good in allowing endless revision: it began as a beginner's house: strident, colorful, etc.; it became a record of our own growing up.[86]

The presentation of the project in the book is composed of a concise definition of the process in the form of notes followed by pages of photographs from the house, and the

[86] Ibid, 135.

section is concluded with plans and sections with many revision notes on them. The drawings with revision notes explain what Koolhaas emphasizes in the above quotation.

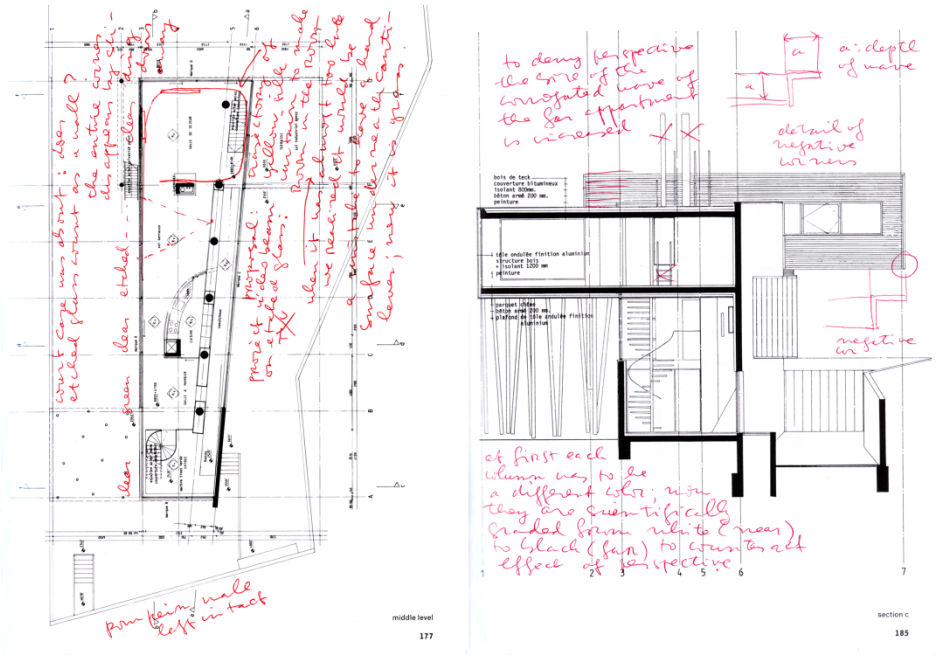

Figure 2.5. Two pages (plan and section with revisions) from "Obstacles: Villa Dall'Ava, St. Cloud, Paris, France, 1991." In Rem Koolhaas and Bruce Mau, *S, M, L, XL* (New York, NY: The Monacelli Press, 1998, first published in 1995), 177, 185.

These two *small* projects exemplify Koolhaas' approach to the practice of his office – OMA. Each project becomes a tool for him to analyze and understand the condition of architecture during the twenty years of office's practice until the publishing of *S, M, L, XL*. In each project he is able to elucidate some concepts related to the global context in which his office is designing. This process of conceptualization cannot be isolated from the projects; moreover it is arguable that such knowledge generation is only possible through these projects.

Le Corbusier and Koolhaas discuss different ideas in different contexts. However, their way of constructing their ideas resemble in the sense that they both think architecturally and write architecturally as well. Their contribution to the discipline of architecture is strongly connected to their way of making architecture. The influence of *Towards a New Architecture* and *S, M, L, XL* on architectural practice in the periods they were written in emerge from the knowledge generated through the experience of their authors in actual design processes. In Le Corbusier's case, his self reflection on his own projects becomes a strong foundation for the defense of his revolutionary ideas, whereas in Koolhaas' case, the concepts that he examines

emerge through a self reflection on OMA's design experiences in the social and economical conditions of the period.

There is a significant difference between the two books under consideration. In 1927, when Le Corbusier wrote *Towards a New Architecture*, academic research in architectural design was not yet an established discipline. Therefore, he feels rather free in using ideas that originally belong to other authors as his motive is to disseminate those ideas through his architectural thinking. In 1995, when Koolhaas wrote *S, M, L, XL*, there exists a research tradition in architecture for decades. Although it is not intended to be a scholarly publishing, Koolhaas is under the influence of this research tradition at least in his cautious listing of references that he used for quotations and images – keeping in mind the copyright issues.

Neither *Towards a New Architecture* nor *S, M, L, XL* can be considered as academic publishing; they are composed of speculations, contemplations, and argumentations on architecture through the personal self reflection of their authors. It is not possible, however, to argue that these books do not contribute to architectural knowledge. The species of knowledge generated in these books can be considered as knowing-how in Ryle's definition although the authors benefit from theoretical knowledge on architecture. The original contribution of these books is in the formulation of the direct form of knowledge by acquaintance that their authors generate through their architectural projects. It can be argued that such knowledge generated through the practice has its own domain of influence and this contribution is valuable in this extent. On the other hand, it is similarly fair to argue that if academic research aims at contributing knowledge in a discipline, there is no reason for not integrating knowledge generation through such architectural thinking into academic research in architecture.

2.3 An Overview of the Main Approaches in Architectural Research

As the aim of this study is to contribute to the definition of knowledge generation through architectural practice as an integral part of academic research, it is crucial to define what is considered as academic research in architecture. Groat and Wang's *Architectural Research Methods* provide an extensive survey on the nature of architectural research and the main approaches that are utilized.

Groat and Wang propose a tripartite division for research paradigms, a model that has been proposed by several methodologists such as Margaret Diane LeCompte and Judith Preissle, and Donna Mertens. According to this model there are "three paradigmatic clusters:

postpositivist, naturalistic, and emancipatory."[87] They argue that postpositivism is a developed form of the positivist paradigm. Instead of the deterministic character of positivism, it assumes that there is a reality that "can only be known within some level of probability." Moreover, although objectivity should be aimed, it may not be achieved.[88] Naturalism is also referred to as "qualitative, phenomenological, hermeneutic, and interpretive/constructivist. According to naturalism, ontologically there are "multiple, socially constructed realities." Therefore, epistemologically "it is neither possible nor necessarily desirable for research to establish a value-free objectivity." The researcher is bound to his/her position and values.[89] Emancipatory research paradigm shares the ontological and epistemological assumptions of naturalism. In addition, it is assumed that multiple realities are constructed through "social, political, cultural, ethnic, and gender issues."[90]

Basic Beliefs	**Positivism/Postpositivism**	**Interpretive/Constructivist**	**Emancipatory**
Ontology (nature of reality)	One reality; knowable with probability	Multiple, socially constructed realities	Multiple realities shaped by social, political, cultural, economic, ethnic, gender, and disability values
Epistemology (nature of knowledge; relation between knower and would-be-known)	Objectivity is important; researcher manipulates and observes in dispassionate, objective manner	Interactive link between researcher and participants; values are made explicit; created findings	Interactive link between researcher and participants; knowledge is socially and historically situated

Figure 2.6. Tripartite framework of research paradigms. Adapted from Donna Mertens, *Research Methods in Education and Psychology* (Thousand Oaks, California: Sage Publications, 1998), 8. In Linda Groat and David Wang, *Architectural Research Methods* (New York, NY: John Wiley and Sons, 2002), 32.

Within this tripartite model, Groat and Wang provide a set of standards for assessing the quality of research. While the standards set forth for postpositivist and naturalistic paradigms share similar purposes but differ in understanding of them, the standards of emancipatory

[87] Linda Groat, "Systems of Inquiry and Standards of Research Quality," in Groat and Wang, 2002, 32.

[88] Ibid, 32-33.

[89] Ibid, 33.

[90] Ibid.

paradigm differs quite radically. The definitions for the standards of truth value, applicability, consistency, and neutrality in postpositivism and naturalism are listed below. In emancipatory paradigm, quality of research is measured in more holistic concerns such as "historical situatedness of the inquiry, the extent to which the inquiry acts to erode ignorance and misunderstanding, and the transformative potential of the inquiry."[91]

Standard	**Positivism/Postpositivism**	**Naturalistic**
Truth value	*Internal validity* Equivalence of data of inquiry and phenomena they represent	*Credibility* Check data with interviewees; triangulation – multiple sources of data collection
Applicability	*External Validity* Generalizability	*Transferability* Thick description of context to assess similarity
Consistency	*Reliability* Instruments must produce stable results	*Dependability* Trackability of expected instability of data
Neutrality	*Objectivity* Methods explicated; replicable; investigator one-step removed from object of study	*Confirmability* Triangulation of data; practice of reflexivity by investigator

Figure 2.7. Comparative Analysis of quality standards, 1981. From Egon Guba. In Linda Groat and David Wang, *Architectural Research Methods* (New York, NY: John Wiley and Sons, 2002), 35.

There are seven research strategies that Groat and Wang point out for generating architectural knowledge in one of the research paradigms, meeting the standards that are set within these paradigms. These strategies are interpretive historical research, qualitative research, correlational research, experimental research, simulation research, logical argumentation, and case study research. In many occasions, combinations of these strategies are utilized whenever necessary.

Interpretive-historical research and qualitative research are based on interpretation and Wang defines them generally as interpretive research. He defines interpretive research as "investigations into social-physical phenomena within complex contexts, with a view toward

[91] Ibid, 40.

explaining those phenomena in narrative form and in a holistic fashion."[92] When the phenomena under investigation are in the past, it is interpretive-historical research, when it is contemporary phenomena, it is qualitative research. Mostly, research is carried on through data collection, interpretation of the compiled data, and meaning construction. In interpretive historical research, data is mostly documents, whereas in qualitative research, data collection involves interaction with people, such as interviews and observations.[93] Researchers operate in naturalistic or emancipatory paradigms when they utilize strategies of interpretive research.

Correlational research aims to "clarify patterns of relationships between two or more variables, i.e. factors involved in the circumstances under study."[94] There is an extensive use of statistics in the analysis of data to understand relationship between variables. Mainly there are two types of correlational research: relationship studies, which "focus more specifically on the nature and predictive power relationships [among variables]," and causal-comparative studies, in which the researcher selects comparable examples "to isolate the factor(s) that could reveal a 'cause' for significant differences in the levels of measured variables.[95] Mostly used ways of collecting data are surveys, observation, mapping, sorting, and archives.[96] This strategy is mostly appropriate for postpositivist research paradigm.

Experimental research strategy is accepted as the essence of postpositivistic paradigm in architectural research. Although it is the most appropriate way to attain knowledge about phenomena in natural and applied sciences, when naturalistic and emancipatory inquiries of architectural research are considered, it is "either inappropriate or insufficient for research about certain social and cultural phenomena."[97] According to Groat, there are five defining characteristics of experimental research: "the use of a treatment, or independent variable; the measurement of outcome, or dependent, variables; a clear unit of assignment (to the treatment); the use of a comparison (or control) group; and a focus on causality."[98]

Simulation research is based on the controlled "replication of a real-world context (or a hypothesized real-world context)." Interactions with this replication are possible and data

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[92] David Wang, "Interpretive-Historical Research," in Groat and Wang, 2002, 136.

[93] Linda Groat, "Qualitative Research," in Groat and Wang, 2002, 180.

[94] Linda Groat, "Correlational Research," in Groat and Wang, 2002, 206.

[95] Ibid, 212, 215.

[96] Ibid, 218-238.

[97] Linda Groat, "Experimental and Quasi-Experimental Research," in Groat and Wang, 2002, 251.

[98] Ibid, 252.

collected through these interactions provide valuable information for "application into the real-world context."[99] Although conventional modeling techniques and mock-ups are still in use, with the help of computer technologies provides more accuracy in replication and decrease costs in simulation and modeling research. As it is a very appropriate way of creating controlled environments, simulation research is closely related with experimental and correlational research strategies. It is mostly used as an episodic tactic in larger research projects.

Logical argumentation attempts "to frame logical conceptual systems that, once framed, interconnect previously unknown or unappreciated factors in relevant ways."[100] According to Wang, logical argumentation aims at a holistic explanation by constructing systems in a rational manner. It comprises a spectrum ranging from rule-based propositions that utilize formal or mathematical explanations to treatises that utilize cultural or discursive explanations.[101] Therefore, this strategy is applicable in both pospositivist, naturalistic, and emancipatory paradigms.

A case study is to investigate a phenomenon in its context. It gains significance "especially when the boundaries between the phenomenon and the context are not clearly evident."[102] Groat states that there exist five characteristics in case study research: "a focus on either single or multiple cases, studied in their real life contexts; the capacity to explain causal links; the importance of theory development in the research design phase; a reliance on multiple sources of evidence; with data needing to converge in a triangulating fashion; and the power to generalize to theory."[103] Case study is an appropriate strategy for inquiries in architecture. It serves for the purposes of the research paradigm for which it is utilized if the research is designed according to the appropriate usage of the case study.

Although Groat and Wang define these seven strategies as distinct, throughout the book they imply that these are interrelated in their purposes and methodologies. Therefore, it is possible to come across studies that employ combinations of these strategies as well as studies that are

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[99] David Wang, "Simulation and Modeling Research," in Groat and Wang, 2002, 279.

[100] David Wang, "Logical Argumentation," in Groat and Wang, 2002, 302.

[101] Ibid, 302-303.

[102] Linda Groat, "Case Studies and Combined Strategies," in Groat and Wang, 2002, 346, quoting Robert K. Yin, *Case Study Research: Design and Methods*, 2nd ed. (Thousand Oaks, California: Sage Publications, 1994), 13.

[103] Ibid.

constructed with an emphasis on a single strategy. The preference for a research strategy is strongly related with the nature of the research question.

Prior to discussing seven research strategies that Groat and Wang traced in architectural research, in the chapter titled "Design in Relation to Research," Wang discusses the relationship between the two activities of design and research acknowledging the literature on design research and research by design. He argues that there are two main difficulties concerning this relationship.

Firstly, the natures of these two activities are different. While design is a "generative" activity, the activity of research is "analytical." With reference to Kant, Wang argues that generative and analytical activities are both "within the domain of reason" although "the process of art production is indeterminate; that is, it cannot be fully captured by determinate propositions."[104]

The second difficulty arises in the definition of the usage of research within the context of design. Wang differentiates "design as research" and "research about the design process." He claims that the latter aims at understanding designer's methods and this kind of contribution to knowledge is possible through appropriate ones among the established research strategies that Groat and Wang discuss in their book. However, when design is considered as research, some "logical difficulties" emerge.[105] These difficulties are related with the Kantian differentiation between "generative" and "analytical" faculties of reason.

> The former [design as research] seeks to subsume a reality that is inherently nonpropositional (generative design as a mode of art production) under the domain of a propositional activity (analytical research), which raises logical difficulties. The latter [research about the design process] seeks, by well-defined propositional frameworks, to understand more deeply the processes involved in the nonpropositional process of design. There is no logical problem with this notion.[106]

Following these problems, Wang summarizes some ways in which they consider design and research can coexist. Among these, "programming and postoccupancy evaluation," "action research and 'design-decision' research" seem to be significant as they directly address the

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[104] Wang, "Design in Relation to Research," in Groat and Wang, 2002, 104-105.

[105] Ibid, 105.

[106] Ibid, 105-106.

design process and some other ways are modifications of these. All of these approaches to research are "episodic" in the "larger domain of generative design," however they argue that these can be considered as clues for bringing design and research together.[107]

Programming is the process of "maximizing the amount of information about a project so that the figural concepts generated can optimally respond to those criteria."[108] Postoccupancy evaluation, on the other hand, is an "after-the-fact data collection" when a project is realized and inhabited by its users. Both of them are conducted in rather serene moments of the design process – either before the act or after the act – and although they provide data for design, they do not address the actual phase of design.

Action research is a term that refers to research conducted during the design processes. Although it may begin with generalizations, mostly it dwells upon the unique characteristics of a specific situation. According to Wang, when design is considered as action research, "the emphasis is upon the specific design venue as a kind of microculture, complete with ways of doing, implicit understandings, technical terms, and so on, that all arise in the midst of creating a design."[109]

After discussing these ways of episodic research in design, which Wang defines as clues for bringing design and research together, he repeats that "generative figural production is a different mode of inquiry from analytical research."[110] According to him, although they can coexist, they are two different modes of activities.

From an alternative frame of reference, as it is discussed earlier in this chapter, these problems in the relationship between design and research that are highlighted by Wang can be overcome. If valid frameworks can be constructed in which it is possible to generate academic knowledge outside the framework of analytical research, the relationship between design and research can be redefined. Such a framework would set its own standards for truth value, applicability, consistency, neutrality, historical situatedness, eroding ignorance, and the transformative potential.

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[107] Ibid, 108.

[108] Ibid, 109.

[109] Ibid, 111.

[110] Ibid, 118.

Groat and Wang present an extensive survey of architectural research paradigms and strategies. For this purpose, in this study, Groat and Wang's survey is considered as a mapping of architectural research. Consequently, their conjectures concerning the relationship between design and research reveal that there is a need for clarification of this relationship. This clarification should begin with the investigation of the extensive literature on research concerning design – in a spectrum ranging from research about the design process to design as research. This area of research is defined as design research in general.

CHAPTER 3

DESIGN RESEARCH AND RESEARCH BY DESIGN

In 1963, Christopher Alexander completed his PhD dissertation titled *The Synthesis of Form; some Notes on a Theory* (published as *Notes on the Synthesis of Form* in 1964) in Harvard University, while Peter Eisenman completed his dissertation titled *The Formal Basis of Modern Architecture* (published in 2006).[111] According to Nigan Bayazıt, Alexander's dissertation is the first PhD study on design methods.[112] Both of these dissertations investigate the generation of architectural form. In this sense, they are the first examples of PhD studies conducted in a specific kind of academic research, which is eventually called design research.

Both Alexander and Eisenman aim to develop a system for explaining form generation in architecture. However, their approaches are completely different in terms of their problem definition and their investigation methods. With his background in mathematics and systems theory, Alexander attempts to formulate solvable small patterns out of complex problems by proposing a rational approach for investigating the design processes. Eisenman tries to develop a formal language derived from relationships of architectural forms by analyzing buildings of modern architects. While Alexander's approach of design methods proved to be applicable through conventional scientific research methods and became a dominant approach in design research for decades, Eisenman's approach of knowledge generation through exploration of architectural design has been exemplary to an alternative track for design research, which aims at developing theories of architecture resting on disciplines of humanities like history and philosophy.

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[111] Alexander, 1967; Eisenman, 2006.

[112] Bayazıt, 2004, 18.

In this chapter, design research and the emergence of research by design from within the tradition of design research are discussed through two distinct frameworks proposed by the authors of dissertations mentioned above. Alexander's approach on design methods is outlined in relation to Bayazıt's overview of design research since the 1960s,[113] while the works of Stanford Anderson, Colin Rowe, and Michael Hays are considered in relation to Eisenman's dissertation for the elaboration of an alternative critical approach in design research.

In this context characterized by the approaches to architectural research either influenced by the methods of sciences or the methods of humanities, ideas began to emerge which argue that this duality is not necessary and there may be other forms of research besides these frameworks. The key texts by Cross and Frayling are discussed in relation to the knowing processes inherent in design activity.[114] Institutionalization of research by design is investigated in relation to research and publications related with attempts of institutionalization in different countries.

3.1 Design Methods

Bayazıt, in her article "Investigating Design: A Review of Forty Years of Design Research," defines the topics of design research as: performance of man-made objects, designers' design processes, qualities of the end product, formation of configurations, and "knowledge related to design and design activity."[115]

As it is discussed earlier in this study, the topics listed above have been investigated since Vitruvius. However, as a consequence of the institutionalization of architectural education and research, design research began to emerge as an academic discipline in 1950s and 1960s. Bayazıt relates the motives for investigation on design to the economical and social needs of the society after World War II. The fulfillment of the needs of the society required investment on knowledge generation on the creativity processes.[116] This condition is closely related with the topic of "designers' design processes." Therefore, with its focus on demystifying design processes, design methods emerged as the dominant area of inquiry in the beginnings of academic design research.

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[113] Bayazıt, 2004, 16-29.

[114] Cross, 1982; Frayling, 1993/4.

[115] Bayazıt, 2004, 16.

[116] Ibid, 17-18.

3.1.1 An Analytical Approach to Architectural Form

In 1963, Alexander completed his PhD studies on architectural form. His ideas begin with the conjecture that architects are no longer equipped with the necessary tools to cope with the demands of a problem at hand. This is closely related with the condition of modern architecture. One of the significant assumptions in modern architecture is the denial of styles as agents of form making. Alexander argues that with the increasing complexity of design problems, it became almost impossible for designers to solve these problems; therefore, they avoided the responsibility of dealing with complexity by referring to styles as the foundation for their form making processes.[117] However, with the ideas of modernity in design, styles became obsolete as a source for form generation. Now (in mid-twentieth century) designers tend to rely on their creative impulses and their "position as an 'artist,' on catchwords, personal idiom, and intuition" to be relieved from the responsibility of dealing with the complexity of design problems.[118] This secured the innocence of designers in facing complex design problems. According to Alexander, such a resistance to "loss of innocence" happened one more time in history, with the introduction of mechanical tools for construction in the eighteenth and the nineteenth centuries. As designers reconciled with the newly introduced mechanical tools in the beginnings of the twentieth century, they should come to terms with the "intellectual loss of innocence" in the mid-twentieth century.[119]

Alexander expands his argument on the loss of innocence by introducing the concept of "goodness of fit." It simply means that "every design problem begins with an effort to achieve fitness between two entities: the form in question and its context." He adds that "the form is the solution to the problem; the context defines the problem".[120] In order to explain our culture's incapability of dealing with the increasing complexity of design problems, Alexander discusses the "sources of good fit" between the context and the form with reference to two different cultural phases, which he calls "unselfconscious" and "selfconscious."[121] The unselfconscious cultures are simpler cultures where the design activity is strictly defined by tradition. There are no specialized people for the production of designed products. For example, everybody builds his/her own house according to the rules that s/he

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[117] Alexander, 1967, 8-11.

[118] Ibid, 10.

[119] Ibid, 9-11.

[120] Ibid, 15.

[121] Ibid, 32-70.

has learned informally by being a part of a tradition. Therefore, when a "misfit" occurs between the context and the form, it is immediately reacted by the user and fixed as the user is the designer at the same time. Furthermore, as design is not a specialized activity and as there are strict rules of a tradition, the designer is not required to exhibit his/her individuality in this process. This guarantees the continuity of the system of good fit, in other words, if there is no misfit in the relationship between the context and the form, this equilibrium continues until there is a misfit. The selfconscious process of design, on the other hand, is guided by specialized designers. These designers are formally educated through concepts rather than the process of "imitation by practice" as in unselfconscious cultures. Therefore, it becomes difficult for a designer to detect a misfit, to conceptualize it, to develop an appropriate solution, and then fixing the misfit. Moreover, as the designers are specialized individuals, in order to maintain their social status among other designers, they are forced to show their individual creativity. This results in the decline of tradition's role of maintaining the equilibrium of good fit. Alexander states that our culture today is a selfconscious culture and our incapability of dealing with complex design problems is related with the problem of "adaptation" as a result of conditions specific to this kind of culture.

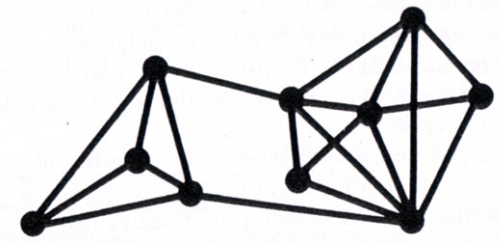

Figure 3.1. Interrelations between variables. In Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964), 43.

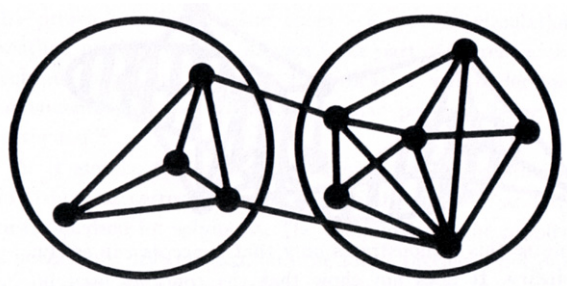

Figure 3.2. Interrelations between variables grouped under subsystems. In Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964), 43.

Adaptation is a significant process in achieving the equilibrium of good fit. When a misfit between the context and the form occurs, it is fixed, and through adaptation, this fixed state

becomes the new definition of the good relationship between the context and the form. This process of reaching equilibrium is bound to the interrelations between variables affecting the designed product. Considering that there may be many variables even in the design of a simple object, if every variable is related with other variables, reaching equilibrium becomes almost impossible (Figure 3.1). If the relations between the variables are analyzed, certain patterns can be observed and these variables can be grouped under "subsystems" in which a limited number of variables affect each other without affecting the variables under other subsystems (Figure 3.2). [122]

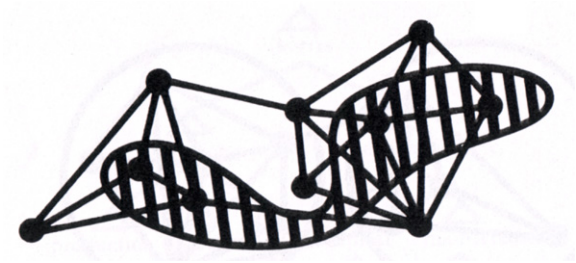

Figure 3.3. Interrelations between variables grouped under conceptual subsets that do not correspond with subsystems. In Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964), 66.

Because of their characteristics listed above, the unselfconscious cultures are capable to deal with misfits in the relationship between the context and the form as they deal with only one subsystem for making an adjustment for fixing the misfit. However, the selfconscious cultures are faced with all the variables at the same time, and as it is almost impossible to deal with, these variables are grouped under conceptual subsets. As the concepts that define these subsets do not naturally evolve from the context of the problem but culturally constructed, most probably they do not correspond to the subsystems of the context (Figure 3.3).[123] Therefore there is a need to propose a framework for our selfconscious culture to deal with design problems successfully.

[122] Ibid, 39-45.

[123] Ibid, 64-66.

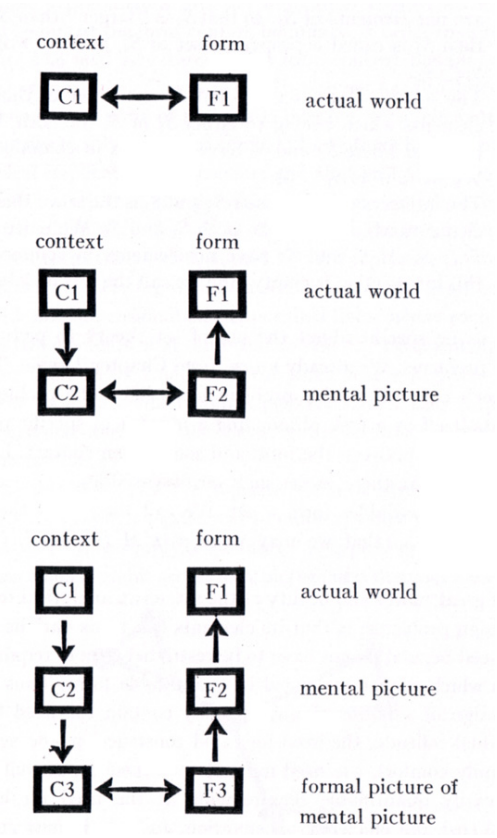

Figure 3.4. Schematic representation of three possible kinds of design processes. In Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964), 76.

Figure 3.4 shows three different design processes that are possible according to Alexander. The first scheme is the representation of an unselfconscious design process where the adjustments according to misfits occur directly. "The human being is only present as an agent in this process." The second scheme represents selfconscious design process where the adjustments occur through conceptual interaction of the designer. The third scheme represents a case where a third level is introduced to the process. In this third level, the conceptual image of the context is transformed into a "mathematical picture" that rationalizes the intuitive conceptual image developed by the designer. Alexander proposes that this mathematical picture is constructed with "mathematical entities called 'sets'."[124] Then he proposes a design method based on the mathematical relations within and between these sets to conclude his dissertation. He exemplifies his statement with a concrete situation of the redesign of a village.

[124] Ibid, 77-78.

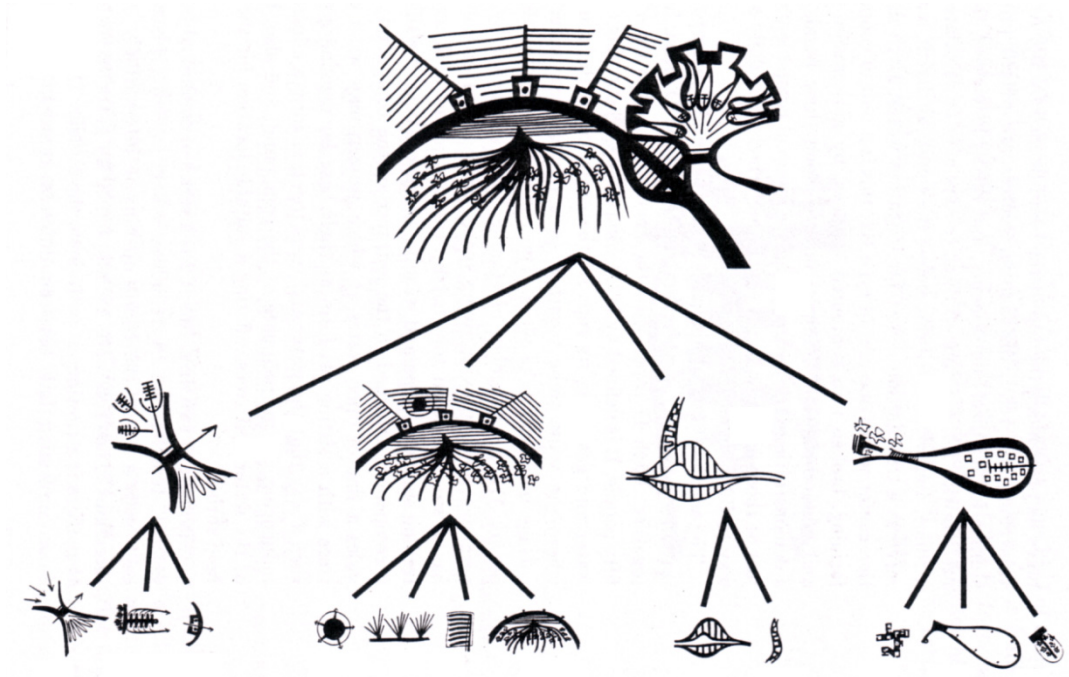

Figure 3.5. The tree of diagrams made during the realization of an Indian village. In Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge, MA: Harvard University Press, 1967, first published in 1964), 153.

Alexander's proposal for a mathematical design method is based on his concept of subsystems. This is the conceptual formulation of his conjecture that complex problems require to be reorganized around solvable small patterns. Only in this way it is possible for us to achieve good fit between the context of the problem and the form that is proposed for the solution of the problem. His introduction of the concept of subsystems is very valuable for architectural design and constitutes the main idea behind his magnum opus *A Pattern Language.*[125] The idea of a pattern language has become influential in design methods in other disciplines such as computer programming. With its considerable influence, *Notes on the Synthesis of Form* can be considered as exemplary to design methods research in architecture. With reference to the discussion of Alexander's dissertation above, design methods research aims at clarifying and rationalizing design processes in order to improve design processes and to transform the activity of design into a discipline with its own body of knowledge. In terms of generating a body of knowledge for design disciplines, design methods research constitutes the beginnings of a search for an integral relationship between design and research.

[125] Christopher Alexander, *A Pattern Language* (New York, NY: Oxford University Press, 1977).

3.1.2 Design Methods as the Dominant Paradigm of Design Research

Alexander's PhD dissertation not only exemplifies but also pioneers an academic research paradigm that is called "design methods." As Bayazıt reminds, such a research program is essential for improving design processes and transforming them into more efficient and systematic processes in order to meet the rising demands of the society after the World War II.[126]

In the beginning, in 1960s, this research endeavor was closely related with methods and approaches borrowed from other disciplines such as operations research (OR) and systems theory as it is evident in *Notes on the Synthesis of Form*. Another significant author in this period of design methods is Simon. His book titled *The Sciences of the Artificial* is published in 1969.[127] Being originally a political scientist, Simon extended his studies in administrative organizations and economics to every form of "artificial phenomena." Therefore, he argues that design as a discipline required its own scientific approach. His application of logical and rational systems for explaining decision-making and problem-solving in design processes laid the ground for future research not only in design disciplines but also in computer science, especially in the field of artificial intelligence.

This attitude towards design methods, which is best exemplified with Alexander's and Simon's studies, began to be criticized in 1970s because of its negation of the role of human beings with their intentions, backgrounds, creativity and shortcomings in the design process. According to Bayazıt, this questioning of the methods of design research marks the differentiation between two generations of design methods. Even Alexander himself became critical of the first generation of design methods.

> The odd thing is that people have lost sight completely of this objective. They have very definitely lost the motivation for making better buildings. I feel that a terrific part of it has become an intellectual game, and it's largely for that reason that I've disassociated from the field. I resigned from the Board of Editors of the DMG Newsletter because I felt that the purpose which the magazine represents is not really valuable, and I don't want to be identified with them.[128]

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[126] Bayazıt, 2004, 17-18.

[127] Simon, 1969.

[128] Bayazıt, 2004, 20-21, quoting Christopher Alexander, "State of Art and Design Methodology: Interview with C. Alexander," *DMG Newsletter* (March 1971): 3-7.

Bayazıt claims that it is Horst Rittel who defined this crisis as a paradigm shift in design methods. Rittel's definition of different paradigms in design research helped the continuation of research in this field.[129] The first generation's utilization of OR models and systems theory to explain and propose logical solutions to design problems opened the way for analyzing design activity, however, as the literature on this area of research gained certain maturity, it is realized that these simplistic abstract models are not sufficient for a coherent understanding of design processes. It is necessary to incorporate human factor as it is humans who design and use the products of design processes. Eventually, the second generation of design methods employed sociological and psychological models for analyzing design. The integration of the methods of social sciences together with mathematical models of the first generation transformed design methods to a scientific discipline.[130] In the beginning of this chapter, referring to Bayazıt, the aims of design research is listed as: performance of man-made objects, designers' design processes, qualities of the end product, formation of configurations, and knowledge related to design and design activity. While the first generation of design methods mostly dealt with designers' design processes, in the second generation, the interests widened to respond to the other aims of design research.

The second generation was very productive during the 1970s and 1980s. Notable contributions of this period were in social studies of the built environment, environmental psychology, user participation studies, and cognitive studies and computer-aided design. Alexander continued his studies during this period and continued publishing. Among his books, *A Pattern Language* and *A Timeless Way of Building* with their association with human values became major works in architectural research.[131] Hillier and Hanson's *The Social Logic of Space* introduced the "space syntax" method to simulate social implications of design. Akın's *Psychology of Architectural Design* is based on his PhD dissertation and it is considered as one of the first studies on cognitive aspects of designers and computer-aided design. These two influential books exemplify the approach and new areas of interest in the second generation of design methods.

Design methods research in general can be considered in positivist/postpositivist research paradigm in Groat and Wang's tripartite division. Although the second generation

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[129] Ibid, 21.

[130] Ibid, 21-22.

[131] Alexander, 1977; Christopher Alexander, *A Timeless Way of Building* (New York, NY: Oxford University Press, 1979).

incorporates the human factor in design research, its tools and methods are chosen to know a single reality within an objective epistemological framework where the researcher separates himself/herself from the phenomena s/he investigates. When the strategies that Groat and Wang described are concerned, correlational research, experimental research, simulation research, and case studies are mostly preferred strategies. The utilization of these strategies do not differ from their usage in established scientific disciplines from which they are borrowed, such as mathematics, economics, sociology, psychology, and cognitive sciences.

As a result of social reception and the already established validity of the methods borrowed from other disciplines, design methods eventually became the dominant paradigm of academic design research since 1960s. However, it is not the only paradigm of design research; simultaneously with design methods, an alternative track for investigating architectural design emerged. Later, in 1990s, it was gradually realized that other forms of academic research can be possible within this area.

3.2 An Alternative Track for Design Research

1960s witnessed another development in architectural research. While researchers like Alexander and Simon were attempting to establish a scientific knowledge base for design disciplines as a result of social requirements after World War II, another group of researchers tried to establish an alternative form of design research that was mainly based on interpretations of architectural history. This form of research aims at developing architectural theories based on a critical approach to works of architecture and to the design processes.

Hays, in the introduction to his anthology of architectural theory, states that contemporary architecture began in 1960s, relating its emergence to "the changes in political theory and practice, the history of philosophy, and general cultural production that the date connotes."[132] He argues that since 1960s, "architecture, both built and projected, has notoriously been discussed and debated according to theoretical categories, from such blunt oppositions as 'white' versus 'gray' or 'rationalist' versus 'historicist' to more sophisticated and articulate –isms."[133] According to Hays,

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[132] K. Michael Hays, "Introduction," in *Architecture Theory since 1968*, ed. K. Michael Hays (Cambridge, MA: The MIT Press, 2000, first published in 1998), x.

[133] Ibid.

> First and foremost, architecture theory is a practice of mediation. In its strongest form mediation is the production of relationships between *formal* analyses of a work of architecture and its social ground or *context* (however nonsynchronous these sometimes may be), but in such a way as to show the work of architecture as having some autonomous force with which it could also be seen as negating, distorting, repressing, compensating, for, and even producing, as well as reproducing, that context.[134]

If the quotation above is considered together with the motives of Alexander in his PhD dissertation, the motives and objects of investigation in design methods and in architectural theory share similar foundations, namely the relationship between the form and its context. However, there are fundamental differences between the two research traditions in terms of the methods they apply, as well as quality criteria for research.

3.2.1 A Critical Approach to Architectural Form

In 1963, the same year in which Alexander completed his PhD studies; Eisenman completed his PhD dissertation titled *The Formal Basis of Modern Architecture* in Cambridge University. In the "Afterword" to the published form of his dissertation in 2006, Eisenman states that one of the two motives in the process of his studies is providing a response to Alexander's *Notes on the Synthesis of Form*, with which he was familiar because Alexander began his studies in Cambridge while he was studying mathematics. The other motive was to distance himself from the ideas of his mentor, Rowe.[135] He starts with the conjecture that contemporary architectural thinking (in 1960s) has an emphasis on history rather than being theoretical. This tendency results in the examination of facts and their relations instead of examining the reason behind those facts, namely theoretical concepts. Therefore, he asserts that his dissertation "can be considered essentially critical rather than historical, in that it will examine certain propositions concerning form in relation to architecture in a theoretical and not a historical sense."[136]

Eisenman acknowledges the influence of recent developments in art history and perceptual psychology of the time. The emphasis on iconographical issues of form in the work of Warburg Institute and Gestalt psychologist's tools for visual analysis of form constitutes the

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[134] Ibid, emphasis added.

