The Question Concerning Design

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ABSTRACT: The American Heritage Dictionary defines design as both a verb and a noun with the general meaning that someone makes and/or executes plans or the actual plans. However, many disciplines claim to design as a part of their productivity and result of their labor. The problem comes when these disciplines and professions work collaboratively. Their individual understandings of the term "design" can lead to much confusion and misunderstandings amongst team members. Since so much design is interdisciplinary and collaborative, this is becoming more and more of issue. I am currently working in an environment with architects, engineers and scientists who are coming together to "design" a project but we are coming at this from very different understandings of the term.

This paper will attempt to unpack the meaning and practice of design for the disciplines of architecture, engineering and science. I will employ the comparative method to examine the way that architects, engineers and scientists use this word to describe what they do in order to discover the similarities and differences of usage. The paper will begin with a look at the etymology of the word," design," and then will provide an overview of the literature and practices available on the topic of design for each discipline. The intent is to find a common ground between the disciplines or at least provide a lexicon for the disciplines when working together.

KEYWORDS: design, architecture, engineering, science, terminology

INTRODUCTION

Martin Heidegger wrote an article/presentation in 1953 titled, "The Question Concerning Technology." The piece was developed over several years as Heidegger grappled with the essence of technology as the destiny of the West in the 20th century. In this article he situates "technology" as that which has always existed and that which is primary to one's understanding of oneself and humankind. His argument extends our understanding of technology and gives our drive to control nature a primacy akin to religion and politics. However, in the 21st century, post-Industrialization world, we have begun to seek other ways of understanding our capacity for creation. In that light, the term "design" continues to gain credibility as disciplines not normally associated with design try to understand how they might reconsider themselves. For example, business schools are now trying to employ "design thinking" as are others.

No philosopher or cultural critic has yet come forward with a transformative essay on the nature of design as a part of our human essence, yet the term is so prevalent as to demand defining and some comparative analysis. In what follows, I am making an attempt to look at the word design from its linguistic roots and then to reveal how three major disciplines use the term.

1.0 THE PROBLEM OF TERMINOLOGY

The word design means to make a plan or a scheme for the construction of an object but can also be used as a noun to describe the constructed object itself. The word is derived from the Latin roots of *de-* meaning to move away from something and *signare* meaning to mark or inscribe; put together – to mark out. The meaning of design always meant more than merely a plan, but rather describes something more thoughtful and intellectual, an exercise beyond rote planning. The key aspect of this is the making of the plan, not just the result of a plan itself or the object that results. Both of these distinct products, a process and an object, are just results of design. In the enlightening essay, "The Etymology of Design: Pre-Socratic Perspective," Kostas Terzdis takes on the challenge of exploring the term "design." Terzdis argues that our notions about design have become more conflated with planning but that the true nature of design is more about discovery and innovation.

Yet, in contemporary usage the term design has taken on metaphorical extensions that are used to describe a variety of activities and processes within different disciplines. In the past couple of years I have been part

of an initiative that brings together scientists, engineers and architects to study and speculate about the coastal environment.[1] These collaborations are often hampered by our initial lack of understanding about each other's fields, beginning with our language. Generally, we are finding that it can take up to four months to start to feel comfortable with each other's terminology and language. The process of doing the actual research work we intend to engage in would be greatly facilitated by expediting the language barriers.

Two of the key thought leaders in the field of design thinking are Herbert A. Simon and Donald A. Schon. While their work was primarily conducted in the 1960's and 70's, their iconic texts, *The Sciences of the Artificial* (1969) and *The Reflective Practitioner* (1982), respectively, continue to provide the defining context for design thinking in the sciences, engineering and architectural disciplines. Simon's book, which is currently in it's 3rd edition, offers a clear look at the underlying difference between science and professions, such as engineering and architecture. He argues that scientists operate through the lens of the natural world, versus the professions, which work through constructed, or artificial, world. This is illustrated in the following passage:

> Historically and traditionally it has been the task of the science disciplines to teach about natural things: how they are and how they work. It has been the task of engineering schools to teach about artificial things: how to make artifacts that have desired properties and how to design.
>
> Engineers are not the only professional designers. Everyone designs who devises a course of action aimed at changing existing conditions into preferred ones. The intellectual activity that produces material artifacts is no different fundamentally from the one that devises a new sales plan for a company or a social welfare policy for a state.

