Exploring Design as a Research Activity

Matthew Peters
Information Sciences & Technology
Pennsylvania State University
State College, PA 16802 USA
mpeters@ist.psu.edu

Helena Mentis
Information Sciences & Technology
Pennsylvania State University
State College, PA 16802 USA
hmentis@ist.psu.edu

Steven Haynes
Information Sciences & Technology
Pennsylvania State University
State College, PA 16802 USA
shaynes@ist.psu.edu

Abigail Durrant
Digital World Research Centre
University of Surrey
Guildford, Surrey GU2 7XH UK
A.Durrant@surrey.ac.uk

David J. Saab
Information Sciences & Technology
Pennsylvania State University
State College, PA 16802 USA
dsaab@ist.psu.edu

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Abstract
Human-computer interaction research often includes a significant design component. In cases where software or other tools are developed and described, but no empirical evaluation is provided, the research consists almost entirely of the knowledge marshaled in support of and as a result of design activities. Very little analysis has been carried out, however, into the scientific and epistemological bases underpinning this kind of research. The purpose of this workshop is to provide a forum for researchers and practitioners to present and discuss different perspectives on the nature of design as a research activity, and the challenges facing researchers who employ design as a methodology.

Keywords
Design research; methodology; theory.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Design is a knowledge generating activity and design activities as part of a research process yield a potentially valuable resource for science. This knowledge can take the form of identified design parameters, design criteria and criteria weighting,

generation of design alternatives, and rules and guidelines for choosing between alternatives, among others. In contrast to the more traditional physical, natural, and social sciences, however, design research has generated little in the way of a recognized philosophy of science. Work in the philosophy of technology sometimes addresses issues related to a design epistemology [2, 4]. But, in general, the scientific grounding of usability design for software-intensive systems is relatively under-theorized.

Design research raises significant philosophical and methodological questions. Are designs theories? Are they models for theories? Are they simply tools or instruments in service of 'real' scientific research? Is there scientific value in a design without empirical evaluation? Attempting to answer these questions may help us to better understand the nature and value of knowledge generated by design research. By analyzing the relationship between design processes and the artifacts that emerge from them, we hope to understand how these important activities can be leveraged more effectively in the growth of knowledge.

The National Science Foundation's Science of Design program has highlighted the importance of design research in the development of interactive systems by bringing researchers together at the First International Conference on Design Science Research in Information Systems and Technology, (http://ncl.cgu.edu/designconference/). Representatives from a range of backgrounds discussed solutions to emerging problems in information systems–from business intelligence and peer-to-peer systems to information systems design—and to explore various and different topics in the space of design. Researchers also discussed design science, its relationship and borders with action science, and its future in information systems. This conference and the NSF's new program on Science of Design point to the emergence of communities concerned with the potential for design to better serve the aims of scientific research. These are among the important motivations for this workshop.

Despite these meetings and programs, a shared conceptualization of the essential nature of design as a knowledge generating activity is still unclear. For example, an engineer and a graphic artist may not agree on what constitutes research in design. But by coming together to develop their understandings in an inter-disciplinary environment, potentially disconnected disciplines could unify findings from otherwise diverse research programs, thereby maximizing the value of design knowledge.

The first Exploring Design as a Research Activity (EDRA) workshop, held at SIGCHI's Designing Interactive Systems (DIS) 2006 conference, brought together researchers from a range of backgrounds to begin building shared conceptualizations of what constitutes design, how design activities and artifacts can be theorized, and how design research can be evaluated. This second workshop builds on results from the DIS '06 workshop, reaching out to more researchers invested in the design of human computer interaction and interactive technologies. We plan to organize additional events at future CHI conferences, as well as other relevant venues such

as the ACM Conference on Computer-Supported Cooperative Work, ASIS&T Information Architecture Summit, and the IEEE's International Conference on Software Engineering.

Sciences of the artificial

Simon [3] defined design as a science of the artificial. He contrasts it with *natural science*—a body of knowledge regarding objects or phenomena that explain how they interact with each other—by describing it as a body of knowledge about *artificial* objects and phenomena designed to meet particular goals. Simon makes a distinction between inner environment and outer environment with respect to designed artifacts. The outer environment consists of all the external forces that act on the artifact. The inner environment consists of the organized components that make up the artifact, including the relationships between the components. Both inner and outer environments constrain the artifact. Design activity consists of bringing together the organized, inner environment components and interfacing them in a particular way with the artifact's outer environment.

Science of design

As the NSF's Science of Design program has made clear, this research effort requires a foundation of "theoretical and empirical knowledge on design, computational methods and tools for design, and new design curriculum for the next generation of designers" (National Science Foundation, n.d002E). The conference on Design Science Research brought together researchers from disciplines ranging from computer science to social ethnography, demonstrating that this space can be informed by the foundations of many established disciplines, but as yet, the discipline of Design itself has had no boundaries drawn.

Building shared conceptualizations

Design is conceptualized in many ways. For researchers, design means many things and these meanings are manifested in different ways. The goal of this workshop is not to develop a single conceptualization of design as a research activity. Nor is it to foster a competition of ideas. Nor do we want to create an anarchistic conceptualization of design, where anything goes and researchers find their conceptualizations to be incommensurable. Rather, our goal is to facilitate broader understanding of how design is conceptualized in differing research traditions and identify loci for productive discourse among researchers from those different traditions.

The first EDRA workshop at DIS 2006 demonstrated the use of "tag" generation following each position paper. As participants presented their work, they were asked to identify two or three concepts or ideas they found central to their work. These were recorded, along with tags suggested by other participants. This process was used to facilitate and direct the discussion of each paper throughout the day. As a final activity in the workshop, participants were grouped to create concept maps connecting all the tags from the day's presentations. Final discussion focused on the similarities and differences among the concept maps.

This EDRA workshop follows the same tag-generation method as the previous, but clusters

participants and discussion to follow each set of three papers. From this, we may be able to work backwards to suggest answers to such fundamental questions as "how are designs theories? How are they models? How are they simply tools or instruments in service of 'real' scientific research?"

Workshop goals

The goals of this workshop are: (1) to share information among researchers and practitioners from the various areas invested in design research; (2) to build shared conceptualizations of what constitutes design research, how this research is conducted and evaluated, and what knowledge is generated; and (3) to explore design research through group activities structured to support differing perspectives and encourage debate.

One outcome of the first goal will reach beyond the workshop participants into the design community through the EDRA website online discussions. The website also shares documents, concept maps, and other artifacts generated in the workshop. Additionally, this workshop will lay the groundwork for a special issue on the topic of design research, sharing the progress made at the workshop as well as unifying researchers in different fields to advance our common goal of developing a shared vision for its direction.

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