[135] Eisenman, 2006, 380.

[136] Ibid, 15.

background on which he develops his critical account on form making in modern architecture.[137] As the ideas for Eisenman's dissertation were formed in his collaboration with Rowe in Cambridge and their trips to Europe,[138] these influences were inevitably introduced to Eisenman by him. Rowe came from the Warburg tradition and studied on the relations between Gestalt psychology and modern architecture since his years in University of Texas at Austin where he wrote the "Transparency" articles together with Robert Slutzky.[139] However, while acknowledging these influences, Eisenman also argues that he intentionally avoided any iconographical or perceptual references in his formal analysis in order to confine his discussion only to formal considerations. His struggle to distance himself from Rowe's ideas seems to be based on these motives. He utilizes Gestalt principles only for "the recognition of form, rather than to validate any particular subjective interpretation of it.[140]

> It is the desire here to consider buildings as a structure of logical discourse, and to focus attention on consistency of argument, on the manner in which spatial and volumetric propositions may interact, contradict, and qualify each other.[141]

The Formal Basis of Modern Architecture shares similar conjectures with *Notes on the Synthesis of Form* when the initial question that they attempted to answer is concerned. Eisenman also argues that we need a formal system as a language to "serve as a basis for communication, whether between teacher and pupil, architect and client, or critic and public."[142] However, the similarities between the two dissertations are only to this degree. When their approaches to formal systems are concerned, Eisenman and Alexander stand in almost opposite ends. Eisenman's solution is based on the investigation of properties and characteristics of the

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[137] Ibid, 15-17.

[138] Ibid, 379.

[139] Caragonne, 1995, 111-122, 157-173.

[140] Eisenman's formalism differs from the common sense acceptance of the term, which places beauty and aesthetics above other concerns. As Rosalind Krauss argues for the architectural work of Eisenman, his approach to formal analysis is akin to that of Russian formalist literary criticism in the early decades of the twentieth century, represented in the work of Victor Shklovsky, Boris Tomashevsky, and Boris Eichenbaum. This intellectual link must have been provided through his collaboration with Rowe, who is well equipped on the European discourse on art and architecture. See Rosalind Krauss, "Death of a Hermeneutic Phantom: Materialization of the Sign in the Work of Peter Eisenman," 1977, in Peter Eisenman, *Houses of Cards* (New York, NY: Oxford University Press, 1987), 166-184; and Lee T. Lemon and Marion J. Reis, eds., *Russian Formalist Criticism: Four Essays* (Lincoln, NE: University of Nebraska Press, 1965).

[141] Eisenman, 2006, 17.

[142] Ibid, 87.

forms themselves, focusing on their geometric references, while Alexander attempts to develop a system for rationalizing the aspects that affect the generation of form.

The language of the formal system that Eisenman propose is based on a system of hierarchies on different levels. Initially, he proposes that there are five elements that constitute architecture: "concept or intent, function, structure, technics, form."[143] The hierarchy of these elements is related with the tension between "the internal and the external (or environmental) requirements of a particular building.[144] He places form in a primary position in the hierarchy among these elements by stating that "the contention will be that architecture is in essence the giving of form (itself an element) to intent, function, structure and technics."[145] He continues his argument by defining two general categories of form, "generic" and "specific." He refers to "generic form" to denote "form thought in a Platonic sense," while he uses the term "specific form" with respect to "the actual configuration realized in response to a specific intent and function."[146] While the generic form is decided under the influence of intent, specific form evolves in a relationship with all of the other elements, namely intent, function, structure, and technics. After discussing the relationship of form and the other elements of architecture, Eisenman introduces the properties of "generic" and "specific" form, which he derives through logical argumentation on the geometries of forms.

The properties that Eisenman defines for "generic form" are related to the usage of forms in architecture. Firstly, Eisenman states that there are mainly two types of "generic" form, a "generic" form is either "centroidal" or "linear," where each condition has its own different characters in terms of geometry.[147] Whether it is "centroidal" or "linear," a "generic" form is defined by the properties of "volume, mass, surface, and movement." He claims that these properties constitute "the basic vocabulary for a formal language." Although he acknowledges that there are other properties related to form such as "light, balance, proportion, scale, and shape" he discusses them as properties of "specific form" rather than of "generic form." Considering "volume" as a primary property, Eisenman proposes the remaining properties (mass, surface, and movement) and "an implied or actual Cartesian grid" as "categories of limiting conditions" of the "volume." An abstract grid is required to act as a

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[143] Ibid, 25.

[144] Ibid, 29.

[145] Ibid, 33.

[146] Ibid, 33-35.

[147] Ibid, 35.

"frame of reference for all perception." In other words, we perceive forms with reference to a grid, at least with reference to the grid in a vertical plane, which refers to gravity, and the grid in a horizontal plane, which is identified with the horizon level or water level."[148]

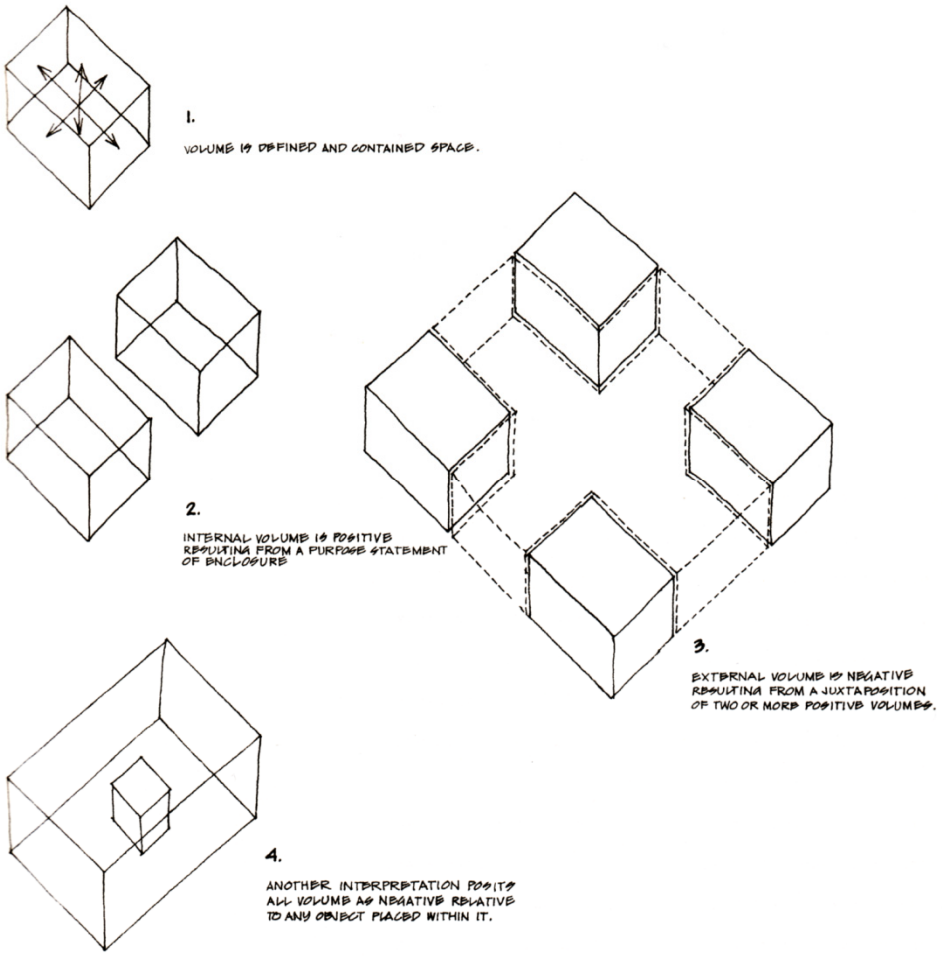

Figure 3.6. Characteristics of volume. Drawings by Peter Eisenman. Drawings by Peter Eisenman. In Peter Eisenman, *The Formal Basis of Modern Architecture* (Baden, Switzerland: Lars Müller Publishers, 2006), 58.

As Eisenman's aim is to show that it is possible to develop a formal language for communication and that syntax and grammar are the basic ordering principles of a language, this conceptual clarification of properties of form becomes crucial. He discusses the associations between the properties of "generic" and "specific" form in order "to indicate the relationship of syntax to the development of a system."[149]

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[148] Ibid, 57-83.

[149] Ibid, 137.

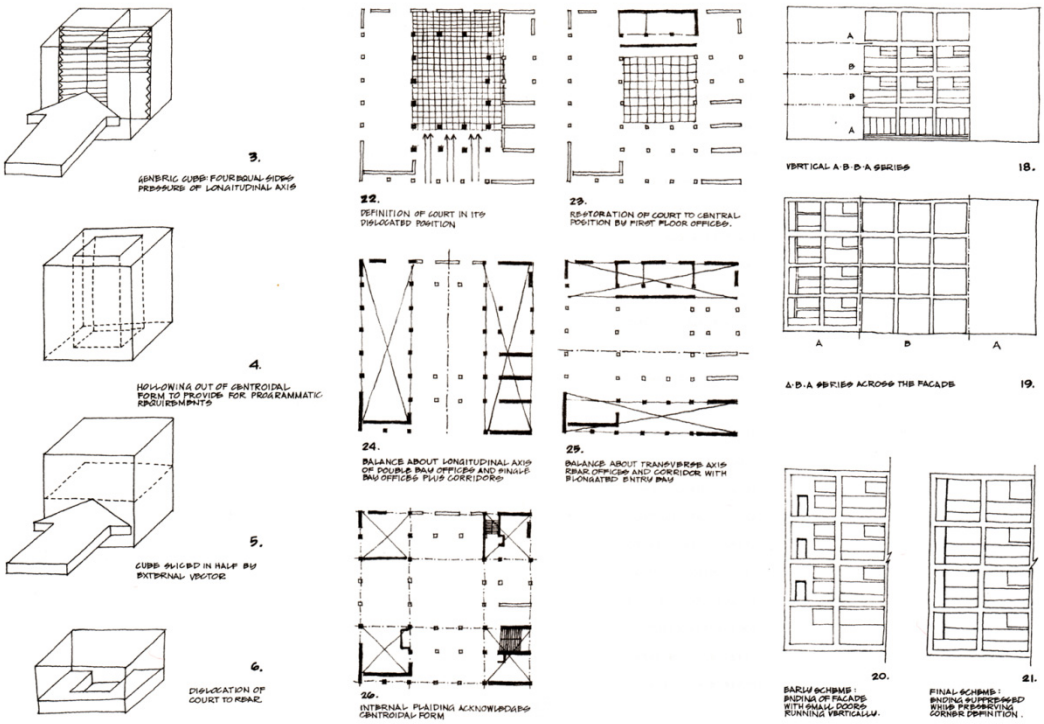

Figure 3.7. Analysis of Casa del Fascio by Guiseppe Terragni; example from volumetric analysis on the left, plan analysis on the center, and façade analysis on the right. Drawings by Peter Eisenman. In Peter Eisenman, *The Formal Basis of Modern Architecture* (Baden, Switzerland: Lars Müller Publishers, 2006), 295, 302, 304.

Finally, to test his conceptual definitions, he analyzes eight buildings by four masters of modern architecture – Le Corbusier, Frank Lloyd Wright, Alvar Aalto, and Guiseppe Terragni – within the formal language that he has developed.

Eisenman does not proceed in an intellectual vacuum. Although his main claim is to propose a new form of architectural investigation that is different from the historical-minded tradition, he has strong affinities with modern architecture and he is able to situate his ideas within the contemporary discourse on architecture. As he explicitly declares in the introduction to his dissertation, he has a precedent which he utilizes methodologically as well as conceptually.

> Indeed this thesis can be thought of as an investigation and interpretation of the conceptual basis of Le Corbusier's 'Four Compositions', illustrated in the 'Ouvre Complete'. Implicit in Le Corbusier's diagrams are the vocabulary, grammar and syntax of a formal language: the intention here is to make them explicit.[150]

[150] Ibid, 21.

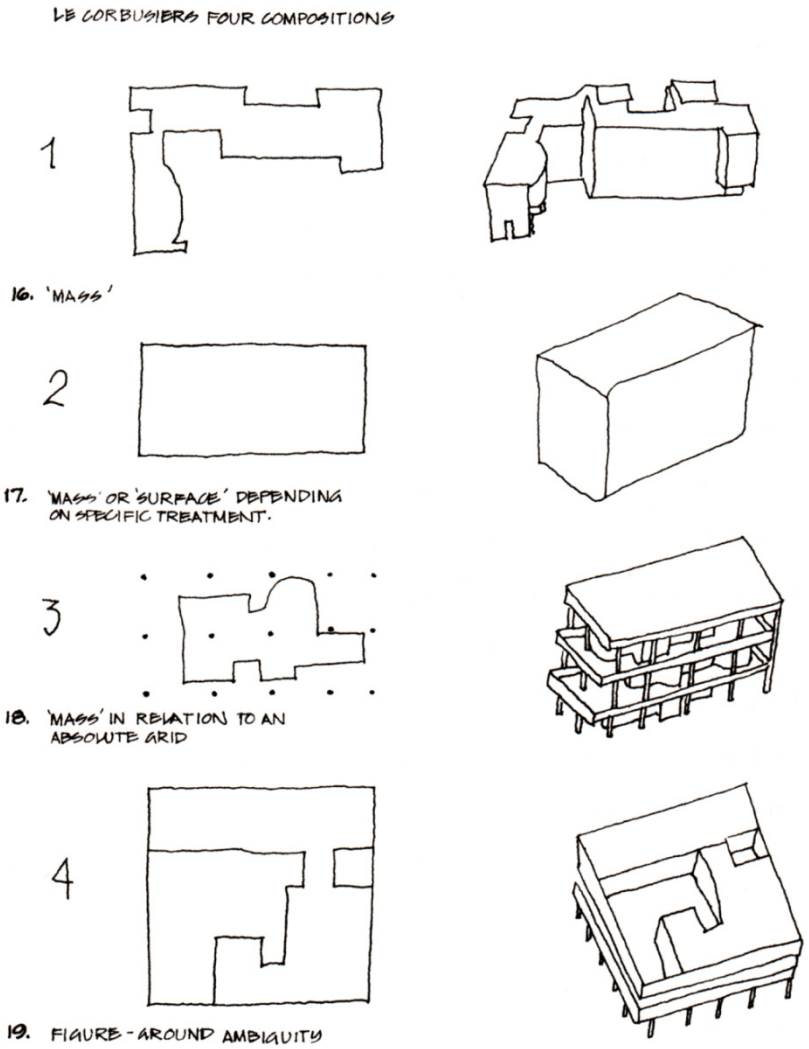

Figure 3.8. Le Corbusier's "Four Compositions" with Eisenman's interpretations. Drawings by Peter Eisenman. In Peter Eisenman, *The Formal Basis of Modern Architecture* (Baden, Switzerland: Lars Müller Publishers, 2006), 106.

Eisenman approaches the problem of architectural form from an entirely different point of view than Alexander's. Instead of simplifying the relationships between the aspects that are effective in form generation to rationalize the process, he attempts to develop a language of formal systems that is based on the qualities inherent in forms rather than the forces affecting them. Alexander refers to history of design to develop his problem statement and proceeds with an analytical approach that he borrows from his mathematical background for the solution of this problem. Eisenman not only defines his problem within the framework of modern architecture and perceptual psychology; but also constructs the argument through his interpretation of architectural form based on the ideas of Le Corbusier. In this sense, his dissertation can be considered as one of the pioneers of a scholarly approach to research on

architectural design, while Alexander's dissertation can be considered as a pioneer of a conventional scientific approach to research on design.

The Formal Basis of Modern Architecture is a theoretical work that is concerned with the conceptualization of form within a historical framework, where the argument is illustrated through critical analyses of appropriate examples. In this sense, although it deals with design processes, it may be considered within the tradition of history, theory, criticism.

3.2.2 History, Theory, Criticism and Design Research

Architectural theory is an integral part of architectural production since Vitruvius as it has been remarked in the previous chapter under the title "Architectural Thinking." However, consideration of theory as an academic research area dates to the second half of the twentieth century when scholars, who have a background in architectural history, began to investigate architectural design. As it has been discussed in the beginning of this section, Hays defines architectural theory as "the production of relationships between formal analyses of a work of architecture and its social ground or context (however nonsynchronous these sometimes may be)."[151]

Rowe's work beginning from 1950s can be considered as one of the earliest examples of academic architectural theory. Resting on his studies on architectural history in the Warburg Institute, he extensively investigated the current condition of architectural design. The "Transparency" articles and "The Mathematics of the Ideal Villa" are not simply studies on architectural history investigating the works of Le Corbusier and Palladio. He attempts to generate conceptual knowledge on form making through his analyses of the works of these architects.

Another significant figure in the early years of academic architectural theory is Anderson. He was the director of MIT's PhD program in History, Theory and Criticism of Architecture, Art and Urban Form between 1974-1991 and 1995-1996. This program acted as a hub for the network of architectural theory. Columbia University, Graduate School of Architecture, Planning and Preservation, where Bernard Tschumi was dean from 1988-2003, and The Institute for Architecture and Urban Studies in New York, where Eisenman was director from its foundation in 1967 to 1982, are two other significant locations for studies on history, theory and criticism.

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[151] Hays, 2000, x.

Although it began as an area occupied by architectural historians, contemporary architectural theory evolved into a research area that provides the practicing architects an academic framework in which it is possible to formulate their ideas on architecture. Architects not only contributed with their writings, but also served as directors, researchers and educators in the institutions that gave emphasis to research on architectural theory as in the cases of Eisenman and Tschumi.

Eisenman's PhD dissertation is a widely referred influential work for research on architectural theory although it remained unpublished since 2006. Venturi's *Complexity and Contradiction in Architecture* of 1966, Rossi's *The Architecture of the City* of 1966, Manfredo Tafuri's *Architecture and Utopia* of 1973, Charles Jencks' *The Language of Post-Modern Architecture* of 1977, Rowe and Fred Koetter's *Collage City* of 1978, and Tschumi's *Architecture and Disjunction* of 1994 can be considered among significant works in research in architectural theory.

History, theory and criticism contributed to architectural knowledge by relating architectural history with the current architectural practice as well as establishing the relations between architecture and disciplines of humanities such as history, philosophy, politics, ethics, economics, or gender studies. When Groat and Wang's tripartite division of research paradigms are concerned, research in architectural theory can be considered in naturalistic and emancipatory research paradigms. The strategies that are employed are mainly interpretive-historical research, logical argumentation, and case-studies. Although design methods research has been accepted since 1960s as a research area that investigates design, also the area of theory, history and criticism contributed to design knowledge as it has been discussed in relation to Eisenman's PhD dissertation. Moreover, it investigates a dimension of design knowledge that cannot be investigated through approaches of design methods, which are borrowed from natural sciences.

Design methods research and research in history, theory and criticism provide knowledge on design and architectural design in particular within two distinct epistemological and methodological frameworks. With their approaches that are borrowed from sciences and humanities, they contribute to our knowledge about design processes, designed products, social perception of design, and designers themselves. However, as it has been pointed out by several scholars since 1990s, there still exists an area in design knowledge that can be investigated neither by the methods of sciences nor by the methods of humanities.

3.3 A "Designerly Way" of Research

"Designerly Ways of Knowing" is the title of Cross' article published in 1982.[152] It is one of the first texts that are concerned with the problems inherent in established approaches in design research. The term of "designerly ways of knowing" is adopted in this study to denote a specific form of knowing that is under investigation. The adjective "designerly" is a self-explanatory term which embraces the distinct character of a form of knowing that is inherent in practices of designers. Research by design as a research area is based on the epistemological assumption that there exist designerly forms of knowing besides theoretical knowledge generated through scientific approaches to design research.

Although there are attempts to create awareness on the issue in 1980s like Cross' article, since 1990s, research by design has begun to be discussed extensively among scholars in design research. Discussion is mostly based on the definition of designerly ways of knowing that constitutes the basis for research by design area.

Beginning with the earliest arguments in 1980s, the discussion has been carried on by researchers who are active in design methods research and who are concerned about the insufficiency of existing approaches in investigating all aspects of design. The overwhelming idea common to all contributions on research by design is the possibility of a third way in design research besides the approaches that are influenced by sciences and humanities, which are examined in previous sections. In other words, there are designerly ways of knowing besides scientific and scholarly ways of knowing.[153] A third way would help to situate the form of architectural thinking that is exemplified in Chapter 2.

3.3.1 Literature on Research by Design

In May 1979, a special issue of *Journal of Architectural Education* (*JAE*) is published under the title "Search/Research."[154] The issue deals with architectural research in a quite unique way when the approaches of design research in this period are concerned. Articles present practicing architects' conceptual approach to research as well as documentation of their investigations through their projects. In "Prologue" written by Richard Bender, who was a researcher in environmental design for years at the time, the questions that resulted in the

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[152] Cross, 1982, 221-227.

[153] Ibid, 223.

[154] *Journal of Architectural Education*, Vol. 32, No. 4, *Search/Research* (May 1979).

preparation of an issue on design research in a quite different way were clearly declared. The following quotation is one of the earliest statements on the issue of pursuing an autonomous field of research in design disciplines.

> Environmental research is often hobbled by the effort to make it conform to scientific research. A particular source of strain is the attempt to quantify attributes that basically are unquantifiable. Conventional practice makes a distinction between basic and applied research, but only in terms of content – the process is supposed to remain the same. But doesn't the shift toward the applied also imply a shift in style? The problem becomes one of matching style and content, and in this regard, our field needs some "research on research." We need to understand what is really appropriate. We also need to regain confidence in some of our original methods – instead of always looking for new tools for our problems, perhaps we should – as Chris Arnold says – find problems for our tools.[155]

The articles that are presented in *Search/Research* focus on either practicing architects' descriptions of what they define as research within their project development processes, or architectural academicians' attempts to differentiate the activity of architectural design and scientific research through a documentation of their research. Therefore, Bender's call for "research on research" seems to remain unanswered at least in this special issue of JAE. Among these articles, Denise Scott Brown's "On Formal Analysis as Design Research" seems to be a real contribution to the concerns that Bender announced in his one page "Prologue." Although it is also a description of Brown's own research in Las Vegas and Levittown, which she carried on with her students, she attempts to situate it in a framework that she develops in relation to architectural education, modern architecture, and suburban environments in the USA. She presents their methods of formal analysis, which are not scientific, measurable, or quantitative, however still generate rigorous knowledge through questioning and analyzing the housing in the case of Levittown, and mapping the Strip with a focus on how it is observed by people in the case of Las Vegas.[156]

There are two journals that began to be published in the early 1980s as part of the efforts of establishing the academic discipline of design. *Design Issues* is the first American academic journal on design while *Design Studies* is a British academic journal that represents the

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[155] Richard Bender, "Prologue," *Journal of Architectural Education*, Vol. 32, No. 4, *Search/Research* (May 1979): 1.

[156] Denise Scott Brown, "On Formal Analysis as Design Research," *Journal of Architectural Education*, Vol. 32, No. 4, *Search/Research* (May 1979): 8-11.

European perspective. Cross' "Designerly Ways of Knowing" is the third of a series of articles that are published in the very first issues of the journal *Design Studies*. The first article of the series, "Design as a Discipline" is written by Archer and published in the first issue of the journal in 1979. After discussing how the system of general education is based on the duality of science and humanities, he argues that Design (with a capital D) should be the third fundamental aspect of education.[157] The second article, "A Timeline Theory of Design and Planning" is written by Nadler in 1980. Nadler agrees with Archer on the necessity of design as the third fundamental aspect of education. He proposes that we should define the substance of design first and attempts to develop a theory based on the timeline axiom for incorporating the actors other than designers in the process of defining the problem.[158] In 1982, Cross, in "Designerly Ways of Knowing," dwells on Archer's idea of the third way in education and clarifies for the first time the different character of design activity that makes it necessary to be established as a distinct third aspect of education. In this investigation, he refers to Ryle's differentiation of knowing-that and knowing-how.[159] He focuses on two aspects of design activity: the design processes and the design products. Concerning design processes, he states that unlike the scientist's problem oriented mindset, designers' thinking process is solution oriented. Designers are regarded to provide concrete solutions to ill-defined problems, whereas scientists and scholars are free to leave the solution open to further research to well-defined problems. Designers tend to think visually based on patterns that he defines as the codes of the language of designers. As natural scientists use mathematical codes and scholars of humanities use literary language, designers use visual codes. He introduces the concept of "tacit knowledge" concerning designers' problem solving processes.[160] Concerning the design products, he argues that designers tend to learn from products, not in a way to copy them, but as they are "immersed in this material culture," they "draw upon it as the primary source of their thinking."[161] Cross concludes by stating that there is a need for research in designerly ways of knowing, the abilities of designers, and "ways of enhancing and developing these abilities through education."[162]

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[157] Bruce Archer, "Design as a Discipline," *Design Studies*, Vol. 1, No. 1 (July 1979): 17-20.

[158] Gerald Nadler, "A Timeline Theory of Design and Planning," *Design Studies*, Vol. 1, No. 5 (July 1980): 299-307.

[159] Cross, 1982, 223.

[160] Ibid, 223-224.

[161] Ibid, 224-225.

[162] Ibid, 226.

In 1983, Schön published his seminal work titled *The Reflective Practitioner: How Professionals Think in Action*. He suggested an alternative approach to understanding practices. Arguing that the positivistic application of knowledge gained through sciences that are related to the specific area of practice is not appropriate for dealing with the complicated nature of the real world problems of practices, he introduces the notion of "reflective practice" to generate knowledge through directly engaging with the complexity of practices. Instead of "specialized, firmly bounded, scientific, and standardized"[163] knowledge base of sciences, he proposes "an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring the situations of *uncertainty*, *instability*, *uniqueness*, and *value conflict*."[164] He develops his idea of "reflective practice through case studies on design, psychotherapy, science-based professions, town planning, and management. As a result of Schön's ability to elucidate the possibility of another form of knowledge through conceptual clarifications with proper references to Polanyi's tacit knowledge and approaches in action research, *The Reflective Practitioner* has informed the discussion on "designerly ways of knowing" extensively, becoming a major reference for the argument since it was published.

In 1990s, the debate has revived in England and since then it has spread through Europe with conferences and actual institutional experiences. Frayling's paper "Research in Art and Design," which brought new insights to the idea of a third way in education, is one of the significant references of the debate since 1990s. Elucidating on Herbert Read's distinction of "education into art" and "education through art" and referring to Picasso's ideas on the kind of research he does for his paintings, Frayling argues that there are "research into art and design," "research through art and design," and "research for art and design."[165] This tripartite division brings a new perspective on the issue of a third way in design research. "Research into art and design" is the conventional understanding of design research conducted through the historical, sociological, or technical methods where art and design becomes the object of the study. "Research through art and design" utilizes art and design as a tool of research and a tool for communicating the results. He considers "materials research," "development work" – i.e. "customizing a piece of technology to do something that no one has considered before, and communicating the results," and "action research" as

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[163] Schön, 1991, 23.

[164] Ibid, 49.

[165] Frayling, 1993, 1-2. Frayling refers to Herbert Read, *Education through Art* (New York, NY: Pantheon Books, 1956, first published in 1943) and "Pablo Picasso: an interview" (reprinted from the Arts, New York, May 1923) in *Artists on Art*, ed. Robert Goldwater and Marco Treves (London: John Murray, 1985), 416-417.

practices of "research through art and design." Finally, "research for art and design," according to Frayling, is "research where the end product is an artefact - where the thinking is, so to speak, embodied in the artefact, where the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or iconic or imagistic communication."[166] Therefore, the design activity itself becomes a process of research. He concludes by stating that we need a great amount of further research for establishing "research for art and design" as a research field. He argues that "once we get used to the idea that we don't need to be scared of 'research' – or in some strange way protected from it – the debate can really begin."[167]

In search for alternative knowing processes inherent in design activity, new problem areas began to emerge since 1980s. Researchers began to focus on characteristic aspects of design, which differentiate it from natural and social sciences. A literature review mostly based on articles published in *Design Studies* and *Design Issues* reveals that heuristics, creativity, expertise, and relationship between practice and research are the most significant problem areas emerged after Cross' notion of "designerly ways of knowing" and Schön's notion of "reflective practice." In 1980s the activity of problem solving emerged as a problem area for understanding design. The notion of heuristics was introduced as an alternative to positivistic approaches to problem solving. The work of Peter G. Rowe and Bryan Lawson in 1980s and Kees Dorst since late 1990s can be considered as significant examples of research on heuristics in design.[168] Another significant characteristic of design activity that became a problem area for researchers is creativity and innovation. Since late 1990s, sources and properties of creativity and innovation in design began to be analyzed and investigated in articles in *Design Studies* and *Design Issues*.[169] Expertise as a significant factor in design began to

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[166] Ibid, 5.

[167] Ibid.

[168] For further information, see Bryan Lawson, *How Designers Think: The Design Process Demystified* (Oxford: Butterworth Architecture, 1991, first published in 1980); Peter G. Rowe, "A Priori Knowledge and Heuristic Reasoning in Architectural Design," *Journal of Architectural Education*, Vol. 36, No. 1 (Autumn 1982): 18-23; Peter G. Rowe, *Design Thinking* (Cambridge, MA: The MIT Press, 1987); Kees Dorst, "Describing Design: A Comparison of Paradigms" (PhD diss., Delft University of Technology, 1997); Kees Dorst and Nigel Cross, "Creativity in the Design Process: Co-evolution of Problem-Solution," *Design Studies*, Vol. 22, No. 5 (September 2001): 425-437; and recently Kees Dorst, "Design Analogy: A Model for Moral Problem Solving," *Design Studies*, Vol. 27, No. 6 (November 2006): 633-656.

[169] For further information, see Richard Coyne, "Creativity as Commonplace," *Design Studies*, Vol. 18, No. 2 (April 1997): 135-141; Bruce Archer, "Viewpoint: Design, Innovation, Agility," *Design Studies*, Vol. 20, No. 6 (November 1999): 565-571; Dorst and Cross, 2001; P. Bertola and J. C. Teixeira, "Design as a Knowledge Agent: How Design as a Knowledge Process is Embedded into

be studied in 2000s focusing on comparisons between novice and expert designers, the relationship of experience and precedents in expertise, and investigation of the work of outstanding designers.[170] Finally, there is extensive research on the discussion concerning "designerly ways of knowing" and the relationship between practice, education and research with the influence of Schön's "reflective practice" since 1990s.[171]

Within this bulk of literature, Dorst's PhD dissertation of 1997, the special issue of *The Journal of Architecture* titled *Opposites Attract: Research by Design* in 2003, Lawson's *What Designers Know*,

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Organizations to Foster Innovation," *Design Studies*, Vol. 24, No. 2 (March 2003): 181-194; and Chris Rust, "Design Enquiry: Tacit Knowledge and Invention in Science," *Design Issues*, Vol. 20, No. 4 (Autumn 2004):76-85.

[170] For further information, see Niraj Verma, "Design Theory Education: How Useful is Previous Design Experience," *Design Studies*, Vol. 18, No. 1 (January 1997): 89-99; Manolya Kavakli and John S. Gero, "The Structure of Concurrent Cognitive Actions: A Case Study on Novice and Expert Designers," *Design Studies*, Vol. 23, No. 1 (January 2002): 25-40; Bryan Lawson, "Schemata, Gambits and Precedent: Some Factors in Design Expertise," *Design Studies*, Vol. 25, No. 5 (September 2004): 443-457; and Nigel Cross, "Expertise in Design: An Overview," *Design Studies*, Vol. 25, No. 5 (September 2004): 427-441.

[171] For further information, see Richard Buchanan, "Education and Professional Practice in Design," *Design Issues*, Vol. 14, No.2 (Summer 1998): 63-66; David Fleming, "Design Talk: Constructing the Object in Studio Conversations," *Design Issues*, Vol. 14, No. 2 (Summer 1998): 41-62; Nigel Cross, "Design Research: A Disciplined Conversation," *Design Issues*, Vol. 15, No. 2 (Summer 1999): 5-10; Ranulph Glanville, "Researching Design and Designing Research," *Design Issues*, Vol. 15, No. 2 (Summer 1998): 80-91; Susan Roth, "The State of Design Research," *Design Issues*, Vol. 15, No. 2 (Summer 1998): 18-26; Luz Maria Jimenez Narvaez, "Design's Own Knowledge," *Design Issues*, Vol. 16, No. 1 (Spring 2000): 36-51; Fiona Candlin, "Practice-based Doctorates and Questions of Academic Legitimacy," *Journal of Art and Design Education*, Vol. 19, No. 1 (February 2000): 96-101; John Hockey and Jacquelyn Allen-Collinson, "The Supervision of Practice-based Research Degrees in Art and Design," *Journal of Art and Design Education*, Vol. 19, No. 3 (October 2000): 345-355; Nigel Cross, "Designerly Ways of Knowing: Design Discipline versus Design Science," *Design Issues*, Vol. 17, No. 3 (Summer 2001): 49-55; Richard Buchanan, "Design Research and the New Learning," *Design Issues*, Vol. 17, No. 4 (Autumn 2001): 3-23; David Durling, "Discourses on Research and the PhD in Design," *Quality Assurance in Education*, Vol. 10, No. 2 (2002): 79-85; Peter Kroes, "Design Methodology and the Nature of Technical Artefacts," *Design Studies*, Vol. 23, No. 3 (May 2002): 287-302; Fiona J. Doloughan, "The Language of Reflective Practice in Art and Design," *Design Issues*, Vol. 18, No. 2 (Spring 2002): 57-64; Bryan Lawson, "The Subject that Won't Go Away but perhaps We are ahead of the Game: Design as Research," *ARQ*, Vol. 6, No. 2 (June 2002): 109-114; Cal Swann, "Action Research and the Practice of Design," *Design Issues*, Vol. 18, No. 2 (Winter 2002): 49-61; John Hockey, "Practice-based Research Degree Students in Art and Design: Identity and Adaptation," *Journal of Art and Design Education*, Vol. 22, No. 1 (February 2003): 82-91; *The Journal of Architecture*, Vol. 8, No. 2, *Opposites Attract: Research by Design* (Summer 2003); Ken Friedman, "Theory Construction in Design Research: Criteria, Approaches, and Methods," *Design Studies*, Vol. 24, No. 6 (November 2003): 507-522; Bryan Lawson, *What Designers Know* (Oxford: Architectural Press, 2004); Guy Julier, "From Visual Culture to Design Culture," *Design Issues*, Vol. 22, No. 1 (Winter 2006): 64-76; Theodore Zamenopoulos and Katerina Alexiou, "Towards an Anticipatory View of Design," *Design Studies*, Vol. 28, No. 4 (July 2007): 411-436; Owain Pedgley, "Capturing and Analyzing Own Design Activity," *Design Studies*, Vol. 28, No. 5 (September 2007): 463-483; *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007); Maarit Makela, "Knowing through Making: The Role of the Artefact in Practice-Based Research," *Knowledge, Technology, and Policy*, Vol. 20, No. 3 (October 2007): 157-163; Kees Dorst, "Viewpoint: Design Research: A Revolution Waiting to Happen," *Design Studies*, Vol. 29, No. 1 (January 2008): 4-11.

and recently, the special issue of *JAE* titled *Architectural Design as Research, Scholarship, and Inquiry* in 2007 are significant contributions.

In his PhD dissertation titled *Describing Design: A Comparison of Paradigms*, Dorst defines two main paradigms of design methodology as "rational problem solving" and "reflective practice." He relates the former to the positivist approaches of design methods as it is developed since 1960s, while the latter is by definition constructed around Schön's criticism of positivist approaches. By comparing these two paradigms and supporting the discussion with an empirical protocol analysis, Dorst aims at exploring what aspects of design activity can be explained with "rational problem solving" and what aspects can be explained with "reflective practice."[172] Through this comparison, he constructs a "dual mode-model of design and design methodology" that relates two paradigms for a coherent analysis of design.[173] This is a significant effort because he incorporates Schön's ideas on design research through a meta-methodological investigation in doctoral level.

Lawson, in *What Designers Know*, has moved further from his 1980 book *How Designers Think*. While in 1980, he argued a rationalistic approach towards the analysis of design, in 2004, his conception of designer's knowledge has expanded to incorporate Schön's "reflective practice" and contributions by design researchers such as Cross' "designerly way of knowing."[174] The book is a brief account of the literature on the relationship between design and knowledge focusing on issues like problem solving, design brief, computation, conversations, precedents, and expertise.

The special issue of *The Journal of Architecture* in summer 2003 is titled *Opposites Attract: Research by Design*. It was edited by Hill, and it focuses on architectural research that is generated in the university but it is not limited within the limits of the university to engage with architectural practice. Similar to the special issue of *JAE* titled *Search/Research* in 1979; it is composed of theoretical arguments and documentation of attempts to generate knowledge through specific practices. Starting with the etymology of the word "design," in "Hunting the Shadow: Immaterial Architecture," Hill argues that design is the creation of the links between idea and form (immaterial and material). After discussing the properties of immaterial and material in architecture and the relationship between them, he argues that engagement with both of them

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[172] Dorst, 1997, 45-150.

[173] Ibid, 151-174.

[174] Lawson, 2004, 95-119.

coherently is necessary for accommodating "evolving conceptions of the individual and society."[175] Mark Dorrian and Adrian Hawker, in "The Tortoise, the Scorpion and the Horse: Partial Notes on Architectural Research / Teaching / Practice," and Jane Rendell, in "Between Two," discuss the relationship between design and research, and theory and practice.[176]

The September 2007 issue of *JAE* is titled *Architectural Design as Research, Scholarship, and Inquiry*. This marks the transformation of the journal into a dual form composed of two sections. Beginning with this issue, *JAE* welcomes articles that are presented mainly in visuals that convey ideas through projects, studio works, exhibitions etc. under the title "Design as Scholarship" besides articles of scholarly research under the title "Scholarship of Design." Some articles contribute to the discussion of design as research in general such as Lily Chi's "Translations between Design Research and Scholarship," Peter Schneider's "Disegno: On Drawing Out the Archi-texts," Matt Powers' "Toward a Discipline-Dependent Scholarship," and B. D. Wortham's "The Way We Think about the Way We Think: Architecture is a Paradigm for Reconsidering Research."[177] Some articles focus on research in the design studio such as Kazys Varnelis' "Is there Research in the Studio?," and David Hinson's "Design as Research: Learning from Doing in the Design-Build Studio."[178] And some articles that are written by practitioners discuss research in architectural practice such as Stephen Kieran's "Research in Design: Planning Doing Monitoring Learning."[179]

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[175] Hill, 2003, 177.

