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Ethics and technology design

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Abstract. This article offers a discussion of the connection between technology and values and, specifically, I take a closer look at ethically sound design. In order to bring the discussion into a concrete context, the theory of Value Sensitive Design (VSD) will be the focus point. To illustrate my argument concerning design ethics, the discussion involves a case study of an augmented window, designed by the VSD Research Lab, which has turned out to be a potentially surveillance-enabling technology. I call attention to a ''positivist problem'' that has to do with the connection between the design context and the use context, which VSD seems to presuppose, and I argue that it is necessary to clearly distinguish between the two, since the designers' intentions do not always correspond with the users' practice; in fact, the relation between design and use is very complex and principally unpredictable. Thus, a design theory must accept that foresight is limited to anticipation rather than prediction. To overcome the positivist problem, I suggest a phenomenological approach to technology inspired by Don Ihde's concept of multistability. This argument, which is general in nature and thus applies to any theory of design ethics, is intended as a constructive criticism, which can hopefully contribute to the further development of design ethics.

Key words: ethics, multistability, surveillance, technology design, value sensitive design

Introduction

In this article I will discuss the connection between technology and values and, specifically, I take a closer look at ethically sound design. In order to bring the discussion into a concrete context, the theory of Value Sensitive Design (VSD) will be my focus point, and to illustrate my arguments concerning design ethics, the discussion involves a case study of an augmented window, designed by the VSD Research Lab, which has turned out to be a potentially surveillance-enabling technology that gives rise to privacy concerns.

In the discussion of VSD, I call attention to a ''positivist problem'' concerning the connection between the design context and the use context, which the theory seems to presuppose. I argue that it is necessary to clearly distinguish between the two, since the designers' intentions do not always correspond with the users' practice; in fact, the relation between design and use is very complex and principally unpredictable. Thus, a design theory must accept that foresight is limited to anticipation rather than prediction. To overcome the positivist problem, I suggest a phenomenological approach to technology inspired by Don Ihde's concept of multistability.

Even though the focus is on VSD, I consider the presented arguments to be general in the sense that they apply to any theory of design ethics. Similarly, the illustrative case of the surveillance-enabling augmented window could be replaced by any other case of technology design. However, it should be mentioned that the choice of a surveillance-enabling technology is not a coincidence. The research presented in this article is part of my doctoral dissertation work on surveillance and ethics, so I am motivated by the long-term ambition to develop a framework for ethical considerations when technologies are designed for purposes that directly or indirectly involves surveillance.

It should also be stressed that my intention here is not to reject the possibility of ethically sound design. On the contrary, my article is intended as a constructive criticism, which can hopefully contribute to further developments of design ethics. In this way the argument is based on the Socratic theory of knowledge, which emphatically states that to know what we do not know is actually to know more. Similarly, I argue that in order to improve our capabilities of designing ethically sound technology, we must

acknowledge the limitations of what can be known to the designers and, thus, be prepared for the fundamental openness of future use contexts.

The article is divided into three parts, which also indicate the progression of my argument: Firstly, technology, values and ethics will be discussed in order to establish and render probable that designing technology is also the shaping of an ethical scenario. Secondly, the theory of VSD is studied, and I call attention to the positivist problem involving the connection between design and use. Thirdly, the case of the surveillance-enabling augmented window is discussed.

Technology, values and ethics

The preoccupation with the values embedded in technology can be traced through a long and complex history, and the same is the case with the more narrow focus on technology and ethics. Even within the limited period of the twentieth century, it is difficult to give a comprehensive account due to the large number of directions taken and the manifold disciplines of departure. In the following I will highlight tendencies in the modern history of technology and values, and I will discuss the characteristics of the ethical approaches seen in the recent years.

In his classic article "Do Artifacts Have Politics?" (1980),[1] Langdon Winner famously describes the development of the road system on Long Island, New York. Apparently, Robert Moses (1888–1981), the responsible urban architect in New York City, had a rather repellant political agenda, since he supposedly wanted to reserve the attractive beaches and recreational areas of Long Island for the wealthy.[2] This very controversial plan was carried out in secret by designing the bridges over the road system in a certain way: The bridges were built to be very low in order to avoid public transportation, such as buses, which were too high to pass. Only private cars could go under the bridges thus enabling the wealthier people, who could afford to own cars, to have the benefits of Long Island's attractive areas, at the same time as the poorer people who had to rely on public buses were in practice kept away. Accordingly, the development of an urban road system seems to "have politics", since the infrastructure results in certain politically motivated consequences.

