Using the Framework for Design Alternatives and Variants

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This paper presents a framework for considering multi-team, multi-disciplinary design of interactive systems in a structured manner. IT practitioners can read the paper to gain a deeper understanding and new perspectives of interaction design processes.

Introduction to the Framework

The design of digital interactive systems requires the recognition and acceptance of both the complexity of the system to be developed and the complexity of the design situation which is characterised by multi-disciplinary teamwork and by an interplay of creative, situated and analytical thinking. Several authors refer to the need for a better understanding of the increasingly complex interaction design processes (Stolterman 2008, Visser 2006). The paper suggests a conceptual framework for interaction design that accommodates and unifies different perspectives from general design research while considering the specificities of the domain. We follow (Visser

2006) in understanding design activities as domain-specific construction of external design representations expressing three aspects of the system under design: the what (the system itself), the how (the process of implementation), and the why (the design rationale).

Within the framework, description and analysis is done through the lens of *design spaces*, *design artefacts*, and *refinement relationships* between design artefacts. Every design representation that is created for an intended use, or becomes meaningful in the design process, is considered to be a design artefact (e.g., prototypes, scenarios, formal specifications or implemented products). The design space concept is a tool for a less prescriptive approach to design. A design space is the conceptual gathering together of all, and any, design artefacts used within a design process. It is the basic unit to describe designer-user relationships, and the assumption here is that there is a 'contract' between the designer and the user which basically says that however intangible the design process might be there always emerges at least a minimum set of requirements which must be satisfied by the final design. What is therefore equally important to idea generation is the designers' ability to compare different design artefacts and understand how they are related and whether or not they satisfy some initial or evolving requirements and constraints. Such design progress is expressed in terms of refinement relationships between design artefacts. In the context of interaction design, the paper introduces four types of refinement.

Given the multi-disciplinary approach, design spaces are typically complex spaces consisting of nested sub-spaces. This captures the idea of sub-teams working iteratively, both independently and together, towards a solution guided by an evolving understanding of the design problem and constraints. A specific characteristic of the proposed framework is the distinction between *alternatives* and *variants* as two types of design options describing the convergence of design ideas within and across design sub-spaces. The complex design spaces with design alternatives and variants emphasise the importance of understanding local design goals and values within a global context.

Guiding Framework for Empirical Studies

While the focus of this paper is on the general framework and its uses, we also present a brief overview of an exploratory study which we conducted to investigate the potential of the framework as a descriptive tool for studying interaction design practices. The actual types of design artefacts included in the design spaces will be particular to a given design situation but we expect in our framework that sub-teams have similar behaviours in discussing the problems, options, decision making and explicitly create and forward design artefacts to other sub-teams as we describe it in the framework. The study took place within a small locally based web-design company who were tasked with re-designing the web site of a large medical company. Our researcher conducted observations, supported by note-taking, audio recordings and access to all design artefacts. They were located with the design team, attended all meetings and had access to the online collaborative material. The intention was to use the framework as a mechanism to structure the observations and identify its suitability for this purpose. Within this study we were able to see how the framework enables us to identify where design decisions are made, and in light of constraints consider what might have led to them. We were also able to identify design entities that were not included in the original framework (namely implicit and explicit design constraints). Of course, this example study is necessarily small to fit with the initial investigations, the first step for any future work will be to apply the same process across a longer and larger design project.

Formal Reasoning about Design Spaces and Traces

From a (formal) software engineering perspective, it is interesting to explore the suitability of a formalised version of the framework to track selective elements within interaction design processes for later reasoning about properties of both the design product and the performed design activities. In (Bowen and Dittmar 2018) we present a formal description of design spaces and their dynamics and show advantages over common tracking approaches. The central idea of our approach is to use traces in conjunction with formalised simple and complex design spaces to follow the evolution of an actual interaction design process in terms of the distributed creation, modification and discarding of design artefacts and their relationships. We can consider properties of design artefacts (and underlying requirements,

constraints or design ideas) such as persistence and finalisation to identify when decisions or choices are made in a design process, when alternatives are discarded, when variants are generated, or whether specific requirements remain. Unfolded or partly unfolded traces of complex design spaces support reasoning about distributed design activities with local and global iterations within and across sub-spaces. Inconsistencies in the use of design artefacts can be detected, for example, whether and when revisions of artefacts are lost in a complex design space. The detection of such inconsistencies helps to improve the artefact under design, but it can also inform a redesign of the design space or process itself.

References

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