
SITUATED DESIGN COMPUTING: INTRODUCTION AND IMPLICATIONS

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This paper describes some of the limitations of current design computing. It then proceeds to introduce fundamental notions of situated design computing followed by the description of some applications. The paper concludes with a discussion of some of the implications of situated design computing.

ANALYSING LEADERSHIP ACTIVITIES IN DESIGN: HOW DO LEADERS MANAGE DIFFERENT TYPES OF REQUIREMENTS?

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How do leaders react to different requirements and how successful are they in doing so? This question is part of a research project of engineers and psychologists, which aims to analyse leadership processes in design. In three engineering design departments leadership processes were observed and analysed. 321 situations were evaluated due to activities and performance. The data reveal that relevant leadership situations in design departments are primarily related to coordinating and planning activities. Furthermore, it can be shown that the types of requirements (content, process, relation) are managed differently in terms of success. Deficient leadership qualities arise especially in situations of goal elaboration and conflict management.

ON METHODOLOGICAL CHARACTERISTICS OF ENGINEERING DESIGN RESEARCH

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Its growing importance requests us to better understand engineering design and design research. Our investigation focuses on the methodological characteristics of design research. The method of investigation is dissociation, a speculative demarcation of the characteristics of research in natural/social/technical sciences and of design research. We sorted the characteristics in common, counter and unique categories. Relativity, constructivism, and interpretive nature are seen as the counter parts of absoluteness, reductionism, and explanatory nature of research in sciences. Design research has unique methodological characteristics: teleological, multi-focal and normatively instrumental. However, it is neither paradigmatic nor predictive.

TOWARD A DATA MATURITY EVALUATION IN COLLABORATIVE DESIGN PROCESSES

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This paper concerns the engineering data exchange control. It proposes to define a data evaluation system based on the concept of "data maturity" in order to control the design collaboration. Data maturity helps to measure the data usability level for each designer view as the provider or the receiver of the information. The method decomposes maturity with parameters specific to each point of view. A correspondence matrix to translate evaluation of the provider into receiver language or receiver into provider, it supports dialog on common values.

THERE IS NOTHING AS PRACTICAL AS A GOOD THEORY – AN ATTEMPT TO DEAL WITH THE GAP BETWEEN DESIGN RESEARCH AND DESIGN PRACTICE

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The paper addresses the gap between the expectations of designers working in a competitive industrial environment and the outcome of design research focusing on specific, scientifically interesting areas of design. To bridge this gap, related requirements for design research like a commonly agreed terminology and an involvement of research into the transfer-process were formulated. Using the full power of design methods and tools also requires a basic understanding and a mental internalization of the models behind them. Convincing examples of solving “real-world” design problems demonstrate the success of a methodically based design practice.

IMAGES OF INNOVATION - AN ONTOLOGICAL APPROACH

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Innovation perceived as the front-end of product is a frequent research topic. However, since innovation research is relatively young, these studies tend to originate from different domains, representing a wide spectrum of viewpoints. This diversity results in the published findings of the studies to be circulated and recognised mainly in their original domains, pointing to the necessity of synthesising the knowledge within innovation research communities locally. The aim of this paper is twofold: first, to discuss the diversity in research activities related to product innovation; second, to discuss the industrial implication of this research diversity. We attempt to use an ontological approach to understand many perceptions of innovation.

THE LURE OF THE MEASURABLE IN DESIGN RESEARCH

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Beginning design research projects by defining success criteria, judged by numerical measurements, is a very attractive idea. But defining a priori success criteria is problematic, as is using numerical metrics to assess the success of a new method or computer tool. The paper points out some pitfalls of using metrics for success. It argues from experience of studying design processes that projects should begin with objectives derived from research questions, but these objectives should be revised as needs and opportunities emerge. Success criteria for of new methods and tools should be derived later from a detailed specification of requirements. Researchers should aim first for understanding their effects, and derive evaluations from that.

EXTENDING THE C-K DESIGN THEORY TO PROVIDE THEORETICAL BACKGROUND FOR PERSONAL DESIGN ASSISTANTS

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We show that to operationalise the C-K design theory in the form of a computational tool, a third space, the environment space E, must be introduced. We propose such a version, the C/K/E theory by using notions from situated cognition. Extending the C-K theory by including E allows its operationalisation in the form of (computational) situated design agents. These tools can be used for design aiding as personal design assistants. Beside powerful features like learning, creativity and adaptation, such personal design assistants would have solid theoretical background based on C/K/E design theory and situated cognition.

NEW IDEAS FOR KNOWLEDGE MANAGEMENT IN PRODUCT DEVELOPMENT PROJECTS

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Complex product development projects require the handling of information/knowledge from three domains. While product and project related information is at least formally modelled, design process knowledge is usually not captured at all. The article shows different approaches to manage this specific knowledge and describes the new software tool "The Semaril". "The Semaril" is based on the principle of semantic nets, in which different entries can be linked by user-defined relations one to another. The use of the tool during a design process will be shown in a particular example.

MORE ON SYNTHESIS OF CONCEPTS AS AN OPTIMAL COMBINATION OF SOLUTION PRINCIPLES

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The use of morphologic diagrams in the design of new products suffers from a major shortcoming: the apparently unsolved problem of finding and designating the potentially better combinations of solution principles, among the huge number of possible combinations. In the current study the Direct Synthesis Optimization method, which solves the problem, is introduced. It is based on the ranking of the solution principles on two scales – Performance and Risk and subsequently re-arrangement of the morphologic diagram into a friendly shape. The DSO is a simple, straightforward method that works efficiently, without investment of excessive effort and helps to achieve better combinations of solution principles.

DESIGN CRITERIA FOR MULTILAYER WOUND WINCH DRUMS FOLLOWING LIGHTWEIGHT DESIGN PRINCIPLES

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In all material handling and conveying machines winch drums play an important safety role for the whole equipment. With increasing power and loads the demands of larger rope loads and rope storage capacity under the restricted space and weight leads more and more to multi-layer drums with special winding systems. This contribution will present recent research undertaken at the Institut für Maschinenwesen of the Technical University of Clausthal, that demonstrates how ad-vanced structural design can considerably enhance the load carrying capability of these machine elements.

CROSSING THE CHASM: DEVELOPING AND UNDERSTANDING SUPPORT TOOLS TO BRIDGE THE RESEARCH DESIGN DIVIDE WITHIN A LEADING PD COMPANY

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This paper proposes a series of principles to be considered when developing creative support systems within a product design company, specifically aimed at bridging the research design divide. The need for such systems and the principles required to aid successful implementation emerged from a three year longitudinal study of a leading design company in practice. The study consisted of a series of ethnographic investigations over the time period, focussing on various aspects of the design practice, as well as the more mundane, practical and administrative elements of running a successful company.