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Title: The Non-propositional Knowledge in the Design of Environmental Artifacts

Dissertation Abstract

1. Introduction:

Design is by its very nature a problem-solving activity. How is it, then, that a designer can arrive at a solution to the problem at hand? And what distinguishes a good designer from a bad one? A widespread view is that “good designers simply have a knack for coming up with something that ‘does the trick,’ just as good artists have a knack for creating beautiful or intriguing artworks.” (Parsons, 33) Good designers, in other words, simply rely on intuition to find good solutions.

This widespread view—that traditional designers rely on their intuition—worried many design theorists. The concern is that intuition is regarded as inaccessible (even for designers themselves) and, therefore, unteachable and unreliable when addressing complex problems in modern society, such as urban planning and mass-production design (Parsons 33; Jay 14; Jones 1992, 45; Simon 112). Due to this worry, a group of designers and design theorists—whose leading figures include Bruce Archer, John Chris Jones, Christopher Alexander, and Horst Rittel—launched the “Design Methods” movement in 1962, seeking to introduce systematic methods from other fields (especially science) into design. A series of conferences on design methods were held in the 1960s and 70s and many design methodology books were also published in this period (Langrish, 3-4).

The end of Movement, however, is disappointing. Christopher Alexander, one of the leading figures of the movement, in the new preface to his book *Notes on the Synthesis of Form*

completely denied the idea that design methods can be a subject of study separate from design practice:

Indeed, since the book was published, a whole academic field has grown up around the idea of “design methods” and I have been hailed as one of the leading exponents of these so-called design methods. I am very sorry that this has happened, and want to state, publicly, that I reject the whole idea of design methods as a subject of study, since I think it is absurd to separate the study of designing from the practice of design. (Alexander, Preface)

Another leading figure, John Chris Jones, experienced the most drastic change. Jones published *Design Methods* in 1970, which is the most comprehensive review of different new design methods proposed in 1960s, and from 1971-73 he served as the Chair of the Design Research Society, the organization committed to design method research. However, in a poetry collection first published in 1984, he articulated his opposition to the Design Methods movement: “In the seventies I reacted against design methods. I dislike the machine language the behaviourism, the continual attempt to fix the whole of life into a logical framework.” (Jones 1991, 22) Jones resigned from his university position in 1974 and started doing poems and experimental forms of writing.

The movement ended in the 1980s, and to this day, no systematic approach to design has been universally accepted by the design community. Judged by its outcomes, the movement can be considered a total failure. However, the concern that sparked it has not disappeared: How can designers rely on inaccessible intuitions to tackle complex design problems, and how can the intuitions be taught? Although this concern is rarely mentioned by contemporary design

theorists, it continues to subtly trouble the design community, which is reflected in the fact that most design schools still teach flexible problem-solving frameworks—such as the analysis-synthesis model—in introductory design classes.

My dissertation attempts to address the problem mentioned above. I think that designers and design theorists who are troubled by the intuitive approach in design are in the same situation as sailors in 12th-century Europe who rejected the use of the compass and considered it demonic because they did not understand magnetism. Their distrust of the intuitive approach and their doubts about its teachability did not stem from the failure of the approach or its education, but from ignorance of its underlying mechanism. Hence, rather than proposing another systematic design method, I argue that the design community does not need one. The so-called “intuition” is not an inaccessible black box; it can be explained in terms of non-propositional knowledge, and it can be shown to be acquirable via correct pedagogical strategies.

I will argue that designers’ non-propositional knowledge involves two kinds. The first is designers’ know-how—the same kind as knowing how to swim. This know-how is inexpressible but can be acquired through practice. For example, designers know how to transform inspiration into geometrical structures (a process similar to how artists transform what they see into lines and shades), and they acquire this ability through repeated practice guided by propositional instruction.