Schon's book follows in some parts, on the thinking of Simon, but delves more deeply into the nature and manner in which professionals think and act.

The question of design, and our understanding of it, has been studied by many different groups including the Design Research Society (UK) which publishes the journal Design Studies: The International Journal for Design Research in Engineering, Architecture, Products and Systems. In its own words, the journal aims to:

> *Design Studies* is the only journal to approach the understanding of design processes from comparisons across all domains of application, including engineering and product design, architectural and urban design, computer artefacts and systems design. It therefore provides a unique forum for the analysis, development and discussion of fundamental aspects of design activity, from cognition and methodology to values and philosophy. The journal publishes new research and scholarship concerned with the process of designing, and in principles, procedures and techniques relevant to the practice and pedagogy of design.
>
> As design increases in complexity and in its social, cultural and economic importance, it is vital for researchers, educators and practising designers to stay abreast of the latest research and new ideas in this rapidly growing field; with its interdisciplinary coverage, *Design Studies* meets these needs with maximum effect.

In trying to compare the thinking of architects, engineers and scientists, I created the diagram in Figure 1 to explain the differences between the fields in term of perspective, design process, design goals and applicability. The results show that the fields have varying degrees of creativity, experimentation and expectations in their use of the term design.
The authors Kees Dorst and Judith Dijkhuis wrote a very helpful article in *Design Studies* titled "Comparing paradigm for describing design activity." In this article, they posit that there are fundamentally two paradigms for describing design activity: the rational and the reflection-in-action. I will be applying this terminology to the disciplines outlined below.

2.0. METHODS

My inquiry into the use of the term "design" began as a generalized issue within a collaborative practice. I have employed the comparative method when looking at the use of the term "design" across three disciplines. Although I am an architect, I have attempted to learn about the other disciplines in order to understand and illuminate our differences and likenesses. I will also be using illustrative examples from each of the disciplines to demonstrate the thinking behind each. It is interesting to note some of the similarities and differences in modes and choices of topic in the representational aspects of each discipline. The role of

the diagram is not a key component of this argument but could be expanded, as could the role of the model and notions of what is meant by the term “research.”

Design thinking professionals	ARCHITECTS	ENGINEERS	SCIENTISTS
Perspective on design	process oriented	product oriented	process oriented
Design process	creative	prescriptive	creative/prescriptive
Design goals	firmness, commodity, delight	optimization	hypothesis
Applicability	product	problem-solving	knowledge

Figure 1: Diagram showing the comparative values and approaches to design, by design thinking professionals. Source: (Author 2012)

3.0. ARCHITECTURE AND DESIGN

Architects generally think of design as a process but are also are accustomed to referring to a project as “the design,” meaning the end result of their work. For an architect, designing is a creative process that can take different forms including a data and information driven form, or a more intuitive form (reflection-in-action). Generally speaking, architectural projects have many complex variables that have to be considered, from the clients wishes, to the technical limitations of site, structures and materials. Through the design process, an architect can only be responsive to some of the variables at any given moment. In arriving at the final project design, Schon describes the architect’s process of design as one of continuous “talking back” and response, or a conversation with the situation. Because of the complexity of an architectural project (and perhaps loose disciplinary boundaries), the architect’s use of the term “design” is inherently more holistic in referring to the entire project rather that a component or a system.

