

Aesthetics as a Critical Design Issue in Proactive Computing

ABSTRACT

This paper explores how the notion of pragmatic aesthetics could be used to design proactive information technology. Proactive IT is a vision initiated by Tennenhouse. According to this vision, technology disappears from sight into material environment, taking action on its own based on information from sensors.

One of the consequences of this vision is that people lose a good deal of control of IT after configuring devices and systems. As technology is built into existing material environment, aesthetic issues become crucial in terms of whether people accept and whether they do not accept new technologies.

This paper reports one study – called the Four Lamps Study – from a larger project Morphome, conducted in Tampere and Helsinki in 2003-2004. We explored the aesthetics of proactive IT with four aesthetically different lamps. If aesthetics is understood pragmatically, we get a useful insight into what kind of work ordinary aesthetic judgements do when people relate to new technologies.

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THE VISION OF PROACTIVE INFORMATION TECHNOLOGY

At the turn of the decade, David Tennenhouse [1] presented a vision of "proactive computing," or information technology that surveys its environment with sensors, taking action based on occurrences observed by these sensors without human intervention. These actions extend from changing lighting to critical control systems of the home. In a weak version of this vision, technology suggests actions to users, giving control to them. A stronger version maintains that technology ought to take action on its own without the users' awareness [2,3].

This vision may solve a basic problem in the earlier notion "ubiquitous computing," presented by Weiser [4]. Some 15 years ago, Weiser noted that although personal computers have become icons of modern information technology, they contain only a small portion of processors in modern life. More processors exist in other technological equipment than the traditionally grey box we call the "computer": toys, mobile devices, alarm clocks, thermostats, ovens, and toasters. Weiser's notion has been turned into an important research topic, as well as into an increasingly important area of design, including such "obvious" design objects as DVDs and digital TVs to more traditional things like furniture, and to spaces and environments [5].

The problem with this notion is that human beings cannot control hundreds of IT devices in their environment. The solution is to take control away from them, and let technology take action independently; technology ought to be "calm," not require continuous attention [6]. The proactive vision has a promise of an environment in which familiar things – like furniture – changes its behavior, or which is infested with new technological objects. The environment monitors humans, and not just reacts to their behavior, but behaves in new ways.

However, if information technology is embedded into objects such as pillows, sofas, tables, chairs, not to mention ceilings and walls, it easily clashes with traditional, conventional uses, or "affordances" of these objects [7, 8, 9]. People expect that these objects function in certain, traditional ways. If these objects come to have new functions based on information technology, people may experience such environment as uncanny, out-of-control, as their trust in their own, traditional methods of action fail to anticipate its behavior. Surprises, frustration and anger feed suspicions about technology's usefulness and harmlessness, degrading user experience. Designers have to give people something in return: I will explore how aesthetics could be used as a design resource for designing proactive technologies of the future.

WHEN PROACTIVE TECHNOLOGY GOES HOME, PRAGMATIC AESTHETICS IS NEEDED

If we understand aesthetics from a pragmatic perspective [7], we need to understand it as something people do, not in the abstractions of philosophy or other learned discourses, not in emotional responses to products, as in Don Norman's recent

work. In contrast, the pragmatist perspective situates aesthetics to human action. In brief, people place objects to space and adopt them to their activities partly on aesthetic basis. From a sociological point of view, this aesthetics is

- *dispersed into a multitude of acts over time and space*, ranging from browsing the IKEA magazine to redecorating the home
- *dynamic*, changing over time
- *social* – done by several people on several basis
- *impure* – based on not just considerations of beauty or awe, but also value, brand names, etc.
- *based on lay theories*: what is beautiful to granny Hill may not be beautiful to a Gothic rock music fan, whose reference group sees ugliness as a cornerstone of aesthetics

In methodological terms, accepting this idea leads to a paradigm shift. It is the researchers' analytic exercise to tease it out from data, and use their understanding to further design. In practice – and this is historically proper, given that pragmatics and interactionist sociology are historically closely linked [8] – this leads us to an interpretive understanding of aesthetics: we need to understand how people define things aesthetic terms, how these definitions direct their action, and how they pose limits to design.