The second kind is non-propositional yet expressible knowledge, an idea drawn from Susanne Langer’s *Philosophy in a New Key*. In that book, Langer points out that some things in the world—such as intuitive knowledge and emotion—are not expressive using a discursive form of language. (88) By “discursive,” Langer means the linear structure of language, which always requires us to “string out our ideas” to express them (81). However, she argues that there are

non-discursive symbolic schemas (such as pictures and music) that can convey what cannot be strung into the discursive form of language. (93) I will argue that designers' knowledge of material and manufacturing technology has to involve this category.

Design, like other specialized forms of human activity, has a long history and has evolved into various branches. To avoid the risk of overgeneralization, I will limit the following discussion to the ancestral and foundational field of design: the design of physical artifacts that significantly shape the environments we inhabit, such as buildings, furniture, and lighting. I refer to these artifacts as "EA" (Environmental Artifacts). When referring to the EA design process, I will use the term "EA designing," and to the direct outcome of such a process "EA design."

2. What is EA Designing?

The goal of my research is to clarify the "intuition" that makes EA designing possible and to show that it is reliable and acquirable. A preliminary step of my research is to shed light on EA designing. Contrary to non-designers' impressions, EA designing is not the making of physical things, and EA designs are not EA such as chairs or buildings. This distinction between designing and making is clear in architecture—architects do not design by actually constructing a building—but it can be blurred in other areas because many furniture and lighting designers also fabricate EA based on their designs, when acting as independent designers who need to reduce production costs. However, like architects, many furniture and lighting designers—especially those working for design companies with sufficient budgets—do not participate in the making of EA artifacts. Another common misunderstanding is to think of EA designing as making prototypes. It is true that in practice EA designers often undertake the task of making a prototype.

But, the making of a prototype is not essential to EA designing—EA designers can outsource prototyping without diminishing their authorship of a design.

EA designing, essentially, is best explained by appealing to the philosophical view that, contrary to the standard ontological bifurcation between spatiotemporal and non-spatiotemporal objects, there are temporal but non-spatial objects. (Irmak, 2; see Thomasson’s “The Ontology of Art” for a detailed argument that works of music and literature cannot be accommodated within traditional ontological bifurcations.) Many artifacts fall into this category and are often called “abstract artifacts.” For example, Beethoven’s *Fate Symphony* is temporal in that it did not exist before he composed it, yet it is not located in space. EA designs can be regarded as a type of abstract artifact: they do not exist prior to EA designing, and they are not located in space. In design discourse, such abstract artifacts are usually referred to as “concepts,” which are often conveyed through sketches or maquettes (rough models). Accordingly, EA designing is the making of this type of abstract artifact.