It can be argued that the bridges themselves do not carry these specific political consequences, since bridges and road systems with the same functionality, but with completely other political consequences, can easily be imagined. In reply, it must be argued that artifacts or technology at least *have* consequences of a non-technical nature, e.g. politics. Even though this example (Moses and the urban planning in New York) might be historically incorrect, it still makes up a good illustration of the connection between technology and values.

Another recent tradition relating to technology-embedded values is the theories of user-centered design. As the name implies, the starting point of these theories is how technology can be designed with a focus on the users' wants and needs. Central to such efforts is the involvement of the expectations of the end-user in the design process and even, as seen in the theory of Participatory Design, inviting the users to take part in the development phase. Besides Participatory Design, prominent theories of user-centered design include Cooperative Design and Contextual Design as well as a number of influential books, e.g. Donald A. Norman's *The Design of Everyday Things* (1990). A number of the user-centered design theories have their departure in the Scandinavian traditions of computing and engineering in the 1970's, however, other more recent directions of thinking should be mentioned. One development has been a change in focus from the users' wants and needs to the social construction of the user. This shift of attention to the power dynamics in the constitution of the user is, in part, a result of contributions within the broad field of Science and Technology Studies (STS).

As the brief history sketched out in the above indicates, it seems uncontroversial today to claim that technology and values are mutually important; many and diverse value aspects of technology, such as politics, social impacts, environmental issues and ethics are well recognized in the academic debate, just as technology is considered to be an important topic within the disciplines relating to these topics.

Jeroen van den Hoven has recently suggested an interpretation of the modern history of ethics and IT as a development towards a current focus on design and values.[3] Ethics in the beginning of the modern

[1] First published in the journal *Daedalus*, Vol. 109, No. 1, Winter 1980 and later reprinted in Langdon Winner: *The Whale and the Reactor* L. Winner. *The whale and the reactor: a search for limits in an age of high technology*. University of Chicago Press, Chicago, London, 1986.

[2] This thesis has been disputed by Bernward Joerges and others. In an article with the clever play on words: "Do Politics Have Artifacts?" B. Joerges. Do Politics Have Artefacts? Social Studies of Science, 29, 3, 411–431, 1999, Joerges rejects Winner's interpretation as historically incorrect.

[3] This interpretation of the modern history of ethics and technology by Professor Jeroen van den Hoven was suggested in his keynote address "Values, Design and Information Technology: The front loading of ethics" delivered at ETHICOMP 2005.

era until the twentieth century has been mainly occupied with theory, and the best known theories include Immanuel Kant's deontological critique of practical reason, the utilitarian calculus of the greatest good for the greatest number, and, finally, virtue ethics. These theories have dominated the ethical debate within philosophy; however, in the mid-twentieth century the debate was broadened to include an application perspective. A number of tangible problems concerning for instance medicine and technology came into focus, which led to considerations of the broader context of phenomena that were earlier thought of in isolation. An example of this trend is the discussions concerning the development of atomic weapons at the end of the Second World War. The irreversible consequences of atomic weapons (and their use) seemed to demand ethical and political reflections, and the Danish physicist Niels Bohr (1885–1962) was a well-known opponent to the idea of using the insights of atomic physics to developing weapons of mass destruction. Once the atomic bombs were developed and the war was over, he proposed that the knowledge of atomic weapons, at least, should be shared in the international science community thus avoiding the incipient atomic arms race, however, the thought of sharing atomic secrets were opposed by Roosevelt as well as Churchill.

Since the mid-twentieth century and the ''applied shift'' within ethics, a wide range of other specific and sometimes controversial issues have emerged. The branches of applied ethics include medical ethics, legal ethics and, of course, computer and information ethics, and it is characteristic for these fields of study that both technical experts and scholars take part in the discussion. Over the years, these ethical branches have grown into established fields, and Computer Ethics has become an independent tradition with a number of peer-reviewed journals and international conferences. Van den Hoven argues that in recent years, another development within ethics seems to be emerging – a ''design shift''. These changes are noticeable in that the focus of many contemporary ethicists seems to move from the consequences or impacts of technology, especially IT, to the shaping or designing of technology and in particular IT.

Similar to the shifts in focus within ethics from theory to design, van den Hoven suggests that the history of IT can be interpreted as a series of phases towards a focus on value. The first of these phases simply focused on technology. This period of early computerized IT ended roughly around 1980, and the center of attention among developers and interest groups was predominantly the many possibilities in the technology itself. However, in the 1980's and 1990's an increasing awareness of the context began to show, especially within social and behavioral sciences saw a broader focus. In this phase, a number of issues surfaced relating to situations and matters involving IT such as work environment and the so-called ''digital divide''. Since the late 1990's another shift in focus is traceable that has to do with ethics. The development of IT is increasingly getting attention from the humanities, including aesthetics and ethics, and the characteristics of this new focus are sensitivity to values ''built in'' to the technology.