AESTHETICS IN IT: INTERPRETIVE METHODOLOGY FOR DESIGN

Morphome is a study of how proactive technology could be designed [3]. Its methodology combines an iterative user-centered design process with insights from interpretive social science. After a probes study in 2002, we focused on designing ambient elements like lighting and sound world, and built a wireless network into cushions to test RFID technology and programming protocols, as well as the robustness of technology in the hands of children.

In 2003, we built an experience prototype, which was a lamp designed with an IKEA style which was installed into 12 homes [9]. It proved out that the IKEA style facilitated trust in technology but it was impossible to study aesthetics in more detail in that study. In the current study, called the *Four Lamps Study*, we have build a series of four lamps with varied designs (Fig. 1). All lamps react to sound levels by changing intensity and color; these designs are not proactive in Tennenhouse's sense, but enough sophisticated to give people an experience of what proactive technology might do.

These designs were installed into two homes in Tampere, and two homes in Helsinki for four weeks (each lamp stayed one week in each home). To collect experiences, people were interviewed before and after the study. Since our technology is at the simpler end of the proactive vision, we embedded the lamp designs to more technologically advanced scenarios in closing interviews. Being true to the pragmatic starting point, analysis followed interpretive methodology [9]. To this paper, I have studied only the Tampere homes; the Helsinki study is still underway.



< *IKEA*: Hides technology by covering it with a stereotypical modern taste.

Granny: hides technology by covering it with a traditional granny lamp design.



< *Glow*: hidden into a steel bar, LEDs illuminate a room by reflecting light from the roof.

Giger – a futuristic design: the aesthetics of this lamp is deliberately out-of-place in most homes.



Fig. 1. Designs in the *Four Lamps Study*

RESULTS

The results of the study fit under three main headings.[10]

Aesthetics is an ubiquitous aspect in the adoption of home technology

Although in another home, people relied heavily on the rhetoric of utility, telling again and again that their decisions are based on utility and rational thinking alone, they still told that aesthetics plays a role in their decisions. When we pointed out that there are different types of lamps – like lamps in the ceilings vs. on desks or on floors – and asked about differences in acquisition and use, these criteria changes somewhat: “OK, of course the appearance matters in the final instance when you are buying it.” And later, when talking about a new television, “It is good that it looks good. However, appearance is not the most important quality, it is just that I wouldn't buy something that looks ridiculous.” In the other home, aesthetics was a

legitimate part of the vocabulary of technological thinking all along. It is a “fact”: neglecting aesthetics risks any design.

Aesthetics is a practice, not a thought model

We learned that to study aesthetics properly, we need visual materials, not just interviews. In all, the Tampere homes had to make 8 decisions about how to place the lamps – and how much attention they would give to them. In addition, one lamp migrated over a week into a quieter place. These placement decisions were not random. Although in six cases, the lamps were placed next to TV, two other choices placed the lamps further away from TV, the center of social life in these homes. The younger family places the *Granny* lamp to a far corner, where it stayed with other paraphernalia in a sort of cabinet of curiosities. Also, when they placed the *Giger* lamp next to the TV, they quickly added a Giacomottian, tortured human figure made from iron bar next to it., turning it into a small collection of artistic objects.

Thus, studying placement decisions and items in these places provide important cues about aesthetic choices. Next to an “altar,” a lamp gets a different meaning than in a cabinet of curiosities. As researchers, we need to pay attention to these constructed, aesthetic realities at home.

Aesthetics may pose limits to what can be designed into proactive direction

After having experience about lamps, people were not fearful of proactive technology. When we probed what kinds of proactive devices people would like to see in the future, we got a predictable list: dirty, repetitions tasks could be delegated to this technology. Also, important issues that do not normally get much attention are accepted: reminders of insurance policies getting old and so forth. Limits to technology were also known from previous studies: fears of systemic technology running wild; doubts about AI’s ability to interpret and predict human actions correctly, etc.

Some limits were aesthetic. For instance, people thought it would be a bad idea to ruin antique with technology, even though they accepted the idea of creating new items with old styles in retro design fashion.

Interviewee: Eh, the only thing I can think about where I wouldn’t like to have such technology is something like an old grandfather’s clock. It’s the point of the clock that it comes from another, older, era. Modern information technology would ruin the basic idea.

