

Quality-in-Use - educating the reflective designer

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1 Introduction

In the early 1980s I became a frequent traveller from Sweden to Denmark (where I live today). I flew there to do research on systems development for quality of work and product together with my colleagues from Aarhus University. During these trips two coffee pots opened my eyes to aspects of design and usability that I had not been thinking of before.

It all started about 30 000 feet above the ground on a SAS flight from Sweden to Denmark. Since this was a business trip and not a holiday I skipped the champagne and had coffee with my sandwich. The coffee was served in the ugliest pot. This container really looked cheap, like the plastic flower pots in green or red that I remembered from the 1950s. Only that this one was black and had a handle that looked as if it was taken right from a motor bike. As far as I could understand, if there is anything like rules of aesthetics the designers of this artifact had broken them all.

Safe on the ground in Denmark and during evening work in a colleague's home it was time for coffee again. This was a typical middle-class intellectual home. The house was built in the "white style", the Danish version of functionalism in architecture. Inside there were artifacts expressing the same style. For example our work at the table was well illuminated by the famous PH-lamp, designed by Poul Henningsen, "the light-maker from Skagen", and the sofa beside, in Børge Mogensen's classical furniture design, was perfectly expressing craft, simplicity and functionalism. On the table was this ingenious and simple solution of a container for coffee. The shape was fantastic. The pot was just a cylinder of stainless steel, that is how simple it was. Furthermore, even though it was a thermos pot it could be operated one-handed, via a suspended tilting lid which opened and closed by the motion of pouring. I was told that it was designed by the famous industrial designer Erik Magnussen and that it was represented at museums throughout the world. I knew that one day I was going to have such a coffee pot, as well as a lamp and a sofa in the same style. Though at that time I knew nothing about Eric Magnussen, Poul Henningsen and Børge Mogensen as designers and their relations to functionalism as style.

I did, however, have some knowledge about the work done by industrial designers at the Ergonomic Design Group in Stockholm. In fact I had been co-operating with some of them developing full-scale mock-ups for a printing industry computer workstation for text and image processing systems. These full-scale mock-ups were used to support user participation and

early "envisionment" as fundamental aspects of our research on systems development for quality of work and product. To say the least, it was quite a surprise for me to find out that the "cheap looking" SAS coffee pot was designed by Maria Benktzon and Sven Eric Juhlin from the Ergonomic Design Group. It even turned out that the design method they had been using designing the coffee pot was highly participative and that mock-ups for user envisionment were extensively used throughout this design process. Together with stewards and stewardesses they had been trying to solve a major work environment problem for the personal in the cabin - the frequent muscular-skeleton injuries from serving coffee. At the same time the pot had to be "drip free" so there was no risk to spill coffee on the customers.

It turned out that their design was a success, not only in the sense that it won a design prize. For several years on my flights between Sweden and Denmark I always asked the person serving the coffee if he or she was satisfied with the new coffee pot, and there was always a positive answer. I can not tell you exactly why and how, but in the light of this knowledge about the participatory design process, the work environment problem to which the artifact obviously contributed to a solution, and the satisfied users, my view on this coffee pot changed. I do not find it ugly anymore. Maybe it is not beautiful, but the design seems appropriate, and later on I have understood that this appropriateness as a relation between form and function also link aesthetics and ethics together.

In the meantime I got my stainless steel coffee pot. It was truly beautiful, but using it at home revealed new aspects. It turned out not to be "drip free", however more important, the suspended tilting lid which opened and closed by the motion of pouring was smart, but it could not keep the coffee warm for more than an hour. That was a disappointing experience, when expecting to have a hot cup of coffee on an evening working late. The beautiful stainless cylinder together with the tilting lid was also the source of another problem. The relation between the base and the height of the steel cylinder made it rather unstable and easy to tilt, and then the tilting lid opened. With small children around my beautiful coffee pot became a dangerous trap, at least during the first hour when the coffee still was hot. So my beautiful stainless steel cylinder ended up in the closet, and the only time I use it now is when I tell this story to my students. I still, however, find Eric Magnussen's coffee pot beautiful, but now with reservations. I do no longer find the design exemplary, at least I do not find it appropriate in the context of family life with small children or as a container for hot coffee to keep you awake when working late. Appropriateness, I have now learned is a more important aesthetic category than beauty, and a "pretty interface" is only so in an appropriate context.

