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Designing the invisible computer
– from radio-clock to screenfridge

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ABSTRACT
This paper will discuss the concept of invisible computing in a product design context. Within product development and advertising, design is commonly used to disregard chronology and semantics. New, unsettling objects can be made to seem old and familiar, or vice versa, something old can acquire a new, "modern" look.
The paper argues that it is not unproblematic to make computer technology invisible. Hiding technology and products means to naturalise and normalise something that is highly complex and problematic. Instead design should be used to express and visualise these complex issues. The paper advocates a critical design perspective using theories influenced by feminism.

Keywords
Invisible computing, Product design, Design theory, Product Semantics, Feminism.

1. INTRODUCTION
When the radio was new and people where reluctant to the benefits of this new technology, radio-developers went through a lot of creative thinking to convince people to buy it. Radios where advertised as healthy, fun and educating. "Radio teas" where advocated as the new and fashionable way of meeting friends and family. But radio programs where scarce and radios where bulky and difficult to use. To make the product more socially accepted the radio was made invisible, that is, was built in another, well known and traditional appliance in the home. The radio clock was a traditional grandfather clock with a radio hidden in the body. A loudspeaker was integrated in the middle of the front panel and to turn the radio on, the front of the clock was opened. In the evening, the family would gather round the clock and listen to an enlightening program turned towards the display. A compelling image.
Today information technology is integrated in the homes and the concept of "The invisible computer" [12] is in the air. Electrolux the largest producers of powered appliances in the world, has moved into the promising area of Smart homes with a product called Sreenfridge [13]. They have put a computer in a fridge, placing the hardware in the door and the screen on the front panel. The computer is supposed to serve as a centre for family information and logistics and as a netsurfer. Needless to say the radio clock was never a success, for the Screenfridge this remains to be seen.

How plausible is actually the idea of making computers invisible? And what role should aesthetics and design play in the development of Smart homes?
Will all our hidden and integrated information technology just become another radio-clock? The radio-clock is a humorous example more than a warning lesson. If our development of smart home appliances is not worse then that it might not be too bad. One could of course argue that we should know better almost a century and many design theories later. But what does it mean to hide powerful technology in order to make us accept it? And how will in fact this environment penetrated by reactive computers affect us?

2. VISIONS OF THE FUTURE

Leading researchers presents various strategies for technical and conceptual development of computer technology in the home. Mark Weiser from Xerox Parc, who coined the concept of "Ubiquitous Computing" [17] sees a world of "calm technology" [18] where our windows are large screens that have information in the background or perhaps the soothing sound of raindrops whose frequency indicates the number of emails in our computer. The walls can become transparent or opaque as needed, and can flexibly adapt themselves to mood or function. Nicholas Negroponte, the founder of M.I.T.'s Medialab, advocates the use of "intelligent agents", a kind of digital butler that does all your work for you while you take it easy.[11]

Philips Design's project Visions of the Future[19] was one of the first to present domesticated Information Technology, in well designed, and nicely packaged scenarios. Their core idea is to make IT appliances for social and emotional communication. According to Philips's head of design, Stefano Marzano, the future home will be a place that will resemble homes of the past more than the homes of today. All technological gadgets will be gone, a beautiful painting on the wall will also be the Television and the computer screen. The decorative objects on the table will also be a communications station**,** and the powder-compact a mini-computer.[10]

Donald Norman explores the Ubicomp concept in his book "*The invisible computer*" [12] and develops scenarios for an intelligent, reactive and serving environment. The term was slightly changed in EU research program "The Disappearing computer" [4] which include universities and organisation from all over Europe in 16 imaginative research projects.

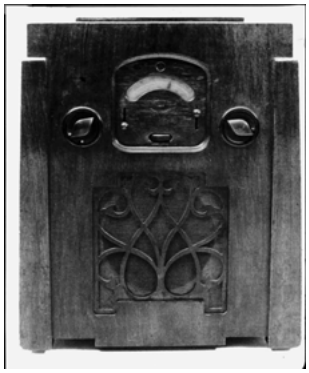
In the "smart home" business, IT companies have adapted themselves to reality and are aiming themselves primarily at the large and wealthy 40s generation that will soon become old and sick. Here, there is clearly both a large human need - and money [6],[8],[14]. What is on offer are mostly so-called safety services, that is to say alarms of different kinds. These networks and sensors of different kinds are concealed in the walls and appliances in the home and not subjected to any form of conscious design.