[176] Mark Dorrian and Adrian Hawker, "The Tortoise, the Scorpion and the Horse: Partial Notes on Architectural Research / Teaching / Practice," *The Journal of Architecture*, Vol. 8, No. 2, *Opposites Attract: Research by Design* (Summer 2003): 181-190; Jane Rendell, "Between Two," *The Journal of Architecture*, Vol. 8, No. 2, *Opposites Attract: Research by Design* (Summer 2003): 221-238.

[177] Lily Chi, "Translations between Design Research and Scholarship," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 7-10; Peter Schneider, "Disegno: On Drawing Out the Archi-texts," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 19-22; Matt Powers, "Toward a Discipline-Dependent Scholarship," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 15-18; B. D. Wortham, "The Way We Think about the Way We Think: Architecture is a Paradigm for Reconsidering Research," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 44-53.

[178] Kazys Varnelis, "Is there Research in the Studio?" *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 11-14; David Hinson, "Design as Research: Learning from Doing in the Design-Build Studio," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 23-26.

[179] Stephen Kieran, "Research in Design: Planning Doing Monitoring Learning," *Journal of Architectural Education*, Vol. 61, No. 1, *Architectural Design as Research, Scholarship, and Inquiry* (September 2007): 27-31.

Since 1980s, especially after 2000s, "designerly ways of knowing," design as research, or research by design have been important topics of discussion in design literature. This discussion contributed to differentiating design knowledge from propositional knowledge of natural and social sciences. However, as the discussion revolves around these differences, knowledge generation processes that are particular to the activity of design are not discussed in depth. On the other hand, growing academic interest in the subject eventually resulted in transformations in institutions. With the introduction of research by design in institutions, the process of the definition of this research approach would be accelerated.

3.3.2 Institutionalization of Research by Design

The establishment of research by design in institutions should not be considered as research programs in isolation. In this study, institutionalization is considered as attempts of establishing research programs that are supported with conferences, publications, and governmental reports. Therefore, initiatives in Delft University of Technology (TU Delft) in relation to conferences held there, the "Millennium Programme" in Scandinavian countries in relation to publications on the program, and research programs in two institutions in England – The Bartlett School of Architecture (The Bartlett) and Architectural Association School of Architecture (AA) – in relation to governmental policies are discussed as significant attempts of institutionalization of research by design.

Initial attempts for the institutionalization of research by design began in TU Delft in mid 1990s. The first conference on the issue was held in TU Delft in 1996. This conference is titled *Doctorates in Design and Architecture* and in its proceedings there are significant essays on the issue of research by design in doctoral level.[180] The ideas that were presented in this conference are remarkable in their attitude for practical issues concerning the institutionalization of research by design with a focus on PhD research. Francis Duffy, in "The Value of a Doctorate in Architectural Practice," discusses the relationship of practice and research with an emphasis on practice-based research resting on his own experience in architectural practice and his duty at RIBA.[181] Jerker Lundequist, in "Research in Architecture and the Idea of a Social Science," defines architectural practice as a social practice, and argues

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[180] *Doctorates in Design and Architecture*, Proceedings, Volume I: The State of the Art (Delft: Delft University of Technology, 1996); *Doctorates in Design and Architecture*, Proceedings, Volume II: Results and Reflections (Delft: Delft University of Technology, 1996).

[181] Francis Duffy, "The Value of a Doctorate in Architectural Practice," in *Doctorates in Design and Architecture*, Proceedings, Volume I: The State of the Art (Delft: Delft University of Technology, 1996), 9-17.

that architectural research should be reconsidered in relation to social sciences for "clarifying the concepts that are crucial to this practice."[182] In "Design PhDs in Architecture", David Yeomans searches for establishing an academic ground for design PhDs in architecture.[183] Richard Foqué's "Epilogue: Design Research: The Third Way" reconsiders Frayling's tripartite division.[184] Herman Neuckermans, in "Doctorates in Architecture – Architecture in Doctorates" discusses the criteria for PhDs in architecture in a similar approach with Yeomans and argues that research and design are two distinct activities; therefore neither one of them can be expressed in the form of the other.[185]

After this conference, in 1999, TU Delft Faculty of Architecture initiated a research program titled "Architectural Intervention." This program resulted in the conference of *Research by Design* in 2000[186] and the methodological book titled *Ways to Study Architectural, Urban, and Technical Design* among other educational outputs.[187] The book compiles different research strategies in design research. Jack Breen's article "Designerly Enquiry" is significant in terms of proposing concrete categories for designerly enquiry. These categories are "decomposition," "variation," "visualization," and "references study." Although there are clues for these categories in Cross' articles that discuss the possibility of "designerly ways of knowing," Breen moves one step further in identifying the characteristics of these categories.[188] The articles that discuss examples of research by design are grouped under the title of "Study by Design." Theo van der Voordt and Taeke de Jong, in "Types of Study by Design," classifies "prototype design," "experimental design," "design re-construction,"

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[182] Jerker Lundequist, "Research in Architecture and The Idea of a Social Science," in *Doctorates in Design and Architecture*, Proceedings, Volume I: The State of the Art (Delft: Delft University of Technology, 1996), 77-85.

[183] David Yeomans, "Design PhDs in Architecture," in *Doctorates in Design and Architecture*, Proceedings, Volume I: The State of the Art (Delft: Delft University of Technology, 1996), 118-123.

[184] Richard Foqué, "Design Research: The Third Way," in *Doctorates in Design and Architecture*, Proceedings, Volume I: The State of the Art (Delft: Delft University of Technology, 1996), 125-129.

[185] Herman Neuckermans, "Doctorates in Architecture – Architecture in Doctorates," in *Doctorates in Design and Architecture*, Proceedings, Volume II: Results and Reflections (Delft: Delft University of Technology, 1996), 43-46.

[186] Annaloes Nieuwenhuis and Marieke van Ouwerkerk, eds., *Research by Design*, Conference Book, Delft: DUP Satellite, 2000; Marieke van Ouwerkerk and Jürgen Rosemann, eds., *Research by Design*, Proceedings A (Delft: DUP Science, 2001).

[187] T. M. de Jong and D. J. M. van der Voordt, eds., *Ways to Study Architectural, Urban, and Technical Design* (Delft: DUP Science, 2005).

[188] Jack Breen, "Designerly Enquiry," in *Ways to Study Architectural, Urban, and Technical Design*, eds. T. M. de Jong and D. J. M. van der Voordt (Delft: DUP Science, 2005), 95-102.

"scenario design," and "leaving out pre-suppositions" as types of study by design.[189] According to Voordt and Jong,

> When study by design is oriented primarily on generating knowledge and insight we can rightfully speak about a study. If optimizing a spatial solution is the first aim, it is a case, actually, of product development.[190]

In 2000, *Research by Design Conference* was held in Delft. This is the final event of the research project titled "Architectural Intervention." The term "research by design" was introduced through this conference to identify knowing processes particular to design activity. Although "designerly ways of knowing," "research through design," and "practice-based research" are terms that define similar forms of research, "research by design" is preferred in this study as it defines the specific relationship between the two activities. It considers design as the epistemological and methodological tool for research instead of considering them as two distinct processes coming together as in "research through design" or "practice-based research."

As a consequence of these attempts, TU Delft Faculty of Architecture has transformed its education into a process of research by design. There are remarks on its website emphasizing research by design as a core to the curriculum. This demonstrates how the Faculty of Architecture defines itself with its competence in research by design. This is the result of years of preparation, academic discussions, educational experiments, and theoretical clarification.

> 'Research by Design' is central to the MSc Architecture track. The research conducted in the faculty serves as a source of inspiration for the creation of your final design project. The interaction between research and design provides a constant stimulus for innovation in the course.[191]

Concurrently with TU Delft's "Architectural Intervention," a research program titled the "Millennium Programme" has reached its final stage in Scandinavian countries. In the article

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[189] Theo van der Voordt and Taeke de Jong, "Types of Study by Design," in *Ways to Study Architectural, Urban, and Technical Design*, eds. T. M. de Jong and D. J. M. van der Voordt (Delft: DUP Science, 2005), 455-457.

[190] Ibid, 456.

[191] "MSc Mastertrack Architecture," TU Delft Faculty of Architecture, [Internet: WWW], ADDRESS: http://www.tudelft.nl/live/pagina.jsp?id=44257998-ba89-476b-ac79-933c25c3440d&lang=en [ACCESSED: 14 April 2008].

titled "The 'Millennium Programme': Looking Back, Looking Forward," Halina Dunin-Woyseth provides a detailed description of the program. This program is the initiative of a network founded in 1992, which focuses on "co-operation on research education for 'making' professionals."[192] After "research education courses" organized in 1992 and 1993 in Oslo, in 1993 in Bergen, in 1994 in Aarhus, in 1994 in Sigtuna, in 1995 in Karlskrona, and in 1996 in Helsinki, four national research courses are organized in the academic year 1999-2000 constitute the main body of the "Millennium Programme." The first course in Norway is titled "Introduction to the Programme and The Scale of Objects," the second course in Sweden is titled "The Scale of Buildings," the third course in Denmark is titled "The Scale of Urban Space," and the fourth and final course in Finland is titled "A Unifying Milieu Perspective at the 'Making' Knowledge and Some Conclusions."[193]

Besides Dunin-Woyseth's article describing the program, the ideas evolved during the program have been developed in reports and articles. In 2001, "Towards a Disciplinary Identity of the Making Professions: The Oslo Millennium Reader," which was edited by Dunin-Woyseth and Jan Michl, was published in Oslo, Norway.[194] In the same year, *Architecture: Theory, Research and Practice* edited by Seppo Aura et al. was published in Finland.[195] In 2003, Dunin-Woyseth presented the theoretical construction of this 10 year endeavor in "Theorising Making Knowledge: Notes on 10 Years of Experience from Building up Doctoral Curricula at some Scandinavian Schools of Architecture and Planning."[196]

Architecture: Theory, Research and Practice is significant for the discussion of the relationship between tacit knowledge, action research, and architecture. Moreover, Aura et al. propose criteria for doctoral dissertations in design-based research departing from criteria of qualitative research such as "presentation of the research context and delineation of the

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[192] Halina Dunin-Woyseth, "The 'Millennium Programme': Looking Back, Looking Forward," *Nordic Journal of Architectural Research,* Vol.2 (2002): 8.

[193] Ibid, 9-10.

[194] Halina Dunin-Woyseth and Jan Michl (eds.), "Towards a Disciplinary Identity of the Making Professions," *The Oslo Millennium Reader*, Research Magazine No. 4 (2001).

[195] Seppo Aura, Juhani Katainen, and Juha Suoranta, *Architecture: Theory, Research and Practice* (Tampere, Finland: Tampere University of Technology, 2001).

[196] Halina Dunin-Woyseth, "Theorising Making Knowledge: Notes on 10 Years of Experience from Building up Doctoral Curricula at some Scandinavian Schools of Architecture and Planning," (paper presented at the Planning Research Conference, Oxford Brookes University, April 8-10, 2003).

problem," "credibility and accountability," "plausibility built into the research report," and "usability, transferability and news value of the findings."[197]

The "Millennium Programme" is an important attempt of developing a research program for professionals in 'making' disciplines. Its significance lies in its success in creating collaboration between institutions of four countries within a conceptual framework. This framework results in fruitful discussions that contribute to the area of research by design.

In England, where the discussion on "designerly ways of knowing" initiated, practice-based research was accepted in policies concerning architectural education. In late 1990s and early 2000s, RIBA began to place emphasis on the relationship of design and knowledge in the reports concerning architectural education in England. In 1999, RIBA Review of Architectural Education published a report titled "Architectural Education in the 21st Century" in 1999.[198] The chairman of the review, Colin Stansfield Smith argues in his foreword that, "design [is] an activity that is not a branch of learning, but the scope of knowledge relevant to its practice without limit; each problem generating need and defining its own territory."[199] One of the goals of the review is that "research and specialisms should be vigorously promoted across education and practice to create a cutting edge to architecture as a knowledge-based profession."[200] In 2002, RIBA's criteria for validation in architectural education are published and it became effective beginning from 2003.[201] The document classifies themes in architectural education under groups of "Design, Technology and Environment, Cultural Context, Management Practice & Law and Communication," which are to be studied in Part 1, Part 2, and Part 3 courses with increasing specialization.[202] It approaches these themes as equals only with an exception on the theme of design. Design is considered as the core of architectural curriculum and it constitutes the half of study in Part 1

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[197] Aura, Katainen, and Suoranta, 2001, 42-43.

[198] "Architecture Education in the 21st Century," RIBA Review of Architectural Education, October 1999, [Internet: WWW], ADDRESS: http://www.archaos.org/resources/CSSreport.pdf [ACCESSED: 19 May 2005].

[199] Ibid, 3.

[200] Ibid, 6.

[201] "Criteria for Validation," RIBA, 2002, [Internet: WWW], ADDRESS: http://collaboration.aia.org/SiteObjects/files/arb_riba_criteria_for_validation_final_document.pdf [ACCESSED: 19 May 2005].

[202] Ibid, 3.

and Part 2 courses.[203] "Awareness, knowledge, understanding, and ability" are defined as four levels of achievement in each theme that organize the validation criteria for architectural education.[204] Introduction of these four levels indicate that learning in architecture is related to more than just the acquaintance of theoretical knowledge. These two reports published by the regulating body of architecture in England reveal the emphasis on design as an integral part of knowledge generation in institutions in the country. In 2005, the web site of Arts and Humanities Research Council (AHRB) of United Kingdom published a guide titled "Fellowships in Creative and Performing Arts: Frequently Asked Questions" that emphasizes practice-based research.[205] This document demonstrates how practice-based research is accepted as a preferred form of research in arts. In 2002, "Submission to Research Assessment Exercise 2001 by Royal College of Art" was published. [206] With its reference to Frayling's tripartite division of "research into art and design," "research through art and design," and "research for art and design," the report that Royal College of Art prepared in response to Research Assessment Exercise 2001 shows to what degree a practice-based approach to research is internalized in institutions. Within such a network, the governing bodies and institutions have developed programs that are based on practice-based research in England. The research programs that emphasize close relationships between research and practice in The Bartlett and AA should be considered in relation to educational policies of the country.

The Bartlett offers a doctoral program titled "MPhil/PhD Architectural Design" based on the dual production of a design work and a text. The text is not considered as the description of the project, instead the text and project are considered as the essential tools for knowledge generation constantly feeding each other.

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[203] Ibid.

[204] Ibid, 4.

[205] "Fellowships in Creative and Performing Arts: Frequently Asked Questions," Arts and Humanities Research Council (AHRB), 2005, [Internet: WWW], ADDRESS: http://www.ahrb.ac.uk/images/4_96487.doc [ACCESSED: 10 September 2005].

[206] "RA5a: Structure, Environment, and Staffing Policy," in *The RAE 2001 Submission of Royal College of Art in the Unit of Assessment on Art and Design*, 2002, [Internet: WWW], ADDRESS: http://195.194.167.103/submissions/Textform.asp?route=1&HESAInst=H0003&UoA=64&Msub=Z&Form=RA5a [ACCESSED: 12 December 2006].

> A research by architectural design thesis has two inter-related elements of equal importance – a project and a text – that share a productive relationship. The project may be drawn, filmed, modeled, built, or use whatever media is appropriate.[207]

The program is based on research questions that are investigated through projects. The text and the project develop in coherence through this investigation. The topics to be researched through projects may vary according to the interests of the researcher/designer. For example an early dissertation by Hill, who is the director of the program today, is titled *Creative Users: Illegal Architects* and he discusses the relationship of users and design.[208] In a recently completed dissertation titled *The (Existenz-) Minimum Dwelling*, Ersi Ioannidou discusses the modernist definition of minimum house and its relationship to current experience of the home. The investigation is organized in a twofold approach that is composed of analysis of texts and projects on the one hand, and development of a series of projects on the other.[209]

AA's Design Research Laboratory (AADRL) is founded in late 1990s in order to investigate digital possibilities of making in architecture. Although the program is now titled "Architecture & Urbanism," it has gained worldwide reputation for the innovative architectural work as AADRL; therefore it is referred to as AADRL in this study. Working with real sites and real clients, the design teams at AADRL aim to generate knowledge on particular site, functional requirements, digital technologies, and form making techniques through their thesis projects.[210]

> The studio-based course develops advanced skills and knowledge through the making of design proposals for new, alternative forms of architectural and urban space. The course treats the design project as a form of research and emphasizes an analytical, data-driven investigation into all parameters shaping an architectural project. Studio projects, alongside related design workshops and seminars, focus on the challenges of new and emergent spatial formations, complex social organizations and new design techniques.[211]

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[207] "MPhil/PhD Architectural Design," The Bartlett School of Architecture, [Internet: WWW], ADDRESS: http://www.bartlett.ucl.ac.uk/architecture/programmes/mphil_phd_d/mphil_phd_d.htm [ACCESSED: 14 April 2008].

[208] Ibid.

[209] Ibid.

[210] "AADRL MArch," Architectural Association School of Architecture, [Internet: WWW], ADDRESS: http://www.aaschool.ac.uk/Default.aspx?section=school&page=aadrl%20MArch [ACCESSED: 14 April 2008].

[211] Ibid.

Since 1997, design teams have produced projects on topics like "corporate fields," "nanourbanism," "responsive environments," and "parametric urbanism."[212] There are mainly two accepted methods of design. "Creative intelligence: studies on material performance" investigates the "interrelationship between material and digital methods of exploring material behaviors" whereas research on "prototypes" focuses on bridging "the gap between digital techniques / modeling and the acts of making."[213]

The examples selected above illustrate how research by design is understood in architectural institutions within the frameworks of academic literature and governmental policies. This selection demonstrates that each attempt of institutionalization of research by design is shaped according to the background of the particular institution. Besides these selected attempts of institutionalization, conferences continued to be organized for the establishment of research by design in architecture.[214]

It is evident that there is an extensive literature, especially since 2000, on the discussion of the possibility of an alternative form of research that aims to generate knowledge through design activities. A review of the literature demonstrates that the discussion is developed by researchers within design research tradition such as Cross, Lawson, Dorst, and Frayling. Moreover, the discussion has evolved around a comparison of design activity with the activities in natural and social sciences, which are the primary epistemological and methodological sources for the paradigms of design research since 1960s. Research by design has evolved within the design research tradition with profound links to studies in design methods and history, theory and criticism; however the related literature points to the evolution of a new paradigm in design research.

As it can be understood from the majority of theoretical texts, although the discussion has moved further from its initiation in early 1980s – through its acceptation in scholarly journals and institutions – it is still limited to describing the differences between design's own knowledge and propositional knowledge of natural and social sciences. It has now been widely acknowledged that design has its own knowledge, therefore it should have its own form of research. However, there is still a need for clarification of the conceptual basis of the problem area and definition of the epistemological and methodological boundaries of it.

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[212] "Archive," AADRL.

[213] "Methods," AADRL.

[214] *Design + Research: Project Based Research in Architecture*, Melbourne, Australia, 2003; *Futureground*, Melbourne, Australia, 2004; *The Unthinkable Doctorate*, Brussels, Belgium, 2005.

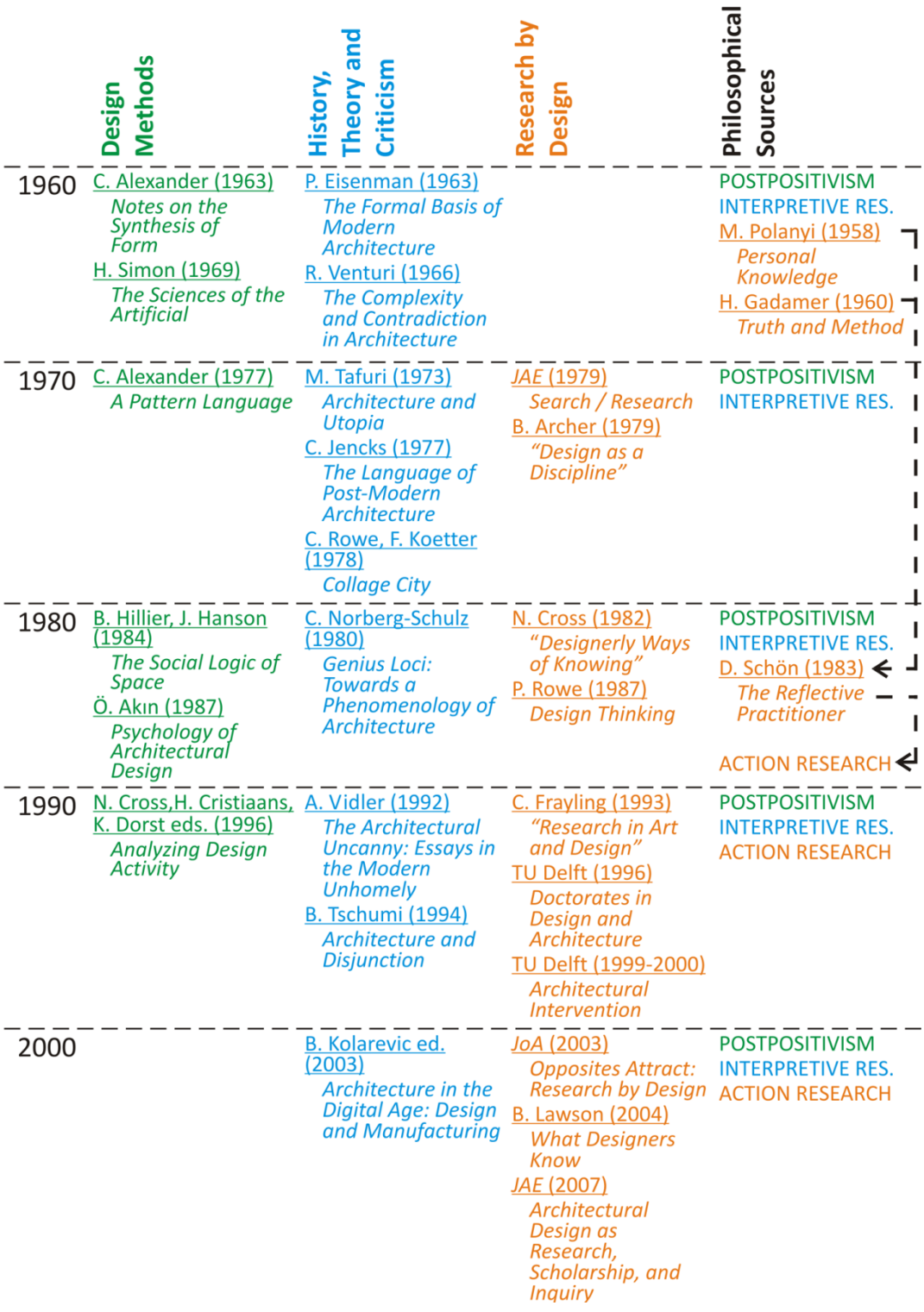

Figure 3.9. Evolution of research by design within design research. Drawing by the author.

Figure 3.9 shows the evolution of research by design by illustrating significant texts exemplifying the developments in design methods research, theory, history and criticism, and research by design in a timeline from 1960s to today. The table also demonstrates Schön's influence in research by design. The literature on research by design is concentrated in 1990s and 2000s after the reception of Schön's concept of reflective practice. Schön introduces methods of action research to design research by depending epistemologically on Polanyi's tacit knowing. Although Schön is the main reference of discussion, it is evident that in terms of defining the boundaries of research by design, his argument corresponds to today's quasi academic attempts in which there is the dominance of a relativistic approach in epistemological and methodological foundations of research by design. As his argument is primarily methodological rather than being epistemological, his formulation is insufficient for developing the conceptual basis for research by design. Therefore, if reflective practice is considered as the most appropriate description of a particular knowing process in action, then Schön's epistemological references to Polanyi's tacit knowing and his methodological references to the tradition of action research should be investigated. These investigations provide clues for the missing portion in literature on research by design, which results in a relatively closed discussion, which is rather unproductive in terms of constructing an epistemological framework.

CHAPTER 4

REFLECTIVE PRACTICE AND ACTION RESEARCH

The literature concerning research by design attests that there is a shift marked with the publication of Schön's *Reflective Practitioner: How Professionals Think in Action* in 1983. While introducing action research as a new paradigm for research in professional practices like architecture, Schön explicitly refers to the concept of tacit knowing as it was structured by Polanyi in his *Personal Knowledge: Towards a Post-Critical Philosophy*, which was published in 1958. While the notions of action research and tacit knowing have been widely covered in literature on research by design, the references are often to Schön's work. These concepts are considered as given and discussions are constructed around them in search for developing a knowledge base and methods for research by design through elaboration of secondary concepts. In this study, it is argued that there is a need for further examination of the concepts developed by Schön in relation to his epistemological and methodological references for defining the possibilities and boundaries of research by design.

Therefore, in this chapter, firstly, Schön's *Reflective Practice* is overviewed through constructing its relationship with architectural practice. Then, Polanyi's concept of "tacit knowing" is investigated. Finally, the general framework of action research is discussed. Through the investigation of these primary conceptual references of research by design, it is possible to develop a conceptual framework that makes it possible to reflect on an epistemology of *knowing what through the act of design*.

4.1 Reflective Practice

Although he investigated this issue since 1950s, Schön's concept of "reflective practice" has become very influential in the debates concerning professional education since the publication of his book titled *The Reflective Practitioner: How Professionals Think in Action* in 1983.

Schön develops a critical stance towards the positivist understanding of knowledge. After defining "Technical Rationality" as the dominant epistemology of professions and discussing the crisis of confidence in professional knowledge in the 1960s, he introduces the concept of "reflective practice" as a part of a new epistemological framework for professionals.

4.1.1 Technical Rationality and the Crisis of Confidence in Professional Knowledge

Schön defines Technical Rationality as "the view of professional knowledge which has most powerfully shaped both our thinking about the professions and the institutional relations of research, education, and practice." It is based on the belief that "professional activity consists in instrumental problem solving made rigorous by the application of scientific theory and technique."[215] From the point of view of Technical Rationality, there is a scientific knowledge base that can be applied to problem situations. Schön considers four essential properties of this "systematic knowledge base" as being "*specialized*, *firmly bounded*, *scientific*, and *standardized*."[216] He relates the "crisis of confidence" in professional knowledge to this separation of knowledge base and practice. The problem arises in the application of strictly defined scientific and theoretical knowledge to problem situations. Schön argues that since the application of scientific knowledge base fails to be systematic as it claims to be, there has been a mystification of professional knowledge.

This mystification has resulted in a tradition of "radical criticism" according to Schön, in which "both the Technological Program and the professional's claim to extraordinary knowledge are treated as mystiques."[217] Radical criticism places client to the forefront in the professional-client relationship. It resists professional's efforts to control the client.[218]

4.1.2 Reflection-in-Action

Schön proposes the idea of "reflection-in-action" as a primary component of reflective practice. According to him, "when someone reflects-in-action, he becomes a researcher in the

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[215] Schön, 1991, 21.

[216] Ibid, 23. Emphasis added.

[217] Ibid, 288.

[218] Ibid, 294.

practice context."[219] Reflection-in-action emerges as an alternative to the inefficiencies of both traditions of Technical Rationality and radical criticism.

Reflection-in-action differs from "reflecting on knowing-in-practice." The latter is common to many practitioners as they evaluate their positions and actions after "their handling of the case" in a relatively serene moment by looking back. This reflection has implications for the professional's preparation for upcoming situations.

Stephen Newman, in his article *Constructing and Critiquing Reflective Practice* of 1999, defines three components of reflective practice. The first being "knowing-in-action," which is described above, and the second being "reflection-in-action," he identifies a third and most complex component referring to Schön, which is "reflection upon reflection-in-action." According to Newman,

> Schön has variously characterised it as research in practice, or as turning thought back on itself; it is, he argues 'a process of getting in touch with the understandings we form spontaneously in the midst of action'.[220]

Reflective practice is "an epistemology of practice implicit in the artistic, intuitive processes which some practitioners do bring to the situations of *uncertainty*, *instability*, *uniqueness*, and *value conflict*."[221] As opposed to the causal relationship between means and ends of accomplishing a task in Technical Rationality, reflection-in-action constantly reconsiders the nature of this relationship as well as the nature of means and ends.[222] This reconsideration of the relationship of means and ends becomes possible through a reframing of problems from problematic situations.[223] Therefore, the focus is not only on problem solving, but equally on problem defining.

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[219] Ibid, 68.

[220] Stephen Newman, "Constructing and Critiquing Reflective Practice," *Educational Action Research*, Vol. 7, No. 1 (1999): 149. He refers to Schön, 1983, 309; D. A. Schön, "Toward a New Epistemology of Practice," in *Strategic Perspectives on Planning Practice*, ed. B. Checkoway, 231-249 (Lexington: Lexington Books, 1986), 246; D. A. Schön, "Concluding Comments," in D.A. Schön (Ed.) *The Reflective Turn: Case Studies in and on Educational Practice*, 343-359 (New York: Teachers College Press, 1991), 357; and D. A. Schön, "The Theory of Inquiry: Dewey's Legacy to Education," *Curriculum Inquiry*, Vol. 22, No. 2 (1992): 126.

[221] Schön, 1991, 49.

[222] Ibid.

[223] Ibid, 68.

Schön explains his argument through analyses of some typical situations in different professions such as design, psychotherapy, science-based professions, town planning, and management. The case study on design is an analysis of the conversation between an architectural design critic and a student. Therefore, while discussing reflection-in-action in architectural design professions, he also provides insights for professional education.

4.1.3 Reflection-in-Action and Architectural Design

Schön's analysis of an exemplary design process is quite remarkable. The process is a conversation between a critic (whom he refers to with the alias Quist) and a student (whom he refers to with the alias Petra) during the early phases of an architectural design exercise. Besides the dialogue between Quist and Petra, Schön conceives an interaction between a designer and a design situation as a "reflective conversation". He conceptualizes this conversation as a protocol. There are three dimensions of the protocol; "design domains," "implications," and "shifts in stance." "Design domains" refer to the background of a designer, which shapes his/her language in his/her actions. Each action has some "implications" for the later phases of the process. While responding to these implications, a designer should feel free to "shift his/her stance" for the sake of the reflective conversation with the situation.[224]

This protocol is based on Schön's broader concept of reflection-in-action instead of a causal means-ends relationship of a Technical Rational flow process. Although he manages to conceptualize the process as described above, this formulation does not exclude the situations of *uncertainty*, *instability*, *uniqueness*, and *value conflict*. This formulation bears resemblances to trial and error method. However, unlike a simple trial and error method, there is the significant role of *experience* that enables the designer to cope with the particular situation. As Schön points out, Quist is able to consider many *implications* of his particular action, therefore, he is able to predict the later phases of the process and act accordingly. This is the main difference between the critic and the student, and actually this is the crucial point where the student encounters some difficulties. Although Petra still lacks experience, after this reflective conversation with Quist, she acquires some tools to work out a design problem.

The protocol that Schön develops for the analysis of this design process is based on the tacit knowledge of the designer. The first dimension of the protocol, design domains, is related

[224] Ibid, 95-104.

with experience that is required for the definition of the problem. In each stage of the design process the problem is constantly redefined. Knowing that each action will have implications for the next phase of the process is the second dimension. Finally, a designer should be able to shift his/her stance according to newly defined problems, which are implied by earlier actions. Acting in this protocol requires being aware of "the design domains," "implications" of every design act, and "shifts in stances" simultaneously. A formulation of this simultaneity can be founded in Polanyi's elucidation of the concept of "awareness" in his formulation of tacit knowing. These concepts that are related with awareness will be discussed in the section on tacit knowledge. Through her conversation with Quist, Petra acquires a basic pattern of action. Although she still lacks experience and foreknowledge of the design domains, by reflecting on that particular design work, Quist constructs a framework for Petra that she can utilize in her design actions.

4.1.4 Reflective Practice and Professional Knowledge

Schön compares his proposal of reflection-in-action with Technical Rationality and radical criticism, which emerged after the crisis of confidence in professional knowledge. As reflective practice is conceived as an epistemology of professions, this comparison is necessary for discussing the implications of reflective practice on professions. His argument is constructed around the changes in "professional-client relationship," the relationship between "research and practice," the "institutions," and finally the "place of professionals in the larger society."

When considering the professional-client relationship, he proposes an alteration in the "contract." The contract would take the form of a reflective conversation with the client just as the reflective practice takes the form of a reflective conversation with the situation. The key dimension of this conversation is the "meanings." The professional would recognize that "his actions may have different meanings for his client than he intends them to have" and s/he should strive to reveal these meanings.[225]

The relationship between research and practice is redefined through reflective practice as Schön proposes an integration of knowing and practice. He defines four types of reflective research; "frame analysis," "description and analysis of images, category schemes, cases, precedents, and exemplars" that he refers to as "repertoire-building research," "methods of

[225] Ibid, 295.

inquiry and the overarching theories of phenomena" that he refers to as "action science," and the "process of reflection-in-action itself."[226] He emphasizes "action science" for generalizing reflection-in-action. This is important for reflective practice, which is already inherent in some occasions of practice, to become a general pattern of professions.[227]

In terms of institutions of research and practice, Schön states that when a practitioner begins to reflect on his/her action, s/he will eventually transform the rules, spaces, and processes of the formal bureaucracy of his/her institution. Consequently, he argues for a "cooperative inquiry in policy making"[228] by referring to "professionals as agents of society's reflective conversation with its situation, agents who engage in cooperative inquiry within a framework of institutionalized contention."[229]

Schön's formulation of reflective practice provides an epistemological framework for demystifying particular dimensions of professional practices that cannot be apprehended from within the existing frameworks of Technical Rationality and radical criticism. With its implications for the improvement of individual and institutional realms of professions, this new framework has been largely referred in professional literature.

However, there are criticisms of the overwhelming effect of "reflective practice" as a new epistemological paradigm. Newman claims that it would cause limitations to associate such an approach to practical knowledge only with Schön's ideas. He concludes his criticism by stating that this approach to professional knowledge should be apprehended within a more comprehensive framework.

> Given that the term 'reflection' is so widely used, and so often associated with Schön's work, the baggage which comes with the term 'reflective practice' may now be proving more of a hindrance than a help. One term which might be an appropriate alternative to describe reflective practice of the sort I have suggested here is 'critical practice' (cf. Tomlinson, 1995, p. 3); another possible term might be 'practical philosophy' (Elliott, 1991, p. 51). Both terms can be seen as giving recognition to the view that philosophy need not be 'an academic discipline dissociated from the realities of everyday social practices and engaged in by

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[226] Ibid, 309.

[227] Ibid, 354.

[228] Ibid, 351-353.

[229] Ibid, 353.

> specialists operating outside them' (Elliott, 1991, p.51); both also suggest an approach which practitioners can adopt in the different social contexts in which they find themselves.[230]

Although Schön does not acknowledge the relationship between reflective practice and practical philosophy, he refers explicitly to Polanyi's concept of tacit knowing in order to exemplify the nature of knowing processes in reflection-in-action and action research in order to propose a method for generalizing reflection-in-action.[231]

4.2 Tacit Knowledge

There are "certain cognitive processes and/or behaviors" that "are undergirded by operations inaccessible to consciousness."[232] Daniel Barbiero, in his article on tacit knowledge, states that this conception of tacit knowledge goes back as far as Helmholtz's work in the 19th century. When Aristotle's idea of prudence (*phronēsis*) as an intellectual virtue, and its relationship with action (*prāxis*) are considered, it can be said that the discussion of a species of knowledge that is "inaccessible to consciousness," which governs "certain cognitive processes and/or behaviors," goes back to the fourth century BC. Although the idea has existed since the beginning of the history of philosophy, it is Polanyi who effectively conceptualized it as "tacit knowing" in the mid 20th century.

Polanyi's masterwork *Personal Knowledge: Towards a Post-Critical Philosophy* of 1958 is the formulation of an epistemology that focuses on what he calls "personal knowledge."[233] As he often suggests, explicitly or implicitly, this is related with a criticism of "objectivism" of scientific tradition that began with the achievements in Renaissance, particularly with the Copernican Revolution. Polanyi refers to this tradition as the "critical" tradition, and relates it with the revival of the ancient Greek rational philosophy after the dogmatic tradition of the middle ages. This is why the subtitle of his book is "towards a post-critical philosophy."

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230 Newman, 1999, 161. Newman borrows the term "critical practice" from P. Tomlinson, *Understanding Mentoring: Reflective Strategies for School-based Teacher Preparation* (Buckingham: Open University Press, 1995), 3; and "practical philosophy" from J. Elliott, *Action Research for Educational Change* (Buckingham: Open University Press, 1991), 51.

231 Schön, 1991, 52, 319-320, 354.

232 Daniel Barbiero, "Tacit Knowledge," [Internet, WWW], ADRESS: http://www.artsci.wustl.edu/~philos/MindDict/tacitknowledge.html [Accessed: 20 August 2002].

233 Michael Polanyi, *Personal Knowledge: Towards a Post-Critical Philosophy* (New York, NY: Harper & Row, 1964, first edition, 1958).

His main argument is based on the premise that every intellectual act involves a "tacit coefficient" in it, and it is necessary to acknowledge and investigate this tacit coefficient in order to arrive at a comprehensive understanding of phenomena. He discusses the nature of tacit knowing through an investigation of skills. His elucidation of the concepts of "awareness," "problem-solving," "intellectual beauty," "intellectual passion," and "subception" allows an in depth analysis of tacit knowing and its significance for human actions. In the context of this study, these various concepts related with tacit knowing are reconsidered for understanding the nature of knowing-how that is essential in architectural design.

4.2.1 Two Kinds of Awareness

Polanyi explains two kinds of awareness that arise in accomplishing a work. These are "focal awareness" as the awareness of the task we are performing, and "subsidiary awareness" as the awareness of the parts of the process of accomplishing a task. He gives the example of driving a nail with a hammer to explain this distinction. While we are driving a nail to a wall with a hammer, our focal awareness is on the insertion of the nail into the wall, the main task is this. However, we are also aware of our holding the hammer, of our holding of the nail, of our hits on the nail, or of the speed of the hammer. We are aware of these secondary tasks subsidiarily; this is an awareness of the tools that we are using. If our focal awareness shifts to one of these subsidiary ones, we often fail to accomplish the task. When these two kinds of awareness are considered together, it helps us to reflect on how we are doing what we are doing. This results in a level of self-consciousness.[234]

Concerning the awareness of particulars, Polanyi, with reference to his discussion of two kinds of awareness, argues that, "particulars can be noticed in two different ways." If we focus our attention on the isolated particulars, we notice them "uncomprehendingly;" if we direct our attention beyond particulars to their participation in the comprehensive entity, we are aware of them "understandingly."[235] His discussion of two kinds of awareness in intellectual acts is applicable to the parts as well. When one is engaged with a comprehensive entity or a task, s/he is focally aware of it and subsidiarily aware of the particulars of the entity or the task. When our attention is directed to the particulars, this distinction still applies but now in reverse; to notice the particulars one is focally aware of the particulars, and

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[234] Ibid, 55-57.