The history of ethics and IT, interpreted in this way, come together in the focal points design and values. Ethics has developed from fully theory-oriented through application and context awareness to a focus on the process of designing; similarly IT has gone from being solely technology driven through context awareness to value sensitivity. As a consequence, a current and notable relation between ethics and IT is the focus on values in the design process. The characteristics of this shift in focus, according to van den Hoven, are a ''front loading of ethics'', which brings a number of new responsibilities. The overall change in this front loading is a duty to look forward instead of backward when assessing the ethical implications of IT. In this way, it is possible to overcome the notorious problem of technology assessment, namely that it takes place *after* the technology is implemented and the ethical issues have become manifest. When ethics look ahead instead of backwards, ethical evaluations will not be about determining who to blame for mishaps and concerns, since the ''new'' role of ethics will be to assist in the actual development and design of IT.

In my opinion, Van den Hoven's interpretation shows that the preoccupation with the design process has – or is about to – move a step further to the ethics of the user. Whereas the first attempts with user-centered design were pragmatically oriented towards the user's wants and needs, and the social constructivist approach concerns itself with how power relations can stabilize in the construction of the user, then the recent ethical approach attempts to throw light on the scenario of possible ethical actions in which the user is situated. Also, this line of attack, which primarily has its roots in Computer Ethics, seems to systematically involve the classical ethical theories thus bridging the ethical tradition with the pragmatics of design.

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The purpose of designing technology is most often to make it serve a certain function. This connection between technology and functionality is, of course,

rather obvious and uncontroversial. Moreover, the connection between technology and values, including the shaping of ethical scenarios, has been well-established in the twentieth century as described in the above, and it is important to notice that the ethical dimension is not optional; technology has ethical implications regardless of whether the technology has been designed with this in mind or not. Consequently, it becomes a much desired objective to somehow be able to control both functionality and ethics in the design process, and this potentially far-reaching ambition raises a number of important questions. I will return to these questions after a brief introduction to a dominant design theory that takes ethical issues into account.

Value sensitive design

One of the most ambitious and promising approaches to ethically sound technology design is the theory of Value Sensitive Design (cf. Friedman 1997; Friedman et al. 2002; Friedman and Kahn 2003; Friedman 2004), which is affiliated with the VSD Research Lab, University of Washington,[4] The theory of VSD promises to take into account human values:

> "Value Sensitive Design is a theoretically grounded approach to the design of technology that accounts for human values in a principled and comprehensive manner throughout the design process." (Friedman, Kahn and Borning 2002: 1)

According to Friedman et al. (2002), VSD has a number of advantages compared to other attempts to combine design and ethics. The mentioned approaches are Computer Ethics, Social Informatics, Computer Supported Cooperative Work (CSCW) and Participatory Design, and the theory of VSD builds on these four fields of study, but in a way that compensates for their alleged shortcomings.[5]

Proponents of VSD acknowledge that the two first mentioned fields, Computer Ethics and Social Informatics, have advanced our understanding of key values in the intersection of computer technology and human lives and provided sound social–technical analyses of deployed technologies.[6] However, both theories seem to be too divorced from the technical side of the problems and thus fail to be helpful in providing practical knowledge of the design process and actual implementation of technology. Similarly, CSCW has generated important knowledge regarding the workplace, helping people collaborate more effectively, but, unfortunately, the relatively narrow focus (the workplace) and the emphasis on collaboration disqualifies the theory in regards to ethics and technology in general. The final theory, Participatory Design, has yielded important developments by embedding democratic values into its practice, and important techniques, such as Future Workshop, has been developed. However, like CSCW the theory of Participatory Design is too limited, because it fails to provide adequate guidance when put into more diverse contexts.

Building on selected parts of the above mentioned theories and methods, VSD introduces "a unique constellation of features" summed up in seven points (cf. Friedman et al. 2002: 2):

(1) VSD is proactive, as it influences the design process from beginning to end;
(2) VSD deals with a broad variety of contexts, including the workplace, education, the home, commerce, online communities and public life;
(3) VSD deals with a broad variety of human values, including cooperation, democracy and especially values with moral import;
(4) VSD combines conceptual, empirical and technical aspects into an integrated methodology;
(5) VSD is interactional, because it combines the views that social systems affect technological development, and new technologies contribute to the shaping of individual behavior and social systems;
(6) VSD draws on ethical theory in order to attain a principled approach of abstract ethical values to the design process that maintains certain universal values regardless of casual opinions;
(7) Ethical theory aside, VSD take into consideration concrete values that are universally held through different ages and cultures.