So far my experiences of design and the artifacts we call coffee pots. Now to the appropriateness of telling this story of in the context of information technology and this conference. The idea I want to illustrate by the example is that in design of IT artifacts we have a lot in common with designers in other design fields. I also want to draw the readers attention to the twofold character of design as both a process for determination of an artifact (*design process*) and as the product of this process (*artifact-in-use*), and how not only engineering and technical but also ethical and aesthetic aspects of design are fundamental to both process and product. Finally there is a hint to the importance of context and style. Designing for usability really means to designing for quality-in-use. How do we do it? What can we learn from other design disciplines?

Some answers are suggested by Terry Winograd and others in *Bringing Design to Software* (Winograd 1996). We can learn that design is conscious, keeps human concerns in the center,

is a conversation with the material, has social consequences, is a social activity, etc. The book is opened with a reprint of "A Software Design Manifesto" written by Mitchell Kapor, founder of Lotus Development Corporation and the designer of Lotus 1-2-3 spread, in 1990. As an industrialist Kapor observed:

The lack of usability and poor design of programs are the secret shame of the industry. (...) By training and inclination, people who develop programs haven't been oriented to design issues. This is not to fault the vital work of programmers. It is simply to say that the perspective and skills that are critical to good design are typically absent from the development process, or, if present, exist only in an underground fashion. We need to take a fresh look at the entire process of creating software - what I call the software design viewpoint. We need to rethink the fundamentals of how software is made.

In this paper I will argue that this "software design viewpoint" has to do with our ability in practice to concurrently handle seven questions about quality-in-use. What is needed is a social, behavioural and humanistic focus on artifacts-in-use that can take into account an appropriate balance of technical objectivity, social use, and subjective experience of software artifacts.

I will also give an example of how a "repertoire of exemplars" on the Internet- The Qualitheque - can be used in educating the reflective software designer.

2 Design for quality-in-use

As designers we can be said to have relations to three "worlds": the objective, the social and the subjective. The languages of these worlds are very different. The objective world has to do with rationalistic design. Quality is a question of prediction and control. The social world concerns understanding, interpretation and communication. Quality becomes ultimately a question of ethics. In the subjective world we deal with emotional experiences and creativity. Quality is a question of aesthetics. We relate to these worlds and their language both in design as product (*artifact-in-use*) and process (*design process*).

What we need is a way to address significant aspects of the control, ethics, and aesthetics of software artifacts. This was the approach to "design" taken by the architect Vitruvius about two thousand years ago. When architects today assess buildings in terms of their *structure, function, and form*, this goes back to the *de Architectura* in which he divided the study of buildings into *firmitas, utilitas and venustas* (firmness, commodity, and delight). These are exactly ways to assess the objective, social, and subjective quality of artifacts.

In summary, our ability to judge the quality artifacts has historically been focused on the "objective" structural or technical aspects. Taken alone, no matter how well they are understood, these aspects say very little about quality-in-use. To understand the quality-in-use of a software artifact, we also have to be concerned with the contextual aspects of function and form. To that end we have well-elaborated design perspectives with which to judge the "social" functional aspects of an artifact. Finally, when it comes to the "subjective" experience of IT artifacts, we are just beginning to form an aesthetic perspective. Without such a perspective, our ability to judge the quality of an IT artifact is severely hampered (Ehn and Löwgren 1997).