[235] Michael Polanyi, "Knowing and Being," 1961, in *Knowing and Being: Essays by Michael Polanyi,* ed. Marjorie Grene (Chicago, IL: The University of Chicago Press, 1969), 128.

subsidiarily aware of their participation in the whole. This reciprocal relationship is quite clear in understanding the shift of attention between different layers of an entity or task.

Polanyi's distinction between these two kinds of awareness helps to conceptualize "the cognitive processes or behaviors that are inaccessible to consciousness."[236] This identification of two levels of awareness operates for the understanding of our acts, which are tacitly knowable.

4.2.2 Problem-Solving

Resting on contemporary learning theories, Polanyi argues that tacit coefficient of knowing exists in the phases of learning that come before "articulation" of the mind. These are common to animals and human infants. He describes three stages of learning; "trick-learning" that is the stage of invention, "sign-learning" that is the stage of observation, and "latent-learning" that is the stage of interpretation. In this analysis, his formulations of "problem" and "problem-solving" are remarkable. Two quotations explain his emphasis on tacit acts of problem definition in the process of problem solving. He states that, "To see a problem is a definite addition to knowledge, as much as it is to see a tree, or to see a mathematical proof – or a joke."[237] He clarifies this view by stating that:

> … nothing is a problem or discovery in itself; it can be a problem only if it puzzles or worries somebody, and a discovery only if it relieves somebody from the burden of the problem.[238]

Knowledge is conceived as an activity in Polanyi's epistemology. His engagement with personal and tacit knowing with a clear elucidation of the two kinds of awareness is related with clarification of this activity of knowing. "The knowledge of the problem is, therefore, like the knowing of unspecifiables, a knowing of more than you can tell."[239] He claims "knowledge is an activity which would be better described as a process of knowing."[240]

Problem posing and problem solving are integral parts of architectural design activity. For Polanyi, they are integral to the activity of knowing as he defines knowledge as an activity.

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[236] Barbiero, "Tacit Knowledge."

[237] Polanyi, *Personal Knowledge*, 1964, 120.

[238] Ibid, 122.

[239] Polanyi, 1961, 131.

[240] Ibid, 132.

The concept of "foreknowledge" is indispensable to the process of problem posing. Finding the right questions to be investigated is closely related with the background of the investigator and the interpretation of the precedents in the particular subject area. These together constitute the personal foreknowledge.[241]

4.2.3 Intellectual Passion

Through the analyses of problems, Polanyi introduces the concepts of "intellectual passion" and "intellectual beauty." Intellectual passion that makes someone to engage in some phenomena, to define a problem from that phenomena, and to strive to understand that phenomena, is undoubtedly a "personal (tacit) act of knowing." "Elegance," "economy," and "simplicity" that are achieved during the investigation of a problem are personal. These have a very important role in knowing, and these cannot be addressed within the framework of "critical epistemology;" in Polanyi's words, they are "tacit." While responding to critiques who claim that this is a subjective point of view, Polanyi distinguishes three inferences concerning intellectual beauty. These are:

> … the power of intellectual beauty to reveal truth about nature; the vital importance of distinguishing this beauty from merely formal attractiveness; and the delicacy of the test between them, so difficult that it may baffle the most penetrating scientific minds.[242]

4.2.4 The Structure of Tacit Knowing, Integration and Irreversibility

In his 1965 essay, *The Structure of Consciousness*, Polanyi explains the structure of tacit knowing through the example of perception of a stereo-image. In the example of looking at a "stereo-image," he begins by explaining two kinds of awareness, namely focal and subsidiary awareness. Through this discussion he constructs the structure of tacit knowing as he defines its characteristic aspects as "functional," "semantic," and "phenomenal."

> We may describe the situation by saying that we are *focally aware* of the stereo-image, by being *subsidiarily aware* of the two separate pictures. And we may add that the characteristic feature of subsidiary awareness is to have a *function*, the function of bearing on something at the focus of our attention. Next we may observe that the focal image, into which the two subsidiary pictures are fused, *brings out their joint*

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[241] The concept of "foreknowledge" is further elaborated in Chapter 5 by referring to Gadamer.

[242] Polanyi, *Personal Knowledge*, 1964, 149.

> *meaning*; and thirdly, that this fusion *brings about a quality* not present in the appearance of the subsidiaries. We may recognize then these three features as parts of a process of knowing a focal object by attending subsidiarily to the clues that bear on it.[243]

Polanyi argues that our understanding of a three dimensional image from two separate images is not the result of an "argument," we cannot explicitly define the situation, but we tacitly know it. Of course it is possible to explain how these two pictures are produced by taking photographs from two points away from each other with a distance that is equal to the distance between our eyes. However, the fusion of these two distinct pictures into a three dimensional image is tacitly known as we experience the moment. Polanyi explains this process of tacit knowing with his theory of the two kinds of awareness and "integration."

> The fusion of the two stereoscopic pictures to a single spatial image is not the outcome of an argument; and if its result is illusory, as it can well be, it will not be shaken by argument. The fusion of the clues to the image on which they bear is *not a deduction* but an *integration*.[244]

One significant notion that helps to clarify the difference of tacit and explicit inferences is the notion of "reversibility." Polanyi explains it with reference to Piaget's differentiation between sensorimotor act and explicit inference. "Irreversibility" explains the peculiar nature of problem posing, problem solving, discovery, innovation, and eventually of design process.

> Explicit inference is reversible: we can go back to its premises and go forward again to its conclusions, rehearse the whole process as often as we like. This is not true for the sensorimotor act: for example, once we have seen through a puzzle, we cannot return to an ignorance of its solution.[245]

4.2.5 Personal Knowledge and Architectural Design

Polanyi's aim is not to render explicit the tacit coefficients of knowing. On the contrary, he argues that although it is not possible to formalize such knowledge, as it is personal, it is crucial to acknowledge the importance of tacit knowledge in the investigation of intellectual acts, including achievements of practical performances as well as scientific developments. He

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[243] Michael Polanyi, "The Structure of Consciousness," 1965, in *Knowing and Being: Essays by Michael Polanyi,* ed. Marjorie Grene (Chicago, IL: The University of Chicago Press, 1969), 212.

[244] Ibid.

[245] Ibid, 212-213.

aims at bringing back personal intellectual acts of belief and passion to the endeavor of attaining truth without falling into dogmatism. He believes that it is possible after the experience of dogmatic tradition of the middle ages and critical tradition that came after, as now we have both experiences as precedents to build on.

> We must now recognize belief once more as the source of all knowledge. Tacit assent and intellectual passions, the sharing of an idiom and of a cultural heritage, affiliation to a like-minded community: such are the impulses which shape our vision of the nature of things on which we rely for our mastery of things. No intelligence, however critical or original, can operate outside such a fiduciary framework.[246]

While referring to the works of the Gestalt psychologists in relation to his formulation of two kinds of awareness, Polanyi also points to the phenomenological tradition as one of philosophical sources of his ideas. He states that it is possible to trace the origins of his arguments in Ryle's "*informal logic* of science and knowledge in general," or Husserl's and Merleau-Ponty's "phenomenology of science and knowledge." He refers to Dilthey and existentialism in relation to his notion of "indwelling." Polanyi also refers to Kant's categories, "by which experience of external objects is possible." These categories reappear with his arguments "in the active knower participating in all live knowledge."[247]

The significance of tacit knowledge in terms of architectural design can be discussed in two dimensions. Firstly, tacit knowledge and related concepts would provide ways for understanding of the nature of architectural knowledge and generation of knowledge through the act of design. Secondly, they are related in pedagogical terms, in other words, how tacit knowing applies to the transmission of architectural knowledge.

The notion of "subception" is significant in the elaboration of the transmission of tacit knowledge. Polanyi gives some examples of experimental evidence concerning tacit knowing after explaining it through some simple human actions like riding a bike and swimming. He explains an experiment done by Lazarus and McCleary.

> … a person is presented for brief periods with several nonsense syllables and after certain of those syllables he is subjected to an electric shock. Soon the person shows signs of anticipating the shock at the sight of the shock syllables; yet on questioning,

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[246] Polanyi, *Personal Knowledge*, 1964, 266.

[247] Michael Polanyi, "The Logic of Tacit Inference," 1964, in *Knowing and Being: Essays by Michael Polanyi,* ed. Marjorie Grene (Chicago, IL: The University of Chicago Press, 1969), 155-156.

> he fails to identify them. He has come to know when to expect a shock, but cannot tell what makes him expect it.[248]

Lazarus calls this process as "subception." Psychologists define subception as "a process of *learning without awareness*."[249] Polanyi then argues "if there is learning without awareness, there must be also *discovery without awareness*, since discovery is but learning from nature."[250] This notion of subception is crucial for understanding architectural design practice. It is not possible to develop explicit propositions for a design act, which may be considered as a series of problems and discoveries; furthermore, it is not possible to formulate architectural design education explicitly, as it is generally formulated as a self-enlightenment process that can only be guided by some critics. The importance of Polanyi's articulation of "tacit knowing" in design research should be considered in this sense. However, it is not sufficient to label architectural design knowledge as tacit. It would be fruitful to investigate design practice – in a way as Polanyi investigates human achievements– to understand the nature of design practice and to identify in which ways we tacitly know and learn architectural design.

> While tacit knowledge can be possessed by itself, explicit knowledge must rely on being tacitly understood and applied. Hence all knowledge is *either tacit* or *rooted in tacit knowledge*. A *wholly* explicit knowledge is unthinkable.[251]

Polanyi's illumination of the concepts of "awareness," "problem-solving," "intellectual passion," "intellectual beauty," and "subception" can be applied to an investigation of architectural design process. In his masterwork, *Personal Knowledge*, he explicitly refers to tacit coefficient in abstract arts while relating it to mathematics in a particular section.[252] In this context, it is understandable why many contemporary discussions on research by design in architecture refer to tacit knowing as it is formulated by Polanyi. It is evident that there is a search for a "post-critical philosophy" of architecture that does not exclude the tacit acts of knowing in the act of design.

It is possible to develop an epistemology based on practical performance. By focusing on machines, and particularly digital computers as the most developed form of machines that are

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[248] Ibid, 142-143.

[249] Ibid, 143.

[250] Ibid.

[251] Ibid, 144.

[252] Polanyi, *Personal Knowledge*, 1964, 193-195.

created by human intelligence, Polanyi shows that even in such formalized systems of operation there is the need for personal participation for the accomplishment of a task. Polanyi defines three elements of a practical performance; "materials," "tools," and "processes." There are "operational principles" that govern these processes. While scientific *discoveries* add to our knowledge of materials, tools, and processes, technological *inventions* bring new operational principles.[253] Even in highly formalized systems of operational principles, there is a need for personal reflection for achieving a task, and evaluating the accomplishment of the task.

> Let us recognize that tacit knowing is the fundamental power of the mind, which creates explicit knowing, lends meaning to it and controls its uses. Formalization of tacit knowing immensely expands the powers of the mind, by creating machinery of precise thought, but it also opens up new paths to intuition; any attempt to gain complete control of thought by explicit rules is self-contradictory, systematically misleading and culturally destructive. The pursuit of formalization will find its true place in a tacit framework.[254]

Tacit knowing is the formulation of a certain form of knowing that is different from theoretical propositional knowledge. Like Aristotle, Gadamer, and Ryle, Polanyi also addresses the role of knowing-how when the insufficiency of knowing-that in our comprehension of the world is considered, especially when human actions are considered. In this sense, it acts as an epistemological tool for Schön to formulate his approach to action research.

4.3 Action Research

The Reflective Practitioner can be considered as an attempt to develop an epistemological framework following Schön's studies on organizations in 1970s, during which he collaborated with Chris Argyris. *Theory in Practice* of 1974 and *Organizational Learning* of 1978 were written during Argyris and Schön's collaboration for developing "a theory of individual and organizational learning in which human reasoning – not just behavior – becomes the basis for diagnosis and action."[255] Schön's methodology and his preference for the term "action

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[253] Polanyi, *Personal Knowledge*, 1964, 155-157.

[254] Polanyi, "The Logic of Tacit Inference," 1964, 156.

[255] Chris Argyris, Robert Putnam, Diana McLain Smith, *Action Science: Concepts, Methods, and Skills for Research and Intervention* (San Francisco, CA: Jossey-Bass Inc., 1985), xx. See also Chris Argyris and Donald A. Schön, *Theory in Practice: Increasing Professional Effectiveness* (San Francisco, CA: Jossey-Bass

science" to denote a research paradigm that embraces reflection-in-action were derived from this collaboration. Argyris, Robert Putnam, and Diana McLain Smith argue in *Action Science* that, their perspective is based on the viewpoints of two pioneers of action research, Lewin and John Dewey.

Action research refers to a form of research in social sciences that is oriented on changing the existing situation while attempting to understand it. With this emphasis, it differs from research traditions in social sciences. As the aim is creating a change in existing situations, mostly the research is carried on by the actors in the situation, or with close collaboration with those actors. In this sense, some formulations of action research are also referred to as collaborative or participatory research.

Davydd J. Greenwood and Morten Levin summarize the core characteristics of action research (they abbreviate it as AR) by focusing on various dimensions including research problems, identities of researchers, meaning construction, and credibility.

- AR is context bound and addresses real-life problems holistically.
- AR is inquiry through which participants and researchers cogenerate knowledge using collaborative communicative processes in which all participants' contributions are taken seriously.
- AR treats the diversity of experiences and capacities within the local group as an opportunity for the enrichment of the research-action process.
- The meanings constructed in the inquiry process lead to social action, or these reflections on action lead to the construction of new meanings.
- The credibility-validity of AR knowledge is measured according to whether actions that arise from it solve problems (workability) and increase participants' control over their own situation.[256]

The term action research is firstly used within the social experiments that Lewin undertook in 1940s. However, the idea emerged in the beginning of the twentieth century with the writings of Dewey on reflective thought. Although these two authors remain as the pioneers of action research, Peter Reason and Hillary Bradbury list other sources of inspiration for action research in the introduction to the *Handbook of Action Research*.

Inc., 1974); Chris Argyris and Donald A. Schön, *Organizational Learning* (Reading, MA: Addison-Wesley, 1978).

[256] Davydd J. Greenwood and Morten Levin, *Introduction to Action Research: Social Research for Social Change* (London: SAGE Publications, 2nd edition, 2007), 63.

According to Reason and Bradbury, theoretical links of action research vary, including pragmatic philosophy, critical thinking, the practice of democracy, liberationist though, humanistic and transpersonal psychology, constructionist theory, systems thinking, and complexity theory.[257]

As it can be seen from these diverse sources of inspiration and theoretical links, it is not yet possible to define a single paradigm or tradition in action research. In a sense, this is understandable when the nature of action research is considered. If a change is aimed in a particular situation and if the research is carried on by the actors or with the actors of that particular situation, the form of research is mostly formulated within the conditions of this situation. Therefore, there are varying forms of action research according to their contexts. A better way to understand action research is through an overview of different approaches within the contexts they were developed, rather than attempting to search for a unified research paradigm.

Recently it became possible to group several approaches in action research since it emerged. Greenwood and Levin provide definitions of three groups of approaches in the history of action research. Although other groupings may be possible, Greenwood and Levin's grouping is sufficient for an overview within the purposes of this study. Their historical grouping of various approaches include "industrial democracy," "participatory action research," and "human inquiry / collaborative inquiry" chronologically.[258] These groupings also represent a difference between the "north" and the "south." Industrial democracy is developed in developed countries in North America and Europe, within the conditions of organizations in these countries. On the other hand, participatory action research is developed in the south, in underdeveloped countries in South America.

Greenwood and Levin's tripartite grouping of different approaches and Reason and Bradbury's list of diverse sources for action research demonstrates the heterogeneous nature of this paradigm of social research. Similar to the literature on research by design, action research approaches, by their nature, develop strategies that are appropriate for specific problem situations. These different approaches share common basic definitions that are provided by Dewey in early twentieth century and by Lewin in 1940s.

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[257] Peter Reason and Hillary Bradbury, "Introduction: Inquiry and Participation in Search of a World Worthy of Human Aspiration," in *Handbook of Action Research*, ed. Peter Reason and Hillary Bradbury (London: SAGE Publications, concise paperback edition, 2006), 3-4.

[258] Greenwood and Levin, 2007, 14-27.

Dewey's and Lewin's contributions are not only important for their role in the development of Schön's ideas and action science, but also for understanding some main assumptions of action research in general. Therefore, these basic definitions should be investigated to have a complete account of action research.

4.3.1 Origins of Action Research

Although the term action research is firstly used by Lewin in 1946, in his article titled "Action Research and Minority Problems," initial ideas on the unity of social science and social practice emerged in the work of Dewey in 1910s. These philosophers did not publish systematic accounts on action research, however, some of the methods they utilize in social sciences and some concepts that they elaborated constitute the basis for the development of a research paradigm that considers change as its main purpose. For this study, their significance lies in their influence in action science approach and eventually Schön's conceptualization of reflective practice. Therefore, this section focuses on Dewey's definition of "reflective thought" and Lewin's formulation of "circular processes in action."

Dewey's book titled *How We Think* was published in 1910 and it aims at investigating the nature of thinking in order to reach conclusions for educational transformations. The main theme of the book is the concept of reflective thought, its nature, its aims, and how one can be trained to think reflectively. He defines reflective thought as "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it, and the further conclusions to which it tends."[259] The basic elements of it are a doubting and testing. Dewey considers these elements as the "subprocesses" of "reflective operation." These elements are further elaborated to be defined in five steps:

> (*i*) a felt difficulty; (*ii*) its location and definition; (*iii*) suggestion of possible solution; (*iv*) development by reasoning of the bearings of the suggestion; (*v*) further observation and experiment leading to its acceptance or rejection; that is, the conclusion of belief or disbelief.[260]

[259] John Dewey, *How We Think* (Mineola, NY: Dover Publications Inc., 1997, first published in 1910), 6.

[260] Ibid, 72.

As Dewey also argues, this formulation is a definition of scientific thought;[261] however, it differs from the positivistic understanding of science with its avoidance of epistemological remarks on the nature of knowledge that is to be gained as the result of this reflective operation. It is rather an inclusive formulation of thinking process.

This openness to different forms of knowledge becomes evident in Dewey's construction of the relationship between action and thought. His investigation on "play," "work," and "playfulness" is based on the idea that intellectual possibilities inherent in these are crucial for the personal development of individuals. In the activity of play, there are defined sets of rules that introduce the player a concept of organization; furthermore, s/he is in a world of meanings that goes beyond the objects that s/he is dealing with.[262] The latter characteristic of the activity of play is significant in the definition of playfulness. Dewey introduces playfulness as an attitude of mind and he argues that "when things are treated simply as vehicles of suggestion, what is suggested overrides the thing."[263] The primacy of the meanings over the objects leads to the incorporation of playfulness in work. When reflection on the suggested meanings is applied to the objects, then the means and ends process of work can be altered and improved.[264] He suggests an alternative formulation for expressing the distinction between play and work in order to reinforce his concept of playfulness as a form of reflective thought that relates action and thinking.

> The true distinction is not between an interest in activity for its own sake and interest in the external result of the activity, but between an interest in an activity just as it flows from moment to moment, and an interest in an activity as tending to culmination, to an outcome, and therefore possessing a thread of continuity binding together its successive stages. Both may equally exemplify interest in an activity "for its own sake"; but in one case the activity in which the interest resides is more or less casual, following the accident of circumstance and whim, or of dictation; in the other, the activity is enriched by the sense that it leads somewhere, that it amounts to something.[265]

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[261] Ibid, vii.

[262] Ibid, 162.

[263] Ibid.

[264] Ibid, 163.

[265] Ibid, 164.

The term "action research" was firstly used by Lewin in his article "Action Research and Minority Problems," which was published in 1946. This article is not only significant for its introduction of the term action science to social research, but also for the formulation of the circular processes in action. Among his contributions to action research there are concepts like "space of free movement," "gatekeeper," or "unfreezing, moving, and freezing," which are referred in action science approach as well as in *Reflective Practitioner*.[266] Although the focus is on his idea of circle of reflection as it provides the methodological insight for Schön's argument, these concepts are clarifying for understanding Lewin's approach to action research.

Space of free movement emerges in the article on patterns of aggressive behavior in groups. By comparing three controlled group environments, which are authoritarian, democratic, and laissez-faire (group with no leader), Lewin, Ronald Lippitt, and Ralph K. White investigate dynamics of groups under different leadership conditions.[267] The space of free movement for the individuals varies in each type of leadership condition. Democratic group provides the largest space of free movement as it is expected, it is narrower in the laissez-faire group as the activities of every individual interferes, and the narrowest space of free movement is in the authoritarian group as a result of the pressure applied by the leader.[268] Lewin, Lippitt, and White argue that a narrow space of free movement is a source for tension in the group and aggression is an effect of this tension.

Concepts of "gate" and "gatekeeper" are clearly explained in Lewin's article titled "Group Decision and Social Change." Through experiments on decisions concerning food in a group, he investigates group dynamics and possibilities of social change.[269] He argues that there are channels for the admission of change in a group and there is a certain area in a channel, where the forces that define the admission of change are denser in this area. This area is called a gate. In every group there is a gatekeeper who exercises the decisions according to a group ideology that defines the gate and who decides on the admission of a change. For example, in food experiments, if other members of the family have different ideas concerning

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[266] Argyris, Putnam, and Smith, 1985, 8-9; Schön, 1991, 319-320.

[267] Kurt Lewin, Ronald Lippitt, and Ralph K. White, "Patterns of Aggressive Behavior in Experimentally Created 'Social Climates'," *The Journal of Social Psychology*, Vol. 10, No. 2 (1939): 271-299.

[268] Ibid, 293.

[269] Kurt Lewin, "Group Decision and Social Change," in *Readings in Social Psychology*, ed. Eleanor E. Maccoby, Theodore M. Newcomb, and Eugene L. Hartley (New York, NY: Holt, Rinehart and Winston, Inc., 1958), 197-211.

the decision on food, they have to affect the housewife for a change as she is the gatekeeper on the issue of food.[270]

"Unfreezing, moving, and freezing" emerges as a "three-step procedure" for introducing change to "quasi-stationary social equilibrium" that is protected by the gatekeeper. Lewin defines the stable condition of a group as a quasi-stationary equilibrium in order not to exclude interior adjustments in the forces that define the equilibrium. The forces that tend to change the conditions are equal to the forces that tend to preserve it. However, the strengths of these forces may vary without damaging the equilibrium. When a group of forces gain more strength, there emerges a "degree of conflict," which initiates a change in the social structure of the group.[271] Forces that protect the existing situation constitute a set of rules that is called "social habits" or "group standards." In order to "break the habit" an additional force should be added to "unfreeze the customs."[272] After moving to a new level, there is a need for freezing, in other words setting new group standards for a new quasi-stationary equilibrium. This process of freezing ensures the permanency of the new higher level in a social group.[273] This three-step procedure of change constitutes the backbone of Lewin's circle of reflection.

In "Action Research and Minority Problems," Lewin defines action research for social practice as "a comparative research on the conditions and effects of various forms of social action, and research leading to social action."[274] After differentiating the main questions of social research as "the study of general laws of group life" and "the diagnosis of a specific situation," he suggests that in the fields of social management the diagnosis should be supported by "experimental comparative studies of the effectiveness of various techniques of change."[275]

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[270] Ibid, 199-200.

[271] Ibid, 208.

[272] Ibid, 209.

[273] Ibid, 211.

[274] Kurt Lewin, "Action Research and Minority Problems," in Kurt Lewin, *Resolving Social Conflicts: Selected Papers in Group Dynamics*, ed. Gertrud Weiss Lewin (New York, NY: Harper & Brothers, 1948, originally published in *Journal of Social Issues*, Vol. 2, No. 4, 1946, special issue, "Action Research: A Challenge," issue editor David Krech: 34-46), 202-203.

[275] Ibid, 204-205.

According to Lewin, "rational social management" consists of "a circle of planning, action, and fact-finding about the results of the action."[276] Figure 4.1 is a visualization that Lewin uses for presenting this circular process. The process of planning, action, and fact-finding begins with a "general idea." This general idea is a consideration of the "objective" and the "means" that are available for the accomplishment of the objective. Then within this general idea, an "overall plan" for reaching the objective is organized while the "first step of action" is decided. The "execution of the first step" is followed by a process of "fact-finding." This process serves four functions, which are "evaluating the action," providing feedback on the general idea, "planning the next step," and "modifying the overall plan." Then the circle is repeated for the next step of action.[277]

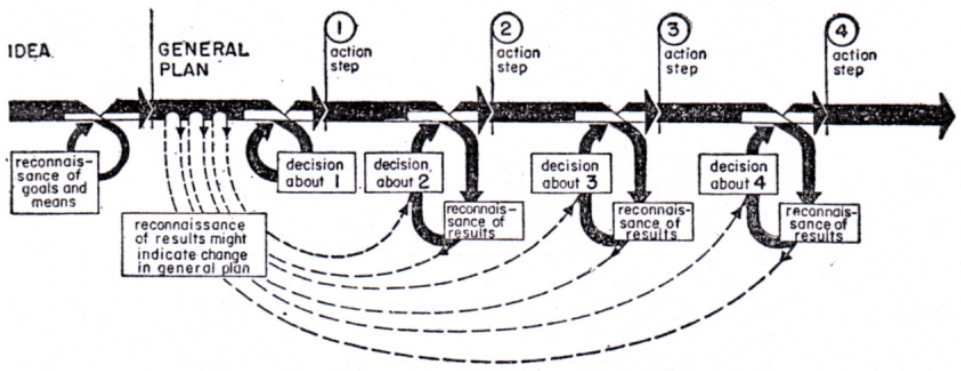

Figure 4.1. Planning, fact-finding, and execution. In Kurt Lewin, "Group Decision and Social Change," in *Readings in Social Psychology*, ed. Eleanor E. Maccoby, Theodore M. Newcomb, and Eugene L. Hartley (New York, NY: Holt, Rinehart and Winston, Inc., 1958), 200.

This circular understanding of action results in the improvement of the process during the process as well as it contributes to knowledge concerning the specific social practice. During the process of change, it becomes possible to improve the action of change as well as knowledge concerning that specific situation that requires change. This reflective circle constitutes the basic model for action research methodologies since it is formulated in 1946. This model is generally called the action-reflection cycle. Although every approach to action research develops its own methodologies appropriate for the subject that is under investigation, the core is the action-reflection cycle. Action research methods are variations of this cycle.

[276] Ibid, 206.

[277] Ibid, 205-206.

As research by design is linked to action research through the ideas of Schön, this study focuses on his approach to action research, which is "action science" that he developed in collaboration with Argyris. Action science, with its direct references to Dewey and Lewin, provides insights for the fundamental values and properties of a research paradigm that promotes change as source of knowledge.

4.3.2 Action Science Approach

Action science emerged in 1970s as an approach to action research in social sciences. With its focus on professional effectiveness and organizational learning, and because of the positions of its promoters as external academic investigators, the action science approach can be considered under the approach of "industrial democracy" in the tripartite division of the history of action research.

Within the purposes of this study, action science is significant as it represents Schön's approach to action research. As literature on the relationship between design and action research is mostly developed around Schön's idea of "reflective practice," the background of his ideas should be comprehended.

After the collaboration between Argyris and Schön in 1970s, which has culminated into two books on work environments, *Theory in Practice: Increasing Professional Effectiveness*, and *Organizational Learning*,[278] action science approach is coherently discussed in *Action Science: Concepts, Methods, and Skills for Research and Intervention* by Argyris, Putnam, and Smith in 1985 with reference to Schön's *Reflective Practitioner.*[279]

There are two main reasons for their preference on the term action science instead of action research. Firstly, the main intention in action research has evolved into solving a critical problem for a client whereas testing theories remained as a secondary purpose. However, Argyris, Putnam, and Smith argue that "there is a value in combining the study of practical problems with research that contributes to theory building and testing."[280] Secondly, many action researchers have employed the methodologies of "standard social sciences" for developing rigorous research. According to Argyris, Putnam, and Smith, this results in a disconnection between methods and the reality under investigation, and eventually findings

[278] Argyris and Schön, 1974; Argyris and Schön, 1978.

[279] Argyris, Putnam, and Smith, 1985.

[280] Ibid, x.

are no more useful in terms of proposing a solution to a problem. Studies that are built on the early studies in 1930s were "indeed more rigorous, yet far less usable by human beings in real-life conditions than the original studies."[281]

Because of these conjectures on the tradition of action research, Argyris, Putnam, and Smith prefer the term action science rather than action research to illustrate the difference of their approach from the previous studies on action research. The same conjectures that are described above lead Argyris, Putnam, and Smith to turn back to the early pioneers of action research to dwell upon. They build on the work of early action researchers such as Lewin and Dewey. The work of these pioneers was free in terms of methodologies. However, as action research has developed into a tradition, the problems described above have emerged. Therefore, instead of constructing relations with the contemporary works of action research, Argyris, Putnam, and Smith propose a perspective that is developed upon the studies of early action researchers. According to them, Lewin's and Dewey's work "were interested in adding to fundamental knowledge while solving practical problems."[282] Action science is constructed on the idea of better societies, to which Lewin and Dewey were committed to. This is closely related to the notion of "liberating alternatives."[283] Argyris, Putnam, and Smith argue that "social science should have an important role in generating liberating alternatives" and relate this idea of change with its context by stating that "this objective cannot be accomplished without challenging the status quo."[284]

The book *Action Science* is an attempt to organize an approach to action research based on the "theory of action" approach developed by Argyris and Schön in 1970s and by Argyris in late 1970s and early 1980s.[285] The argument is constructed through three stages. Firstly, the philosophical background is presented through a comparison of "mainstream social science" and its counterpart, "hermeneutic" approach. Within this dual context Argyris, Putnam, and Smith place action science as an exemplar of critical theory of the Frankfurt School to propose solutions to the shortcomings of the duality. Secondly, through case studies they attempt to present the limitations and possibilities of action science with relation to normal

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[281] Ibid.

[282] Ibid, xi.

[283] Ibid.

[284] Ibid.

[285] Ibid, 80.

science. Thirdly and finally, skills and methods required for learning and conducting action science are discussed.

Besides emphasizing concepts like tacit knowing and problem solving, which are also significant in Schön's reflective practice, action science stands out with its identification of action research by comparing it to normal sciences in terms of "models of theories-in-use" that explain different epistemological positions in different social situations. These models are "Model I" and "Model O-I" (where "O" represents "organizational") that denote a descriptive epistemology, and "Model II" and "Model O-II" that denote a normative epistemology. The aim of action science is to move from the limited environment of Model I to the liberating environment of Model II. The level of liberation is related to the difference of individual and organizational learning styles inherent in each model. Argyris, Putnam, and Smith define "single-loop learning" as the dominant form of learning in Model I, and "double-loop learning" for Model II.[286] Problem solving that is constructed of governing rules, means that are defined within those governing rules, and solution constitute the main elements of these different modes of learning. In single-loop learning, if means fail to solve the problem, new means are searched within the same governing rules. However, in double-loop learning, in addition to a search for new means, the governing rules are also questioned for a redefinition of the problem at hand.[287]

> The mainstream epistemology of practice focuses on means-ends rationality. Failure to achieve the intended ends leads to a reexamination of means and a search for more effective means. The action science epistemology of practice focuses on framing or problem setting, as well as on means-ends reasoning or problem solving. Failure to achieve intended consequences may, given this model, lead to reflection on the original frame and the setting of a different problem. We will refer to the first approach as *single-loop learning* and to the second as *double-loop learning*.[288]

In the origin of action science, there are conjectures on methodological approaches in action research, which are presented in the beginning of this section. Preference of critical theory in relation to a dichotomy of mainstream social sciences and hermeneutics, and development of models of theories-in-use based on the difference of single-loop learning and double-loop

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[286] Ibid, 88-102.

[287] Ibid, 85-88.

[288] Ibid, 52-53.

learning are attempts to propose a framework that can overcome these methodological questions.

As it has been mentioned above, while developing their discussion, Argyris, Putnam, and Smith find inspiration in the work of two pioneers of action research, Dewey and Lewin. Dewey is significant for them as he is one of the first philosophers to criticize the separation of knowledge and action. He criticizes an understanding of the relationship between social sciences and social practice as an extension of the relationship between natural sciences and engineering.[289] Lewin is the first author to use the term action research in 1946 while being the earliest action researcher as we understand the term today. His contribution to the development of action science is more profound as he introduces the concepts of "space of free movement," "gatekeeper" and "action-reflection cycle." Among many concepts that Argyris, Putnam, and Smith use with reference to Lewin, the "three-step model of change as unfreezing, moving, and freezing" emerges as a significant concept especially in the elaboration of skills that are required in learning and conducting action research.[290]

Dewey's formulation of reflective thought, with its brief discussion of the role of action, is the starting point for Schön's *Reflective Practitioner*. Reflective thought provides the definitions for supporting the idea of reflective practice as an alternative to technical rationality. Lewin's circle of reflection is the core idea behind Schön's analysis of the cases in terms of reflection-in-action. Schön's influence on research by design in architecture should be considered within his background in action research and his references to tacit knowing. When this investigation is woven together with paradigms of architectural design research through the elaboration of appropriate knowing processes, it is possible to provide answers to methodological and epistemological problems that emerge with the discussion of research by design.

[289] Ibid, 6-7.

[290] Ibid, 270-273.

CHAPTER 5

THE METHODOLOGICAL AND EPISTEMOLOGICAL TRANSFORMATION

This chapter focuses on epistemological and methodological shifts that emerge with the definition of research by design as a research area in architectural design. In other words, the primary concern is on the transformation of the subject of inquiry within the design research tradition. How is it possible that the main epistemological question shifts from *knowing what design is* and *knowing how to design* to *knowing what through the act of design*?

These questions are addressed in terms of two dimensions: general and specific. As it is seen in the overview of action research approach, every research program related with actions are context bounded, therefore any research by design attempt should develop its boundaries within the context of its inquiry. However, there is still a need for definition of a general framework through which the specific conditions of the context are encountered.

In this respect, in this chapter, a general framework for explaining the epistemological and methodological transformation that emerges with the discussion on research by design is constructed. Schön's concept of "reflective practice" provides the clues for such transformation and it constitutes a starting point. However, a larger framework should be constructed for understanding this transformation. This framework is based on the assertion that every action is based on a moral decision. This claim is investigated through a relatively less examined philosophical concept in the context of action research, namely Aristotle's *phronēsis* (prudence, practical wisdom, or moral practical knowledge).

The thesis rests on the conjecture that research by design as a form of design research rests on the transition of the act of design from being the object of inquiry to being a research approach. Firstly, this conversion undoubtedly raises methodological questions. The research processes and validation criteria need to be reconsidered. Secondly, as a consequence of the problems of research methodology, some epistemological questions arise. The primary

epistemological question shifts from *knowing what design is* and *knowing how to design* to *knowing what through the act of design*.

It is seen in the beginning of this study that design, research, and knowledge may denote more than their academic connotations when the common usage of the terms are considered. The verb "design" denotes intellectual operations that go further than merely the creation of artifacts; when the Italian word *disegno* is considered it involves certain processes of meaning generation through drawing. Similarly, "research" not only refers to scientific inquiry that yields to theoretical knowledge. This is evident in usages of the word in various languages such as the Italian word "ricercar." It means to seek and as the name of a musical form, it provides investigation around a theme that constitutes a framework for musical discoveries. Among these three terms, the verb "knowing" has the most obvious variety in its usage. Knowing refers to the justification of truth about something as well as ability to do something. Therefore, it is clear that the nuances of the general terms that are under consideration in this study, namely design, research, and knowledge, provide clues and act as instigators for further investigation on the nature of the relationship between them.

The main epistemological problem for considering research by design as a form of academic research emerges with the distinction of two types of knowing processes: knowing-how and knowing-that. It is the problem of incorporating direct, practical knowing processes *of* architecture within academic research, which is dominated by indirect, theoretical knowing processes *about* architecture.

Documentation of knowing-how, as exemplified in the works of Le Corbusier and Koolhaas, is an influential source for the advancement of architectural knowledge. However, such documentation is not considered within the boundaries of academic research because it is not possible to define its validation criteria, rigor, and contribution to knowledge within an academic framework, whose methods are developed for the generation of theoretical knowledge.

Design is a subject of academic architectural research since the mid-twentieth century. Mainly there are two approaches in design research based on the methods of sciences and humanities. Design methods research aims at developing a scientific approach for understanding the design activity as exemplified in the PhD dissertation of Alexander. On the other hand, researchers in history, theory, and criticism approach design from a scholarly point of view as exemplified in Eisenman's PhD dissertation. Both approaches to design research employ already established academic methods of related disciplines such as

correlational research, experimental research, simulation research, interpretive historical research, logical argumentation, and case studies.

Within this system of architectural design research, with the influence of Schön's idea of reflective practice, several design researchers realized that there is a species of knowledge that is not covered in the existing paradigms. Therefore, alternative approaches to design research, which can be called research by design in general, began to be discussed. It was acknowledged that existing research strategies were insufficient for conceptualization of architects' own designerly ways of knowing, which was considered as a significant dimension of architectural knowledge. This discussion has been constructed around Schön's formulation since the early 1980s. Although his ideas are very important in terms of demonstrating the potentials of reflection-in-action, the discussion has been revolving around these potentials since then while the primary epistemological and methodological problems have remained relatively unresolved. Since the 2000s, with the beginning of institutionalization of research by design within this climate of discussion, addressing these primary problems has become crucial.

It is evident that these epistemological and methodological problems cannot be fully investigated with reference to Schön. The idea of reflective practice should be considered together with established research traditions in design research by the aid of philosophical concepts that help elucidate knowing processes inherent in practices.

The literature on research by design reveals that the primary epistemological question of *knowing what through the act of design* is related with two dimensions of design. Firstly, the activity of designing is considered as a source of knowledge with a focus on heuristics, creativity, innovation, expertise, and participation. These characteristics can be considered as common in every social practice and therefore the discussion on them share similar grounds with action research in social sciences. On the other hand, the designed product, the artifact, can be considered as another source of knowledge. The act of design culminates in the artifact; therefore it deserves to be investigated in its own terms. Therefore, in this section, the epistemological transformation from *knowing what design is* and *knowing how to design* to *knowing what through the act of design* is discussed in two dimensions of the design acts and the artifact.

