Seamful Design – The Other Way Around

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ABSTRACT
This paper describes a new way of thinking when designing ubiquitous technology. Instead of trying to hide all of the technologies from the user the paper propose that the limitations of the ubiquitous system should be made visible. This to encourage the user to use the technology in new ways and to let the user to be a part of the development of ubiquitous computing.

Keywords
Interaction design, ubiquitous computing, seamfulness, seamlessness, appropriation.

1. INTRODUCTION
Since Mark Weiser coined the phrase ubiquitous computing, invisibility has been seen as something that is tightly connected to this subject. Mark Weiser thought that invisibility was something fundamental concerning ubiquitous computing. This is not a surprising opinion, when building ubiquitous components you often hide electronics and technology inside everyday objects. There is a quotation by Mark Weiser that has become widely known and that has been used to lay a foundation for today's view of ubiquitous computing. *"A good tool is an invisible tool. By invisible, I mean that the tool does not intrude on your consciousness; you focus on the task, not the tool"* [1]

It seems that these words has a loot to do with today's view of ubiquitous computing and that ubiquitous technology should be invisible and seamless integrated into its surroundings. Seamless integration means that technology is hidden for the user, the user should not be aware of shortcomings that are caused by underlying technology. The technology is not supposed to have any visible seams.

Mark Weiser's words about visibility has been equalized with seamlessness and this has become some sort of truth and a lot of research has been concentrated on making ubiquitous systems that strive for invisibility and seamlessness. This, despite of the fact that Mark Weiser both before and after the publication of the above quotation clearly have showed that he does not think that invisibility and seamlessness must mean the same thing. In 1991 Mark Weiser stated that:

"Therefore we are trying to conceive a new way of thinking about computers in the world, one that takes into account the natural human environment and allows the computers themselves to vanish into the background.

Such a disappearance is a fundamental consequence not of technology, but of human psychology. Whenever people learn something sufficiently well, they cease to be aware of it. When you look at a street sign, for example, you absorb its information without consciously performing the act of reading… All say, in essence, that only when things disappear in this way are we freed to use them without thinking and so to focus beyond them on new goals." [2]

By this, Mark Weiser means that there is no need for technology to be physically invisible to seem invisible for the user. It is not necessary to strive for seamlessness in order to obtain invisible technology. Once a technology becomes a part of the daily life it automatically turns in to an invisible technology.

Matthew Chalmers and Ian MacColl points out that Weiser during talks in 1994 and 1995 claim that; making technology seamless is the same as doing everything the same way, and that it is better to set focus on making seamful technology with "beautiful seams" [3] According to Chalmers and MacColl this statement is the same as: *"making everything the same is easy; letting everything be itself, with other things, is hard."*

It is probably from these statements that Chalmers and MacColl have found inspiration for there own thoughts about how to design technology for ubiquitous computing.

"We suggest, however, that letting a ubicomp system be itself means accepting all its physical and computational characteristics—that may either be weaknesses or strengths."

It is in the above quotation that the essence of this paper can be found. The idea is to shift from designing seamless technology and instead design for seamful interaction. Instead of trying to make the technology completely invisible for the user seamful designing means the opposite. Build ubiquitous technology that displays the seams and make sure that the user becomes aware of the limits and constraints that a certain technology has.

A simple way to show what the difference is between designing for seamless interaction and designing for seamful interaction is the example that follows. This is an example that is used by several of the researchers within this field. [2]

Today, a mobile phone is a very popular accessoar that is being used by a lot of persons and it is also the technology within ubiquitous computing that has become the most popular. The signal strength that a mobile phone has is a physical property that depends on the structure of the mobile phone network. This property is shown to the user via numerous bars in the display. Except this, the signal strength can be noticed by how clearly a user can hear the person that he or she is talking to. Which cell the telephone currently is using is however not displayed to the user, nor is the shifting between cells. This is an example of seamlessness, the technology is hidden to the user and there is often no way to make this information visible. On the other hand if it had been possible for a user to choose which cell to connect to it would have been an example of Seamfulness. If this was the case, a user of a mobile phone should have the possibility to find stronger or weaker signal strengths.

This new way of thinking, to design for seamfulness does not mean that all technology should be made visible. Presenting new ideas is often done by taking a nearly extreme attitude towards the subject. This is a way of raising a debate about the subjects that are being presented. The truth is almost never black or white, which all researchers are aware of, even if it sometimes may seem like they are prepared to defend an angle of approach in an almost absurd way. I believe that ubiquitous technology should not be completely hidden, but I also believe that there is no point in trying to make all the technology visible. I think that the best way is to strive for an increased visibility in ubiquitous computing. But I also think that it is important to realize that there are ubiquitous technologies that more or less can be completely hidden. One example of such a technology is RFID, a technology with a lot of advantages compared to the old bar codes. This is an example of a case where the interaction has been simplified, an interaction that prior to RFID was necessary but not wanted.

A lot of ubiquitous technologies benefits by being visible, especially technologies that uses well-known technology and has well defined boundaries. In my opinion there has to be technologies that has no purpose in being visible. I believe that RFID is one of those, at least when used as a substitute for bar codes in logistics management.

Designing for seamlessness or seamfulness does not inevitably mean that a technology is always visible or always invisible. Instead one should focus on making a technology visible when necessary and then to disappear when not needed anymore.