Shifting from product to process it is interesting to notice that not until the sixteenth century "design" emerged in European languages as a term. The emergence of the word coincided with

the need to describe the process of design and the profession of designing. Especially the term indicated that designing was separated from doing (Cooley 1988). In modern times the design process has been studied as an academic field since the early 1960s. The field has been dominated by architectural and industrial design.

he development of design approaches can be described in three generations corresponding to each of our three design worlds (Cross 1984, Ehn 1995). The "first generation" design approach focused on *engineering*. It addressed our "objective world" and the answer had to do with control - with the correct representation and manipulation of objects, facts and data. The second one focused on *participation*. It addressed our "social world" and the answer had to do with ethics - with democracy and appropriate social interaction. The third one focused on *design ability*. It addressed our "subjective world" and may be described as having to do with aesthetics - with the expressive and creative competence of designers. In retrospective the design approaches seem complementary rather than mutually exclusive.

This leaves us with six related questions to which we will have to come up with appropriate responses, and a seventh holistic question that has to do with our ability to relate these questions to each other in a proper way in the practice of designing software for quality-in-use - in practising the design viewpoint. (See table).

"World"	objective	social	subjective
Aspect			
artifact-in-use	structure How do we make sure that the artifact is made of the right material?	function How do we make sure that the artifact is useful in its context?	form How do we make sure that the artifact supports appropriate experiences?
design process	engineering How do we control of the technical development of the artifact?	participation How do we support appropriate interaction in the design process?	design ability How do we support creativity in the design process?
Quality-in-use	appropriateness How do we find a proper balance among our responses to the questions above in our design practice?		

3 Educating the reflective designer - an example

In architecture and industrial design, professional design competence rests upon a knowledge of exemplars, traditions, epochs, and styles like classicism, functionalism, modernism, and post modernism. A "style" is typically expressed by a repertoire of exemplars that at a certain period make up the general frame of reference (Scruton 1979). As in the sciences, this is a question of paradigmatic understanding (Kuhn 1962).

The IT Design project, which started in October 1993, is based on the idea that we in the IT field have a lot to learn from other design disciplines, like architecture and industrial design. When the project started we assumed that improvements in the IT design process fundamentally depended on improvements in the IT designers' ability to assess and appropriate the quality of the contextual products of this process. As designers of IT, we, like other designers, needed to focus on artifacts-in-use and find a language for critique. To go beyond process and method, we had to understand computers in context. In approaching this problem, we were inspired by "theories of styles" in architecture and industrial design. What we needed were basic concepts and a repertoire of exemplars that would help us reflect on the contextual quality of IT artifacts. We started to build a repertoire by examining exemplars of IT in use, focusing on ethical and aesthetic as well as technical aspects. We wanted to understand how people used the artifacts socially, how they subjectively experienced them, and how the technology supported these contextual aspects.

We still strongly believe in the appropriateness of this approach and have come to the conclusion that the task is too important, too complex and, too huge, to be left to a single research group in one corner of the world. That is why in the summer of 1995 we started to develop the Qualitheque (Ehn et al. 1997).

The Qualitheque is an international, interactive and virtual medium where structured representations of IT artifacts-in-use are presented and debated on the Internet. It is technically implemented as a world wide web server and is accessible through standard browsers.

To professional practitioners in the field of software design, including researchers, teachers, and students, the Qualitheque has the potential of becoming a studio and exhibition which will form a valuable source of good examples, an extended repertoire of exemplars, a more comprehensive design language, a network and ongoing dialogue with colleagues, and more engaged learning based on real-world cases.

The Qualitheque is a multifaceted enterprise involving many people in different roles.

Potential contributors to the Qualitheque submitting structured representations of IT systems in use include, practitioners, researchers and students in the IT field, organizations using IT describing their use experiences, organizations developing IT systems presenting their work, and so on.

Visitors to the Qualitheque investigate the contributions and comments, try out interactive prototypes of the represented artifacts, and engage in a dialogue about the contributions and the critiques.

The studio and exhibition "grows" as more people offer contributions, critiques and comments.