The epistemological discussion serves as a ground for the elaboration of validation criteria for the accomplishment of the research projects and it gives clues for new methodologies that can be appropriate for different forms of research by design. Being a form of action research, each endeavor of research by design is expected to develop methods and approaches that are appropriate for the context of a particular situation.

5.1 Moral Dimension of Design Acts

In Chapter 2, which focuses on the relationship between knowledge, architectural design, and research, it has been pointed out that from a particular point of view the natures of the activity of design and of the activity of research are considered so contradictory that it is not so possible to think one activity in terms of the other. Wang identifies the difference by stating that research activity is analytical, whereas the activity of design is generative.[291] However, as it is revealed throughout the discussion of this study, the problematic of this contradiction is apparent only within a particular framework that considers academic research as the generator of propositional knowledge. Scientific research is an analytical activity that aims at systematic investigation of phenomena through defined processes of inquiry within an objective perspective. Design, on the other hand, is a generative activity that aims at changing the current state of phenomena within a subjective point of view that is shaped by the context of the phenomena. Therefore, the main assumption of the conventional conception of research is that the aim of research is to understand existing phenomena and an attempt to change it cannot be considered within the scope of research.

An alternative epistemological framework for scientific research emerges with action research in social sciences. With its focus on changing the current situation for achieving at better situations, action research embraces generative activities as well as sources of knowledge besides conventional analytical research. According to Greenwood and Levin, action research benefits from two lines of thought that have developed in the twentieth century to construct an alternative framework to the conventional understanding of scientific research that is developed through the Enlightenment. These lines of thought are "general systems theory" and "pragmatic philosophy."[292]

General systems theory was developed in 1920s in disciplines such as physics, chemistry, biology, and engineering. It is based on "holistic concepts" for understanding the organization of the world rather than attempting to understand the nature of the particular elements of the organization. In other words, it aims at investigating the relationships between phenomena instead of focusing on the phenomena. It focuses on the interconnections between phenomena through their relationships at different levels.[293]

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[291] Wang, "Design in Relation to Research," in Groat and Wang, 2002, 104-105.

[292] Greenwood and Levin, 2007, 57-62.

[293] Ibid, 57-58.

Greenwood and Levin argue that general systems theory provided a motivation for action research as "both rely heavily on an interconnected and holistic view of the world." [294] Action research aims at understanding human beings within social systems that are not static structures. Social systems are in continuous motion, "they are dynamic and historical." They transform the context in which they operate. The social systems are linked to one another; therefore they form "complex interacting macro-systems."[295]

Pragmatic philosophy is developed in the USA in the beginning of the twentieth century through the writings of Dewey, Lewin, and William James. The most significant characteristic of pragmatic philosophy is its negation of the separation between thought and action, or theory and practice, which underlies the positivist epistemology of scientific research.[296] The contribution of Dewey's and Lewin's work to action research has been discussed in the previous chapter. It has been emphasized that their formulations of the relationship between action and research constitute the basis for later approaches to action research.

With reference to general systems theory and pragmatic philosophy, as it has been discussed in Chapter 4, in the beginning of the section titled "Action Research," Greenwood and Levin define action research as a context bound form of research that provides the ground for cogeneration of knowledge by the actors of the problem situation. It considers the diversity of individuals as an opportunity in the cogeneration process. Constructed meanings and action are in a reciprocal relationship, in other words, meanings that are constructed through inquiry transform social action, while reflection on social action lead to the construction of new meanings. The credibility or validity of knowledge generated through action research is determined according to the capacity of actions in solving problems and the capacity of actions in increasing the actors' control over the situation.[297]

Although general systems theory and pragmatic philosophy seem to provide adequate foundation to action research, there is a very significant yet not acknowledged line of thought in this epistemological framework, which is constructed to bridge the gap between action and research, and researcher and the research subject. Surprisingly, practical philosophy, as it is developed in Gadamer's philosophical hermeneutics with references to Aristotle's moral

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[294] Ibid, 59.

[295] Ibid.

[296] Ibid, 59-62.

[297] Ibid, 63.

virtue of *phronēsis* (prudence, moral practical knowledge, or practical wisdom), is not investigated in terms of its relevance in action research. As Greenwood and Levin state:

> That AR [action research] practitioners have not carefully examined the work of Gadamer and that of other contemporary hermeneuticians is hard to understand and contributes to their vulnerability to improper but energetic criticism from conventional social researchers who are well ensconced in their academic bunkers.[298]

In the discipline of education there are attempts to investigate the relationship of *phronēsis* and reflective thinking. These discuss the pedagogical relevance of *phronēsis* in terms of its relation with the act of teaching, the act of learning, values, and principles.[299] These exemplary attempts should extend to other disciplines of action research as well as research by design for new inspirations.

When design is considered as a process that aims at bringing about change, the characteristics of the design process are similar to those of social action. Therefore, the investigation of the significance of *phronēsis* in design also provides insights for action research in general. Research by design differs from action research in social sciences in terms of the product of change. In action research, the solution to a problem transforms the relationships among social groups, whereas in research by design the solution is in the form of an artifact that serves to a particular purpose besides the social transformation it brings about. The role of the artifact in knowledge generation is discussed in the next section while this section focuses on knowledge generation during the process of change.

A process of change is defined through a series of decisions. Decisions in the act of design are mostly choices among alternatives as in social action. Any choice in design has moral implications as design decisions have consequences for human beings. Many choices are moral decisions. In this sense, *phronēsis*, which can also be defined as moral practical knowledge, is crucial for understanding knowledge generation through acts of design that are based on choices.

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[298] Ibid, 72.

[299] For examples, see Terence H. McLaughlin, "Beyond the Reflective Teacher," *Educational Philosophy and Theory*, Vol. 31, No. 1 (February 1999): 9-25; Christopher Winch, "What do Teachers Need to Know about Teaching? A Critical Examination of the Occupational Knowledge of Teachers," *British Journal of Educational Studies*, Vol. 52, No. 2 (June 2004): 180-196; Carrie Birmingham, "Phronesis: A Model for Pedagogical Reflection," *Journal of Teacher Education*, Vol. 55, No. 4 (September/October 2004): 313-324; Paul Gibbs, Carol Costley, Pauline Armsby, and Aletia Trakakis, "Developing the Ethics of Worker-Researchers through Phronesis," *Teaching in Higher Education*, Vol. 12, No. 3 (June 2007): 365-375.

In Chapter 2, Aristotle's concept of *phronēsis* has been discussed with reference to his elaboration on the nature of *choices* and his differentiation between *things made* and *actions done*. After an overview of design research and action research, the relevance of these notions has been discussed; however, there is a need for further clarification.

It has been asserted that making aims to produce a product while doing is concerned with the act of doing itself, where the aim is doing well. This is what differentiates *phronēsis* from *technē* (technical skill). Technical skill is concerned with the appropriate production of the end product. *Phronēsis* has to do with the creation of new values in action. It is a form of evaluating the action, as Aristotle states, "Prudence is a truth-attaining rational quality, concerned with action in relation to the things that are good for human beings."[300]

Aristotle differentiates three elements that govern action and the attainment of truth: "Sensation, Intellect, and Desire." Sensation is not related with action while Desire and Intellect are directly related with it. He emphasizes the role of choices in practical thinking by relating to the intellect and rightness of desire. Within such affirmation it is revealed that the attainment of truth, namely knowledge generation, corresponds to the investigation of falsehood of the affirmation in Scientific Faculty that deals with knowledge of invariables. On the other hand, knowledge generation in practical thinking corresponds to the investigation of goodness of choice in relation to the rightness of desire.

> Pursuit and avoidance in the sphere of Desire correspond to affirmation and denial in the sphere of the Intellect. Hence inasmuch as *moral virtue is a disposition of the mind in regard to choice, and choice is deliberate desire, it follows that, if the choice is to be good, both the principle must be true and desire right, and that desire must pursue the same things as principle affirms.* We are here speaking of practical thinking, and of the attainment of truth in regard to action; with speculative thought, which is not concerned with action or production, right and wrong functioning consist in the attainment of truth and falsehood respectively. *The attainment of truth is indeed the function of every part of the intellect, but that of the practical intelligence is the attainment of truth corresponding to right desire.*[301]

Within this distinction, Gadamer defines *phronēsis* as "moral knowledge" and asserts that "the human sciences stand closer to moral knowledge than to that kind of 'theoretical'

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[300] Aristotle, 1994, 339.

[301] Ibid, 329, emphasis added.

knowledge." With "theoretical knowledge," Gadamer refers to the sphere of *epistēmē* (scientific knowledge) and claims that hermeneutics is not related with it. "Hermeneutics of the human sciences" does not address invariables, but on the contrary it is concerned with humans as "acting beings."[302]

> An active being, rather, is concerned with what is not always the same but can also be different. In it he can discover the point at which he has to act. The purpose of his knowledge is to govern his actions.[303]

In Aristotle's assertion, the cause of action is choice, and the cause of choice is desire.[304] Therefore, attainment of truth in practical thinking lies in the investigation of this hierarchical relationship. As an investigation of relationships should be based on criteria that define the nature of those relationships, Aristotle proposes that the criterion defining the hierarchical relationship between desire, choice, and action is "goodness." The definition of goodness in relation to a particular action is definitely a moral question, and consequently Aristotle introduces *phronēsis* as a virtue that is concerned with this dimension of thinking.

Before discussing the relevance of *phronēsis* in research by design, it is important to overview three varieties of *phronēsis* as they are defined by Aristotle: "deliberative excellence" (resourcefulness, *euboulia*), "understanding" (*sunesis*), and "consideration" (judgment, *gnōmē*).[305] These varieties provide different dimensions for investigating the relationship between action, understanding, and knowledge generation. In a sense, they constitute a foundation for Gadamer's interpretation of the concept of *phronēsis*.

The first variety that Aristotle introduces is "deliberative excellence." He defines excellence in deliberation as "correctness of deliberation with regard to what is expedient as a means to the end, a true conception of which constitutes Prudence [*phronēsis*]."[306] In this sense, deliberative excellence differs from correctness of knowledge or opinion, as they are concerned with the correctness of an affirmation. Deliberation refers to the process of thinking on a particular object and excellence in deliberation is based on the correctness of choices made during this process.

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[302] Gadamer, 2006, 312.

[303] Ibid.

[304] Aristotle, 1994, 329.

[305] Ibid, 353-361.

[306] Ibid, 357.

"Understanding" is another crucial operation with respect to *phronēsis*. According to Aristotle, "when we employ the faculty of Opinion to *judge* what another person says about matters that are in the sphere of Prudence [*phronēsis*], we are said to *understand*."[307] If *phronēsis* is considered as a virtue of evaluating actions for making moral statements of "what we ought to do or not to do," understanding constitutes a significant part of it as it provides us with the ability of making judgments concerning others' ideas on the action as well as the changing conditions as a result of our own actions.

As a third concept that is related with *phronēsis*, Aristotle introduces the quality of "consideration." He argues that consideration is "the faculty of judging correctly what is equitable."[308] Acting equitably is a defining characteristic of *phronēsis* in terms of credibility of moral statements on actions. These statements can be considered valid and credible as far as they are concerned with what is good for others. According to Aristotle, "consideration for others is that consideration which judges rightly what is equitable; judging *rightly* meaning judging what is *truly* equitable."[309]

Deliberative excellence is a search for correctness in the relationship between means and ends, while understanding emerges as a fundamental concept for conversation between actors as well as conversation between the actors and the action. Finally, consideration is the exploration of equity while deliberating on actions and stating judgments. These three virtues of a prudent man explain Aristotle's differentiation of *phronēsis* from other kinds of knowing such as scientific knowledge (*epistēmē*) and technical skill (*techne*). These virtues cannot be attained by any other form of attaining truth.

The relevance of Aristotle's concept of *phronēsis* for action research is clear when his exploration of the attainment of truth in relation to human actions is considered. His conceptual clarification of *phronēsis* is so profound that it is applicable to a discussion on epistemological and methodological problems that arise with action research and research by design. His ideas on the relationship between desire, choice, and action, and the role of deliberative excellence, understanding, and consideration in attainment of truth regarding actions are significant for defining knowledge generation through practices.

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[307] Ibid, 359.

[308] Ibid.

[309] Ibid, 361.

Similarly, as it has been discussed in Chapter 2, Gadamer reveals the relevance of *phronēsis* for his clarification of philosophical hermeneutics that is composed of understanding, interpretation, and application. He focuses on the differences between *technē* and *phronēsis*, on the relationship between means and ends, and on the relationship between moral knowledge and understanding. His consideration of Aristotle as a reference for discussing the relationship between understanding, interpretation, and application is based on Aristotle's grounded elaboration of the virtue of *phronēsis* with its all dimensions related with action and thinking.

The core characteristics of research by design, such as defining a problem, considering appropriate means for particular ends, reconciliation between disciplines, conversation between individuals, describing the relationships between particulars of a situation, the role of experience, and the problem of validity of this species of knowledge is discussed in relation to design research, reflective practice, and tacit knowing within the framework provided by *phronēsis*. The emergence of these core characteristics is not a simple coincidence. Problems, conversation, and experience are sources of knowledge that cannot be comprehended through established paradigms of design research that are based on sciences and humanities. These characteristics are investigated in terms of what can be learned through them, instead of focusing on the nature of them. The role of problems, conversation, and experience in the process of architectural design can be investigated through reflection on each of these properties of design. It is not always possible to conduct well structured reflection on these aspects as it is pointed out through an investigation of the work of Schön and Polanyi. Therefore, *phronēsis* provides a moral framework for guiding reflection on aspects that are defined through tacit intellectual processes.

5.1.1 The Significance of Problem Definition

The nature of design problems emerged as one of the earliest themes in research by design with the introduction of heuristics into design research. It has begun to be discussed prior to Schön's analysis on design processes. Actually, questioning the problem solving processes is the underlying idea for design research since its first initiation in 1960s. As an alternative approach, heuristics integrates intuition as a part of rational problem solving.

Generally accepted paradigms in design research, namely design methods and history, theory and criticism which are discussed in the Chapter 3, assume that design is an activity of problem solving. The main claim of design methods was that design problems are quantifiable in terms of its particulars. Therefore, if a system can be defined for the

relationships between these particulars, the process of problem solving can be explained. For example, Alexander, in his PhD dissertation titled *Notes on the Synthesis of Form* argues that a complex problem that is unsolvable can be redefined as a relationship between solvable small patterns. On the other end of the spectrum, history, theory and criticism approaches to design process as an activity that is situated in a context that is defined by history and philosophy. Eisenman's PhD dissertation titled *The Formal Basis of Modern Architecture* exemplifies this approach. He claims that design processes in modern architecture can be examined through tools that are provided by Gestalt psychologists in the early twentieth century within a framework Le Corbusier's "Four Compositions." These investigations generate knowledge on architectural problems in terms of improving ways of problem solving. However, there is a region in research on problems that remains rather uninvestigated. The intuitive processes in problem definition and problem solving, which began to be discussed with research by design, address generation of knowing-how through the problem solving process. In other words, problems should be investigated in terms of their knowledge generating capacity.

Architectural design processes can be considered to include problem solving activities as every other process that aims to change the current situation. If the current situation does not meet certain requirements, a need for change emerges. Describing the need for a change is called a problem definition and activities that are done for changing the situation is called problem solving. In architectural design, a problem emerges as a need for an artifact that helps transform the environment.

As every attempt of change, architectural design is initiated with the definition of a problem, in other words, a statement of the needs that are not met by the current environment. With the introduction of the role of intuition and personal coefficients in problem solving, the definition of the problem became a significant issue in understanding the nature of problem solving.

Schön emphasizes the role of problem definition in his analysis of architecture in *Reflective Practitioner*. Framing and reframing of a problem constitutes a major part of intellectual work done by the studio critic (Quist) and the student (Petra) during their studio conversation. He points out that a practitioner approaches each problem as a unique case. Therefore, although s/he utilizes existing theoretical knowledge, each problem situation initiates a process of

discovery.[310] When Petra is stuck during her design process Quist approaches by criticizing her framing of the problem implicitly as he leaves "his criticism of the old problem to be inferred from his way of restructuring it."[311] By doing this, he "steps into the situation, to make himself part of it." As Petra proceeds with the reframed problem, they together have a chance to reflect on the new problem definition.[312] Therefore, the situation is transformed from an unsolved problem situation to a process of reflection-in-action, which provides space for constant reframing of the problem. This is the basis of reflective practice. The emphasis on the significance of problem definition is not made only by Schön. It constitutes an important characteristic of tacit knowing, a notion that was influential in the construction of the ideas in *Reflective Practitioner*.

Polanyi, in his exploration on tacit knowing, demonstrates that seeing a problem constitutes a significant part of solving it.[313] However, seeing a problem mostly depends on personal intuition and tacit knowing even in the case of the discoveries in natural and social sciences.[314] This is the case also for the definition of architectural design problems. Although s/he benefits from theoretical knowledge on the subject area, the definition of the specific design problem with its all dimensions is an intellectual operation that is shaped by the architect's "knowing of more than s/he can tell."[315] Although it may not be possible to explicitly conceptualize these operations of tacit knowing, it is important to find ways of generating knowledge by reflecting on one's own decisions.

As it is seen through the ideas of Schön and Polanyi, structuring of a problem cannot be fully explained through explicit theoretical statements; it is governed by tacit components of thinking. It is the first step of decisions in a process of change. In order to generate knowledge through these decisions it is necessary to find ways on reflecting on our choices that result in these decisions. In this respect, *phronēsis* appears as an embracing concept, which relates all discussion concerning knowledge generation through problem defining and problem solving.

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[310] Schön, 1991, 129.

[311] Ibid, 130.

[312] Ibid, 131.

[313] Polanyi, *Personal Knowledge*, 1964, 120; Polanyi, 1961, 131.

[314] Polanyi, 1961, 131-132.

[315] Ibid, 131.

The definition of an architectural problem is composed of series of choices. Certain aspects that are related with the context of the problem are brought forward while others are considered as secondary. These aspects can be physical, which are related with the site, functional program, or materials to be used, social, which are related with the actors in the design process, users, or economical issues, and technical, which are related with the technology that is to be utilized during design and construction. Choosing among these aspects yields to a set of variables to begin with. This set is called an architectural problem to be solved. Although it is possible to form many different sets from physical, social, and technical aspects of a design project, the chosen set is the first personal action of the designer.

At this point, it is important to remember Aristotle's ideas on choices; the cause of action is choice, and the cause of choice is desire. Therefore, reflecting on initial choices is based on considering their relationship with the initial desire and actions that follow these choices. Aristotle's "deliberative excellence" applies in this process of reflection. Deliberation on the relationship of initial desire, initial choices, and actions is concerned with the *correctness* of this relationship. In other words, the initial desire to change an existing situation in an environment should be accompanied by *right* choices among certain aspects of the environment. The investigation of the conditions of *correctness* and *rightness* in the relationship between desires, choices, and actions is an effective way of reflection. As each situation in practice is defined by Schön as *uncertain*, *instable*, *unique*, and full of *value conflict*,[316] in each case different forms of relationship between desires, choices, and actions from which we can learn are constructed. "Deliberative excellence" is an appropriate tool for investigating these relationships. By reflecting on initial choices in relation to initial desire in terms of the actions that are results of these decisions, it becomes possible to test the applicability of the initial choices, in other words, the problem definition. The conceptualization of this investigation is a contribution to knowledge that is crucial for dealing with future situations of *uncertainty*, *instability*, *uniqueness*, and *value conflict*. To exemplify this process of reflection on problem definition, it is illuminating to reconsider Le Corbusier's and Koolhaas' contributions to architectural knowledge, which are discussed in Chapter 2.

Le Corbusier, in his discussion on "Mass Production Artisan's Dwellings," reframes the architectural problem of mass production in a way to propose his solutions concerning physical and technical aspects of design process. His initial choices emphasize two aspects of

[316] Schön, 1991, 49.

the existing situation, while considering others as secondary. These aspects are first, the lack of spaciousness, which is the consequence of economical concerns and second, the use of materials. Within this hierarchy, it becomes possible for him to reflect on the actions, choices, and desires that shape the architectural form. His reframing of the problem becomes the framework for his reflection on his actions.

Similarly, Koolhaas, in "Nexus World Housing" and "Villa Dall'Ava," reframes the architectural problem around social aspects of design. These aspects are conflicts between two cultures in the case of "Nexus World Housing," and legal and economical issues related with the client in the case of "Villa Dall'Ava." By constructing a *correct* relationship between desires, choices, and actions, his design work becomes a contribution to architectural knowledge.

As in every attempt of action research, the validity of research by design is characterized with the role of choices in solving a particular problem. Therefore, it is necessary to consider definition of a problem together with processes of solving it in order to investigate *correctness* of the relationship between them.

5.1.2 The Significance of Conversation in Design Processes

When architectural design process is defined as a problem solving process, knowledge generation through design becomes a reflection on problem definition and problem solving. In the previous section, the role of problem definition in knowledge generation is discussed; however, this role emerges only when reflection on problem definition is considered together with problem solving processes to discover *correct* and *meaningful* relationships between them.

Problem solving is one of the mostly investigated topics in literature on research by design. It is a defining characteristic of this alternative approach to design research. Instead of attempting to discover *the nature of problem solving*, researcher aims at utilizing *problem solving process as a tool* for generating architectural knowledge. Such an epistemological difference characterizes the difference of research by design from existing research approaches that investigate design processes – design methods and history, theory and criticism. This alternative approach to problem solving is based on a constant reassessment of the relationship between means and ends. In this sense, problem definition is considered as an integral part of problem solving as it is the defining parameter in this relationship.

This approach is based on Schön's idea of "reflective conversation." The main assumption of reflective practice is that practitioner's reflection on unique cases of problem situations yields

to knowledge generation on practice, therefore it improves practice. He identifies this process of reflection as reflection-in-action.

A key concept of reflection-in-action is reflective conversation. In the analysis of an architectural design process, Schön derives from Quist's actions that he is in a "reflective conversation with the situation." Conversation means verbal communication between two persons, which is based on *interchange* or *exchange* of information, thoughts, ideas, and feelings.[317] Therefore reflective conversation with the situation is an analogy that refers to the designer's comprehension of newly defined problems as consequences of changes in the situation. While analyzing an actual conversation between Quist and Petra, Schön exemplifies this conversation. The actual conversation between Quist and Petra is another source of knowledge as the exchange of ideas between an experienced and novice designer opens up new ways for the definition and solution of the problem situation.

Constant reframing of problem is the result of practitioner's active engagement with the situation. Instead of imposing a set of predefined decisions on the problem situation and attempting to solve it within the initial framework, Quist is ready to reframe his approach to the problem according to changes in the situation as a result of his actions. Therefore conversation transforms the relationship between means and ends. In processes where means and ends are open to change constantly, it is not possible to define a causal relationship between means and ends.

Reconsideration of the problem, means, and ends in a reflective conversation with the situation is a clear explanation for design processes. The significance of this explanation lies in its potential to provide insights for knowledge generation through the activity of design. It is evident that designers employ conversation for the solution of complex and ill defined problems; what Schön introduces is that this characteristic of design processes can be illuminating for knowledge generation in practices in every field for improving practices.

Reflection on one's own actions is a personal process of generating knowledge. In many cases transformations in problem definitions, means, and ends are difficult to be expressed in propositional statements. Therefore, these tacit knowing processes should be analyzed within appropriate frameworks.

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[317] conversation. Dictionary.com. *The American Heritage Dictionary of the English Language, Fourth Edition* (Houghton Mifflin Company, 2004), [Internet: WWW], ADDRESS: http://dictionary.reference.com/browse/design [ACCESSED: 20 June 2008].

Polanyi's distinction between "two kinds of awareness" applies for understanding the intellectual operations during identification of various components of an action. It helps explain how one can constantly redefine his/her mindset during the process of accomplishing a task. It explains the tacit component in Schön's analysis that enables Quist to consider the potentials and shortcomings of a choice that he made. He is focally aware of situating a building into a site while he is subsidiarily aware of the potentials of his formal proposal. There are sub-decisions in the formal proposal and the hierarchy of focal and subsidiary awareness applies all of those sub-decisions in a similar way. The interactions between these different levels of awareness result in restructuring of means and ends. In some cases, it is possible to reframe the approach to the problem when the restructuring of means and ends is not sufficient for advancement towards a solution. Polanyi's distinction between "focal" and "subsidiary" awareness explains the components of Schön's concept of conversation with the situation. Therefore, the distinction between focal and subsidiary awareness is one step further in explaining this complex process of knowing.

Schön refers to Lewin's ideas as precursors of action science. Lewin is also the originator of the idea of learning from the situation as it proceeds. His action-reflection cycle is a clear analytic explanation of the steps in the process that Schön calls conversation with the situation. In Lewin's formulation, an action is decomposed into parts that include a general idea, an overall plan that governs steps of action, execution of a step, and fact-finding related to the executed step. Although this formulation explains a linear sequence instead of simultaneous action and reflection as it is proposed by Schön, its specification of the effects of fact-finding in each part of the action including the general idea is remarkable.

Figure 5.1 represents a detailed interpretation of this action-reflection cycle in terms of direct effects of fact-finding. *Evaluation* of the executed step provides *feedback* for the general idea, which can be identified as the problem definition, it *modifies the overall plan* for problem solving, and it is a starting point for *planning the next step*.[318] This is a well organized analysis of the components of conversation with the situation. When these components are considered together with a dual awareness as proposed by Polanyi, a better explanation for reflection-in-action is possible. To break the linear sequence and achieve coexistence of action and reflection it is important to be aware of the components of planning, execution and fact-finding simultaneously.

[318] Lewin, 1948, 205-206.

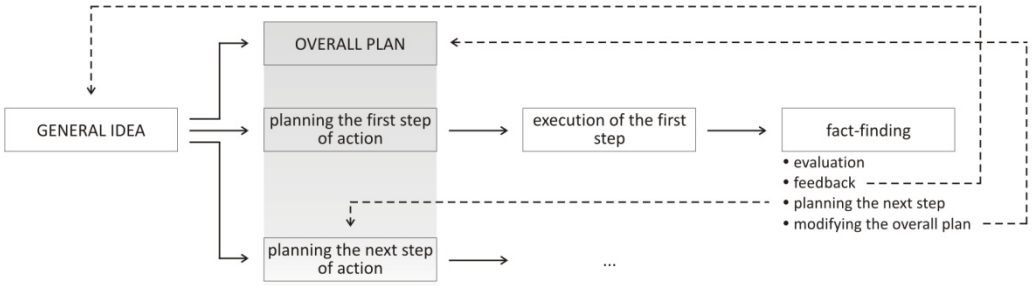

Figure 5.1. Circle of planning, action, and fact-finding in rational social management as formulated by Lewin. Drawing by the author.

Dewey's investigations on reflection provide insights for achieving simultaneity in action and reflection. If his ideas on the concept of "playfulness" are recalled, it is seen that he elaborates the concept of play as an operational tool for explaining the coexistence of action and reflection. He does not prefer to define the difference between play and work in terms of their aims. He claims that the difference is not between an "activity for its own sake" and an activity whose interest is in "the external result." Rather, he argues that the distinction is in the processes, between an activity defined "as it flows from moment to moment" and an activity that is defined by its "culmination."[319] Dewey defines play as an activity that allows constant deliberation on actions as opposed to the activity of work, which is focused on the accomplishment of a task. In this sense, play is a very appropriate way of learning. Therefore, he argues that "playfulness" as a state of mind should be transferred to work environments for improving reflection during actions.

The concept of "play" is elaborated by Gadamer in a slightly different manner, although they share similar intentions with Dewey concerning the reconciliation of human understanding and human actions. Gadamer uses this concept to explain his discussion on works of art and their hermeneutic significance. Through a discussion on understanding works of art, he utilizes play as a model for understanding the structure of understanding. For Gadamer, in play "the mode of being is self-presentation." In this sense, he shares similar ideas with Dewey in terms of deliberation.

> … the self-presentation of human play depends on the player's conduct being tied to the make-believe goals of the game, but the "meaning" of these goals does not in

[319] Dewey, 1997, 164.

> fact depend on their being achieved. Rather, in spending oneself on the task of the game, one is in fact playing oneself out.[320]

Self-presentation exists independent of an audience, "artistic presentation, by its nature, exists for someone, even if there is no one there who merely listens or watches."[321] Gadamer's conception differs from Dewey at this point as he proposes the concept of "transformation into structure" as a result of self-presentation.[322] When it becomes detached from "the representing activity of the players," then it is possible to comprehend the pure content of play, it becomes "repeatable" and "permanent." In this sense, Gadamer calls play as structure.[323]

The concept of play is a useful analogy that helps us to understand how our actions generate *meanings* that can be transferred to principles. This transfer is the aim of a pattern of behavior that is called "conversation with the situation" by Schön.

Schön's concept of "reflective conversation," Polanyi's "two kinds of awareness," Lewin's "action-reflection cycle," and the "concept of play" as it is elaborated by Dewey and Gadamer are inter-related to each other in terms of the clarification of knowledge generation during the accomplishment of a task. Aristotle's concept of *phronēsis* is a unifying concept for all these aspects as it provides the general principles for conversation with action. Among the varieties of *phronēsis*, "deliberative excellence" – as in the case of problem definition – and "understanding" are closely related with knowledge generation during problem solving processes.

"Deliberative excellence" is a search for *correctness* of the relationship between desires, choices, and actions. In this sense, it is the most encompassing definition for "conversation with the situation." All forms of reflection during problem solving that are discussed in this section are based on such an investigation and all are applicable to architectural design processes. Ways of investigating *correctness* may differ in different contexts of design activity, however, the relationship between desires, choices, and actions remains as the main subject of inquiry in all forms of research by design. While reflecting on the relationship between desires and choices yields to knowledge generation through problem definition, reflecting on the relationship

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[320] Gadamer, 2006, 108.

[321] Ibid, 110.

[322] Ibid.

[323] Ibid.

between choices and actions yields to knowledge generation through reflective conversation. These two areas of knowledge generation are bound together with choices of the designer.

"Understanding" as a variety of *phronēsis* is defined by Aristotle as the ability of making judgments concerning others' ideas on actions. This is the primary characteristic of a conversation, which refers to interchange or exchange of information, thought, ideas, and feelings. Such an interchange is not possible without making relevant judgments of each other's ideas. In architectural design, as exemplified in Schön's analysis of the dialogue between Quist and Petra, interpersonal conversation becomes an integral part of "conversation with the situation." Architects work in contexts whose characteristics are defined not only by the context itself, but also by different actors in the context. Therefore, "understanding," which is the interpersonal coefficient of *phronēsis*, becomes crucial in knowledge generation processes through reflection-in-action.

If Le Corbusier's and Koolhaas' contributions are recalled, it is seen that their aim is not to document their problem solving processes in the form of a conversation with the situation. Although they construct their arguments upon their projects, they focus on the final judgments concerning knowledge they generate during their design processes. In this sense, documentation of conversation emerges as an integral part of research by design. The species of knowledge that is generated through the works of these two architects is revealed through the reader's construction of relationships between ideas and projects. However, it is crucial for the architect himself/herself to construct this relationship as an integral part of his design and research process. This essential characteristic of research by design will be discussed in the section concerning credibility and validity of this type of research.

The conversation between Quist and Petra in Schön's analysis reveals that there is a crucial personal dimension in the intellectual processes of problem definition and problem solving. This dimension is the significance of experience. It is not a coincidence that experience emerges as another major topic in literature on research by design besides problems. It is what differentiates reflective practice from a simple trial and error method.

5.1.3 The Significance of Experience

Expertise is one of the important topics in research on research by design since the 2000s. The role of previous design experiences in improving design knowledge has been discussed with a focus on the differences between expert and novice designers, the differentiating characteristics of outstanding designers, and the significance of the knowledge of precedents.

This interest has a precursor – as many topics in research by design – in Schön's *Reflective Practitioner*.

Schön focuses on the role of experience while he discusses the conversation between Quist and Petra. Experience is a factor that makes reflection-in-action different from a simple trial and error process of problem solving. Quist's guidance of Petra's design process is based on his anticipation of the consequences of his actions. While Petra is being stuck on a particular step in the design process, Quist is able to show her a different structuring of the problem. He can understand why Petra is stuck with his past design experiences; and he is able to propose a different approach to the problem, which suggests new ways of problem solving. He is able to consider possible future actions that Petra may undertake within the newly defined problem, and he is able to consider what to do next according to Petra's actions.[324]

In this process, experience provides a starting point for reframing the problem situation; therefore it triggers a series of reflections towards the solution. However, its role is not limited to the beginning of the process. As reflection-in-action is a process of constant reframing of the problem situation, in every step, experience is an important factor in governing the actions. When the action-reflection cycle of Lewin is considered, if change is conceived as a cyclical process composed of planning, action, and fact-finding, each step in the cycle is shaped by the experience of the practitioner. This is evident in the analysis of the conversation between Quist and Petra. The only significant difference between these two designers is that one of them has greater experience than the other. This explains how Quist is able to propose a new approach when Petra is stuck.

Gadamer relates experience with the concept of "fore-understanding." He refines the concept of "fore-understanding" with reference to Heidegger's concept of "fore-structure for understanding," which emerges as the key to the hermeneutic circle. In every act of understanding there are "fore-meanings" with which a person tries to understand and interpret.[325] These may be replaced with more appropriate ones as the person proceeds. Again with reference to Heidegger, he identifies the three dimensions of "fore-understanding" as "fore-having," "fore-sight," and "fore-conception." According to Gadamer, Heidegger utilizes these concepts to claim that:

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[324] Schön, 1991, 137-140.

[325] Gadamer, 2006, 270-272.

> Methodologically conscious understanding will be concerned not merely to form anticipatory ideas, but to make them conscious, so as to check them and thus acquire right understanding from the things themselves.[326]

This elucidation of "fore-structure" is to justify the role of "prejudgments" or "prejudices" in understanding. Although the Enlightenment, according to Gadamer, has discredited it, "prejudice" has always been a part of understanding and interpretation in history.[327] Although the term has negative connotations, he prefers to use it to refer to our "prejudgments" on a task of understanding.

> … the French préjudice, as well as the Latin praejudicium, means simply "adverse effect," "disadvantage," "harm." But this negative sense is only derivative. The negative consequence depends precisely on the positive validity, the value of the provisional decision as a prejudgment, like that of any precedent.[328]

Although he claims that "neutral" understanding is not possible, Gadamer also refutes the idea that all our understanding is based on our prejudgments. Understanding should be "sensitive" to what is presented by the situation yet, for him, "this sensitivity involves neither 'neutrality' with respect to content nor the extinction of one's self, but the foregrounding and appropriation of one's own fore-meanings and prejudices." If the person is aware of his/her "own bias," only then s/he is able to comprehend what is offered new with the situation.[329]

Phronēsis is an intellectual virtue, which is based on life experience. All the qualities that it suggests are based on the experience of the individual. Therefore, Aristotle's clarification of *phronēsis* applies for understanding the role of experience in research by design.

> …we say that at such and such an age a man must have got intelligence and considerateness, which implies that they come by nature.
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> … Consequently the unproved assertions and opinions of experienced and elderly people, [or of prudent men], are as much deserving of attention as those which they

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[326] Ibid, 272.

[327] Ibid, 268-306. Gadamer refers extensively to Heidegger's *Being and Time* in this discussion.

[328] Ibid, 273.

[329] Ibid, 271-272.

> support by proof; for experience has given them an eye for things, and so they see correctly.[330]

This statement should not be interpreted as *phronēsis* can be naturally gained through age and experience. With deliberative excellence, understanding, and consideration, *phronēsis* provides the channels from which one's experience may lead him/her to reach *correct* relationships between desires, choices, and actions.

When practical knowledge is considered, existing knowledge constitutes a base for building upon new knowledge. Since it is a direct form of knowing as opposed to indirect form of theoretical knowledge, relating new knowledge with existing intellectual structure is a crucial step for the attainment of practical knowledge and generating new knowledge.

The role of experience is evident in Le Corbusier's *Towards a New Architecture* and Koolhaas' *S, M, L, XL*. Both Le Corbusier and Koolhaas are influential figures in architectural practice. Their professional practices are shaped with the forces of the intellectual framework of architecture. Not only their involvement in networks of ideas, but also their own experiences during their practice are significant factors in their formulation of ideas. It was discussed in Chapter 2 that Le Corbusier constructed upon sociological and technological ideas of the late nineteenth and early twentieth century. Moreover, his own observations during his journeys – as exemplified in his observation on Parthenon – constitute a major starting point for his argument on a new architecture. Similarly, Koolhaas, since his education as an architect, is practicing within an environment shaped by critical stances that have developed since the second half of the twentieth century, especially since 1968. Le Corbusier's and Koolhaas' discourses are based on their practical experiences that are shaped within the practical and discursive context in which they are practicing.

Experience, problem definition, and problem solving are significant in knowledge generation through actions that aim to change existing situation. The characteristics of these aspects in design share similar grounds with social sciences. These aspects are related with the moral dimensions of actions done in the process of change. However, in the activity of design, each action is embodied within the artifact, which is the purpose of design. Therefore, the

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[330] Aristotle, 1994, 363. The words in brackets are a suspicious addition; Thomson claims that "prudence is irrelevant here" (Aristotle, 1976, 220, footnote 7), and Rackham states that "no one can become prudent merely by getting older" with reference to Burnet (Aristotle, 1994, 363, footnote c). However, as the section is titled "Examination of Prudence Concluded" and as the main discussion is on the relationship between Prudence and Intelligence, the general idea is concerned with the characteristics of prudent man.

relationship of desires, choices, and actions should be considered in relation to the artifact in its own terms, because artifact is a source of knowledge as important as the moral dimensions of design acts.

5.2 The Significance of the Artifact as a Source of Knowledge

The significance of the artifact as a source of knowledge is discussed by Cross in his article titled "Designerly Ways of Knowing." He introduces "designerly ways of knowing" in two subtitles: "design processes" and "design products." While he contemplates on several approaches to design research when he is discussing design processes, his argument concerning design products is limited to stating that:

> A significant branch of designerly ways of knowing, then, is the knowledge that resides in the objects. Designers are immersed in this material culture, and draw upon it as the primary source of their thinking. Designers have the ability to 'read' and 'write' in this culture: they understand what messages objects communicate, and they can create new objects which embody their message.[331]

Cross refers to Mary Douglas and Baron Isherwood's *The World of Goods* for defining the process of "reading" and "writing" in material culture. The passage he quotes from Douglas and Isherwood briefly explains the significance of the artifact and its relation to different forms of knowing, which are different from theoretical knowledge.