3. PRODUCT DESIGN AND NEW TECHNOLOGIES

Within product development and advertising, design is commonly used to disregard chronology and semantics. New, unsettling objects can be made to seem old and familiar, or vice versa, something old can acquire a new, "modern" look. The success story of the twentieth century is intimately connected to objects, and industrial design is like the soft padding around these objects. That is the reason for us to be willing to let all these objects into our homes and into our arms, and also the reason why we abandon them for better and newer ones. In the beginning of the twentieth century, Peter Behrens started working for AEG, Allgemeine Elektriche Gesellshaft, a company that primarily produced electricity and had begun to enter the consumer market. The problem for many electricity companies at the beginning of the century was that usage was divided unevenly during the course of the day and that it is difficult to store electricity. There was a peak during the morning, then during the day consumption fell to almost zero, and then rose to its maximum during the evening hours. In order to meet demand, the companies had to have the same high output at every hour. This was obviously not profitable and many shrewd men were wondering how to increase demand for electricity during the day. One of the most successful ventures turned out to be kitchen appliances. The electric stove, mixer, toaster, washing machine, kettle, heater, and iron were all developed in quick succession, to name just a few products. Behrens designed electric kettles in three different materials and with around ten different patterns in order to satisfy every taste. Soon electrical stoves and kitchen appliances started their march into our kitchens. [7]

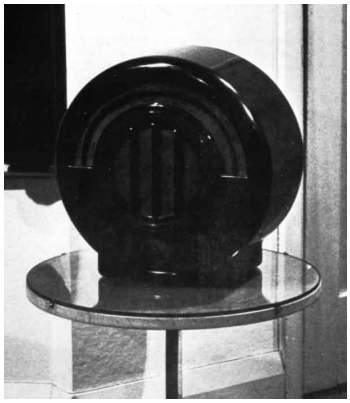
A similar development occurred in all new technologies. The radio, for example, was developed during the beginning of 20th century, but was perceived as being too difficult and dangerous to use in the home. Radio manufacturers resorted to different strategies to overcome this. One was to change public opinion using advertising and "radio events". Another was to use design to make the radio more acceptable. Radios could be built into traditional wooden cabinets, or concealed in a grandfather clock or an armchair. But it was not before the radio found its rounded, utopian form in Bakelite that it became a product icon.

In 1932 we could read in Svenska Slöjdföreningens magazine *Form* that "*The radio as a cultural phenomenon is still very much in its formative stages. The chaotic lack of style in radio broadcasts has slowed down innovation within the industry. As far as the appearance of these devices is concerned, it can be noted that they have still not become an item of furniture that fits naturally into a room. The average*



The Archaic radio design

The Suppressed radio design



The utopian radio design

radio with its in-built speakers still uses forms reminiscent of an oversized, clumsy table clock." [3]
The development of radios went through three design phases: the archaic, the suppressed and the utopian.
This has appeared so often in industrial design that they might be said to from a basic grammar. [7] We can see the same development today within the field of so-called "smart homes". Broadband and IT technologies are entering our homes across a wide range of applications. From the first stages of crude technology and archaic solutions it has now entered a stage of suppression. The products should not be seen at all.

4. DESIGN AND SEMIOTICS

How believable is it that we will build technology only in order to hide it? The radio armchair was never a hit and the radio clock did not have its break-through until 50 years later, and then it was the clock that was built into the radio, not the other way around. Every period and every technology needs to develop its aesthetics in an organic relationship with its own time. Hiding technology also means that we put aside and naturalise something incredibly complex and problematic. Product design and aesthetics is what literary *expresses* the product. The product can be read as a text that conveys a number of semantic messages. On the denotative level it tells us what it is and how to use it. When we analyse it we can detect the connotative levels where issues about culture, identity and context is buried. In his book Mythologies, Roland Barthes [2]explains the way myths work and the power they have on the way we think. Taking a lot of examples Barthes shows how seemingly familiar things signify all kind of ideas about the world. As Forty [7] remarks: "*Unlike the more or less ephemeral media, design has the capacity to cast myths into enduring, solid and tangible form, so that they seem to be reality itself."*
One such myth would be that household work nowadays is fun, easy and efficient compared to the old days when housewives where chained to the kitchen. Household appliances are considered to have liberated women to professional work and made housework fun and fast. Housework is seemingly done by itself with the housewife only supervising the work. Household appliances were advertised as the "solution to the servant problem". But on the contrary, a range of studies [9] shows that women spend *more* time doing household work today that in the twenties. This is explained to be caused by raised standards in

cleaning, cooking and clothing. 80 years ago, shirts and underwear were at most changed after one week of use; today we rarely wear the same garment more than a day. So instead of sending laundry away to a cleaning lady once a month, the washing machine is on every day.

