Design for use quality in home informatics

A multiple perspectives view

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Both theory and practice of use quality and usability are well developed in the area of information technology (IT) for work, but we know less about how to design for the home. Architects have, however, designed homes for a long time and industrial designers have designed a multitude of products for it. It's time to learn from these fields and allow them to enter the area of human-computer interaction. Kristina Hooper argued this as early as 1986, but we have only recently begun to see it in practice due to the development in embedded computers and the Internet.

I believe that the different design professions can learn from each other, and I suggest a model of use quality influenced by architectural and industrial design. It is a multiple perspectives model, and I argue that it is highly applicable in a home context. I will also indicate how this model can be used in a formative sense in design practice.

Multiple perspectives of use quality

The human-computer interaction (HCI) community traditionally sees quality in use as consisting of effectiveness, productivity and satisfaction as described by Bevan (1997). This definition, also adopted by ISO/IEC 14598-1, is strongly related to office software. When used on non-work applications its bluntness is apparent and the satisfaction category tends to become a large "misc."; a category into which everything that does not fit anywhere else is squeezed. Similar models, stating desirable usability attributes, have been suggested throughout the years, examples include REAL: Relevance, Effectiveness, Attitude and Learnability (Löwgren, 1993); and LEAF: Learnability, Effectiveness, Attitude, and Flexibility (Schackel, 1990). The originators may have intended for them to be seen as use qualities rather than product qualities. But considering the way they are used in software development they have unfortunately turned out as product qualities.

I would argue that instead of stipulating lists of attributes like the ones above, it is more rewarding to take a step back and view the whole use in its totality from different value perspectives. To get a holistic understanding of the total situation of use, the designer has to actively alter between perspectives, looking at the situation from different angles. This may be important when designing for work too, but when entering a novel design situation (e.g. the home) it gets even more important. If the designer don't question the pre-conceptions of what good use quality is, she risks over-generalising her repertoire of design examples. The purpose of altering perspectives is avoiding that.

Several multiple perspectives models of use quality have been suggested during the

last decade (Löwgren & Stolterman, 1998; Ehn, Meggerle, Steen & Svedemar, 1997; Ehn & Löwgren, 1997; and Dahlbom & Mathiassen, 1995). These models draw heavily on the traditions of architectural and industrial design (e.g. Paulsson & Paulsson, 1957; and Lambert, 1993). Literature, preliminary research, discussions with colleagues and teaching interaction design have lead me to use the following perspectives in my work:

Practical use quality is what traditional usability work and much of informatics is about. How the artefact helps the users to achieve their goals and meet the objectives of the organisation. I will exemplify with a quiz game for interactive television (for a closer description see Arvola and Holmlid, 2000): The designer decides that the feedback in the game should be strong enough for the remote-owner to see and recognise her actions. This is a decision made from a practical perspective.

Ethical use quality denotes the wider effects of the use and misuse of the artefact. Aspects of power, authority, control and environmental issues are closely linked to this perspective. For the game mentioned above, there is a matter of sequencing of control. Should it be a turn-taking game or should one person have the remote control, and who is then holding the remote? Is it the man of the house?

Social use quality is related to how the object is used in relation to other people. An artefact may be a symbol of status, social differentiation and identification. Furthermore, some artefacts are more appropriate in some contexts than in others. Regarding the game: Is it appropriate to play it in the living room where the television set is, and what does it say about the owners of interactive television? Another, more direct aspect of social use is the artefact as a conversation piece, feeding into the interaction between people and directly structuring the social interaction. A quiz game certainly has this function. If it is to work properly in a social setting the rather weak feedback decided on from a practical perspective must be stronger so that the by-sitter knows what is going on.

Aesthetic use quality is characterised by a moment of contemplation over the experience of using the artefact. The players of the game must find it appealing at first contact, still cool after some time and rewarding after several gaming sessions.

Constructional use quality is the material aspects of the otherwise immaterial information technology. This perspective carries qualities commonly addressed in software engineering such as robustness, maintainability, portability, compatibility and so fourth. It's also about the possibilities and constraints of the material. Some things can't be done because of, for example, memory constraints or lack of bandwidth. A question in the case of the game is which platform it is on: cable, satellite, or terrestrial. To achieve acceptable downloading times the feedback visualisations may have to be cut down or sound left out.