> For too long a narrow idea of human reasoning has prevailed which only accepts simple induction and deduction as worthy of the name of thinking. But there is a prior and pervasive kind of reasoning that scans a scene and sizes it up, packing into one instant's survey a process of matching, classifying, and comparing. This is not to invoke a mysterious faculty of intuition or mental association. Metaphorical appreciation, as well as the words we have used suggest, is a work of approximate measurement, scaling and comparison between like and unlike elements in a pattern.[332]

In this way, Cross claims that designerly ways of knowing are not limited to design processes, on the contrary, products are valuable sources of knowledge that is specific to the design activity. He argues that designers use "nonverbal graphic codes" for translating "abstract

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[331] Cross, 1982, 224-225.

[332] Mary Douglas and Baron Isherwood, *The World of Goods* (New York, NY: Routledge, 2003, first published in 1979), viii.

requirements into concrete objects." The reversal of this operation is also possible, as Cross states, designers use these "codes to both 'read' and 'write' in 'object languages'."[333] When design research is considered these "nonverbal graphic codes" of communication, which are particular to design disciplines, assume the role of verbal symbolic coding systems in natural and social sciences. It is crucially important for research by design to find ways of integrating artifacts into the reflection process through its own coding systems.

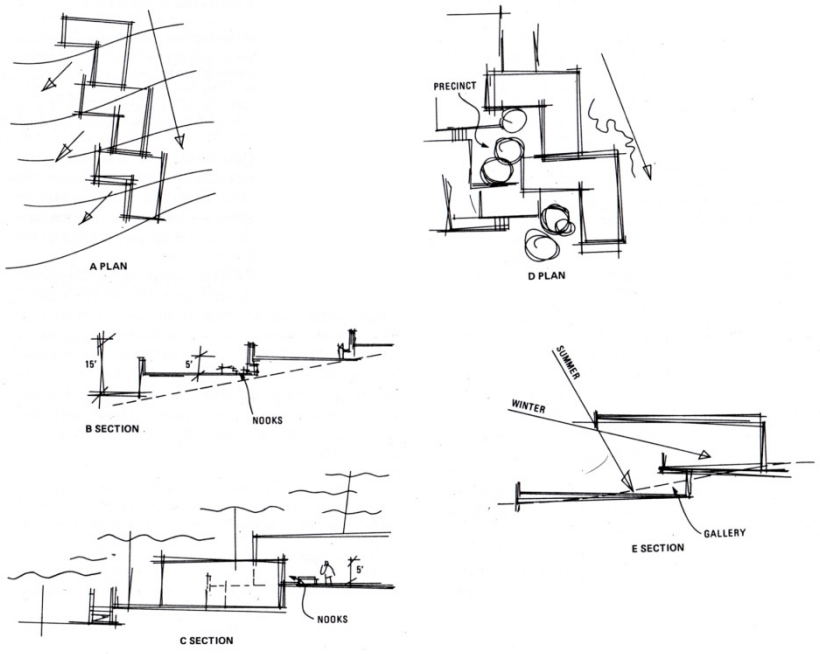

Figure 5.2. Sketches produced during the conversation between Quist and Petra as abstracted by Schön. In Donald A. Schön, *The Reflective Practitioner: How Professionals Think in Action* (London: Basic Books, 1991, first edition, 1983), 86-87.

Schön's analysis of the reflective conversation between Quist and Petra is based on the sketches that they produce during their conversation. The conversation is not based on the meanings of statements within their relationship with graphical material; sketches are the only tools for generating those particular statements. "Reflective conversation with the situation" emerges in a nonverbal graphic language. The artifact is the agent for exchange of information between Quist and Petra and this exchange of ideas is the generator of new knowledge concerning the solution of the problem.

Figure 5.2 is a representation with which Schön explains the role of sketches in the reflective conversation between Quist and Petra. For example, the concept of "nooks" appears through

[333] Cross, 1982, 226.

some sectional sketches. These are small spaces that *emerge* as a result of vertical shifting of building blocks in order to fit the composition to the slope of the land. The *emergence* of these nooks as well as other defined spaces such as galleries is only possible with working on the section of the building. While Quist and Petra are drawing, they are thinking through the elements of that drawing. This intellectual action is particular to design disciplines. An action that aims to make a product becomes a tool for reflection on that action.

At this point, Aristotle's distinction between *doing* and *making* becomes relevant for explaining the role of the artifact in knowledge generation. According to Aristotle,

> … the act of making is not an end in itself, it is only a means, and belongs to something else. Whereas a thing done is an end in itself: since doing well (welfare) is the End, and it is at this that desire aims.[334]

This is the differentiation between *things made* and *actions done*. This differentiation constitutes the basis of the distinction between *technē* (technical skill) and *phronēsis* (practical wisdom). *Technē* is concerned with processes of *making*, whereas *phronēsis* is the knowledge of doing. Although Aristotle states that neither doing nor making can be considered as a part of the other,[335] when reflection through actions of making a product is considered, the distinction between these rational qualities blurs.

Technē is composed of necessary skills for creation of an object. The aim of utilizing these skills is producing a product. On the other hand, *phronēsis*, as discussed above, is concerned with the correct relationships between desires, choices, and actions. *Phronēsis* deals with doing actions and the aim in doing is doing well. The intellectual content of *technē* can be considered as a means to an end that is defined by other rational operations, whereas doing is an end in itself. However, with the establishment of disciplinary bases for practices of making – such as architectural design –, actions of making become tools of reflection. This is the result of the intention to improve existing patterns of making, and improvement is possible with generation of new knowledge on practice. Making is no longer only a means to an end, but it is transformed to an end in itself. When actions are considered as ends in themselves, then they can be considered within the sphere of *phronēsis*. As the aim in actions that are self referential is doing well, actions that are made through physical tools can be investigated through deliberation.

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[334] Aristotle, 1994, 331.

[335] Ibid, 335.

To clarify this discussion, it is helpful to recall the creation of "nooks" in the conversation between Quist and Petra. Drawing of the lines to create a section of the building requires technical knowledge. Knowing the properties of a sectional representation is crucial for this process. Both Petra and Quist know what is represented in a sectional drawing, what is meant by horizontal and vertical lines. They also know how to draw lines. These are components of *technē* concerning the drawing of sections. However, utilizing sectional sketches as a tool for knowledge generation cannot be explained by *technē*. Technical skill (*technē*) is necessary for the act of drawing, but utilization of this action as a tool for reflection requires other intellectual operations, which can be described by practical wisdom (*phronēsis*). During the drawing process, small cozy spaces emerge at the intersections of horizontal lines, which represent floor slabs at different levels. The emergence of these spaces simultaneously generates new meanings in the designer's mind. Eventually, such a process is closely related with the designer's experience. While Petra is not able to construct such meanings, Quist can easily relate those small spaces to "nooks," where children can spend their time, based on similar cases that he has encountered in the past. In this process, Petra is focused on fitting each segment of horizontal line (floor slab) to a continuous inclined line (slope of the site), however, besides this main aim, Quist is also aware of the properties of each line and the potentials that are created through the relationships of those lines. This recalls Polanyi's concept of "two kinds of awareness." The intellectual process is based on reflecting on "subsidiary awareness" of the lines without repressing "focal awareness" of fitting the building blocks on the slope of the site. This kind of reflection is a form of *phronēsis* although it is closely bounded with forms of knowing that are in the sphere of *technē*. In this sense, technical skill is not sufficient by itself, for "doing well" it is necessary to evaluate the existing situation with the values that are attained through the experience of the designer.

The particular form of thinking that is seen in the works of Le Corbusier and Koolhaas is based on processes that are described above. This can be called thinking architecturally. Architecture can be used as an adjective for thinking when it is considered within a framework that brings *technē* and *phronēsis* together. The perspective drawing that Le Corbusier produced for "Mass-production Artisan's Dwelling" that is shown in Figure 2.3 illustrates the significance of his lines in the emergence of ideas like the creation of an *unexpected* dimension by the use of the diagonal of the square.[336] The creation of an *unexpected* dimension is the result of experimentation with the artifact; it is not a pre-made decision that is represented in

[336] Le Corbusier, 1970, 237.

the artifact. Similarly, Koolhaas incorporates drawings of "Villa Dall'Ava" with revisions that are made with red-ink pen for illustrating the role of endless revisions on the design process. These revisions are possible with the existence of drawings to reflect upon. Many of the revisions are themselves in the form of sketches. The graphical language of reflection is a tool for generating knowledge through the design process of the villa. What is learned from this villa for the improvement of his practice – and eventually for architectural knowledge in general with the publication of *S, M, L, XL* – is learned through the sketches made with red-ink pen on the existing drawings.

In this section, the discussion has been illustrated through drawings. However, this discussion can be generalized to every form of artifact including three dimensional models and buildings themselves. The relationship between *technē* and *phronēsis* is significant in any form of created artifact, which requires skill for the actions of creating it and reflection for generating knowledge through these actions.

In summary, knowledge generation through research by design has two main aspects: *the design process* and *the artifact*. The design process can be conceptualized as processes of *problem definition* and *problem solving* in light of the *experience* of the designer. Reflection on these processes is based on moral choices similar to reflection in any process of change, which can be called as action research in general. The significance of the artifact is particular to the processes of change in design disciplines, which aim at generating a product as the result of change. The products in a design process turn out to be objects of reflection, thus we can learn from them and we can go beyond them. Processes of change become sources of knowledge within the framework of *phronēsis*. When the significance of the artifact is considered knowledge is generated through the simultaneity of *phronēsis* and *technē*.

5.3 Credibility and Validity

For a research approach to gain credibility and validity it is important to define the sources of rigor in the kind of knowledge that it generates. One of the aims of this study is to contribute to the definition of rigor in research by design. Certain processes of knowing concerning design processes and artifacts are discussed above. The credibility of research by design as a form of action research in design disciplines is constructed around the methodological and epistemological transformation in understanding these different forms of knowing processes inherent in the activity of design.

Schön calls upon action science for generalizing his attempts to conceptualize reflective practice. In other words, criteria of validity that apply to knowledge generated through action science are accepted as the criteria for reflective practice. Therefore, it is necessary to dwell on the credibility of action science, or more accurately action research in general, for initiating a discussion on the validation criteria for knowledge generated through research by design.

As it was mentioned in the previous chapter, as one of the properties of action research, Greenwood and Levin define the most important criteria for validity in action research as its power to solve problems and increase the actors' control over the situation.

> The credibility-validity of AR knowledge is measured according to whether actions that arise from it solve problems (workability) and increase participants' control over their own situation.[337]

They define credibility as "the arguments and the processes necessary for having someone trust research results." Within this definition two kinds of credibility is defined: internal credibility and external credibility. Internal credibility is the participant actors' trust in the research results. Testing of internal credibility is based on the evaluation of "direct consequences" of the change that is introduced to the situation. External credibility is defined as "knowledge capable of convincing someone who did not participate in the inquiry that the results are believable." Problems of validity emerge when external credibility of action research is concerned. While credibility in conventional social science is based on generalizability and universalizability of propositions, the main assumption of action research is that every situation is a unique case. Therefore, according to Greenwood and Levin, "only knowledge generated and tested in practice is credible."[338] In order to overcome this compatibility problem, they propose the concepts of "workability," "making sense," and "transcontextual credibility."

"Workability" is concerned with "the solution of the action research problem under examination locally." The credibility of knowledge generated through action is tested in terms of degrees of effectiveness of the action in the solution of the problem. This concept for credibility is borrowed from pragmatist philosophy, which is one of the philosophical sources of action research.[339]

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[337] Greenwood and Levin, 2007, 63.

[338] Ibid, 67.

[339] Ibid, 68.

"Making sense" is a testing procedure for meaning construction through deliberative processes. It is the testing of "chains of arguments" that are generated through reflections on actions. Greenwood and Levin propose two possible methods for the testing of deliberation: Jürgen Habermas' "ideal speech situation," and Gadamer's hermeneutics. In Habermas' ideal speech situation, the actors in meaning construction process "seriously and honestly judge" the arguments that are proposed. When there is no better explanation as a result of this process, an ideal situation is reached and an understanding of the situation arises. However, this is based on an ideal conversation, which excludes personal coefficients such as "emotions, power, and inequality." In this context, Gadamer's hermeneutics offers a more embracing framework for conversation to deal with complex real world situations. His hermeneutics offers a "fusion of horizons" taking into consideration "the historicity of knowledge, interpretations, and experiences the participants bring.[340]

"Transcontextual credibility" is not the same with generalization and universalization of findings. According to Greenwood and Levin, "action research does not generalize through abstraction and the loss of history and context."[341] Instead, they argue that there is a need for reflection in every new case for the investigation of it in terms of its relationship with the existing situation through which certain meanings are constructed.

> Meanings created in one context are examined for their credibility in another situation through a conscious reflection on similarities and differences between contextual features and historical factors.[342]

Polanyi's concept of "intellectual beauty" becomes a significant characteristic of meaning construction in action research. Although he develops this concept for emphasizing the role of "elegance," "economy," and "simplicity" of propositions in every form of scientific research, intellectual beauty becomes an integral part of action research by contributing to the credibility of results. This is another explanation for "making sense" as Greenwood and Levin define it. Making sense is based on "beautiful" expression of arguments that are constructed through the experience of the actor, his/her interpretation, and through the reflective dialogue between the actors.

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[340] Ibid, 68-69.

[341] Ibid, 70.

[342] Ibid.

It can be seen that workability, making sense, and transcontextual credibility emerge directly from reflections on decisions made during a process of change. Therefore, as the research process itself, the credibility and validity of action research depends on moral virtues. The three varieties of *phronēsis* apply to the credibility of knowledge generated through actions. "Deliberative excellence" and "understanding" are tools for meaning construction and conversation; these processes are also applicable to the testing of these processes for "workability" and "making sense." The third variety of *phronēsis*, which is "consideration," is concerned with the transcontextual credibility of personal practical wisdom. It is "judging correctly what is equitable."[343] Equitability is a concept that relates personal judgments with the judgments of others. It is concerned with the applicability of judgments to the largest group of variety as possible. Equitability is reached through reflection on different situations in terms of the findings of the situation that is under investigation.

Documentation of research constitutes a significant part of the validity of research results. It is the medium through which internal credibility, workability, making sense, and transcontextual credibility is communicated. How can such a dynamic process of knowledge generation be documented?

Writing is the most appropriate technology for preserving and transferring knowledge. The text is a common tool for sharing knowledge that is generated in any form of activity. Although in action research the primary source of knowledge is within the change itself, or within the artifact in the case of design, knowledge must be transferred to text in order to be shared with the general academic community, which may be outside the participants of a particular research. Greenwood and Levin emphasize the role of narrative in reflecting the dynamic and progressive process of knowledge generation in action research.

> AR [action research] needs a genre of writing that faithfully reflects the dynamic and developmental nature of AR, that recreates for the reader key elements in the experiential learning cycles. The reader might not need to understand all learning sequences, but the reader needs to have a clear access to the major learning history of the project. This demand would integrate a narrative style into experiential learning cycles.[344]

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[343] Aristotle, 1994, 359.

[344] Greenwood and Levin, 2007, 109.

The text has a dual purpose in the documentation of action research; it addresses the practitioners and academicians. Therefore, the challenge in narratives is to construct "a persuasive connectedness between theory and practice."[345] This is achieved through breaking the "linear form of conventional research-based publication."[346] Action-based publications should convey the process of constant reframing of the problem and the effects of conversation during the solution of the problem. It is in the form of a spiral, which is simply abstracted in Lewin's action-reflection cycle. According to Greenwood and Levin, "the knowledge that is generated in the project will be conveyed to the reader following the same basic logic as it was achieved in the real project."[347]

Thus, credibility and validity of action research is based on the transparent presentation of newly constructed meanings through reflection on problem solving processes that are proved to generate change in the situation.

These criteria for validity also apply to research by design in architecture with one crucial difference. In social sciences, the change is generated on a sociological situation, in other words, generated knowledge is apparent in the relationships between people. Therefore, textual documentation is the only instrument for preserving and conveying this kind of knowledge. However, in design, generated knowledge is inherent in a material object, the artifact. In this sense, a text becomes supplementary to the artifact in terms of transferring the generated knowledge into a form that is commonly accepted for knowledge transmission. Nonetheless, as the artifact is the main source of knowledge, a graphical coding system, which is coherent with the generation process of the artifact, is the main tool for communication in research by design.

It is discussed in this chapter that, the nature of knowledge that is generated through actions is fundamentally different from that of conventional scientific research. Rather than a linear understanding of hypothesis, testing, and theory, it is based on a cyclical investigation of the *correct* relationship between the motives and application of an action. It is based on moral choices. This is the epistemological transformation that emerges with research by design. This epistemological transformation triggers methodological transformation in research. Methods for changing an existing situation become the tools for generating knowledge on the situation

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[345] Ibid, 110.

[346] Ibid, 111.

[347] Ibid, 111-112.

within a framework that provides ways of conscious reflection on these methods. As the methods for changing the situation is based on moral practical choices, Gadamer's hermeneutics paves the way for rediscovering the significance of Aristotle's concept of *phronēsis* (practical wisdom) as a key concept for the development of a conceptual framework for conscious reflection on moral choices in actions.

The conceptual framework that is developed in this chapter delineates a general outline for knowledge generation through acts of design. This general outline is based on the unity of the design process and the artifact; and it provides different principles for engaging these two sources of knowledge within the embracing concept of *phronēsis*. However, as in any form of action research, methods and approaches of research by design are defined within the characteristics of a specific problem situation. The contextualization of research by design is necessary for defining its possibilities and boundaries for knowledge generation.

CHAPTER 6

DESIGN AS AN ACT OF KNOWING IN THE STUDIO CONTEXT

As it has been mentioned in the previous chapter, in this study, the question of *knowing what through the act of design* is addressed in two dimensions: general and specific. The general outline of a conceptual framework that embraces epistemological and methodological transformation that accompanies the emergence of research by design was constructed in the previous chapter.

The specific context that is under investigation in this study is the studio context of architectural design education. There are two main reasons for this preference. Firstly, the author is in engagement with undergraduate architectural design studios as a design critic. The experience that has been accumulated during this practice is a starting point for reflection on the process of design in the design studios. Secondly, the studio environment is a relatively controlled environment. The main educational action is architectural design, which can be considered as a simulation of professional design processes. However, the factors that are affecting the design processes in the studio are limited in number and the actors of the design processes have well defined roles. Moreover, it is assumed that the primary aim of the design processes in architectural education is knowledge generation through the activity of design. Therefore, reflecting on the design processes in the studio context is not only necessary, but it also has the potentials of instigating reflections on design processes in professional contexts.

In this chapter, firstly, for preparing a ground for the application of this general framework to the specific context of architectural design education, an overview of modern architectural education is introduced. The motives and innovations of the Bauhaus and its consequences are overviewed. Several attempts of generating knowledge on certain aspects of architecture within the system developed in the modernization of architectural education are discussed.

Then, within the specific conditions of modern architectural design education, a conceptual mapping for research by design is constructed. This investigation firstly focuses on the function of institutional and personal background in the design process. Then the role of the critic as reflective practitioner is elaborated. This is followed by an exploration of the relationship between *doing* and *making* in terms of education. Finally, knowing through design processes in the studio is discussed and the chapter is concluded with remarks on the conceptualization of this generated knowledge. It is clear that the studio context provides its own boundaries and possibilities in terms of the relationships among the actors of the design process, the actors' engagement in the action, and the significance of the designed product.

6.1 An Overview of the Evolution of Modern Architectural Education

It is assumed that architectural education, with its emphasis on hands-on learning, constitutes an example of alternative modes of knowledge generation. On the basis of such an assumption, Schön utilizes the practice of architectural education as the first example of his construction of the framework of "reflective practice." The significance of this teaching and learning practice lies in the fact that the design studios, where students are expected to learn through design processes, constitute the core of the curriculum. For reflecting on this learning environment, firstly its characteristics should be defined.

In its simplest definition, the design studio is based on a dialogue between an expert designer (the critic) and a novice one (the student). The student is expected to develop an architectural proposal to a design problem that is defined through the studio process. However, the crucial dimension is not only the development of a proposal, but also the process of this development. This process is characterized with the dialogue between the critic and the student. There are mainly two types of dialogue in terms of participation. Firstly, there is *one to one* relationship between the critic and the student. This kind of dialogue is mostly referred to as "desk critique" and it is based on the direct conversation between the critic and the student concerning the student's proposal for a particular phase in the project. The other form of dialogue is *group interaction*. This consists of group discussions during the studio as well as the special form of evaluation that is called "the jury." These group interactions are crucial, because they provide an environment for the participation of different actors in the design process; therefore, it becomes possible to integrate different perspectives on the same problem situation.

Sarah M. Dinham, in a study on teaching in architectural design studios, provides brief and clear descriptions for these two modes of interaction. For example, on desk critiques, she states that:

> The "desk crit" is a brief event occurring repeatedly through an afternoon. Typical the critic moves through the studio on a random or sometimes an informal "appointment" basis, meeting with students at their desks and discussing their thinking, their work, their progress, and their problems with the project assignment.[348]

She classifies group discussions that focus on a particular topic of the problem assignment and panel critiques as "group meetings."

> Occasionally – and more likely at the beginning of a project – the critic will gather students in the studio or lead them into a nearby room to provide explanations for the assignment, organize students for team efforts, or make observations on problems seen in enough desk crits to suggest that a general problem might exist. … In an interim review the crit calls the students together and takes them into a room whose walls are lined in tackboard. Students pin-up their work in progress, and the crit moves from one to the next, commenting on the individual student's work and summarizing the lessons for the entire group to glean from the example at hand.[349]

For Dinham, the "jury" is a tradition for evaluating the student's progress as it is represented in his/her project.

> The students' work is displayed for a panel of reviewers (principally local faculty, occasionally supplemented by local practitioners or guest faculty) who hear students in turn give oral introductions and explanations of their thinking and products, and who then provides criticism of both. Usually final reviews are public events: other students are expected to attend and to *learn* from reviews or their peers' work.[350]

In this study, the dialogical process between an expert designer and a novice one is classified in terms of the degrees of participation. Therefore, instead of considering "desk critiques," "group meetings," and "juries" as three modes of dialogue, the focus is on the differentiation

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[348] Sarah M. Dinham, "An Ongoing Qualitative Study of Architecture Studio Teaching: Analyzing Teacher-Student Exchanges" (paper presented at the annual meeting of the Association for the Study of Higher Education, Baltimore, USA, November 21-24, 1987), 5.

[349] Ibid, 5-6.

[350] Ibid, 6, emphasis added.

between *one to one* relationship, which refers to the process of desk critique, and *group interaction*, which refers to the form of interaction that provides different perspectives of different individuals such as group discussions, panel critiques, and juries.

These different forms of dialogue are based on the student's design proposal. Different from design processes in professional contexts, in educational design processes, the artifact is primarily a tool for knowledge generation besides being an object of use. In this sense, there is a more convenient relationship between the artifact and reflective conversation during the design process when compared to professional design processes where the artifact is the ultimate purpose of the design process.

These forms of course conduct have developed with the institutionalization of architectural education and today they are considered as established methods of learning by *making*.[351] With reference to the Bauhaus, the developments in the twentieth century are often assumed to have a significant role in the emergence of modern architectural education as we understand it today. However, what was introduced with the Bauhaus was rather a transformation in the understanding and utilization of the existing methods. The methods of learning by making were established in the institutions of the Enlightenment. Allen Cunningham, in his article titled "Notes on Education and Research around Architecture," provides a brief summary of institutions of architectural education prior to the Bauhaus while demonstrating that the main pedagogical tools of communication such as desk critic and jury have predecessors in these earlier establishments.

> The model from which all subsequent pedagogies have benefited was established in eighteenth-century Paris, the Ecole des Beaux Arts. Modern project-based education in the arts owes its structure, content and method in large measure to the Ecole.[352]

For this assertion, Cunningham refers to Collins' article titled "The Eighteenth Century Origins of Our Full-Time Architectural Schooling." Collins states that "our present concept of architectural education unquestionably had its roots in the system which originated in Paris

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[351] "Learning by doing" is a generally accepted term with reference to a particular pedagogical model that is developed in the Enlightenment as an alternative to "rote learning." This issue will be discussed in the section on the Bauhaus system. In this study, the term "learning by making" is used with reference to Aristotle's differentiation between *doing* and *making*. The activity in the architectural design studio is based on the production of an artifact for an intended use. In this sense, it is in the sphere of *making* according to this distinction.

[352] Allen Cunningham, "Notes on Education and Research around Architecture," *The Journal of Architecture*, Vol. 10, No. 4 (September 2005): 415.

in 1671 as part of Louis XIV's establishment of the Académie Royale d'Architecture."[353] After the French Revolution, certain traits are established within this tradition that goes back to 1671. This newly established system is referred to as the "Beaux-Arts system" following the most influential school of the period.[354]

Frank Weiner provides a brief history of architectural education in the nineteenth century. The first schools in Europe are "the Architectural Association in London (1847), the ETH in Zürich (1855) and Ecole Des Beaux-Arts in Paris (1863)." Simultaneously the first schools in the USA were established. These are "The Cooper Union for the Advancement of Science and Art (1859), Columbia (1881) and Harvard (1893)." He defines polytechnic institutes that are established in Paris in 1794, Prague in 1806 and Vienna in 1815 as the forerunners of these schools of architecture.[355] The educational system in these schools in the late nineteenth and the early twentieth century is referred to as the Beaux-Arts system to differentiate the general approach in these schools from the general approach after the Bauhaus.

The Bauhaus is characterized with its introduction of a new conceptual framework for the same patterns of pedagogical behavior that had developed in the eighteenth century Beaux-Arts system. These patterns are based on learning by making and conversation between an expert and a novice designer. In order to propose a framework for knowledge generation through these patterns, the origins of them in the Beaux-Arts system should be investigated prior to understanding the conceptual transformations of the Bauhaus, which is assumed to be the foundation of today's architectural education.

6.1.1 The Beaux-Arts: Institutionalization of Apprenticeship

The Academie Royale d'Architecture was founded in 1671. During the eighteenth century, with the efforts of Blondel, it established the initial principles for full-time architectural education. After the revolution it merged with the Ecole des Beaux-Arts, which was founded by Cardinal Mazarin in 1648.[356] Since the early nineteenth century, the pedagogical approach that was developed in the Academy has been referred to as the Beaux-Arts system. In this

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[353] Peter Collins, "The Eighteenth Century Origins of Our System of Full-Time Architectural Schooling," *Journal of Architectural Education*, Vol. 36, No. 1, *Beginnings* (November 1979): 2.

[354] Ibid.

[355] Frank Weiner, "Five Critical Horizons for Architectural Educators in an Age of Distraction," (1st Prize), *EAAE Writings in Architectural Education*, No. 26, *EAAE Prize 2003-2005* (2005): 24.

[356] Collins, 1979, 2.

respect, in this study, the term "Beaux-Arts" is used to denote a pedagogical approach, not a particular school.

The establishment of institutions for architectural education began after the Renaissance when architecture became to be recognized as a profession. In the sixteenth and the seventeenth century with the influence of Alberti's *De re Aedificatoria*, the profession of architects began to be defined as the profession of "the complete designer," who is "capable of planning cities and designing everything from palaces to churches to a humble farmhouse."[357] In the medieval system, "a man was trained through formal apprenticeship and as he worked his way up in the system, each step increased his responsibilities until, as a qualified mason, he could undertake the design and direction of a building himself."[358] For Alberti, theory is what distinguishes architecture from being a trade and makes it a discipline.[359] Modernization of architectural practice and transformation of this practice into a profession inevitably necessitated schools for organized learning of the practice as well as knowledge generation for the profession. The process of apprenticeship was not responding to the necessities that are stated above. According to Myra Nan Rosenfeld, "the Royal Building Administration provided the means for the modernization of medieval architectural practice in France through the introduction of new methods from Italy."[360] In this sense,

> … the curriculum of the Royal Academy and of its successor, the Ecole des Beaux-Arts, was the basis for the method of instruction used in architectural schools until the advent of the Bauhaus in the twentieth century.[361]

The difference of education within an institution from apprenticeship was based on the formalization of the relationship between an expert designer and a novice student. There were lecture courses that provided theoretical knowledge and site visits that were required for

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[357] Catherine Wilkinson, "The New Professionalism in the Renaissance," in *The Architect: Chapters in the History of the Profession*, ed. Spiro Kostof (New York, NY: Oxford University Press, 1977), 124.

[358] Ibid, 131.

[359] Ibid, 149.

[360] Myra Nan Rosenfeld, "The Royal Building Administration in France from Charles V to Louis XIV," in *The Architect: Chapters in the History of the Profession*, ed. Spiro Kostof (New York, NY: Oxford University Press, 1977), 161.

[361] Ibid.

the detailed study of major buildings in order to learn from them.[362] These traits were innovations in architectural education and they served to the purposes of advancement in theoretical knowledge, which was prioritized by Alberti. However, "the center of the student's world was the *atelier* or studio where competition projects were worked out."[363]

In these ateliers students worked under the supervision of a *patron* who was generally a practicing architect. The patrons used to come to the atelier for brief periods of time, usually in the evenings for giving critiques and coordinating the problem in general terms. At other times the responsibility of the atelier was on the senior students, who govern the process of design in its daily routines guided by the general framework that was set by the patron. There was a strict hierarchy in the process of learning by making. According to Jean Paul Carlhian, "in the atelier, students received advice and encouragement from the elders in return for help in menial tasks."[364] Although there was a formal process of problem solving, whose goals were well defined by the patron and which was supported with theoretical and surveying courses, the actual process was based on apprenticeship. The hierarchy of this apprenticeship was defined by the patron, the senior students, and students from top to bottom. The major activity that formed this hierarchy was the system of critique. The person who was on an upper level in the hierarchy criticized the work of a student on a lower level. The end product of this design process was evaluated in a jury. A project would either be evaluated as "pass," "fail," or "HC (Hors de Concours)." The latter means out of competition and it is equivalent to fail. It was used to be given to projects which were not compatible with the rules that were set at the beginning.[365]

Within this critique system, the basic patterns of behavior in architectural education, which are still common in architectural education today, were developed. These were primarily the desk critiques and the juries. Although these formal traits have developed, the content of the educational process is still based on learning a certain way of making architecture. Resting on the precedents, the critiques and the juries were a guarantee for the continuity of a building

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[362] Joan Draper, "The Ecole des Beaux-Arts and the Architectural Profession in the United States: The Case of John Galen Howard," in *The Architect: Chapters in the History of the Profession*, ed. Spiro Kostof (New York, NY: Oxford University Press, 1977), 211; Collins, 1979, 5-6.

[363] Draper, 1977, 211.

[364] Jean Paul Carlhian, "The Ecole des Beaux-Arts: Modes and Manners," *Journal of Architectural Education*, Vol. 36, No. 1, *Beginnings* (November 1979): 7.

[365] Carlhian, 1979, 14.

tradition. In this sense, the establishment of this critique system was the primary essence of the institutionalization of apprenticeship.

6.1.2 The Bauhaus: Education through Self-Reflection

The Bauhaus (House of Building) is the common name used to denote Staatliches Bauhaus, which is a school of design that placed architecture to the center. It was founded in 1919 by Walter Gropius. The school was active between 1919 and 1925 in Weimar and between 1925 and 1932 in Dessau. For a short period it was active in Berlin between 1932 and 1933 until its closing down in 1933. Gropius directed the school between 1919 and 1928. Hannes Meyer was the director between 1928 and 1930. The last director of the school was Ludwig Mies van der Rohe between 1930 and 1933.[366]

The manifesto of the Bauhaus begins with the statement, "the ultimate aim of all creative activity is the building."[367] With this statement in mind, the school was organized to form a unity among crafts, arts, and industry for the education of the architect. This intention emerged from Gropius' critical approach to the Beaux-Arts system, which he called the "academy." According to him, the education of the academy resulted in the isolation of the artist from the social and economic realities of the community.

> The tool of the spirit of yesterday was the "academy." It shut off the artist from the world of industry and handicraft, and thus brought about his complete isolation from the community.[368]

"The spirit of yesterday" was based on the studying of existing buildings for learning how to design. Instead, the Bauhaus proposed a new framework that focused on the materials, techniques and forms that produce a building. Learning by making was still the essence of the education offered there with a change in the intellectual content of it.

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[366] Frank Whitford, *Bauhaus* (London: Thames and Hudson Ltd., 1991, first published in 1984), 9-10.

[367] Walter Gropius, "Manifesto of the Bauhaus, April 1919," (originally published in the *Programme* of the Bauhaus in a four-page leaflet published by the school) in Frank Whitford, *Bauhaus* (London: Thames and Hudson Ltd., 1991, first published in 1984), 202.

[368] Walter Gropius, "The Theory and Organization of the Bauhaus," in *Bauhaus*, ed. Herbert Bayer, Walter Gropius, and Ise Gropius (Boston, MA: Charles T. Branford Company, 1952, first published in 1938), 21.

> … it was logical to establish the following basic requirements for the future training of all gifted individuals: *a thorough practical, manual training in workshops actively engaged in production, coupled with sound theoretical instruction in the laws of design.*[369]

In this respect, the curriculum was devised in three parts: the preliminary course, instruction in a craft, and instruction in architecture. This division of the curriculum is illustrated in Figure 6.1. The preliminary course was lasting half a year and it consisted "elementary instruction in problems of form, combined with practical experiments with different materials in the workshops for beginners." It was resulted with admission to one of the craft workshops. In the workshops, the student, as an apprentice, received "advanced instruction of form" through experimentation on one of the crafts of stone, wood, metal, clay, glass, color, or textiles. This period was proposed to last three years. As a result, the student received a "Journeyman's Diploma of the Chamber of Crafts" and s/he became qualified for instruction in architecture. The ultimate degree of education in the Bauhaus was instruction in architecture. It was based on "practical participation in buildings under construction and, for especially talented journeymen, independent architectural training in the Bauhaus Research Department." The duration of instruction in architecture varied "depending on achievement and special circumstances." It was resulted in the "Master's Diploma of the Chamber of Crafts, and, under special circumstances, Diploma of the Bauhaus."[370]

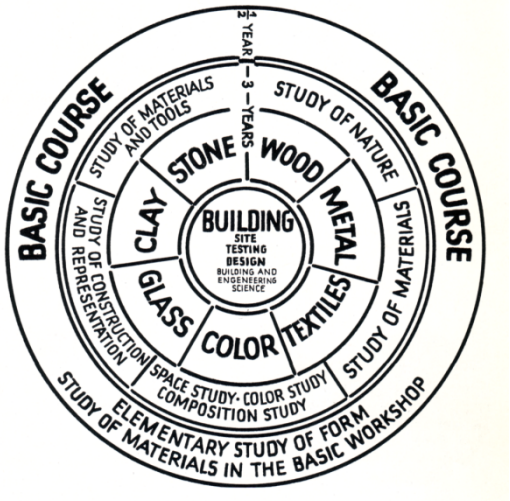

Figure 6.1. Diagram of the Bauhaus curriculum, published 1923. In Johannes Itten, *Design and Form: The Basic Course at the Bauhaus* (New York, NY: Reinhold Publishing Corporation, 1966, first published in 1964), 13.

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[369] Ibid, 22.

[370] Ibid.

The studio, workshop, or the Bauhaus Research Department constituted the core of this curriculum. As it can be understood from Figure 6.1, the basic course (preliminary course) constituted the foundation, upon which all of the studies that were undertaken in the Bauhaus. The building on the other hand, considered as the center around which all the studies revolve and the "ultimate aim of all creative activity." Similar to the Beaux-Arts system, learning by making was essential in architectural education in the Bauhaus; however, there was a crucial difference. While in the Beaux-Arts system the aim of learning by making was to impose on the students a particular way of designing based on a stylistic investigation of precedents, in the Bauhaus the aim was to provide a ground on which the students were expected to develop themselves through experimentation with materials, techniques and forms. According to Gropius, the aim of the preliminary course was to "liberate the individual by breaking down conventional patterns of thought in order to make way for personal experiences and discoveries which will enable him to see his own potentials and limitations."[371] Johannes Itten, who was the originator of the preliminary course, states that:

> My best students are those who found new ways through their own intuition. Mere outward imitation and repetition of my procedure is without sparking power. Yet I am well aware that my teaching did not always embody something new; it was also a revival of what had been fundamentals for artists in the past.[372]

This emphasis on the student's self reflection is based on a pedagogical ideal of the nineteenth century. This is the concept of "the innocent eye." Varnelis, in his article titled "The Education of the Innocent Eye," presents a genealogy of this ideal and its reflections on architectural education in the form of "the language of space."[373] This ideal is defined by John Ruskin as "the innocent eye." It is based on a relief from cultural constructions for learning to see the aspects of form beyond what it signifies. According to Varnelis, "Ruskin emphasized drawing *perceptions* rather than *preconceptions* of the outside world."[374]

The educational discourse in the eighteenth and the nineteenth centuries provides the context for Ruskin's conceptualization of the innocent eye. Varnelis goes back to Jean-Jacques

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[371] Ibid, 24.

[372] Johannes Itten, *Design and Form: The Basic Course at the Bauhaus* (New York, NY: Reinhold Publishing Corporation, 1966, first published in 1964), 7.

[373] Kazys Varnelis, "The Education of the Innocent Eye," *Journal of Architectural Education*, Vol. 51, No. 4 (May 1998): 212-223.

[374] Ibid, 213.

Rousseau's *Émile* for investigating the beginnings for this pedagogical approach. With his preference for "learning by doing" as opposed to rote learning that is based on memorization, Rousseau laid the foundations for this alternative form of education.[375] This approach is further developed by Johann Heinrich Pestalozzi who "felt that teaching children words for things they had not yet seen would replace actual perceptions with conventional interpretations, filling children's minds with meaningless signifiers." He developed a system of perceptual learning by doing instead of learning based on repetition.[376] In the nineteenth century, Friedrich Froebel popularized the ideas of Pestalozzi and developed a system based on play as a form of self expression and development of "motor-expression." Varnelis states that, "Froebel believed that tactical and visual knowledge was far more important than language."[377]

Learning by doing was introduced within the concept of the innocent eye through this genealogy. Itten developed the preliminary course in this pedagogical framework that he acquired during his earlier career as a teacher in Pestalozzian and Froebelian institutions.[378] Thus, within the Bauhaus paradigm, a visual language that is based on the "properties of visual perception itself" was developed. With this new visual language the innocent eye became "the basis for design" besides being "just a means for observation."[379]

Instruction in a craft was carried on under the supervision of two masters: a craftsman and an artist simultaneously. In this way it was guaranteed that the student is acquainted in crafts as well as the theory of form simultaneously, therefore this is a step in the unity of arts, crafts, and industry. The graduation of a craft workshop was based on a "work-test in the presence of a committee of established craftsmen."[380] Therefore, the education was based on the traits of apprenticeship that were formalized in the Beaux-Arts system. The dialogue between an expert designer and a novice one was still the main form of course conduct in the Bauhaus. In the Bauhaus this form of conversation found its true meaning of exchange of ideas as a result of the intentions of the institution. In the Beaux-Arts, the aim of the dialogue was the transmittance of knowledge concerning architecture from the masters to the apprentices in a

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[375] Ibid.