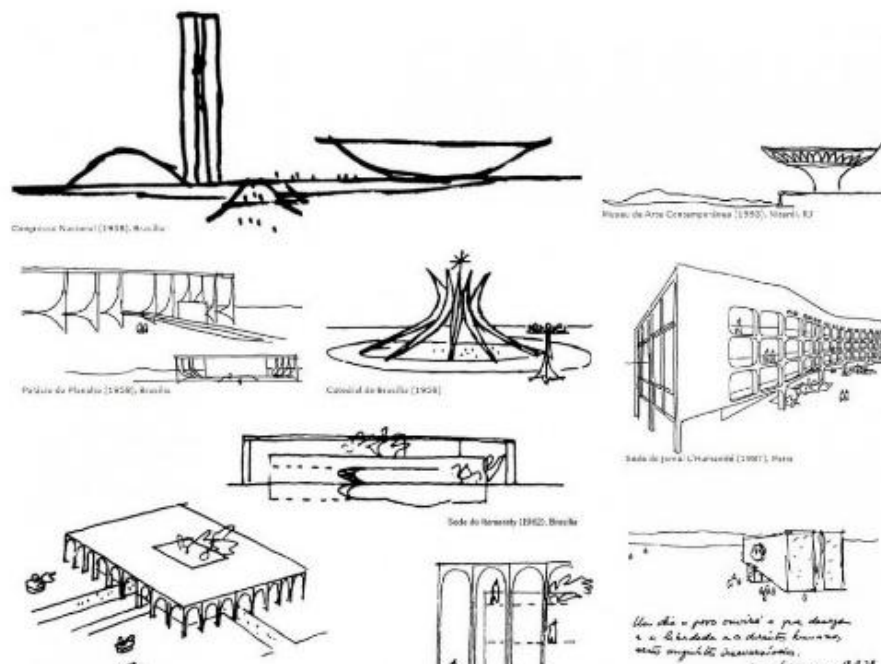


Figure 1 Oscar Niemeyer's Concepts Sketches

Therefore, to understand the process of EA designing is to understand how EA designs, as a type of abstract artifact, are created. To start the discussion, I would like to discuss Evnine's view (69–70) that all artifacts, including those that are abstract (musical works, fictional characters), are the products of one's *intentionally* and *successfully working on materials*. This making is *intentional*, she says, if the content of an intention "provides the conditions on boundaries and flexibility for the objects falling under it." The content is either a given kind (e.g., a dining chair) or explicit specifications of essential features (e.g., The chair has a Victorian style and is to be made entirely out of liquid). If the content of an intention is a given kind, the intentional mind-making is *successful* if an instance of the intended kind is produced (either because the mind-making produces something that can perform the kind-associated function or, in the case of the intended kind has no associated function, it produces something resemble to existing things of the intended kind.) Even though Evnine does not talk about the successful condition reached when the content of an intention is given by explicit specifications of essential features, it is reasonable to think that she would say that the intentional mind-making in this case is *successful* if the made object has the features.

I have two comments on Evnine's view:

1. Evnine does not explicitly explain why artifacts must result from successful mind-making, as defined above. The most plausible reason is that Evnine is committed to her use of the *Aristotelian hylomorphism* idea, according to which artifacts are "ideal objects"—the result of "mind imposing itself on matter." This *hylomorphism* idea implies that the intentional contents not only guide the making of artifacts but is also successfully realized in them. However, this success requirement excludes an important kind of artifacts—failed prototypes, things made with the intention of performing a certain

function that they actually do not perform. For this reason, her success requirement should be abandoned.

2. Evnine's explanation of the intentional requirement—that the content of an intention “provides the conditions on boundaries and flexibility for the objects falling under it”—is not entirely clear. I think this requirement can be best explained as meaning that the making process is, in some sense, guided by an intentional content (I will explain later in what sense it is guided in the field of EA design). If this interpretation is correct, the intentional content must be specific enough to guide the process of making; it always specifies essential features and cannot be merely a general kind. This is evident in fields such as painting and musical composition: painters or composers cannot begin creating if the content of their intention is no more than a general kind, such as an oil painting or a piano concerto. In the field of EA design, for instance, designers may receive requirements as simple as “design a dining chair” from clients. However, the actual intention that EA designers work with—whether self-formulated or derived from others—must be more specific than this.

Based on Evnine's view and the above discussion, we can say that all EA designs are the products of designers working on materials under the guidance of their intentions. Accordingly, EA designing consists in working on materials under the guidance of designers' intentions.

What distinguishes EA designing from other kinds of artifact-making is its special intentional contents and *materials*. EA designers do not work with physical materials, such as wood or metal, but with abstract geometrical elements such as points, lines, forms, spaces, and their variations. This is reflected in the fact that most design students begin their studies with an introduction to these geometrical elements. (The ontological status of these geometrical elements

would be another interesting question to explore, but that topic lies beyond the scope of my task here. My view is that they are imaginative rather than forms in Plato's sense.) EA designers work on these materials by modifying, arranging, and combining them in imagination. The intentional content of EA designing often involves three aspects: (1) sources of inspiration, whose forms or structures will be echoed in the design; (2) physical materials and manufacturing technologies used to realize the design; and (3) other essential features, including functions.

