

Accessing decision-making in software design

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This paper presents an analysis of software design protocols as one of the contributions to the 2010 international workshop 'Studying Professional Software Design'. The aim of the study described here is to analyse the design process of software designers and to compare the results with that of product designers, an area familiar to the authors. Decision-making is the main focus of this study. A descriptive model of decision-making, developed by the authors, has been used to analyse the protocols of the three software design teams. The results give insight in how software designers process their activities, on the influence of individual or team differences, and what the consequences for their outcomes are.

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The study described in this article is one of the contributions to the 2010 international workshop 'Studying Professional Software Design'. The goal of this workshop was to collect a foundational set of observations and insights into software design, drawing on theories and methods from a variety of research disciplines. One of the disciplines that already has a long tradition in design research is product design. Because the authors have their background in research on product design they used their expertise in this area to reflect on the data.

Videos and transcripts of three pairs of professional software designers, working on the conceptual design of a software system were made available. Video material also included a feedback session with each team in which they gave their perception on their own process. Participant researchers were asked to analyse the videos. A fuller descriptions of the design task and data capture can be found in the introduction of this Special Issue.

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Design processes can be studied in different ways. A good example of how the same protocols of designers have been analysed from various – scientific and practical – perspectives is the book by Cross, Christiaans & Dorst (1996). One



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of the most relevant aspects in modelling the design process is decision-making. Simon (1969) already noted that decision-making and design are so intertwined that the entire decision-making might be viewed as design. Particularly, the conceptual design phase when the solution space is explored and product and context has to be observed from multifaceted perspectives is a decision intensive process (Rehman & Yan, 2007). Also Longueville, Le Cardinal, Bocquet, and Daneau (2003) noticed that in recent years a number of proposals have been advanced for the study of decision-making processes in knowledge areas such as management, cognition, engineering design, and artificial intelligence. Decision-making is then a field of study that is constantly addressed in all domain knowledge areas being as a main driver of those studies the cognitive assessment of how decision-making occurs. Therefore, a decision-making framework will be presented that forms the basis for the analysis of the three protocols. The next section will first give some background information regarding design processes in different domains. Next, the method used in this study will be explained briefly, followed by the analysis of the three protocols. The analysis will be twofold, based on: a) the decision-making framework use; b) the summaries (the way each participant view his own performance along the process). Finally, results and conclusions are presented.

1 Background

Research into product development processes has the final aim to understand those processes and to build models that can support design practice in efficiency and quality. It is about designing a better design process. For a number of separate phases in the design process satisfying methods and tools have been developed and implemented such as those dealing with information flows, CAD tools in the detailing process, and methods of production.

Modelling the conceptual phase of the process, however, is still a very complicated issue because this part of the product development process occurs in a state of uncertainty and ambiguity. It involves the generation and evaluation of design alternatives, and selection of a single or a set of design solutions to fulfil a particular need or function. The importance of conceptual design to the overall success of the product is crucial. Once a final concept is chosen the majority of design decisions relating to product behaviour, cost and quality has been fixed; and the subsequent product life-cycle activities (manufacturing, assembly, use and recycle/dispose) are implicitly determined by the concept (Rehman & Yan, 2007). At the same time this phase is the most complicated one because of both the frequent ambiguity of the brief and the consequences decisions taken at this phase have for the result. Whitney (1990) uses the term 'interactions' to express that particular design activities are not that difficult but rather affect each other in circular ways, which makes it hard for designers to detect and for managers to control. 'Furthermore, some variables or decisions in the design sooner or later are found to dominate others in the sense

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