[376] Ibid.

[377] Ibid, 214.

[378] Ibid.

[379] Ibid, 214-215.

[380] Gropius, 1952, 26.

formal method, whereas the Bauhaus laid the foundations for a free conversation based on the students' *self-reflection* in order to construct new meanings. Since there were no stylistic references, the conversation was based on student's experimentation with materials, techniques, and forms. The juries also underwent a transformation with this shift in the mindsets. The jury was no longer only a tool to evaluate the work of the student, as it was a public "work-test;" it became a ground for discussion and generation of new meanings.

As it can be seen in the above discussion, the Bauhaus was not the initiator of the tools of modern architectural education. The Bauhaus utilized traits that were developed in earlier institutions and transformed them in order to develop its pedagogy that was in conformity with the changing social and economical structures. Mass-production and standardization were also significant characteristics of the Bauhaus pedagogy; however they are not discussed thoroughly in this study as it focuses on the pedagogical tools of design. It should be noted that the Bauhaus pedagogy was not a single coherent system; it is characterized with the intentions of the individuals who are active in the school. Methods of self-reflection may vary from Gropius' approach to Itten's, or Lazslo Moholy-Nagy's, or Josef Albers' approaches. This study focuses on the Bauhaus' introduction of self-reflection instead of variations in formulating self-reflection.

The institutionalization of architectural education should be considered in the course of modernity through the continuity of the Beaux-Arts and the Bauhaus. The design studio, learning by making, desk critiques, and juries are the innovations of the Beaux-Arts system. The Bauhaus' curriculum structure is assumed to be the basic framework for later interpretations of architectural design education that is composed of basic design course, instruction of aspects that are related with architecture, and a master of architecture. Moreover, the fundamental intention of the Bauhaus, which was based on the individual's self-reflection for learning how to design, has become the intellectual framework of the architectural design studios since then.

6.1.3 Research within the Framework of the Bauhaus

After the dissolution of the Bauhaus, most of the artists and architects who were masters or students in the institution left Germany and continued their careers in the countries in which they sought refuge. USA was the center for the refugees of the Bauhaus. Gropius went to Harvard and changed the curriculum of the Graduate School of Design, Moholy-Nagy went to Chicago and founded the "New Bauhaus" in 1937, Albers was influential first in Black Mountain College, then in Yale, and a former Bauhaus student Max Bill founded

"Hochschule für Gestaltung" in Ulm in 1950.[381] The dissemination of the founding ideas of the Bauhaus especially in the USA resulted in a transformation of architectural education. This transformation may have many causes, which are not the focus of this study, but a most probable cause seems to be the consistency of the Bauhaus motives with the necessities of a new industrialized society. Gropius' influence on the curriculum of Harvard transformed the initial motives of the Bauhaus in its later interpretations in the USA. The focus was on generating buildings "by translating diagrams of function into built form, taking into account structural considerations, and adding some kind of visual interest based on the same physiological principles of form taught by Moholy-Nagy."[382] According to Varnelis, "based on Gropius' primary interest in architecture as building problem rather than art, the Harvard method failed to stake out an autonomous position for the field."[383] Gropius' influence in the transformation of architectural education is significant because his educational activity in the USA is concerned primarily with architecture while Moholy-Nagy's or Albers' influence was rather on art education. Therefore, although the approaches of individuals who are affiliated with the Bauhaus may differ, in this study the focus is on Gropius' approach.

In order to demonstrate the transformation of the initial motives of the Bauhaus in its later interpretations, reflections of a former Harvard student in the 1940s are illuminating. Robert Geddes describes the influence of Gropius by stating that they "were all modernists." According to him, their "paradigm was rather simple: buildings had a structural frame and a free plan." He defines the key to the paradigm as "social transparency as well as physical transparency."[384] As a result of the political situation in Europe, not only the key individuals of the Bauhaus, but all the discussion on modern architecture migrated to USA. Geddes' position demonstrates this situation. Moreover, this position is complemented with a preference for a source for generation of form. "We were more than willing to allow *functional* dispositions to be determinants of form."[385]

This transformation of the pedagogical system of the Bauhaus in its interpretations in the USA is remarkable. Among its motives, which primarily aim to unite all crafts, arts and

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[381] Whitford, 1991, 197.

[382] Varnelis, 1998, 216.

[383] Ibid.

[384] Robert Geddes, "A Moment in Architectural Education: The Harvard University Graduate School of Design in the 1940s," in *Reflections on Architectural Practices in the Nineties*, ed. William Saunders et al. (New York, NY: Princeton Architectural Press, 1996), 45-46.

[385] Ibid, 46.

industry for architecture through students' own experimentation, functionalism gained dominance. Geddes concludes his statement on free plan by stating that "it was necessarily a *free plan*, although we had arguments between Le Corbusier's and Mies van der Rohe's ideas on that subject."[386] This statement shows that the design processes in the studios resembled to that of the Beaux-Arts system, which the Bauhaus had criticized and proposed to alter. The ideas of the pioneering personalities of the early phase of modernity in Europe had replaced the authority of the precedents in the Beaux-Arts.

When the notion of the innocent eye as the basis of design was generalized and institutionalized in art education with the efforts of Moholy-Nagy in the USA, architectural education was in a crisis.[387] This crisis led to several attempts to investigate ways of constructing a disciplinary basis for architecture.

> We avoid the responsibility of installing any idea in the mind of the student by declaring that we don't want to influence him. … We are critics in the narrowest sense of the term – accepting and rejecting, never informing.[388]

The above quotation from Rowe summarizes the problems that arise within this framework of architectural education. It is a part from the comments written by Rowe and Bernhard Hoesli, and delivered to the faculty of the University of Texas, School of Architecture, at Austin by Harwell Hamilton Harris in 1954. They propose immediate action for solution of this problem. They claim that the faculty should have two obligations to students.

1. To equip the student with the *skills* necessary for the practice of his profession; and
2. To enable him to develop his powers of *selection* by the process of his own *judgement*.[389]

These comments will be reflected on later in the discussion of knowledge generation through design processes in the studio context. For the current discussion, these quotations suggest that there was a new problem situation brought by the newly emerging system of architectural

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[386] Ibid.

[387] Varnelis, 1998, 216.

[388] Colin Rowe, "Comments of Harwell Hamilton Harris to the Faculty, May25, 1954," in *As I Was Saying: Recollections and Miscellaneous Essays / Colin Rowe, Volume I,* ed. Alexander Caragonne (Cambridge, MA: The MIT Press, 1996), 45.

[389] Ibid, 46, emphasis added.

education under the influence of the Bauhaus. However, the attempts for the solution of related problems were nourished from the initial motives of the Bauhaus, which still underlie the newly emerging problematic system.

Design research, as it is discussed in Chapter 3, began with the intention of proposing solutions to the problems that has been stated above. If the problem statements in Alexander's and Eisenman's PhD dissertations are recalled, it can be seen that they were aware of the shortcomings of knowledge generation for developing a disciplinary basis for architecture. Alexander starts from the conjecture that when architects lost the security of depending on the authority of a tradition, it becomes impossible to deal with the increasing complexity of contemporary design problems. As a solution, he proposes a system of solvable small patterns that are mathematically interrelated. Eisenman, on the other hand, claims that architectural thinking has a historical tendency rather than theoretical. Therefore, it becomes difficult to think in terms of concepts that lie behind the facts when the emphasis is on the facts and their relationships. He proposes a formal language based on the investigation of the properties of forms, rather than on what they represent, through analyses of the utilization of forms in the works of the pioneers of modern architecture. In summary, design research, whether in the form of design methods or history, theory and criticism, aims at proposing solutions to the impasse on architectural knowledge generation, which has emerged by the later interpretations of the pedagogical system of the Bauhaus.

Research on architectural education also proposed solutions for knowledge generation within the general framework that was provided by the Bauhaus. The attempts to formulate research by design in institutions, as discussed in Chapter 3, have often addressed the problems within architectural education. Besides these attempts, there are individual endeavors of research within architectural design education, which are not directly linked to research by design. Rowe and his colleagues' experiments in the University of Texas, School of Architecture, at Austin in 1950s, Venturi and his colleagues' efforts of learning from the daily life in the USA, especially in Las Vegas in late 1960s, and a recent attempt by Marc Angélil and his colleagues in Swiss Federal Institute of Technology in Zurich (ETH Zurich) in 2000s are significant examples for such attempts of research through architectural education within the system of the Bauhaus. Each of these endeavors resulted in influential texts that provide significant contribution to knowledge on architectural design education.

"Transparency: Literal and Phenomenal," which was written by Rowe in collaboration with Slutzky, is one of the most influential articles on modern architecture with its uncovering of the formal properties that are inherent in modern architecture. It is the result of the

collaboration of its authors in the studios of the University of Texas, School of Architecture, at Austin from 1954 to 1956. During this period, Rowe focused on the form making processes instead of accepting the dominance of an attitude that relates functionalism with architectural form. According to Varnelis, this was an attempt to investigate the formal basis of architecture, following the example of modern art. With its focus on architectural form, the Texas faculty manages to develop a language space through the notion of the innocent eye that is inherent in the Bauhaus pedagogy.[390] As a result, the experimentations in the design studios merged with Slutzky's knowledge on Gestalt perception psychology and modern art for the development of the concept of "phenomenal transparency" that is defined as a device for organizing architectural space.[391] These attempts became influential in later formal investigations on modern architecture.

Venturi, Brown, and Steve Izenour's *Learning from Las Vegas* is the documentation of a design research studio in Yale University School of Architecture, which was supervised by the authors. Through a site visit to Las Vegas, which was supplemented by library research and interpretation of the findings in the studio, the authors and their students contribute to architectural knowledge in a way that was not possible outside the studio context. The importance of the "sign" and the communicative power of architecture were elaborated for the first time in this research project.[392] With these contributions, the book has become one of the most influential texts on the discussion of postmodernism in architecture.

Inchoate is the title of the book by Angélil, which documents a process of experimentation in the first year design studio in the ETH Zurich by Angélil and his colleagues. The academic year was organized as a series of exercises that were grouped under conceptual titles like "space," "program," and "technology." Each conceptual group was linked to significant periods of experimentation in architectural education in late twentieth century such as the experiments in Texas in 1950s and in Architectural Association in 1970s. The procedure of the studio was based on the continuing reconsideration of the referential content of each exercise through design processes.[393] For example, the second week of the first semester was

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[390] Varnelis, 1998, 216-218.

[391] See Caragonne, 1995; Rowe, 1996; and Colin Rowe and Robert Slutzky, *Transparency* (Basel: Birkhauser-Verlag, 1997).

[392] Robert Venturi, Denise Scott Brown, and Steven Izenour, *Learning from Las Vegas* (Cambridge, MA: The MIT Press, 1977, first published in 1972).

[393] Marc Angélil, *Inchoate: An Experiment in Architectural Education* (Zürich: Swiss Federal Institute of Technology, 2003).

devoted to an exercise titled "A Tango Performance." The design exercise was accompanied with a lecture on "space conception vs. perception" and a discussion on Rowe and Slutzky's text "Transparency." This exercise essentially aimed to develop the student's ability to observe, interpret, and generate an in-between space. This was achieved through observation of the space between two tango dancers while they were performing, analyzing that space, generating a form based on the analysis, and producing an artifact by pouring plastic into a wooden formwork.[394] This process is not limited to personal deliberation on observation and generation of form, but it is in an organic relationship with the lecture and the text that accompanied the exercise. Therefore, the educational process in the studio was situated in the context of production and discourse of modern architecture. This attempt of research in the basic design course bears potentials to influence similar attempts of reconsideration within the Bauhaus pedagogy. In this sense, *Inchoate* has provided one of the major insights for this study.

The role of the Bauhaus pedagogy and its transformations during the twentieth century can be clearly explained in terms of learning theories. There are three main learning theories: behaviorism, cognitivism, and constructivism. Behaviorism (or conditioning) argues that "learning is a change in behavior" and if the environment is structured accordingly, "students can respond correctly and reinforce those responses." Cognitivism argues that "learning involves the forming of networks in memory." The focus is on "the acquisition, storage, and retrieval of information." Constructivism argues that knowledge and beliefs are constructed by the learner. Learning process occurs through relating newly acquainted information with current or past knowledge of the learner.[395]

The initial motives of the Bauhaus promoted a constructivist learning process, which was based on the student's self-development through his design experiments. This is why it was regarded as an alternative to the pedagogy of the Beaux-Arts system. The Beaux-Arts system was based rather on a behaviorist approach, which expects certain responses from the student when certain problems are issued. However, with the later interpretations of the Bauhaus system, it became a dominant system in architectural education, and it is transformed into a behaviorist system as such a system provided the most economical solutions to the demands of the society. When the problems of this system began to be realized, several attempts –

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[394] Ibid, 52-69.

[395] Dale H. Schunk, *Learning Theories: an Educational Perspective* (Upper Saddle River, NJ: Pearson Education, Inc., 2008, first published in 1991), 515-516.

which are discussed above – for introducing constructivist approach once again into the Bauhaus system emerged. In the same manner, research by design in the studio context aims at construction of new meanings by relating new information with existing knowledge.

6.2 Research by Design in the Studio Context

It was discussed in the previous section that it is possible to generate knowledge through design processes in the studio. The studio in architectural design education does not simply address the attainment of certain abilities for the practice of the profession. As it is implied in the initial motives of the Bauhaus, which is considered as the basis of today's architectural education system, the studio is where knowledge concerning the profession of architecture is generated. In this sense, it is important to recall Rowe and Hoesli's proposal for immediate actions for transforming teaching traits in the studio.

> 1. To equip the student with the *skills* necessary for the practice of his profession; and
> 2. To enable him to develop his powers of *selection* by the process of his own *judgement*.[396]

It is not necessary to impose external forms of research on the context of the studio. Reflection on these purposes of architectural design education constitutes the foundation for research by design in the studio context. This reflection investigates the nature of *choices* that are made during the design process while the students are attaining necessary *technical skills* for practicing the profession of architecture. This reflection results in *judgments* concerning knowledge on architectural design education and architectural design in general.

This process of generating knowledge cannot be explained through the epistemological framework of conventional research as it is not theoretical but practical in essence. As opposed to the processes of knowing-that, knowledge through design acts is generated by the processes of knowing-how. In Chapter 2, the differences between indirect form of knowing-that and direct form of knowing-how were elaborated. Resting on these differences, in Chapter 5, a general framework has been developed for conducting research through design processes. This framework is based on the investigation of the concepts related with "reflective practice," which were discussed in Chapter 4, with a focus on the moral dimension of design acts as it is assumed that every act of changing an existing situation involves a series

[396] Rowe, 1996, 46, emphasis added.

of *choices*. As it can be seen in the overview of architectural education in the previous section, it is an obligation to contextualize the conceptual framework that is developed in the previous chapter in architectural design studios. Such an investigation contributes to design research by exploring ways to consider design not as the object of investigation, but as a tool for knowledge generation.

Research by design is defined as a form of action research in this study. In other words, it is conceived as a form of research that is conducted by the actors who attempt to change an existing situation for the solution of problem(s) inherent in the situation. As it is discussed in Chapter 4 and Chapter 5, knowledge that is particular to the practice is generated through this process of change. In the context of architectural design education, the actors of change are *the student* (a novice designer) and *the critic* (an expert designer).

There are mainly three forms of knowledge generated in the studio context in terms of the interaction of the actors involved. These are:

- Knowledge generated by the student,
- Knowledge generated by the critic, and
- Knowledge generated collaboratively by the student and the critic.

In an educational process that emphasizes the student's own self-reflection as the basis of learning, the student constantly constructs his/her own meanings through his/her design process. The main assumption of Gropius' initial ideas on the Bauhaus pedagogy is this process. Therefore, it is assumed that such a process of learning occurs in the design studio today. However, as it is has been indicated in the previous sections, if the student is left alone without necessary exchange of ideas, hesitations in the process of meaning construction occur. In other words, only when the dialogue between the critic and the student is a "reflective conversation" within a conceptual framework, it is possible for students to construct new meanings. As construction of new meanings happens through relating new information with existing knowledge, a conceptual framework offers a common basis for these constructed relationships. With reflective conversation in an appropriate framework, it becomes possible for the student to contribute to architectural knowledge as well as his own knowledge concerning the profession.

The critic is responsible for the development of a conceptual framework for the student's learning process. This conceptual framework includes the devising of a design exercise, the outline of a reflective conversation, whose content is expected to be constructed through the

interaction of the critic and the student, and the criteria for evaluating the student's design work. Knowledge is generated by the critic in the studio context through reflection on his/her process of developing the conceptual framework. This is exemplified in Rowe and Slutzky's "Transparency" articles. The contribution of these articles to architectural knowledge is the result of their reflection on the design experiments in Texas in 1950s while they were actively participating in that particular educational experience.

Finally, it is possible to generate knowledge through design acts in the studio within a close collaboration between the critics and the students. When the conceptual framework of the studio is developed accordingly, while students are learning by making, another form of knowledge is generated through the interaction of the student and the critic. There are significant examples of this kind of collaboration. Venturi, Brown, and Izenour's *Learning from Las Vegas*, Brown's research studio in Las Vegas and Levittown that was discussed in Chapter 3 and Angélil's *Inchoate* are examples of this form of knowledge generation within the studio context.

The relationship between the actors is only one dimension of research by design in the studio context. It should be considered in relation to the actors' engagement in the action and the product of their design acts. As Rowe suggests, in the context of architectural education that was developed around the Bauhaus pedagogy, reflection on *choices* and the consequences of those choices emerged as the major form of inquiry.[397] This is crucial for an educational environment that is capable of continuously restructuring itself in order to respond to the necessities of the practice as well as the social, economical, and technological conditions.

In this sense, the conceptual framework that has been developed in Chapter 5 in order to situate the methodological and epistemological transformation that emerges with the introduction of "reflective practice" is considered as the foundation for elaborating specific aspects of research by design in the studio context. The discussion of certain aspects in architectural design studios is based on the conceptual framework that proposes an investigation of the *correct* relationship between *desires*, *choices*, and *actions*, which is developed upon Gadamer's practical philosophy in relation to Aristotle's intellectual virtue of *phronēsis*. These aspects that are significant in knowledge generation through design acts in the studio are:

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[397] Ibid.

- The role of the institutional and personal background,
- Reflective practice of the critic, and
- The relationship between *doing* and *making*.

Although there are variations among institutions, the design process in the Bauhaus system is composed of three parts: *analytical*, *generative*, and *evaluative*. Although they suggest a linear sequence, because of the cyclical nature of design processes (as discussed in Chapters 4 and 5), these three parts may coexist. The analytical process is composed of two dimensions: the physical and social context, and the program of the building to be designed. The generative process refers to student's production in conversation with his/her critic. The evaluative process is the assessment of the student's product in correlation with his/her ideas by exterior actors for evaluating the student's progress. In ideal environments, all of these three processes are expected to contribute student's attainment of knowledge. Moreover, when they are considered together with the knowledge generating aspects of the studio within an appropriate conceptual framework of practical philosophy, these processes have the potential for contributing to architectural knowledge.

The relationships between these aspects during the established tools of conversation, which are mainly *the desk critique* and *the jury*, constitute the elements of a framework for understanding the process of knowing through making in the studio context. This framework provides possible ways for conceptualization of design acts for contributing to knowledge on architectural education in particular as well as architectural knowledge in general.

6.2.1 Institutional and Personal Background

As it is discussed in Chapter 5, under the subtitle "Experience," the existing knowledge of a designer has a significant role in the generation of new knowledge. This has been illustrated in Schön's analysis of the reflective conversation between Quist and Petra and explained through Gadamer's concept of "fore-understanding." In the context of architectural design education, there are two dimensions of existing knowledge that affect knowledge generation processes: the institutional background and the personal background.

Before reflecting on the institutional and personal dimensions of experience, it is necessary to clarify the role of "fore-understanding" in architectural design. Lawson, in his article titled "Schemata, Gambits, and Precedent: Some Factors in Design Expertise," provides a structure for an operational explanation of the role of experience in design processes. His arguments

are based on empirical studies on the habits of expert and novice designers together with his interviews with expert designers. The structure that he proposes is as follows:

> Firstly, there must be the acquisition of the design domain *schemata*. Secondly, there is the development of a growing pool of *precedent*. … The next stage of design expertise is the identification of some guiding principles which develop over time and further structure and filter the continued acquisition of precedent. … The next stage of developing the ability to recognise situations with little or no analysis and the final stage of building a 'repertoire of tricks' or design *gambits* which are integrated into the schemata used to recognise problem situations surely mark designers out as being 'masters'.[398]

For Lawson, "Schemata" is the simple forms of communication – diagrams, catchphrases, or words – that refer to "complex or sophisticated sets of ideas."[399] These are meaningful in a community that share common values and ideas. "Precedents" refer to the design products that are considered to inspire design processes.[400] "Gambit" is a term most commonly used in chess and it refers to certain patterns of action for the solution of a problem.[401] The relationship between schemata, precedents, and gambits are governed by "guiding principles," which are "sets of values and principles" that are developed through time.[402] Lawson uses this structure to explain the role of "experiential memory" in design expertise as opposed to the role of expertise based on "theoretic memory" in other professions that rely on mostly theoretical knowledge.[403]

The architectural design education offers a compact form of this accumulation of expertise through a series of design exercises. The aim is the initiation of student's expertise while raising awareness in him/her concerning the operational tools for gaining expertise in his/her career.

As the student is the focus of knowledge generation in the studio, his/her background constitutes the ground on which new meanings can be constructed. In later interpretations of the Bauhaus pedagogy, it was assumed that the student should be freed from existing pre-

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[398] Lawson, "Schemata, Gambits and Precedent: Some Factors in Design Expertise," 2004, 456-457.

[399] Ibid, 446.

[400] Ibid, 449.

[401] Ibid, 448.

[402] Ibid, 448-449.

[403] Ibid, 451-453.

judgments in order to avoid a referential attitude that is similar to that of the Beaux-Arts pedagogy. However, as it has been indicated above, this assumption is not in harmony with the nature of design knowledge. Knowing-how is attained through experiential procedures that are constantly nourished by precedents. The concept of precedent is used here to define not only physical references but also certain patterns of actions and values that govern those actions. Consequently, existing pre-judgments do not limit individual creativity; on the contrary, they are one of the major sources of it.

Therefore, it is crucial to acknowledge the student's past experiences both prior to his/her education as an architect and during his education. This is not only important for his/her self development, but it also contributes to the research process in the studio. This is not confined to a first meeting of the studio; it is a constant process throughout every stages of the design process. Although this acknowledgement can be carried through formal methods such as questionnaires, in order not to lose the possibility of group's benefitting from those experiences, a more participatory method such as group discussions seems to be more appropriate. In this way it is possible to share different perspectives from different backgrounds on each step and it is possible to redirect the studio process in a way to be informed by these different perspectives in the constant reframing of the design problem and its solutions. This process of sharing is utilized in the construction of new schemata that is common to the studio group.

Evidently, the role of personal background is not limited with the student's background; as another actor in the studio, the critic's background is equally effective in the design process. The critic has the role of an expert, who has acquired precedents, gambits to initiate actions resting on these precedents, and schemata to define the relationship between the precedents and gambits. The critic is assumed to avoid revealing his pre-judgments for providing freedom to student's creativity in the later interpretations of the Bauhaus pedagogy. However, this is not a valid assumption due to the nature of generation and acquisition of practical knowledge of knowing-how.

The critic's background has two main dimensions: his/her design experience and his/her teaching experience. The first is concerned with the precedents and schemata that are related with a particular design situation. It affects his/her insights for the reframing of the problem during the conversation with the students. The latter is the experience gained through previous interactions with the students. The social organization of the studio is constructed upon this teaching experience. Whether consciously or unconsciously, his/her background affects the position of the critic during the design process. When the critic consciously utilizes

his/her experience in the studio s/he becomes aware of additional factors that enrich the complexity of the design problem. Thus, awareness of this crucial aspect has the potential for more profound understanding concerning design acts.

Besides the backgrounds of the actors, there is a form of collective experience that has a role of varying degrees in educational design processes. The background of an institution is evident in all forms of curricular activities including lectures, seminars, research as well as the design studio. This is the strength of an institution. It affects not only accumulation of knowledge, but also acts as a catalyst in generation of new knowledge upon the existing. It is formed through the personal experiences of the instructors and students who have been members of that institution. It provides common schemata for meaningful communication among the members of the institution. Whether it is critical to the institutional background or not, every new idea emerges within these schemata. Eventually, every experience around these ideas contributes to the institutional background and in some instances reshapes it.

Institutional background is in effect from the moment of the critic's devising of a design exercise for achieving some – loosely or strictly – predefined educational purposes. These predefined purposes are mostly defined as "course objectives" that serve for specific "learning outcomes" in contemporary educational discourse. The educational design processes are organized in relation to these objectives and outcomes, which are defined by the communication between the instructors of the institution. This agreement is based on the common ideas that have been shaped during their collaboration in the institution. On the other side, there is the communication between the students at different levels of their education. An institution provides the environment for the interaction of more experienced and less experienced students. This results in the construction of common schemata concerning design processes in that institution.

In summary, the role of institutional and personal background is evident in design processes in the studio when analytical, generative, and evaluative actions are considered. Lawson's analysis of precedents, schemata, and gambits provide a tangible framework for assessing the role of fore-structure that is demonstrated in institutional and personal dimensions. It is important to find ways of reflection on the fore-structures of design processes in the studio in order to investigate the relation between precedents, schemata, and gambits for providing a base for knowledge generation.

As it is discussed in Chapter 5, a pertinent way for knowledge generation through actions, without ignoring the role of experience, is investigating the *correct* relationships between

desires, choices, and actions. It is argued that *phronēsis* provides the channels from which one's experience may lead him/her to reach these correct relationships. Open, truthful, and profound self-deliberation on the student's, the critic's, and the institution's background yields to a coherent understanding of the sources of desire, their effects on choices, and the actions resulting from those choices. In Lawson's terminology, such a deliberation is crucial for understanding why a particular pool of precedents exists, why certain schemata are developed for communicating through these precedents, and why certain gambits are preferred for initiating action within those particular schemata.

6.2.2 Critic as Reflective Practitioner

Schön exemplifies reflection-in-action with reference to the context of architectural design studio as "a reflective conversation with the situation." As it is discussed in Chapter 5, this process involves an actual conversation between Petra and Quist as well as it is a metaphorical explanation for continuous learning from a problem situation that is *uncertain*, *instable*, *unique*, and full of *value conflicts*. In such a process, every action changes the characteristics of the problem situation; therefore, the comprehension of the problem situation needs to be constantly altered during the process of its solution. In this sense, this process can be identified as an exchange of information, thoughts, ideas, and feelings between the designer and the design problem.

In the architectural design studio, there are two designers, the critic and the student, who are dealing with the design problem. The roles of these actors are not equivalent. Firstly, their involvements in the design problem are in different levels. The student, who is required to propose a concrete solution to the problem, is the actor, who is in an *active* engagement with the situation. The critic, on the other hand, devises the design problem for achieving some educational purposes and is in a *critical* engagement with the situation. By critical engagement, it is meant that the critic is in a position to constantly analyze and evaluate the actions of the student. By the end of his/her education, the student is expected to gain the ability of analysis and evaluation besides certain skills for action. However, during education, the critic is an agent of knowledge generation through the student's actions. Secondly, the level of expertise is remarkably different between the critic and the student. As it was clarified in the previous section, the role of experience in the design studio affects knowledge generation through the design acts of the student.

The role of the student will be discussed in the next section. This section is concerned with the role of the critic in the "reflective conversation with the situation." His/her involvement

is nourishing from the critic's background on design situations and educational processes. This background is reflected on the actions of the critic in the studio. These actions are classified as *one to one* and *group* interactions in terms of the dialogue with the students, and as *group discussions*, *desk critiques*, and *juries* in terms of established traits of conduct in the studio. These different levels of communication through different forms of behavior exist in analytical, generative, and evaluative actions in a design studio.

It was discussed in Chapter 5 that the investigation of the *correct* relationship between desires, choices, and action constitutes the basis of research by design although ways of investigation may differ in different contexts of design activity. In educational design activity, the main agent of knowledge generation through "reflective conversation" is the critic. This is the result of his/her experience. In Aristotelian framework of *phronēsis*, the reflective conversation is constructed upon the critic's "deliberative excellence" and his/her "understanding" of others' ideas. Group discussions, desk critiques, and juries are investigated in this framework.

Group discussions are common in the analytical and generative processes of an educational design problem situation. The physical and social characteristics of the given site and the interpretations of the program of the building to be designed are discussed within the presence of all students and the critics that are participating in the project. This form of communication also applies to critiques on individual student's design proposals. This form of critic is called the panel critic, which provides a ground for group interaction while reflecting on a student's proposal. The main aim of group discussions is to provide a platform for sharing different perspectives on the analytical and generative actions of the students.

The critic is a moderator during the analytical group discussions, while s/he is relating different approaches to the same problem during his/her criticism in the panel critics. In order to transform these processes into knowledge generating processes, in both cases, the critic inter-relates different approaches to the problem in order to develop a common ground on which knowledge can be generated and attained by the students. S/he attempts to provoke the student's ability to relate his/her analysis with his/her generative actions. By doing this, the critic encourages the construction of different relationships between desires and choices of different students. As the main characteristic of group discussions is sharing among the group, the critic, with his/her comments and suggestions, provides a common ground for interrelating different approaches from different students with different backgrounds. This ground is developed through the critic's judgments about the students' ideas in order to relate them with a focus on the solution of the problem. In this way, it

becomes possible to provide feedback for each student while generating knowledge concerning the analytical and generative aspects of the design problem at hand.

Desk critique is a unique form of deliberation as it is based on one to one communication between an expert designer (the critic) and a novice one (the student). It is based on the artifact. The main tools of communication are the drawings, models, or any other representative material. The critic is in a more active engagement in terms of designing when compared to group interactions, which are more focused on the relationships between desires and choices. Desk critique provides the opportunity for reflecting on the relationships between choices and actions.

To recall Lawson's terminology, deliberation in desk critiques focus on the gambits instead of the relationships between precedents and schemata. In this process, the critic should not confine him/herself to an external passive evaluation with the idea of not limiting the student's creativity. The difference between an expert and a novice designer is not based on a simple situation of authority. The critic's role is to inform the student resting on his/her background. However, this process is guided by the relationship between student's desires, choices and actions; therefore the imposing of the critic's individuality is avoided. While deliberating on the student's proposal, the critic should make proper judgments concerning the student's ideas in order to suggest further actions or reframing of the problem situation. Knowledge is not conveyed from the critic to the student; on the contrary, it is generated through the conversation between these two individuals and between them and the situation.

Fostering creativity is not achieved by leaving the student on his/her own and evaluating his/her proposal, but by providing a suitable environment for generation of new meanings through mutual deliberation on the problem situation, which is fed from the background of the student as well as the critic.

As discussed in the overview of modern architectural education, the juries are the traditional meetings for evaluating student's progress in architectural education. The main idea behind the jury system is to provide a quasi-objective framework for evaluating the student. There are guest critics (instructors and/or practicing architects) together with the critics of the studio. This provides different perspectives than the viewpoints of the students and their own critics. In this sense, it is assumed that the evaluation process is in a level of objectivity. What is evaluated during this process is the artifact that is designed by the student together with his ideas concerning that particular design situation.

With the Bauhaus system, juries became an open environment of discussion with the presence of the student, his/her work and an audience. It is generally assumed that as a result of this discussion environment, juries are not only concerned with the assessment of the student' progress, but they are integral parts of the learning process. However, this open environment does not guarantee knowledge generation through juries. Juries should be understood in terms of reflective practice for transforming them into knowledge generating constituents of the design studio.

There are some criticisms of the jury system mostly focusing on the sociological aspects of it – the asymmetrical power relationship between the student and the jury members.[404] If juries are considered in terms of deliberative excellence and understanding as it is discussed in relation to group discussions, it is possible to transform them into knowledge generating environments besides being assessment meetings that involve some sociological problems.

The critic's role is to provide a constructive environment, whose focus is on the relationship between the student's desires, choices, and actions. This is the starting point for an equitable (if not objective) evaluation of the student's progress as well as for providing opportunities of knowledge generation during the jury. First of all, the precedents – not only physical, but also conceptual – should be clearly explained. The backgrounds of the guest members of the jury shape their comprehension of the design work; therefore, their backgrounds should be explicitly introduced. Then, the critic should clarify the design process, with detailed description of the discussions that emerged during the group discussions and desk critiques. In this way, common schemata concerning the design situation are developed among the jury members and the members of the studio. Within these schemata criteria can be developed during the jury for evaluation and investigation of the *correct* relationships between the student's desires, choices, actions, and the artifact that is produced as a result. In this sense, the external critical involvement of the guest members, with their own background and their deliberation within the schemata that is developed in the studio, becomes the main knowledge generating aspect of the jury.

Within the established traits of architectural design studio, which are group discussions, desk critiques and the juries, the critic' role as a reflective practitioner is crucial. S/he is *critically* involved in the process through constant reflection-in-action in search for the *correct*

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[404] Rachel Sara and Rosie Parnell, "The Review Process," *CEBE Briefing Guide Series*, No. 3 (December 2004), [Internet: WWW], ADDRESS: http://www.cebe.heacademy.ac.uk/publications/briefguides/list.php [ACCESSED: 10 July 2008].

relationships between the student's desires, choices, and actions. In other words, *phronēsis* occurs in the studio context with the critic's actions. The student, on the other hand, is expected to produce a concrete proposal for the solution of the design situation. Therefore, s/he acquires the necessary skills for designing while s/he is generating new meanings through his/her collaborative reflection with the critic on the aspects of the design situation. The student designs for an end while s/he is expected to consider the process of making as an end in itself for knowledge generation through the process.

6.2.3 *Doing* and *Making*

In Chapter 5, in the discussion concerning the role of the artifact in research by design, it is argued that as the making professions are evolved into disciplines with a knowledge base, the relationship of *technē* and *phronēsis* became significant. This significance is based on a redefinition of the relationship between two activities, which are differentiated by Aristotle as *doing* and *making*. It is demonstrated in Chapter 2, Chapter 5, and in this Chapter that a crucial dimension of design knowledge is practical knowledge, which is a direct form of knowledge that is attained experientially, as opposed to the indirect form of theoretical knowledge.

In his pioneering article for definition of the area of research by design, Cross defines the characteristics of "designerly ways of knowing" with a focus on the artifact as:

- Design develops innate abilities in solving real-world, ill-defined problems.
- Design sustains cognitive development in the concrete/iconic modes of cognition.
- Design offers opportunities for development of a wide range of abilities in nonverbal thought and communication.[405]

His conceptualization of "designerly ways of knowing" focuses on the interaction of the designer and the artifact. The acquisition of experiential knowledge of design is mainly related with two factors of design activity: its *nonverbal language* and its *solution-oriented nature*.

In the architectural design studio, it is the student who is *actively* involved within in a nonverbal language with a solution-oriented mindset. Besides the critic's *critical* involvement in the knowledge generation through design processes, the student's *active* involvement in the

[405] Cross, 1982, 226.

design process emerges as the other significant source of knowledge generation in the studio context.

The student's actions affect his/her acquisition of knowledge in two dimensions. Firstly, s/he is the person who experiments with the graphical tools as well as spatial, technical, or material tools (which may be defined as gambits in Lawson's terminology) throughout his/her working process on the proposal. Similar to the acquisition of other skills, continuous exercising develops his/her abilities in representational techniques, his/her abilities in spatial organization, and his/her abilities in responding technical and material necessities. Secondly, and more importantly for the purposes of this study, these exercises on the artifact become tools for constructing new meanings on architectural knowledge in conversation with the critic.

As every design process, educational design processes are solution-oriented rather than being problem-oriented. Changing an existing situation in a particular site is possible through proposing a concrete solution to the problem that is defined in that situation. However, by their nature, the solution-oriented processes in architectural design education become tools for student's acquisition of knowledge.

This process is briefly explained in Schön's analysis of the conversation between Quist and Petra during the emergence of the idea of "nooks" as it is discussed in Chapter 5. New ideas are not constructed in design processes as the result of a structured investigation of a problem. As the problems are ill-defined, but the requirements of the solution are well-defined, the design processes focus on proposing a solution to the problem through a constant reframing of the problem according to the changes in the artifact. The emergence of the idea of "nooks" is a discovery for Petra, who cannot learn such possibilities of architectural spaces in any other form of education. However, Schön's analysis properly describes the structure of knowledge generation through exercises for developing technical skills. During her sketches, with the help of Quist, Petra discovers a more meaningful relationship between her initial desire of situating the building block into the slope of the site, her choice of decomposing the building block for situating it into the slope, and her actions concerning the placement of building parts in section. The search for a *correct* relationship between these processes is bound to the lines, which she drew while she was struggling to reach a solution.

In this respect, the product is a source of knowledge in design. In the context of architectural design education, as mostly the products are hypothetical projects for proposing solutions to

a problem situation, the artifact becomes a tool for knowledge generation. Student's reflection on particular aspects of the problem is carried on through a nonverbal graphic language of the artifact. However, the question of how a solution-oriented process becomes a method of research is still valid.

At this point, it is appropriate to recall Aristotle's distinction between *doing* and *making*. It was mentioned above that for Aristotle there are things made and actions done. He relates these two forms of intellectual activity with *technē* and *phronēsis* respectively. In the context of architectural design education, it is the critic's role to provide the necessary links between these two activities. Resting on his/her critical involvement in the process, the critic reflects on the actions of the student and directs the student for the construction of new meanings through his/her actions. While the student is engaged in a continuous search for proposing a solution, in other words, while s/he is *making* an artifact, the critic focuses on the student's actions as ends in themselves. Therefore, the critic is able to reflect on the knowledge generating potentials by comprehending acts of *making* as acts of *doing*.

In a sense, this process is the decomposition of Polanyi's "two kinds of awareness" among the two actors of the studio. The student is focally aware of proposing a solution while s/he is subsidiarily aware of his/her particular actions in the process. Moreover, due to his/her experience level, the student may not be able to relate these two forms of awareness. On the other hand, the critic is focally aware of the student's actions while s/he is subsidiarily aware of the product that is to be designed. The conversation between the critic and the student is the merging of these "two kinds of awareness."