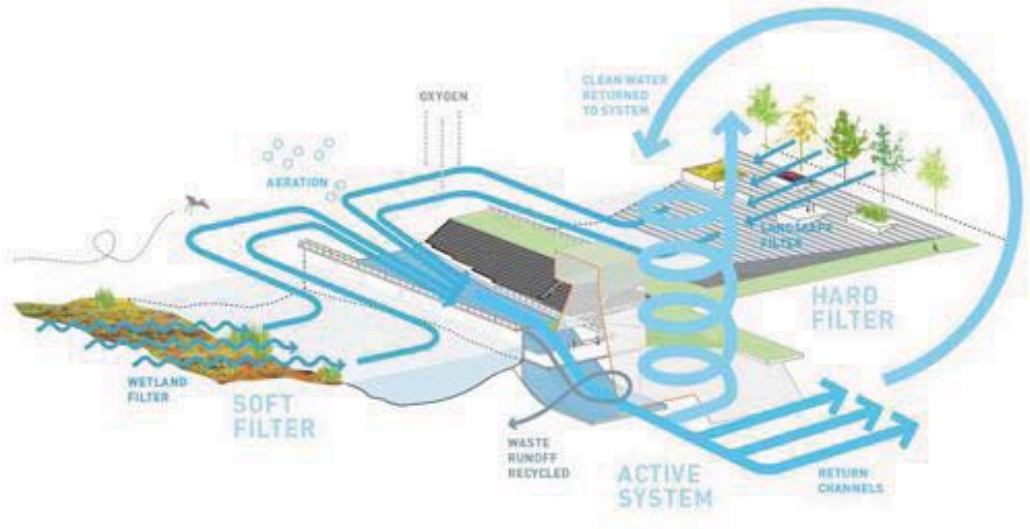

Figure 2: Example of architecture design drawing. Source: (Stan Allen Architect)

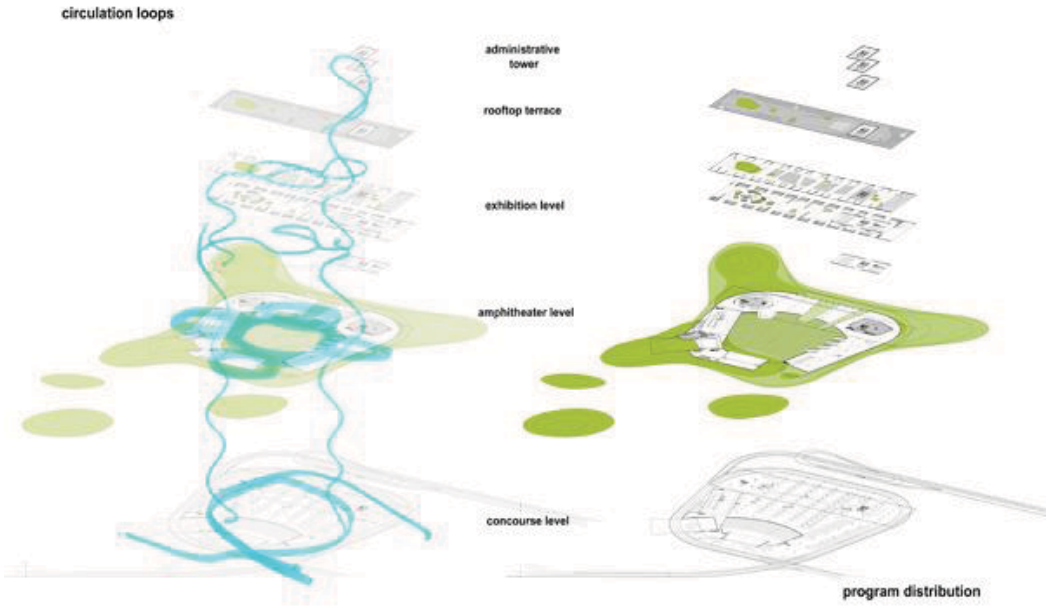

Figure 3: Example of architecture design drawing. Source: (Stan Allen Architect)

4.0. ENGINEERING AND DESIGN

For engineers, design generally refers to a specific performance goal and therefore to an object which results. The ultimate aim of design for an engineer is a product, whether it be a bridge, car, spillway or building. As evidenced in the figures below, for engineers, design is clearly attached to, and perhaps derived from, data and discreet information about an object or condition. There is an entire subset of the discipline of engineering called Engineering Design. Engineers would generally come under the rationalist design paradigm. The primary term that engineers use in describing the goal of a given design problem is "optimization." This term gives every design an almost moralistic imperative to be optimal…which could mean faster, cheaper, stronger…or any combination of these terms. So the goals of design for engineers can be seen as quite different that those of architects and the use of the term "design" is then also quite different.