Exhibits in the Qualitheque are representations of IT artifacts-in-use. Initially there are no categories. Manufacturing systems, inventory systems, accounting systems could be exhibits, but exhibits could just as well be communication devices, programming environments, educational systems, simulations, games, toys, or even art. Exhibits must, however, be representations of real systems that have been in use in practice for some time. The Qualitheque is not an exhibition of ideas and prototypes. The reason is that the Qualitheque is a meeting place for discussions about quality-in-use. Exhibits should be representations of the artifact-in-use in three dimensions - a technical, a social, and a subjective. The exhibits will also contain a storyboard prototype of the system. The mode of representation and the degree of interactiveness is the

choice of the contributor. We anticipate exhibits ranging from simple textual representations to very interactive multimedia representations.

The basic idea with the Qualitheque is the ongoing design quality dialogue, but there will also be special exhibition events with design awards for the best contributions.

The Qualitheque, based on a repertoire of exemplars and informed dialogues about their quality, has the potential of becoming a useful mean for developing the "software design viewpoint" and for "educating the reflective designer" that Donald Schön shows that we need. A person that depend less on rigid decision-making models than on the capacity to reflect before taking action in real complex contextual cases where established theories often are out of place (Schön 1991).

We are only in the beginning of forming a community that share and debate exemplars of quality-in-use software. Participation from many more software designers is a necessity, but the results from workshops that we have carried out so far at several universities with students and colleagues are very promising. And you can always try it out for your self at "qualitheque.ics.lu.se", as Eva does in the narrative below illustrating the Qualitheque. (The story is taken from (Ehn et al 1997) and is written by Odd Steen and Theis Meggerle.)

Darkness was falling and the twinkling of the street lighting started to illuminate the surroundings outside Eva's window. Eva became aware of the street lights and suddenly realised that she had been sitting in front of her computer all afternoon exploring the web with the new version of Netscape. She was now visiting "Qualitheque" which she had read about in an interesting book on software design by Terry Winograd. She was intrigued by the idea of having "living" presentations of IT artifacts-in-use as a source of inspiration and wanted to find out if there was something she could learn about IT design from it.

For the last half hour she had been thinking about ending today's session, but could not drag herself away as she continuously found a variety of interesting topics to discover. She was browsing through the spectrum of topics when suddenly her eye alighted on the word "IKEA-MHS."

"Haven't I seen this system before?" Eva thought and remembered that it was when they bought that nice lamp last week. She clicked on the topic and a new book-cover-like page appeared. On the top of the page was the Ikea logotype and an abstract with links to different interesting parts of the presentation. Eva found this astounding and called Adam.

"Hey, Adam look. Here's a kind of IT gallery or exhibition."

"What?" said Adam.

"An IT design studio. It should interest you."

Adam, who was reading a good book, raised himself from the chair and went over to Eva. He did not like to be disturbed in his reading and thought that Eva had to have a good reason. When he saw the computer screen, he really did not understand why Eva thought that he should be interested, even though it looked nice in a Scandinavian way. But since Eva was a persistent woman, he could not avoid sitting down next to her to find out what this exhibition was all about.

"And why should this interest me?"

"I was thinking about the book on architecture you're working on," Eva said. "Isn't it supposed to be based on cases and related to styles?"

"Yes, something like that."

"Then maybe this can serve as an example of how you can go about it," Eva said. She clicked on the link named "What do the 'Ikeans' think about MHS?" and a new page appeared. This page was divided into two parts; on the left side was a photograph of one of the salesmen and on the right an audio-link to an interview with him. They chose the link and heard Jesper tell them what he thought about the MHS system.

"Funny how he like the system even though he thinks it's old and overloaded. I mean, this system is from the seventies and with today's technology there should be something better," Eva said.

"Well I don't know, you're the expert. Maybe we can find an explanation somewhere else in the presentation?"

Eva clicked back to the abstract page and chose the link to the description of how IKEA is organized. After reading about IKEA's organization and the special Ikea spirit, Eva suddenly exclaimed: "Now I get it! Maybe it's because of the IKEA spirit they like the system. This relatively boring and kind of gray system is in accordance with the IKEA attitude."