The artifact provides the nonverbal language between the designers. The evaluation process is based on the artifact that is produced by the student, because it embodies the discoveries and the meanings that are constructed during the design process. The production of the artifact is the main tool for the student to generate knowledge in the studio context for these reasons.

6.2.4 Knowing through Making in the Studio Context

As discussed in Chapter 5, there are several concepts that refer to the intellectual processes for a "reflective practice," such as Polanyi's "two kinds of awareness," Lewin's "action-reflection cycle," and the "concept of play," which was investigated by Dewey and Gadamer. There is a single intellectual virtue that weaves together all these intellectual operations: Aristotle's *phronēsis*. Within this framework, research by design is based on the investigation of *correct* relationships between desires, choices, and actions.

In the studio context, research by design is defined through varying levels of interaction between the student and the critic. Certain aspects such as institutional and personal background, the critic's reflective practice, and the relationship between doing and making are the main factors of knowledge generation in the analytical, generative, and evaluative processes of the studio. These reflective processes emerge in the forms of established pedagogical tools of architectural education, which are group discussions, desk critiques, and juries.

The *correct* relationships between desires, choices, and actions by focusing on the artifact is based on excellence in deliberation on the actions while making judgments considering the others' ideas for constructing new meanings, which are equitable for all the actors that are involved in the process. In this sense, the concept of *phronēsis* becomes significant for knowledge generation through the activity of design in the studio context. This form of reflection is based on tacit dimensions of thinking as it is constantly restructuring the relationships between two kinds of awareness: of the product to be designed and of the means to reach that end product.

When the educational design processes are formulated as attempts of research by design, the studio evolves from being a learning environment for the student into a learning environment for all of the actors including the student, the critic, and the guest jury members. This learning environment eventually improves the institution.

Such a transformation in the processes of learning recalls the differentiation of "single loop" and "double loop learning" by Argyris, Putnam, and Smith as it is described in *Action Science*.[406] It was discussed in Chapter 4 that single loop learning refers to an alteration of means to solve a problem within the same governing rules in case of a failure in solution; on the other hand, double loop learning occurs when there is a constant reconsideration of the relationship between the governing rules, means, and ends. In double loop learning, if existing means fail to solve a problem, than the governing rules are questioned. This refers to a constant reframing of the problem during the problem solution process.

Single loop and double loop learning is developed by Argyris, Putnam, and Smith for explaining the dynamics of organizations. In this study, the architectural design studio is considered as an organization. Research by design in the studio context is not only related

[406] Argyris, Putnam, and Smith, 1985, 85-102.

with the architectural design processes in the studio, but also with the design of the studio as a learning environment. In this context, following models that are developed for understanding organizations are crucial for understanding design studios.

Argyris, Putnam, and Smith develop two models of theory-in-use referring to Argyris and Schön's *Theory in Practice: Increasing Professional Effectiveness*, which describes the characteristics of a theory-in-use as opposed to espoused theories. Model I theory-in-use, as a *descriptive* model, is unilateral in character and its behavioral strategy is *control*; therefore its governing rules control all of the processes of achieving a task. Its governing variables are: "(1) achieve the purpose as the actor defines it; (2) win, do not lose; (3) suppress negative feelings; and (4) emphasize rationality."[407] Model I results in "defensive interpersonal and group relationships, low freedom of choice, and reduced production of valid information." In such strategies for change it is not possible to observe double loop learning. This is because of its self defensive character, which does not permit the questioning of governing rules. If a failure in achieving a task is related with the governing rules, it is not possible to search for a change. Change is only possible within the rules. In this sense, "error escalates and effectiveness in problem solving and in execution of action tends to decrease."[408] Therefore, it is evident that in organizations that do not question its own structure, opportunities for learning are limited. Consequently, the possibilities for improving the practices of that organization through knowledge generation are narrower.

As an alternative to Model I, Argyris, Putnam, and Smith introduce the Model II theory-in-use. Model II has a *normative* perspective and its behavioral strategy is based on *sharing* with participants of an action. Its governing variables are: "(1) valid information, (2) free and informed choice, and (3) internal commitment."[409] As opposed to Model I's unilateral character, which prevents declaration of personal points of views, Model II encourages different points of views as it is based on the sharing of these views. According to Argyris, Smith, and Putnam, "in Model II the agent combines advocacy and inquiry."[410] Therefore, its consequences are "minimally defensive interpersonal and group relationships, high freedom of choice, and high risk taking." It is likely to foster double loop learning as the governing rules are open to question from different points of view. Thus, the boundaries of

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[407] Ibid, 89.

[408] Ibid.

[409] Ibid, 98.

[410] Ibid.

investigation in case of failure are widened compared to Model I. This would inevitably increase effectiveness over time. In such environments, "dysfunctional group and intergroup dynamics should decrease, and there should be less need for camouflage and games of deception."[411] As a result, it becomes possible to generate knowledge through practices of an organization while improving the effectiveness of it.

Argyris, Putnam, and Smith argue that although Model II theories are welcomed as an espoused theory because of its positive attributes, it is not so easy to "produce them in the real world." This is because of the dominance of Model I in practices. They propose action science as a framework for introducing Model II in social organizations. The above framework for research by design in the studio context, which is constructed around the concept of *phronēsis*, provides possibilities for the reformulation of studio environments from Model I organizations to Model II. In this way, it becomes possible to transform architectural design studio from being a learning environment that focuses on the education of the student into a knowledge generating environment, which constantly improves itself.

As it has been discussed in the beginning of this chapter, the later interpretations of the Bauhaus system diminish the influence of the critic during the design processes in order to leave the student a free space for improving his/her creativity. However, it is also seen that with the second half of the twentieth century, the shortcomings of this attitude began to be realized and ways of constructing systematic research within the Bauhaus pedagogy began to be investigated. As it has been described above, the improvement of creativity in the student is not related with the presence or absence of a system of reflection, but it is related with the nature of that system. Lewin, Lippitt, and White's conceptualization of "space of free movement" reveals the significance of the nature of the system of organization. After their investigations of three groups of children – classified in terms of leadership styles of authoritarian, democratic, and laissez-faire (group with no leader) – to search for patterns of aggressive behavior, they have found out that the largest space of free movement emerges surprisingly in the democratic group not in the laissez-faire group.[412] Therefore, it is evident that an educational environment which is guided by a participatory framework for reflection is closer to a Model II organization, which is likely to foster creativity, innovation, and improvement instead of limiting them.

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[411] Ibid, 102.

[412] Lewin, Lippitt, and White, 1939, 293.

In this sense, the acquisition of knowledge by the student can be transformed into a process of generation of knowledge. Through the desk or panel critiques, the student is able to construct new meanings from reflection on his actions. As it has been discussed in the section on the relationship between *doing* and *making*, the student's knowledge generation in the studio is in the form of reflection in actions of technical skill and concept formation from this reflection. Creativity is developed during this process.

Knowledge generated by the critic in the studio context is mainly concerned with his/her reflection on the student's actions in designing an artifact. This reflection occurs during the critic's interaction with the student in group discussions, desk critiques, and juries. Schön's definition of the "reflective practitioner" applies to the critic in the studio as it is a function of experience. The critic's generation of knowledge is crucial for reconsidering the particular educational environment. If appropriate transcontextual investigation is provided, the improvement of a particular educational environment may contribute to knowledge on architectural education in general.

The most significant form of knowledge that is generated through design processes in the studio is knowledge generation by the collaboration of the student and the critic. Through the critic's and the student's collaborative reflection in action, it becomes possible to improve many aspects related to architectural design. In relation to institutional and personal backgrounds, usage of representational techniques, technical systems, materials, space organization, etc. may be altered and improved within the framework that is provided by *phronēsis*. This is the result of a constant reconsideration of the relationships between precedents, schemata, and gambits. The collaborative research by design in the studio context yields to alternative approaches to problem definition and problem solving processes in architectural design.

Knowledge generated in research by design in the studio context gains its validity and credibility through the aspects that have been discussed in Chapter 5: workability, making sense, and transcontextual credibility. Firstly, it should provide a working solution to the design problem. Secondly, it should make sense within the schemata that is utilized in the studio as well as the literature concerning that particular aspect. Finally, other contexts should be investigated in similar terms in order to search for the applicability of the knowledge generated in different contexts.

It is possible to document research in the studio in a narrative form. However, what is crucial in this narrative is that it should reflect the nature of actions and the artifacts that are the

sources of knowledge. Therefore, it is not so appropriate to utilize a linear form of writing, which is composed of a sequence of research questions, investigation, and conclusions. The text should reflect the solution-oriented nature of research by design in the studio with a focus on the artifact. It should reflect the cyclical nature of actions and reflections through the interaction of the student and the critic. The verbal narrative may be supported with nonverbal material, even with video clips that are illustrating the student's modification of the artifact and the critic's instantaneous reflections on it. Only through such methods that are appropriate for the cyclical nature of research by design, it is possible to document knowledge generation in the studio context.

Thus is research by design can be introduced to the studio context. The initial motives of the Bauhaus, which focus on research as the main activity of architectural education, can be realized within the paradigm of action research. Research by design in the studio context contributes to architectural knowledge while improving pedagogical approaches in a particular institution.

CHAPTER 7

CONCLUSION

This study contributes to the definition of research by design by reconceptualizing it as a form of action research. This definition is then contextualized in the specific conditions of architectural design education. Hence, the discussion is formulated in two dimensions: general and specific, and the conclusions of this study are elaborated through its contributions to the definition of research by design in general as well as research by design in the context of architectural design education.

The main conjecture from which the study starts is the transformation in the apprehension of the activity of design in research processes. When research by design is considered to have evolved from design research, the act of design is transformed from being the object of inquiry to being a research approach. Throughout the study, the methodological and epistemological transformation that started as the result of this transition has been investigated. It is assumed that the primary epistemological question shifts from *knowing what design is* and *knowing how to design* to *knowing what through the act of design*. This shift requires an alternative epistemological framework for situating knowledge generation through the act of design. Such a framework should suggest appropriate methodological tools and validation criteria.

Thus, a conceptual framework for defining research by design as a form of action research in architecture has been developed through the investigation of the methodological and epistemological transformation that accompanies the change in apprehension of design within the context of design research. This investigation begins with a discussion of different forms of knowing with the introduction of practical philosophy against the conventional understanding of scientific research. This is followed by an investigation of the design research tradition in architecture in order to situate research by design within this tradition.

Starting from the main references of the discussion concerning research by design, Schön's formulation of "reflective practice" is investigated by relating it to its precedents in theories concerning "tacit knowing" and "action research." The discussion of knowing processes, design research, and action research provides the basis for the construction of a conceptual framework that explains the methodological and epistemological transformation that emerges with research by design. This framework is then discussed within the specific conditions of architectural design processes in education.

Research by design in architectural design education has been discussed through the behavioral patterns in the architectural design studio. Therefore, prior to an elaboration of the ways of knowledge generation in the studio context, these traits have been analyzed through an examination of the evolution of modern architectural education. A framework for knowledge generation in the studio context has been developed through an investigation of educational tools of modern architectural education within the general framework of research by design.

Firstly, general conclusions concerning the general framework for research by design are examined. This is followed by the elaboration of the study's contributions in term of architectural education. Finally, future implications of these general and specific frameworks are discussed in terms of research by design in architecture and architectural design education.

7.1 General Conclusions

The aim of this study is to provide a conceptual framework for research by design in architecture in order to contribute to the definition of its possibilities, its boundaries, and its methods. This is carried on through an investigation of Schön's influence on research by design by relating it to its precedents. The discussion is based on the denotations and connotations of the terms "design," "research," and "knowledge." Through this analysis, different ways of understanding these terms are explored. Firstly, in Chapter 2, different forms of knowing processes are discussed and then, in Chapter 3, established paradigms of design research are overviewed in relation to the literature on research by design. These two chapters constitute the context in which a conceptual framework can be developed.

Chapter 2 begins by differentiating two forms of knowing: knowing-that and knowing-how. Knowing-that is defined as an indirect form of propositional knowledge whereas knowing-how is defined as a direct form of experiential knowledge. Knowing-that depends on true propositions about the world, on the other hand, knowing-how is practical, it is gained

through acquaintance with the reality that is known. In other words, while knowing-that is concerned with knowledge *about* things, knowing-how is knowledge *of* how to make things and knowledge *of* how to act. It is discussed that the epistemological foundation of academic research is based on the propositional knowledge of knowing-that, which is defined as justified true belief. Within this framework, it is not possible to address particular knowing processes in disciplines that are based on practices. Therefore, there is a need for an alternative epistemological framework in design research, which embraces the experiential character of knowing-how.

This alternative is found in the tradition of practical philosophy. It is discussed through Gadamer's hermeneutics, and as he refers to Aristotle in his theoretical elaboration, Aristotle's discussion of intellectual virtues in the sixth book of *Nicomachean Ethics*. In both formulations, the emphasis is on the virtue of *phronēsis* (prudence, moral practical knowledge, or practical wisdom). *Phronēsis* is concerned with moral actions. In this sense, it is differentiated from *technē* (technical skill). While *technē* is knowledge of *making* something for an end, *phronēsis* deals with *doing*, where the aim is doing well. Doing well is concerned with the assessment of *choices* that are made during an action. With its focus on experiential aspects of knowing-how, practical philosophy provides an alternative to the framework of theoretical science that is based on knowing-that.

For illustrating this specific form of knowledge generation, Le Corbusier's *Towards a New Architecture* and Koolhaas' *S, M, L, XL* are investigated. Although they were not written in academic frameworks, they provide valuable contributions to architectural knowledge. The contributions of these works are based on their authors' specific form of thinking that is based on their personal knowledge of designing. This is defined as architectural thinking in this study. Definition of research by design as an academic research paradigm is crucial for integrating architectural thinking, which is exemplified through these two influential texts, into architectural research.

To conclude Chapter 2, established strategies in architectural research are overviewed. Knowledge generated through these strategies is mostly theoretical knowledge. In order to discuss the generation of practical knowledge through design research, it is crucial to understand these strategies that shape academic research on design.

The investigation in Chapter 2 clarifies the distinction between two forms of knowing: knowing-that and knowing-how. Knowing-that is elaborated to explain theoretical knowledge that is generated through architectural research while it is also demonstrated that knowing-

how is an essential constituent of architectural knowledge. This differentiation is the basis for further discussion throughout the study as well as it is a starting point for the discussion on design research in architecture and the evolution of research by design from design research.

In Chapter 3, architectural design research is considered in terms of the approaches that are influenced by the methods of sciences and humanities. Design methods research is considered as the dominant approach based on a scientific point of view whereas history, theory and criticism provide an alternative approach based on a scholarly point of view to investigating design. The characteristics of these two approaches are discussed through examination of two early PhD dissertations in architectural design research. While Alexander's *Notes on the Synthesis of Form* exemplifies the approach of design methods research that is based on the methods of sciences, Eisenman's *The Formal Basis of Modern Architecture* exemplifies the approach of history, theory and criticism that is based on humanities.

The literature on research by design is initiated by a search for a third way besides this duality between the approaches that are based on sciences and humanities for investigating design. In this respect, literature on research by design is reviewed from early 1980s until today in relation to the authors' positions with respect to the existing design research tradition. This literature review, which is not limited to publications but includes investigation of institutional initiatives, is chronological as well as it is thematic. Some of the themes that are discussed extensively are heuristics, creativity, expertise, and the definition of research by design as a research paradigm.

In Chapter 3, literature review on and a survey of the institutions associated with this approach reveal that research by design is a research area that is emerging from within design research tradition. Firstly, it proposes an alternative to the duality that is inherent in design research. Moreover, the researchers who promote this alternative have a design research background. Finally, research by design addresses similar topics with design research, but it utilizes these aspects of design as knowledge generating tools instead of objects of inquiry. The literature review illustrates Schön's influence on this transformation in design research. It also reveals that the notion of "reflective practice" is not sufficient for developing a coherent framework for research by design. The primary epistemological and methodological questions that emerge with research by design remain relatively uninvestigated as "reflective practice" is assumed to provide a sufficient framework for these concerns. The literature on research by design revolves around secondary aspects by focusing on particular attempts to formulate research by design in a particular context, or particular themes such as heuristics, creativity, and expertise. This results in a relativistic medium, where it becomes difficult to define the

possibilities and boundaries of research by design. Therefore, it becomes necessary to reflect on Schön's formulation by relating it to his conceptual and methodological precedents.

Schön's *Reflective Practitioner* and its background is the focus of Chapter 4. It begins with an investigation of his ideas with a focus on the nature of "reflection-in-action," which is the primary component of reflective practice. This investigation is carried on through his comparison between the dominant positivist epistemology of practices, which he associates with Technical Rationality, and the characteristics of reflective practice. As opposed to Technical Rationality that has a *specialized*, *firmly bounded*, *scientific*, and *standardized* knowledge base, reflective practice is devised for dealing with real life situations of *uncertainty*, *instability*, *uniqueness*, and *value conflict*. His argument is then discussed in relation to architectural design through his exemplary situation in an architectural deign studio.

As Schön refers to tacit operations that guide reflection-in-action, the investigation of reflective practice is followed by a discussion on tacit knowledge. Polanyi's formulation of tacit knowing is discussed through his elaboration of the concepts related to the nature of achieving a task and tacit components of learning. "Two kinds of awareness," "problem solving," and "intellectual passion" constitute significant characteristics of tacit operations that are inherent in accomplishment of tasks. "Irreversibility" of a discovery and "subception" as learning without awareness are discussed in terms of their significance in explaining tacit components of learning.

As Schön explicitly refers to action science for generalization of reflective practice, general characteristics of action research are discussed for understanding the background of Schön's ideas. In this discussion focus is on the particular approach of action science and its predecessors who are the originators of action research: Dewey and Lewin.

When Schön's ideas are investigated within a larger context, it becomes possible to construct a framework for knowledge generation through practices such as architectural design. Otherwise, depending only on reflective practice results in limitations rather than possibilities as it is indicated in the literature review in Chapter 3.

In Chapter 5, a conceptual framework is constructed for explaining the methodological and epistemological transformation that has started with research by design. Starting from the clues that are provided by Schön's reflective practice, the new epistemological question of *knowing what through the act of design* is discussed. This discussion is concerned with two

dimensions of design that are significant in the literature on research by design: the activity of design and the role of the artifact.

It can be seen from the investigation of literature on research by design and the review of action research that these have not yet benefitted from the epistemological framework of practical philosophy. This results in the elaborations of experiential knowing processes with the terminology of theoretical knowledge. In this study, it is argued that there are two different forms of knowing and although they may feed each other, it is not possible to consider one form under the framework of the other. Therefore, practical philosophy as it is elaborated in the works of Gadamer and Aristotle is considered as crucial to improve the definition of research by design.

Moreover, practical philosophy is related with processes of change. A change is constantly defined through decisions. For any attempt of knowledge generation through change, it is necessary to discover ways of reflecting on these decisions. In the context of design, decisions are mostly *choices* among alternatives, and since these choices lead to a change in the physical environment and thus have consequences for human beings, such choices are conditions of morality. It is argued that choices in the context of design are essentially moral decisions. Therefore, *phronēsis*, which is a key concept in practical philosophy, becomes crucial in the construction of a framework for knowledge generation through design processes that are based on moral decisions.

In this framework, following Aristotle's formulation on practical thinking, it is assumed that the cause of action is choice, and the cause of choice is desire.[413] *Phronēsis* is based on the investigation of *goodness* and *correctness* in the relationships between desires, choices, and actions.[414] The two dimensions of design, which are the activity of design and the artifact, become sources of knowledge generation when they are considered within the framework that is constructed around *phronēsis*.

As the activity of design is composed of decision making processes, it bears similarities to the investigation of processes of change in action research in social sciences. Both of them are considered as problem defining and problem solving processes. The moral dimension of

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[413] For the relationship between desires, choices, and actions, see Aristotle, 1994, 329.

[414] For Aristotle's elaboration of *goodness* as the criterion for the relationship between desires, choices, and actions, see Aristotle, 1994, 329, 339; for *correctness* of deliberation on this relationship, see Aristotle, 1994, 357.

problem situations is investigated through its main components of problem definition, conversation, and experience. These moral components of problem definition and problem solving are investigated through the varieties of *phronēsis*, which are deliberative excellence, understanding, and consideration, by relating them to concepts that were developed by Schön, Polanyi, Gadamer, Dewey, and Lewin where they are applicable.

The role of the artifact is evident in design processes as it is discussed in Chapter 5. This does not refer merely to the finished product of the design process. The thinking process of designers is bound to the concrete objects that they generate during their problem solving processes. They can also think in nonverbal graphic languages. This requires a reconsideration of the relationship that is proposed by Aristotle between *doing* and *making*. He proposes a distinction between these two activities by relating them with *phronēsis* and *technē* respectively. However, through concepts of "two kinds of awareness," "playfulness," and "reflective conversation with the situation," it becomes possible to reflect in the framework of *phronēsis* on the activities that are in the sphere of *technē*.

Phronēsis is also relevant in defining credibility and validation criteria for research by design. The third variety of *phronēsis*, consideration, is concerned with the equitability of judgments concerning actions. As it is unlikely to achieve objectivity – as in positivist epistemology – in reflection on moral choices, knowledge generation in processes of change is based on the criteria of equitability. The criteria that are defined in action research in social sciences, which are workability, making sense, and transcontextual credibility, also apply to the moral dimensions of design acts. *Phronēsis*, with its focus on equitability of judgments on actions, provides tools for meeting those criteria.

Several concepts that are referred in the literature on research by design serve to elaborate particular aspects of knowledge generation through design processes. However, there is a need for an embracing framework that relates these particular clarifications. *Phronēsis* is a unifying concept for constructing a coherent framework for research by design by weaving together the seemingly diverse discussions on the issue.

The discussions appear diverse because there is a lack of common epistemological ground. Within a framework that privileges theoretical knowledge it is not possible to relate the discussions on generating practical knowledge in different contexts. The unifying role of *phronēsis* lies in its significance in the development of an epistemological framework for direct experiential processes of knowing-how.

It is not possible to define the boundaries and possibilities of research by design as a form of design research through focusing only on a particular aspect of it. Although these particular explanations provide valuable knowledge concerning its specific aspects, they do not bear the possibility of dealing with the main problem that characterize the discussion concerning research by design. The main epistemological question of *knowing what through the act of design* can only be addressed from a larger framework that makes it possible to reflect on knowing-how. Practical philosophy and the concept of *phronēsis* provide an epistemological framework that is based on knowing-how. This framework provides a common ground for relating the seemingly diverse arguments of design researchers for establishing research by design as an academic research paradigm. It becomes possible to further clarify particular aspects of knowledge generation within a framework that is appropriate for the form of knowing processes that are under investigation.

This conceptual framework based on practical philosophy is not only appropriate for research by design. As its one dimension is based on the investigation of moral decisions concerning the relationship between desires, choices, and actions, it is applicable to similar processes of social change. As it can be seen that practical philosophy is not one of the main references in action research, the conceptual framework that is developed in this study may contribute to action research in general.

7.2 Architectural Education and the University

The general framework that is developed in Chapter 5 is further discussed within the context of architectural design education in Chapter 6. It begins with an exploration of the evolution of modern architectural education. This overview aims at clarifying the educational tools that are still in use in architectural design studios today. Through an investigation of the two main pedagogical systems of architectural education, which are the Beaux-Arts system and the Bauhaus system, the main traits of the studio context are defined. These traits are *the group discussions*, *the desk critiques*, and *the juries*. The behavioral patterns related with these provide different levels of interaction between the actors of the studio: *the student* and *the critic*. Knowledge generation through design processes in the studio context is explained through the role of the actors. Knowledge may be generated by the student, by the critic, or through the collaboration between the two. The nature of knowledge that is generated differs in each case. For the critic it is also possible to learn from his/her own teaching experience, hence to generate knowledge of a different kind.

Research by design in the studio context is discussed through three aspects of the studio that bear the possibility of knowledge generation: the institutional and personal background, the critic's approach in terms of reflective practice, and the relationship between *doing* and *making*. These three aspects are investigated in relation to the *analytical*, *generative*, and *evaluative* actions in the studio.

Research by design in the studio context is explained within the framework that is based on practical philosophy. Specifically, in this context, *phronēsis* emerges through a conversation between an expert designer (the critic) and a novice one (the student). Reflection on the correctness of desires, choices, and actions occurs during this conversation. The role of the artifact is much more significant in this context when compared to design processes in professional contexts. The proposals that are generated by the students in architectural education do not primarily aim at the production of an artifact, but they aim at the students' acquisition of knowledge.

Knowledge generated by the student is based on the reconsideration of the relationship between *doing* and *making*. The student is able to construct new meanings through his/her reflective conversation with the critic. The critic's reflective practice is based on his/her understanding of the students' desires, their choices as the result of their desires, their actions as the result of their choices, and their proposals as the result of their actions. The critic reflects on his/her own actions as s/he tries to understand the students' desires, choices, and actions. The critic inter-relates different students' approaches in order to construct a shared schemata concerning the generation of new meanings in the studio. The most important form of knowledge generation in the studio context is collaborative research conducted through the interaction of the critic and the student. In the architectural design studio, the roles for generating knowledge are distributed among the actors participating in the situation. While the critic's reflection is primarily on moral dimensions of design acts as s/he is in a *critical* engagement with the situation, the student's reflection is primarily on the role of the artifact as s/he is in an *active* engagement with the situation.

Phronēsis is a concept that regulates the conversation between the critic and the student to transform this conversation into a knowledge generation process for the improvement of the educational context. The improvement of a particular educational environment would contribute to the improvement of architectural education in general. This improvement also contributes to architectural knowledge concerning the aspects that are discussed in that particular studio context.

The framework for research by design in general and research by architectural design education in particular provides a different perspective on the relationship between architectural education and the university as an environment of research. As it is discussed in Chapter 2, the dominant epistemology of academic research is based on theoretical knowledge that is concerned with the indirect propositional form of knowing-that. When design disciplines, particularly architectural design that is the focus of this study, are considered, the knowing processes inherent in the activity of design are not in congruity with the methods of investigating them. This creates a problematic situation in the relationship of design disciplines and the established research paradigms. By introducing practical philosophy as an epistemological framework that accounts for knowledge generation through knowing-how, it becomes possible to reconsider the situation of design disciplines within the research environment of the university. This reconsideration of the situation of design disciplines is crucial now than ever with the initiation of a process of reformulating the higher education and research in Europe and in the other parts of the world.

The Bologna Process initiated by some European countries aims at establishing a European Higher Education Area. Within this process, "comparable and compatible" frameworks for describing "workload, level, learning outcomes, competences and profile" in the higher education system of every European country are expected to be developed as well as the construction of "an overarching framework for qualifications."[415]

Through biannual communiqués and related documents such as Dublin descriptors and the criteria of Dutch universities, "knowledge," "competences" and "skills" are redefined within a new understanding of "research."[416] In this context, research is considered in its broadest sense:

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[415] Bologna Process Ministerial Communiqués, "Realizing the European Higher Education Area," *Communique of the Conference of Ministers Responsible for Higher Education*, Berlin, 19 September 2003, [Internet: WWW], ADDRESS: http://www.ond.vlaanderen.be/hogeronderwijs/bologna/documents/MDC/Berlin_Communique1.pdf [ACCESSED: 5 October, 2004].

[416] Bologna Process Documents, [Internet: WWW], ADDRESS: http://www.ond.vlaanderen.be/hogeronderwijs/bologna/documents [ACCESSED: 5 October, 2004]; "Shared 'Dublin' Descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards," *The Joint Quality Initiative Informal Group*, Dublin, 18 October 2004, [Internet: WWW], ADDRESS: http://www.eua.be/fileadmin/user_upload/files/EUA1_documents/dublin_descriptors.pdf [ACCESSED: 10 July 2008]; and A.W.M. Meijers, C.W.A.M. van Overveld, J.C. Perrenet with the co-operation of V.A.J. Borghuis and E.J.P.J. Mutsaers, "Criteria for Academic Bachelor's and Master's Curricula," trans. D. Ogretir (Eindhoven University of Technology, 2005).

> The word '**research**' is used to cover a wide variety of activities, with the context often related to a field of study; the term is used here to represent a careful study or investigation based on a systematic understanding and critical awareness of knowledge. The word is used in an inclusive way to accommodate the range of activities that support original and innovative work in the whole range of academic, professional and technological fields, including the humanities, and traditional, performing, and other creative arts. *It is not used in any limited or restricted sense, or relating solely to a traditional 'scientific method'*.[417]

During this period of transformation in higher education, it is important to reconsider the situation of the discipline of architecture in the university. As "academic research" is redefined to include all forms of knowledge generation, developing a framework for knowledge generation through architectural design activity becomes a significant contribution.

The discussion in Chapter 5 and 6 provides such a framework for situating the discipline of architectural design in the universities. A reflection on desires, choices, actions, and artifacts becomes possible in a framework that is constructed through practical philosophy and *phronēsis* in particular. With the establishment of the European Higher Education Area, the European universities are in a transformation to promote every form of knowledge generation. Dublin descriptors and the criteria of Dutch universities are more specific documents for providing operational tools for this transformation. An examination of these documents reveals that design is becoming one of the key competences in higher education in Europe. There is a need for defining the nature of *knowledge*, *skills*, and *attitudes* that are gained through design education. Research by design in the studio context is explained in a framework of practical philosophy in Chapter 6 in order to transform architectural design education so that it is possible to reformulate architectural education as a process of research. Knowledge generated through activity of design in the studio not only contributes to architectural knowledge, but it also improves architectural education. Therefore, learning can be formulated as research by design. When the educational framework is considered within the general framework of research by design, which is developed in Chapter 5, the practice of design becomes a process of knowledge generation. This transformation contributes to the status of design in education and research in the university.

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[417] "Shared 'Dublin' Descriptors for Short Cycle, First Cycle, Second Cycle and Third Cycle Awards," *The Joint Quality Initiative Informal Group*, Dublin, 18 October 2004, [Internet: WWW], ADDRESS: http://www.eua.be/fileadmin/user_upload/files/EUA1_documents/dublin_descriptors.pdf [ACCESSED: 10 July 2008], 3, emphasis added.

7.3 Implications for Future Research

In this study, a framework for research by design in general and research by design in the specific context of architectural design education is developed. In this sense, the frameworks that are constructed in this study provide clues and possibilities for future research in research by design in architecture and architectural design education. In this section, these clues and possibilities are discussed in a hierarchy from general to specific. The implications of this study are mainly twofold. Firstly, resting on the general framework that explains the epistemological and methodological transformation that has started with research by design, it is possible to construct different frameworks for conducting research by design. Secondly, through the general and specific frameworks, which are constructed on the basis of practical philosophy, further research by design can be formulated that focus on the particulars of design process.

This study firstly elaborates the differences between knowing-that and knowing-how. Upon the definition of characteristics of knowing-how, a framework for research by design is developed starting from Schön's conceptualization and relating the ideas of Polanyi, Gadamer, Dewey and Lewin under Aristotle's embracing concept of *phronēsis*. In this sense, the framework is based on a reconsideration of action research in terms of practical philosophy. It is discussed in the beginning of Chapter 5 that pragmatic philosophy and general systems theory are two traditions of thought that influenced action research. Within the epistemological definition of knowing-how that is provided in this study, investigating these two traditions as well as other approaches would result in new frameworks for addressing different dimensions of research by design. In this study, practical philosophy is investigated in order to discover its potentials to offer a conceptual basis for research by design and action research. As practical philosophy has remained relatively untouched in this context, the framework that is developed in this study highlights its significance. However, as it can be seen through an overview of action research in Chapter 4, it is not the only way of conceptualizing knowledge generation through actions.

The framework of practical philosophy that is introduced in Chapter 5 is applied to architectural design education. Within the same general framework different contexts should be investigated for providing a more comprehensive understanding of research by design in architecture. This is based on the basic premise of action research: each situation is unique. Therefore, only through constant investigation on different situations in different contexts, the area of research by design can be properly defined. Different varieties of professional contexts in relation to different actors that are participating in the design processes would be

one expansion. Another expansion would be provided through the investigation of different design and construction technologies. All of these investigations would provide different contributions through different processes of problem definition, problem solving, and different production techniques of the artifacts.

When architectural education is concerned, it is important to focus on different aspects of the studio context. Firstly, investigations should focus on learning environments in particular institutions. Focusing on one institution, or comparative studies on several institutions are crucial for understanding different pedagogical approaches. Secondly, within the framework that is constructed in this study, it is possible to focus on particular educational tools. This particular form of research would result in the discovery of new ways of utilizing desk critiques, group discussions, and juries in order to transform each educational tool into a knowledge generating agent. Finally, the artifacts that are generated during the design processes in the studio can be the focus of a study to further elaborate the relationship between *doing* and *making*. These further studies would contribute to the improvement of the particular contexts that they address as well as knowledge on architectural education in general.

The main contribution of this study is the construction of a general framework for research by design and the application of this framework to architectural design education. It is not only possible but also crucial to formulate further research starting from this study. These would be either in the form of new frameworks benefitting from the epistemological definition of knowing-how as it is elaborated in this study or concentrating on particular subjects that constitute the elements of the framework that is developed in this study. As in any form of action research, research by design is defined through the specific characteristics of unique situations. This study contributes to the definition of this research area by providing an epistemological and methodological framework for considering research by design as a form of action research in architecture.

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CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Yüncü, Onur
Nationality: Turkish (TC)
Date and Place of Birth: 13 November 1979, Ankara
Sex: Male
email: oyuncu@metu.edu.tr

EDUCATION

Degree	Institution	Year of Graduation
Ph.D.	METU Department of Architecture	2008
M.Arch	METU Department of Architecture	2002
B.Arch	METU Department of Architecture	2000
High School	TED Ankara College, Ankara	1996

PROFESSIONAL EXPERIENCE

Year	Place	Enrollment
2007 - Present	ERKA-AS Design & Research Co., Ankara	Project Architect
2007 - Present	METU Department of Architecture	Part-time Instructor
2007	SFMM Architects, Ankara	Architect
2001 - 2007	METU Department of Architecture	Research Assistant
2000 - 2001	PENTA Architecture, Ankara	Architect
1999 Summer	MESA Housing Industries Corp., Ankara	Intern Architect
1998 Summer	ORTEK Construction Co., Ankara	Intern Architect

ACADEMIC EXPERIENCE

Year	Course
2003 - Present	Studio critic and jury member in "Arch 201 Architectural Design I" and "Arch 202 Architectural Design II"
2002 - Present	Jury member in "Arch 101 Basic Design", "Arch 102 Introduction to Architectural Design", "Arch 301 Architectural Design III", "Arch 302 Architectural Design IV", and "Arch 401 Architectural Design IV"
2006	Member of the organization committee and studio critic in "Brancabika Erasmus IP Workshop, Ankara"
2003 - 2006	Studio critic and jury member in "Arch 470 Digital Design Studio" and "Arch 475 Advanced Digital Design Studio"
2002 - 2003	Studio critic and jury member in "Arch 101 Basic Design" and "Arch 102 Introduction to Architectural Design"

PUBLICATIONS

Year	Publication
2004	Gür, Berin F. and Onur Yüncü eds. *1/1 Yaz Uygulaması (1/1 Summer Practice)* (İstanbul: 124/3 Publications, 2004)

AWARDS

Year	Award
2004	Award Nominee in the Category of Living Environment – "Arılı Primary School Computer Workshop, Fındıklı, Rize" in the 9th National Awards for Architecture (with Berin F. Gür)
2000	Purchase Award in TESKOMB Building Architectural Project Competition (with Ali Kural and Deniz Çalış)
1999	Special Jury Award in Student Category – "UMAG (Uğur Mumcu Center for Journalism) Building (3rd year project)" in TSMD (Turkish Association of Practicing Architects) Awards

PROJECTS

Year	Project
2007	Bozbük Project, Didim, Aydın (as an architect in SFMM Architects, in collaboration with Steven Holl Architects)
2007	As a part of "Arch 190 Construction Summer Practice" course, the organization of the summer practice and the design of monorail station in METU Campus, Ankara (Const.: July– Aug. 2007) (with Berin F. Gür and Gökhan Kınayoğlu)
2006	Competition entry for the Library, Archive and Offices building Complex for the Turkish Grand National Assembly, Ankara (with Berin F. Gür, Özay Özkan, M. Alper Kiremitçi, Esatcan Coşkun)
2005	Design of Çolakoğlu Foreign Trade Co. Headquarters, Kavacık, İstanbul (within METU FARDEP, with Prof. Dr. Haluk Pamir and Onat Öktem)
2004	As a part of "Arch 190 Construction Summer Practice" course, the organization of the summer practice and the design of landscape and restoration of the library building that is built during the summer practice of 1963 in Yassıhöyük Village, Ankara (Const.: July– Aug. 2004) (with Haluk Zelef and Cengiz Özmen)
2003	As a part of "Arch 190 Construction Summer Practice" course, the organization of the summer practice and the design of Arılı Primary School Computer Workshop in Arılı Village, Rize (Const.: July – Aug. 2003) (with Berin F. Gür)
2002	Competition entry for the Ankara Metropolitan Municipality, 50. Yıl Park and War Memorial, Ankara (with Burak Turgutoğlu, Mert Kayasü, Yıldıray Yıldızhan)
2002	As a part of "Arch 190 Construction Summer Practice" course, the organization of the summer practice and the design of ORDOS Mountain Rescue Station in Demirkazık Village, Niğde (Const.: July– Aug. 2002) (with Ahmet Uğursal)
2001	International Competition entry for the Urban Design of İzmir Port Area, İzmir (with Cana Bilsel, Ayça Bilsel, Güven Bilsel, Betül Gül Özyol, Rojda Ekim Tan, Burak Turgutoğlu)
2001	Competition entry for İstanbul Metropolitan Municipality Building, İstanbul (with Ali Kural, Burak Turgutoğlu, Veli Kural)
2001	Competition entry for the Ministry of Environment Building, Ankara (with Veli Kural and Burak Turgutoğlu)
2000 - 2001	Building Survey and Restoration Project of Museum of Painting and Sculpture, Ankara (as an architect in PENTA Architecture)
2000	Competition entry for Ankara Metropolitan Municipality Building, Ankara (as an architect in PENTA Architecture)

2000	Construction Drawings and 3D Visualization for the Department of Defense Industries Building, Ankara (as an architect in PENTA Architecture)
2000	Competition entry for TESKOMB Building, Ankara - Purchase Award (with Ali Kural and Deniz Çalış)

LANGUAGES

Turkish (mother tongue), English (fluent), German (beginner)

INTERESTS

Year	**Interest**
1988 - Present	Ice Hockey (licensed player)
1993 - Present	Guitar (education on classical guitar for one year)