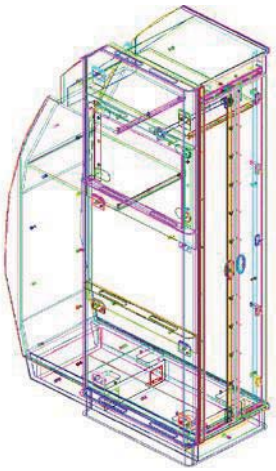

Figure 4: Example of engineering design drawing. Source: (Aero expert)

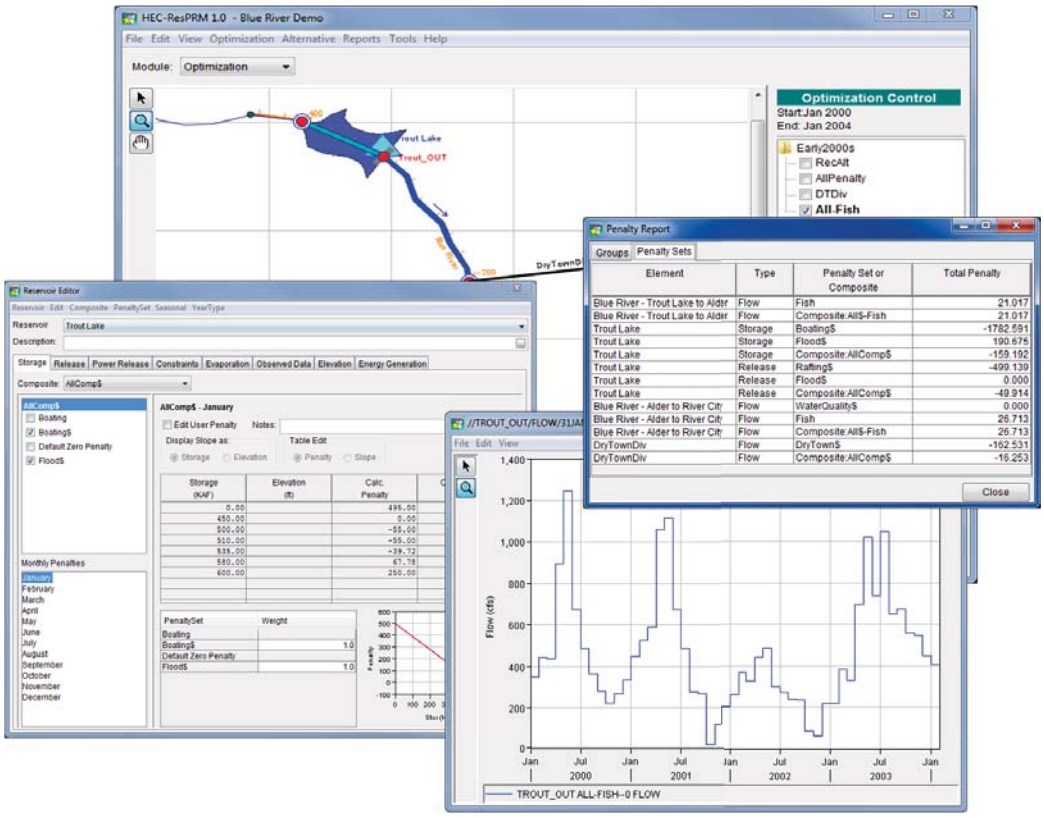

Figure 5: Example of engineering design process with data and applicable information. Source: (US Army Corps of Engineers)

5.0. SCIENCE AND DESIGN

For scientists, design refers to the way in which they develop their experiments and follow through on their hypotheses. For most scientists, the design is as important as the execution, for without a properly designed experiment, the entire endeavor is flawed and therefore invalid. For scientists, design is generally understood through diagrams that show relational values or sequencing. The design rarely refers to an actual object or physical manifestation. Therefore, the goal of design for scientists is not at all based on the final product, but on the process of experimentation, which is used to derive empirical data/knowledge about the natural world.