"You mean that the system could have some kind of symbolic value? That their experience of the system is influenced by the Ikea spirit?"

"Just a guess, but it's as good as any. But if there is a strong connection, it really is important. I haven't thought before of the symbolic value as a determining factor when it comes to how users experience computer systems."

"It reminds me of an architectural theoretician, I think it was Wölfflin, who talked about collective feelings, which in this case could be the IKEA spirit, that are reflected in a style. Maybe it is possible to say that the symbolic value expresses a certain style."

"You mean MHS as a style-forming example?"

"Perhaps. Hm...on the other hand it is not very common to consider the actual use of the artifact in architectural styles, so I might be wrong."

"I wonder if there is a debate on this subject," said Eva. She used the debate tool and a new page appeared with different threads of debates on the MHS presentation. The threads were organized by topic, and one thread started with a contribution by Bo Dahlbom, who was suspicious of the seemingly relaxed atmosphere that was documented in the presentation.

"Look, Bo Dahlbom has written a contribution here!" Eva said.

"Who's he?" Adam asked.

"He's a well-known professor in Gothenburg. He's very much into conflicts and dialectics and thinks that these are the driving forces in systems development. I can imagine what the contribution is like."

Eva opened the debate thread and the debate came into view with Dahlbom's contribution first. "I told you, it would be about conflict," she said.

After reading Bo Dahlbom's contribution, they continued browsing through the different debate contributions and noticed that the debate was chronologically ordered except for retorts, which were kept together with the original contributions. Some of the contributions were more like short comments, and others were longer, like the one by Dahlbom. His contribution seemed to be quite controversial; he had obviously started a vivid debate, considering the many retorts made by others to his contribution. They eventually left that debate thread and started browsing through the others.

"This is really informative," Eva said. "Look, there's a comment about another sales support system."

"Yes it is," said Adam, who thought that he was not so very interested in either computers or things related to their use. But since the Qualitheque might give valuable ideas for his own work, he remained by Eva to look.

Eva opened the comment and read aloud to Adam: "If you read the description of MHS about the symbolic value you will find similarities with how the salesmen experienced "Säljstödet" at Volvo; choose this link to read about it." This made Eva even more interested, but Adam was becoming tired and was thinking of going to bed

"Well, well, Eva, it's late and we have to get up early tomorrow. Let's go to bed."

"You go to bed; I'll stay up a little while."

"OK, said Adam and left the room."

Eva clicked on the link, and after a short while a page with a picture of a Volvo car appeared. Eva read the abstract that explained what this description was about. She also noticed the facts-and-figures table explaining the system and context in short sentences. "Säljstödet" was obviously a Mac system written in 4D running on standard Macintoshes with color screens and laser printers. It was implemented in 1990 and designed by a software company in Stockholm. The system was used by 400 car salespersons, all men. From the abstract she learned that the two young and ambitious researchers at Lund University had found that the symbolic value of the sales support system was very important to the salesmen's self-esteem and the customers' view of the sales process.

She browsed through the description and was reading parts of it more closely when suddenly she was alerted to a text telling her to click a button to have a guided tour through the sales support that would actually let her, in a way, test the system. Of course, she could not resist. After having been guided through and having tested the system, she thought she had a very clear picture of how the sales support system worked and was used. Now she wanted to read and reflect more thoroughly on the description, so she chose to print it out so she could read it over in peace and quiet.

She was quite tired; her wristwatch showed a quarter to twelve, but before she ended the session she wanted to find out how to make a description that could be sent to the Qualitheque. She therefore went back to the Qualitheque main page and opened the info page, containing addresses, names to, and pictures, of the Qualitheque editors in Lund, their homepage on the Internet and a downloadable guideline on how to write Qualitheque exhibits. Downloading the guideline was the last thing she did before turning off the computer and going to bed. Before she fell asleep, she thought that she had to tell her colleagues tomorrow about the

Qualitheque and its obvious virtues, and she heard Adam mumbling about styles in his dream...

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