Hence, EA designing can be characterized more specifically in the following way: *An EA designer manipulates one or more geometrical elements in imagination under the guidance of the intention of creating a form that (1) shadows (echoes, reflects) the forms of the intended sources of inspiration, (2) can be realized using the intended physical materials and manufacturing technology, and (3) fulfills the intended features when realized with those physical materials.*

3. The Non-propositional Knowledge in EA Designing

What does it mean to say that intentional contents provide guidance in making? In the field of EA design, this means that designers' intentions impose constraints on the set of permissible geometrical elements and on the ways these elements may be manipulated. These constraints narrow the vast universe of all possible geometrical elements and manipulations to a manageable space, within which EA designers can make choices according to their *taste*. Without sufficient constraints, designers may become lost in the sheer number of possibilities and never reach a conclusion. These constraints are possible because EA designers are equipped with relevant knowledge, the majority of which is *perceptual* and *non-propositional*. I believe these pieces of non-propositional knowledge constitute the so-called "intuition" that has long puzzled design theorists in the Design Method movement.



Figure 2 Chair of Solemnity, Designed by Siyun Xue

For example, the chair shown in the image above is designed with the intention of creating a form that satisfies the following requirements:

- (1) the form echoes the structure of a wooden easel;
- (2) the form can be fabricated with plywood and CNC machining (a manufacturing process in which pre-programmed computer software dictates the movement of factory tools and machinery);
- (3) the form, when realized with plywood, can function as a chair and can be flat-packed.

These intentions cannot provide any guidance for people who know nothing about plywood furniture design. But, for an *experienced* plywood furniture designer, these intentional contents help rule out many possibilities. The designer is aware of what kinds of structures are feasible with CNC machining, so he would not spend time playing with geometrical elements that have round surfaces. The designer also understands how plywood must be interlocked if the whole structure is to be disassembled and flat-packed, and therefore would avoid creating constructions that do not allow such interlocking. Likewise, the designer knows what structure is strong

enough for plywood and would not create a structure too fragile to function as a chair. Finally, the designer is proficient in translating the easel structure into a construction made from geometrical elements. The experience, awareness, understanding and proficiency in question are all non-proposition knowledge, which is either designers' know-how or non-discursive knowledge in Langer's sense.

4. Prospectus Outline (The number of chapters within a heading is yet to be determined.)

The History of the Design Method Movement

I will begin by examining the history of the Design Methods movement from the 1960s to the 80s, focusing on figures such as John Chris Jones and Christopher Alexander. I will discuss how this movement sought to make design systematic by drawing on methods from science, and why it ultimately failed. I will highlight why the central concern—how to replace the intuitive design approach with a systematic one—remains important today. I will conclude by arguing that this concern should be addressed not by inventing a systematic design method, but by understanding the nature of designers' intuition.

Non-propositional Knowledge: Know-how and Langer's Non-discursive Knowledge

I will explain critically the theoretical background of two key types of non-propositional knowledge: (1) know-how (the inexpressible, skill-based knowledge acquired through practice), and (2) non-discursive knowledge, as discussed by Langer, which is expressible through non-discursive symbolism. By laying out these theoretical foundations, I will prepare the ground for interpreting how such knowledge operates in the design process.

The Ontology of EA Design and EA Designing

I will then introduce my account of EA design as abstract artifacts—temporal but non-spatial objects created through intentional making. I will argue that EA designing consists in working with abstract geometrical elements (such as lines, forms, and spaces) under the guidance of designers' intentional contents. These intentional contents include inspirations, material choices, technological considerations, and other essential features including functional requirements. In this way, I clarify the process of EA designing and make the intentional contents involved explicit.

The Non-propositional Knowledge in EA Designing

I will explain how non-propositional knowledge plays a crucial role in EA designing. I will argue that intentional contents guide the design process by imposing constraints on the otherwise vast design space. I will further argue that the ability to impose such constraints implies that designers are already equipped with know-how and non-discursive knowledge. To support this claim, I will discuss a range of design cases that demonstrate how non-propositional knowledge is embedded in the design process. I will conclude by showing how this reliance on non-propositional knowledge explains the role of “intuition” in design and what this reliance means for design education.

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