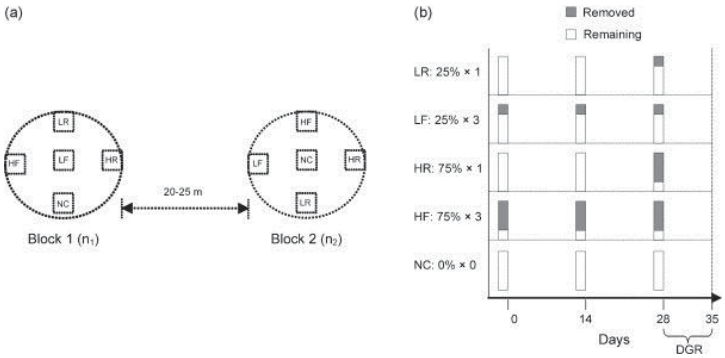

Figure 6: Diagram outlining the design of an experiment by botanists. Source: (Eklöf, et al)

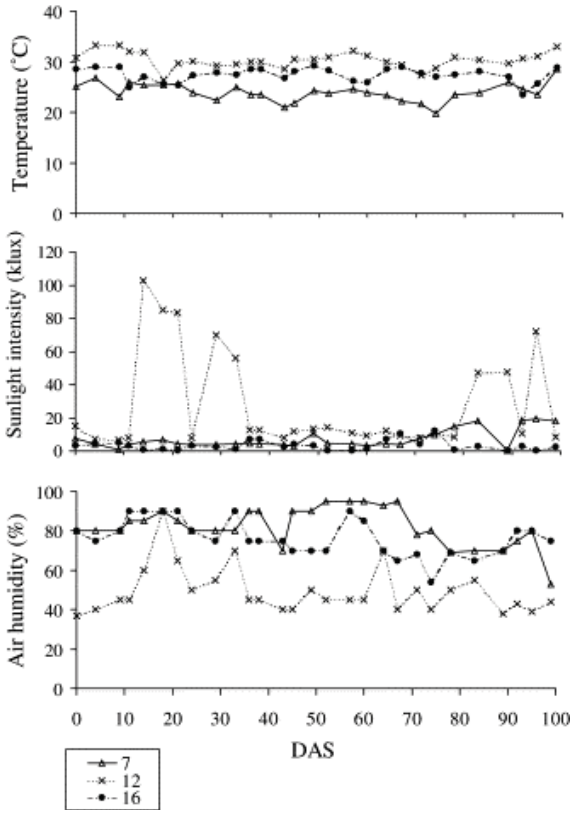

Figure 7: Part of article section called "Experimental procedure and design." Source: (Rodiyati, et al)

CONCLUSION

In popular parlance, the term "design" is somewhat interchangeable with art, and has some implied relationship to a focus on intuition as process rather than on an intentional and rigorous search for knowledge. However, as an activity, design manifests itself in many aspects of non-artistic fields such as engineering, business, law and medicine. The most productive framing for design comes from H. Simon who says, "Everyone who designs devises courses of action aimed at changing existing situations into preferred ones."

However, it is still clear that the disciplines themselves have further refined and defined their own disciplinary approaches to design that is can be difficult to find the common principles of design. It is difficult to expect members of different disciplines to change their typically used terminology and language in order to achieve a common understanding. However, it is crucial to a good working environment for all members of a team to be aware of the differences and relations of terminology, particularly when all members use the same term but with different inferences and applications. There are certainly other terms that could be examined using a comparative method to facilitate understanding such as "research," and "model."

What has been revealed through this study is that design is critical to each of the case study disciplines. Iconic thinkers in the field of design knowledge agree that design is a primary activity, in fact, so primary that design thinking is found in many professional disciplines as well as the science. Design was selected as a key term because of its current focus as a primary human activity and because of its central role in our own work. While Heidegger posited technology as central to the human endeavor in "The Question Concerning Technology," one could question whether design, rather than technology, is a more primary endeavor and one that expands our conception of how and why we seek to continually improve our relationship to our environment.

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ENDNOTES

[1] The LSU Coastal Sustainability Studio is an initiative aiming to bring together multi-disciplinary teams in the study of Louisiana coastal issues. For more information see http://css.lsu.edu.