5. HIDING OR NOT HIDING, THAT IS THE QUESTION

Making or not making technology visible is a long debated issue in industrial design and architecture. One of the main critiques by the modernists in the beginning of the twentieth century was the inconsistent use of material, styles and ornaments during the previous century. The American architect Sullivan coined the expression "Form Follows Function", claiming that function was superior to form. Honesty in form, function and material was another wellspread motto. This meant that no material or function should be hidden behind something else, but clearly and honestly presented in the final design. But this was mainly a *theory* of aesthetics. In reality, most modernistic buildings hide all of their construction under white and smooth surfaces.

There are many reasons for hiding something. One is that it is ugly or untidy. In an unpublished study at CID, KTH [Lindquist personal communication] five families where asked to take pictures of ugly and nice things in their homes. Most of the ugly things were technical appliances such as stereos, Television-sets, computers, piles of cables and light switches. We might also hide something because it reminds us about something unpleasant, or because we do not want to deal with it right now. In a therapy situation the psychologist tries to unravel the memories and feeling of the client that he/she has repressed into the unconscious. The main concept is that such unconscious material still affects the client even if he/she is not aware of it. Problems generally turn out less frightening if we just look at them. Another reason for hiding thing is that we do not want *others* to find out about something. It might cause problems or challenge our own position. Power is often concealed and therefore less obvious and harder to criticise.

Araya[1] has analysed the technological thinking that underlies Ubiquitous Computing using Heideggers ideas about technology as "conditions of possibility", and explored how it reveals itself to man. According to Araya, Ubicomp changes the surrounding world to become not a separate entity but an extension of our selves. Constantly responsive, subjective, movable and reproducible it changes according to our needs and fantasies. This leads to two things; one is that Ubicomp can be seen as a way to obliterate "the others" in parts of the surrounding world by penetrating it with computer technology. The other is that Ubicomp obliterates "the otherness" in parts of the surrounding world in such a way that we are not aware of it, everything is apparently normal. Araya talks about a double invisibility:

- The penetration of computer technology in the environment becomes invisible
- The effects they cause are invisible to us because we can not see them.

This reminds about the double invisibility [16][15] in feministic theory:

- The dominating culture becomes invisible because it is the natural, the self-evident, normality above interests of gender, class and others.
- A culture in opposition becomes invisible because it get less room in the public space and appear as vague, indistinct and temporary.

By applying the theory of the double invisibility on Ubicomp the suggestion to massively penetrate the world with invisible computer technology, appears as a way to normalise, naturalise and reify computer and information technology. The invisibility creates a power position where it is nearly impossible to criticise or change the prevailing system. Feministic theory also points at possible ways of action: to make relative the self-evident and to visualise the vague.

Product designer and writer Anthony Dunne [5] argues that mainstream industrial design is using its powerful visualisation capabilities to propagandise desires and needs designed by other, thereby maintaining a culture of passive consumers. He suggests that design research in the aesthetic and cultural realm should draw attention to the ways products limit our experiences and expose to criticism and discussion their hidden social and psychological mechanisms. Central to Dunnes and partner Fiona Rabys work is a consideration of the imperceptible electromagnetism that surrounds us. From the "natural radio" emitted by the suns activity to the radiation leaking from appliances, Dunne and Raby attempt to visualise the invisible. In a series of conceptual design proposals they criticise and visualise aspects of electronic culture that very rarely have been dealt with within product design.

6. CONCLUSION: TO VISUALISE THE VAGUE

Design and aesthetic is a powerful tool in getting us to accept new things and ideas. Within art, this can be used in a critical or subversive way. But because product design finds itself operating within tight

economic parameters, there have been few opportunities for designers to use their aesthetic know-how for critical projects. In the design of computer and IT artefacts there is usually very little time for explorative and critical aesthetics. Product design is supposed to make an attractive and (at its best) user-friendly product to increase sale.

In the light of the discussion in this paper it is seems a dubious approach to merely make computer technology invisible. Technology as such and computers in particular are too problematic and powerful to be domesticated and hidden behind or in a familiar appliance. An environment penetrated by invisible computers will most likely affect the way we percieve ourselves as subjects in relation to an objective environment. It also appears as a way to normalise, reify and naturalise computer and information technology, thereby making it a natural fact more than a cultural phenomenon. Every period and every technology needs to develop its aesthetics in an organic relation to its own time. Instead of hiding computer technology we should use the power of design to visualise and express this complex issue. This is an important task for design research within the aesthetic and cultural realm.

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8. AUTHOR VITAE

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