Affective use quality is difficult to design for but nevertheless interesting. There is an affective value of many personal items; an artefact that has belonged to your grandmother carries many memories with it. This can not be designed for (except for nostalgia) instead the affective qualities are developed during a long-term use. The players of the game may begin to like it and remembers it with a smile several years later since they had so much fun together while playing it.

There is however one problem with the multiple perspectives. Their origin is in architecture and they don't carry the dynamic properties inherent in the material of IT. Both the use of the object and the object as such is more dynamic. The perspectives tend to focus the designer's attention on static aspects of the use, but using a piece of technology is never static. Like all action it is an ongoing, dynamic process of seeing and doing (e.g. Naisser, 1976; Ihde, 1979; and McCullough, 1998). It can not be dealt with or understood in terms of snapshots. This is even truer for IT than it is for more static

artefacts, like buildings or chairs. Holmlid (1997) has criticised Ehn and Löwgren (1997) on this account, pointing out that their perspectives don't take into the account the differences between buildings and IT:

> "On a continuum from static to dynamic objects, architecture is by virtue closer to the static end than is system development. On another scale the use of architectural objects in most parts is passive, but in some parts interactive as well as pro-active, while the use of software, by definition, is interactive and pro-active, and only seldom passive." Holmlid (1997, p.14.)

His criticism is as valid for the multiple perspectives described above as it is for the framework of Ehn and Löwgren. I therefore suggest a tentative quality perspective of *action quality*: the quality of the flow of interactions. In the case of the game: Does the turn-taking interrupt the game play or is part of its rhythm; do the strong visualisations disturb the interaction with the game; and is the interaction between the players disturbed since they face the screen rather than each other?

I argue that it is important for a designer to employ a broad and flexible model of use quality, when designing and assessing IT in a novel context, like the home is. The multiple perspectives view is both broad and flexible, and can contribute to the designer's understanding of different home-use situations.

Working with the perspectives

I have given examples from a quiz game on how to use the perspectives in interaction design, but let us elaborate on that. The perspectives are not to be seen as complementary but as aspects of a whole—the use of the system (Holmlid, 1997); a design decision concerning the construction of a system should be considered not only from a constructional perspective but also from other perspectives. It's important to consciously alter between the perspectives when approaching a use situation in order to capture the holistic character of the use and not only fragments of it. Consider this example:

> A car designer decides that car accidents are too frequent. That decision is made from an ethical perspective based on the personal ethical values and on the prevalent value systems in the society. The car designer believes that it's vital to listen to these values. One of the reasons for the accidents is the speed of the car. The high speed was initially a social and aesthetic design decision, which now is evaluated from an ethical standpoint. The design solution is an electronically limited speed, let's say 250 km/h. This is easily evaluated from a constructional and practical perspective by measurement. But 250 km/h is still very fast, and may have to be addressed again from an ethical perspective.

In this example, the perspectives are *ethical*, *practical*, *constructional*, *aesthetic* and *social*. The specific use qualities are *speed* and *safety*. The meaning of the specific use qualities is initially loosely defined and the process of specifying them into assessable design goals is gradual by necessity, due to the explorative nature of the design process.

Use qualities of everyday technology

To further explore what use quality of everyday technology is, a cultural probe (Gaver, Dunne & Pacenti, 1999) will be launched. The probe will consist of disposable cameras, diaries, and postcards describing product concepts. Informants receiving the probes will

be asked to write a diary and take photographs on how they meet technology during a week. The focus is to gather emotions and thoughts regarding everyday technology. The postcards are initially only used to provoke reflection. Analysis of the material will be focused on meaningful use qualities, and their underlying values and understandings. The different perspectives will guide the analysis, and aspects of practical, ethical, social, aesthetic, constructional, affective, and action use quality will be explored.

I have suggested that use quality of IT in the home should be viewed in a broad a flexible manner from various perspectives, and that we should question the use quality models prevalent in HCI today. Future work will include launching a cultural probe.

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