2. INVISIBILITY

Together with seamful and seamless, the word invisible is an important component when discussing this topic. Invisibility might seem to be a simple term, but it is used in different ways and can mean different things when talking about it in a ubiquitous context. Invisibility can mean to design for invisibility, to design for a seamless interaction. In this interpretation invisibility is used to describe a way to hide the technology from the user, the user is not supposed to reflect on the underlying technology. Another way of interpreting the word invisibility in this context is that a technology may be visible from the beginning, but when it becomes a part of daily life it suddenly becomes invisible. The technology ceases to exist when it is not seamed as a technology anymore.

Paul Dourish describes this second view of invisibility in his paper “What we talk about when we talk about context” [4] Most of the things in our daily lives are seen as usual and nothing that we reflect upon. If somebody tells you “I saw an accident on the way to the bank office” it is the accident that you enlighten. You do not reflect upon the matter that the person was on his way to the bank, that is something ordinary and will therefore not be questioned. Dourish also points out that it is the mutual understanding about what is ordinary and what is abnormal that makes us interpret things and events as ordinary or abnormal. This view is something that can be transferred to actions. Ordinariness is something that we do and not a stable feature of the world, it is something that can change due to our course of interaction. This is also a mutual achievement, ordinariness must be recognized by both participants in an interaction. Ordinariness also depends on the form of the language used by the participants. Words and phrases that are natural and ordinary for astronauts can sound unnatural to a person of a different occupation.

3. ADVANTAGES WITH DESIGNING FOR SEAMFUL INTERACTION

When designing with focus on seamfulness it is easier to obtain a higher degree of user centered approach in the design process. By letting the user know about the limitations in the technology it is possible to use the users’ uncertainty and to encourage the users to adapt the technology to the situation.

People are curious by nature and they use things and technologies in different ways. By making shortcomings and limitations visible it is possible for the users to change the way they interact with ubiquitous technology and adapt it to a certain context. This way of thinking is called social navigation and was introduced by Chalmers and Dourish in 1994. [5] Social navigation is navigation towards a group of people or a navigation that is based on the fact that other persons have done the same navigation. Dourish et al. [5] means that this can be seen as a woodland path, if no one uses the woodland path it will cease to exist after a while. The status of a woodland path is measured by how much it is used. By taking this in consideration when designing for ubiquitous interaction it is possible to obtain technology that changes over time, just like languages, cities or woodland paths. Chalmers et al. means that it is this way that technology should behave. When it is used its user changes the way it behaves and the way to interact with it. When a ubiquitous technology is used the users’ leaves trails that other users can get help from.

4. UNCERTAINTY

By different sorts of feedback and by involving the users in different ways during the use of ubiquitous technology it is possible to make us of the visible seams. Artifakos et al. [6] claims that users are used to uncertain information, that this is a part of the daily life and something that they are capable of dealing with. Artifakos et al. suggests that uncertain information is something that should be presented to the user in order to let the user choose their preferred way of interaction. Studies have shown that users’ performance increases when uncertain information is presented.

Chalmers and MacColl are also aware of the benefit of presenting the users to uncertain information. They claim that it is important to present uncertain information in a clear way and that developers of ubiquitous systems should try to make us of this uncertainty when designing for seamful interaction

5. APPROPRIATION

Designing for seamfulness is the same as designing for appropriation. Broll and Benford [7] claims that designing for appropriation increases the users’ awareness of the system, there is no longer any need for the user to adapt in order to use the technology. The user is no longer needed to interact with the technology in a predetermined order. Broll and Benford emphasize that by designing for appropriation the users can interact with a ubiquitous technology in a more individual manner and use the seams to develop new ways of using the technology.

According to Dave Curbow [8] people does not like to be forced to interact with something in a predetermined way, people like to improvise. If you want to change a light bulb in lamp a ladder might not be the best equipment to use, you might instead use a chair. This means that the chair has been taken out of its normal role, which is to be seated on. Someone may think that a chair is the perfect object to place a TV on instead of a milk crate. It is not likely that the manufacturer of the chair has had this in mind when designing the chair, but the manufacturer of the milk crates could have this in mind since it is fairly common to use a milk crate for this purpose.

Broll and Benford [7] use another example to show how appropriation can be used. Lack of signal strength is a legitimate reason for not answering a call on a mobile phone. If a mobile phone is designed for Seamful interaction it would be possible to use this knowledge to pretend that you are outside of coverage of the mobile cells or in a tunnel.

6. CONCLUSIONS

I believe that you should design for seamful interaction in ubiquitous computing, it enhances the flexibility of the technology, it lets the user decide how to use and interact with it, to change it and develop the interaction over time.

One thing which is complicated with this subject is that there are no sharp boundaries to rely on. It is not always suitable to design for seamful interaction and it is not always bad to design for seamless interaction. As I earlier has mentioned, there are technologies that benefit of being invisible, as RFID. I agree with Broll and Bredford [7] when they emphasize that the best solution would be to design for seamless interaction but with seamful technology.

It is important to realize that all technology has limitations and that it is impossible to completely get rid of these. One should instead focus on exploiting the advantages of showing the limitations, limitations that makes it easier for users to adapt to new technology and bring it together with existing technology. These limitations and the uncertainty of information are also making it easier for users to collect impressions from the surroundings and make us of this to adapt the ubiquitous technology to his or hers condition.

The biggest problem with designing for seamfulness is that the goals that have been set are very hard to reach, especially because of the fact that there still are a lot of open questions to be answered. There is a need to understand which seams that are important? which seams that should be visible? how the users are supposed to use the visible seams? and how to present this seams to the user?

A lot more work has to be done in this field, before seamful design can be widely used and properly understood. Methods and guidelines on how to answer the above questions should be constructed to make it easier for other researchers and designers to adapt to this new way of designing.

7. REFERENCES

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