Another aesthetic issue was related to interaction style with technology. At the moment, a dialogue with information technology is “ugly”: technology keeps disrupting human activities, uses impolite language, etc. How to design proactive technology that is pleasing to use and does not leave the user with the feeling of being stupid?

DISCUSSION: TOWARDS A RESEARCH PARADIGM FOR THE AESTHETICS OF PROACTIVE TECHNOLOGY

Clearly, proactive technology poses new work and important problems for designers, who have traditionally been responsible for creating not just functional, but also aesthetically pleasing products. This technological vision calls for embedding technology into the existing material world, whether electronic or more “slow” [11]. For designers, this means challenges that go much beyond designing traditional user interfaces for the PC or other computing devices.

Curiously, it may be that with new technology, old design skills become increasingly valuable.

It is important to note that proactive technology is still a vision rather than something in the marketplace. In *Morphome*, we have tried to explore an interpretive methodology to assist designing this technology. Components of an interpretive design methodology include:

- Early user study, including a technology study.
- A piloting user study with a prototype.
- Creating more elaborate designs, and building them into prototypes.
- Installing these designs into actual homes for a period of at least a few weeks to see how people develop an aesthetic relationship with them.
- Studying how people understand the prototype in context: in a studied fashion, not relying on one’s own interpretations of objects, but tracing how aesthetics figures in users’ actions.

As such, this methodology is no news for designers. However, the interpretive component is important. Design needs to be directed by user studies that do more than just “test” theories of human beings: they need to be given a more significant voice with technology that is still in such an early stage that its direction (and fate) is open. We believe that a pragmatist aesthetics as formulated by Graves Petersen et al. [7] provides a crucial, flexible design resource for proactive technology, if we add a solid empirical methodology to it. A research paradigm that keeps designers, engineers, and people in close contact, giving people a crucial role, is called for. This is what we have tried to do in our exploration into David Tennenhouse’s [1] vision.

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REFERENCES

1. Tennenhouse, D.: Proactive Computing. *Communications of the ACM* 43, 5 (2000), 43-50.
2. Want, R., Pering, T., Tennenhouse, D.: Comparing Autonomic and Proactive Computing. *IBM Systems Journal*, 42, 1 (2003), 129–135. Online: <http://www.research.ibm.com/journal/sj/421/want.pdf> [Accessed: June 4, 2004.]
3. Mäyrä, F., Koskinen, I. (eds.): *The Metamorphosis of Home. Research to the Future of Proactive Technologies in Home Environments*. Tampere University Press, Tampere, 2005.
4. Weiser, M.: The Computer for the 21st Century. *Scientific American* 265, 3 (1991), 94-104.
5. Binder, T., Hällström, M. (eds.): *Design Spaces*. IT Press, Helsinki, 2005.
6. Weiser, M., Seely Brown, J.: The Coming Age of Calm Technology. PhysComp Notes: Working notes on physical computing and embedded networking, February 04, 2004. Available at <http://stage.itp.tsoa.nyu.edu/~tigoe/pcomp/blog/archives/000373.shtml>. [Accessed Feb 17, 2005.]
7. Graves Petersen, M., Iversen, O. S. , Krogh, P. K, Ludvigsen, M.: Aesthetic Interaction – A Pragmatist’s Aesthetics of

- Interactive Systems. *Proceedings of DIS2004, Designing Interactive Systems*, July 18-21, Cambridge, MA, ACM Press, 2004.
8. Joas, H.: *G. H. Mead. A Contemporary Re-Examination of His Thought*. Cambridge, MA: The MIT Press, 1997.
 9. Kuusela, K., Koskinen, I., Mäyrä, F., Soronen, A.: Proactive IT as a Design Challenge. Proceedings of *In the Making, The First Nordic Design Research Conference*, Copenhagen, May 29 – June 2, 2005. Available at www.nordes.org.
 10. Kuusela, K., Koskinen, I., Battarbee, K., Soronen, A., Mäyrä, F., Mikkonen, J.: Pragmatic Aesthetics as a Design Resource for Proactive Information Technology. Submitted to DPPI 2005: *Designing Pleasurable Products and Interfaces*, TU/Eindhoven, Oct. 24-28, Eindhoven, the Netherlands.
 11. Hallnäs, L., Redström, J.: Slow Technology; Designing for Reflection. *Personal and Ubiquitous Computing* 5 (2001), 201-212.