To put these seven features into action, a tripartite methodology is proposed, and, accordingly, the

[4] The VSD Research Lab Homepage: http://www.ischool.washington.edu/vs

[5] Unfortunately, the scope of this article does not allow for an expanded discussion of these alleged shortcomings, however, it should be noted that the VSD critique of Computer Ethics, Social Informatics, Computer Supported Cooperative Work (CSCW) and Participatory Design must be considered controversial and debatable. The aim of this introduction to VSD is first of all to present the theory in itself as convincingly and "strong" as possible – which simply seems to be fair and, just as importantly, appears to be the best way to avoid "straw man"-arguments – before pointing out problems in the following discussion.

[6] Here and to the following cf. B. Friedman, P.H. Kahn and A. Borning. *Value Sensitive Design: Theory and Methods*. University of Washington, 2002.

design process is made up of conceptual, empirical and technical investigations (Friedman et al. 2002: 2–3). Firstly, the conceptual investigation is a philosophically oriented analysis of values in general, and how values are supported or diminished by specific technology designs. Important to this part of the design process is the sensitivity to the problems relating to the implementation of technology, since it is often necessary to compromise between conflicting interests. According to the proponents, VSD offers a suitable theory and method to marry the theoretical and the technical, unlike, e.g. Computer Ethics and Social Informatics (Friedman et al. 2002: 1–2). For example, designers must frequently deal with trade-offs between autonomy and trust, or perhaps between privacy and security. Moreover, the relative weight of ethics, functionality and even aesthetics must constantly be considered. Secondly, an empirical investigation must complement the conceptual investigation. Besides informing the theoretical analysis of values by contributing knowledge of the technical context, the empirical investigation is a tool for evaluating a particular design by applying both qualitative and quantitative methods. Thirdly, a technical investigation is carried out in order to identify the particular values that a particular technology support and/or diminish, and consequently:

> ''Value Sensitive Design adopts the position that technologies in general, and information and computer technologies in particular, provide value suitabilities that follow from properties of the technology. That is, a given technology is more suitable for certain activities and more readily supports certain values while rendering other activities and values more difficult to realize. For example, a screwdriver is well suited for tightening screws but functions poorly as a ladle, pillow, or wheel.'' (Friedman, Kahn and Borning 2002: 3)

In the same way as a screwdriver has a disposition for a certain functionality, technology in general and computer technology in particular have a disposition for supporting or diminishing certain values and the technical investigation maps these dispositions. Moreover, the technical investigation proactively shape technology according to the values identified in the conceptual investigation. It should be noticed that technical analyses differ from empirical analyses in that the former focus on technology itself, whereas the latter focus on people and social systems influenced by technology.

To illustrate how the VSD theory and its tripartite methodology actually works, I will take a closer look at one of the cases that the VSD Research Lab has worked on: Cookies and Informed Consent in Web Browsers.[7] The purpose of this project is to improve the support for informed consent when browsing on the Internet. The first step was to carry out a conceptual investigation of ''informed consent''. To do this the research team consulted relevant literature on the subject in order to state more exactly what the concept implies. The second step was to validate and refine their findings from the conceptual investigation by taking on a technical investigation. The research team decided to do a retrospective analysis of how cookie and web-browser technology had changed regarding informed consent over a period of five years. They concluded that the support for informed consent had improved, but the technology design was still inadequate. Based on the conceptual and technical investigation, the team then set out to redesign Mozilla, an open-source web-browser, in order to improve the support for informed consent by advancing the user-control over cookie management. This third step involved empirical investigations, since evaluations of user experiences was a crucial part of the design process. Through empirical investigations the team became aware that users wanted control with the cookies, but it should be in a way that was minimally distracting. This led the team to include minimal distraction in the conceptual framing of informed consent and it inspired a certain technical solution in the design of the web-browser. These three steps demonstrate the flexibility of the design process, since the tripartite methodology is intended to be mutually informative.

