

Design Rationale for Increasing Profitability of Interactive Systems Development

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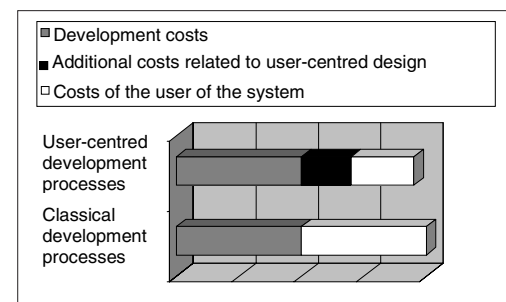
INTRODUCTION

User-centred development (Norman & Draper, 1986; Vredenburg, Isensee, & Righi, 2001) processes advocate the use of participatory design activities, end-user evaluations, and brainstorming in the early phases of development. Such approaches work in opposition of some software-engineering techniques that promote iterative development processes such as in agile processes (Beck, 1999) in order to produce software as quickly and as cheaply as possible.

One way of justifying the profitability of development processes promoted in the field of human-computer interaction (HCI) is to not only take into account development costs, but also to take into account costs of use, that is, costs related to employment, training, and usage errors. Gain, in terms of performance (for instance, by providing default values in the various fields of a computer form) or in reducing the impact of errors (by providing undo facilities, for instance), can only be evaluated if the actual use of the system is integrated in the computation of the development costs.

These considerations are represented in Figure 1. The upper bar of Figure 1 shows that development costs (grey part and black part) are higher than the development costs of RAD (rapid application development), represented in the lower bar (grey part). The black part of the upper bar shows the additional costs directly attributed to user-centred design. User-

Figure 1. Comparing the cost of development processes



centred development processes compensate additional costs by offering additional payoffs when the system is actually deployed and used.

The precise evaluation of costs and payoffs for usability engineering can be found in Mayhew and Bias (1994).

Design-rationale approaches (Buckingham Shum, 1996) face the same problems of profitability as user-centred development processes. As payoffs are not immediately identifiable, developers and designers of software products are still reluctant to either try it or use it in a systematic way.

Design rationale follows three main goals.

1. Provide means (notations, tools, techniques, etc.) for the systematic exploration of design alternatives throughout the development process

2. Provide means to support argumentation when design choices are to be made
3. Provide means to keep track of these design choices in order to be able to justify when choices have been made

Such approaches increase the production of rational designs, that is, where trust in designers' capabilities can be traced back. One of the main arguments for following a rationale-based-design development process is that such processes increase the overall quality of systems. However, when it comes to putting design rationale into practice, that is, within development teams and real projects, more concrete arguments around costs and benefits have to be provided.

Figure 2 reuses the same argumentation process as the one used in Figure 1 for justifying the profitability of user-centred approaches. While user-centred approaches find their profitability when costs related to the actual use of the system are taken into account, design rationale finds its profitability when costs are taken into account amongst several projects. Figure 2 is made up of three bars, each representing a different project. The grey parts of the bars represent the development cost for the project. The black parts represent the additional costs for using a development process following a design-rationale approach. As shown, the lengths of the black parts of the bars remain the same, representing the fact that costs related to design-rationale activities remain the same across projects. According to the projects we have been working on, it is clearly not true for the first project in a given domain.

Indeed, the basic elements of design rationale have to be gathered first, such as the pertinent criteria and factors according to the domain and the characteristics of the project. The other interesting aspect of Figure 2 is the fact that the cost of the development of the project decreases according to the number of projects as reuse from design rationale increases accordingly. The white parts of the bars represent the increasing savings due to the reuse of information by using the design-rationale approach of previous projects. This amount is likely to follow a logarithmic curve, that is, to reach a certain level where the cost decrease will reduce. However, our experience of design-rationale approaches is not wide enough to give more precise information about this.

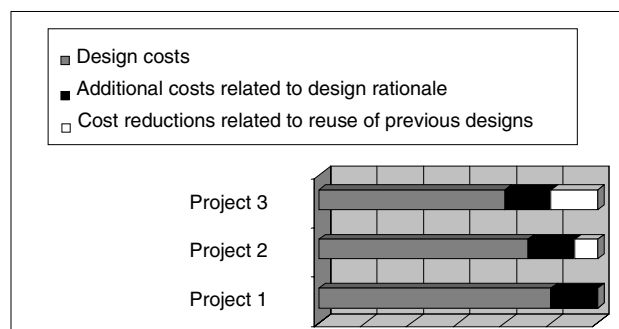
Development processes in the field of safety-critical systems (such as RTCA/DO-178B, 1992) explicitly require the use of methods and techniques for systematically exploring design options and for increasing the traceability of design decisions. DO-178B is a document describing a design process. However, even though such development processes are widely used in the aeronautical domain, the design-rationale part remains superficially addressed.

We believe that this underexploitation of such a critical aspect of the design process lies in two main points.

- There is no integration of current practice in user-centred design processes and design rationale. For instance, no design-rationale notation or tool relates to task modeling, scenarios, dialogue models, usability heuristics, and so forth that are at the core of the discipline.
- There is no adequate tool to support a demanding activity such as design rationale that is heavily based on information storage and retrieval as well as on reuse. In software engineering, similar activities are supported by case tools that are recognised as critical elements for the effective use of notations.

The next section presents a set of design-rationale notations and a tool, based on the QOC (questions, options, criteria) notation (MacLean, Young, Bellotti, & Moran, 1991) that is dedicated to the rationale design of interactive systems.

Figure 2: Profitability related to design rationale



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