Before moving on to my main criticism of VSD and similar design theories – the positivist problem – I will mention another critical remark concerning the theoretical foundation. The seven points above form a pragmatic approach to design ethics, but it seems to lack a fundamental discussion of ethical theory. Even though VSD draws on ethical theory and takes universal values into account (points six and seven), it is not exactly clear *what* theories and *which* values this includes. Could VSD operationalize the ethics and values of, for instance, Nazi Germany? This is, of course, not the intentions behind the theory, but unfortunately it seems to be a possible way to go, since VSD, in principle,

[7] This project has been described in detail in a number of texts (cf. the publications list at the VSD Research Lab's homepage), however, this presentation is based on Friedman et al. Ibid. and Friedman B. Friedman. Value Sensitive Design. In *Encyclopedia of human-computer interaction*, 769–774, Berkshire Publishing Group, Great Barrington, MA, 2004.

appears to be a "neutral" tool for any ethical theory and set of values – regardless of the good intentions behind. It seems to me that VSD must take the foundational questions of ethics into account – theoretically, not just pragmatically – and thus root the methods of design.

The positivist problem

The theory and method of VSD represent a very sympathetic idea for developing technology, especially when we contemplate a future scenario of ubiquitous computer technology. Even though many elements of VSD is known from other contexts, just as the general ambition to administer all aspects of the design process is not new, the combination of theory and practice – conceptualization and "hands on" – seem to be as unique as the research team claim. However, the claim that VSD is a principled and comprehensive account of human values in design seem to be difficult to justify, as such a promise rely on the tacit premise that the intentions of carefully designed technology will correspond with the eventual *use* of technology. It is safe to say that VSD is a pragmatic approach to technology design, but I argue that it also reflects a moderated positivism, since the premise mentioned above (design equals use) must be nuanced substantially. The relationship between designing and using is insufficiently explained and represent a challenge for the further development of the theory. It should be clarified that I am *not* arguing that design and use are principally unrelated, which would make VSD and other theories of design ethics futile, but I argue that careful consideration must go into the limits of foresight. In other words, it must be determined what can actually be predicted – functionally and ethically – in the design process, what would be an informed guess, and, finally, what is simply beyond the knowledge of the designers.

The core of the positivist problem is the relation between the design process and the eventual use of technology. I name it "positivism", because it is the default position that the design of a technology will – more or less – correspond with the use of technology and that this relation does not pose a problem. I consider this default position to be a problem, because design and use does *not* correspond just like that, which can be substantiated historically and phenomenologically. In this article I will not discuss the historical part of the argument, but just refer to well-known examples of technology that have been used very differently than intended in the design process and, moreover, have had social and ethical impacts, which were never imagined in the design process. One of many examples that come to mind is the invention of the telephone (cf. Ronell, 1989), which was originally developed as a prosthetic device for hearing-impaired, but, of course, eventually was found useful in other ways. It must be uncontroversial to claim that even the most visionary designer would have been unable to foresee the functionality and ethical potential of the telephone, the computer and other such technologies.

To present the phenomenological arguments against the positivist position I draw on Don Ihde's work in philosophy of technology (cf. Ihde 1977, 1979, 1990, 1993a, b, 1998, 2002). A basic outcome of Ihde's extensive phenomenological analyses of human–technology relations is that a defining characteristic of technology is that it enters into a context of use. The relational quality implies that technology does not have an essence or basic meaning apart from the use contexts it enters into, and to describe this ambiguity in technology Ihde introduces the central concept multistability. To illustrate the multistability of human–technology relations Ihde draws attention to the so-called Necker Cube, which is an ambiguous line drawing in isometric perspective. The drawing is open to a number of valid interpretations, e.g. two different perspectives of three-dimensional cubes; however, Ihde suggests that the drawing can be interpreted in a number of other ways – e.g. as an imaginary ant-like animal. The point is that there is not an interpretation more "true" or "absolute" than another and, similarly, human–technology relations can be stable in many different ways. The consequence of multistability is that it is necessary to abandon an essentialist or substantivist understanding of technology.

Returning to the above mentioned screwdriver example, the human-screwdriver relation is multistable, because a wide range of use contexts can be conceived. Thus, a screwdriver is not only for tightening screws; when camping a screwdriver can be used as a peg for the tent and even to hammer down other pegs (or screwdrivers!); when at great risk a screwdriver can serve as a potentially dangerous weapon; modernist artists have used screwdrivers to scratch their paintings thus creating a particular surface. The purpose of these examples is to emphasize that technological artifacts can enter into many very different human–technology relations and that a technology is defined by its particular relational context. A screwdriver might not serve well as a ladle, pillow or wheel, but it can certainly be used for many other purposes than tightening screws – even in contexts that we can hardly imagine. Technologies are thus multistable, because they can be used for a wide range of purposes and they can be conceived of

differently according to cultural, historical and social contexts.

In order to overcome the described positivist problem, I argue that VSD and any other design theory must abandon a substantivist–essentialist approach to technology and thus acknowledge the limits of designing. Instead, I suggest that the tripartite method of VSD is developed in order to include the multistable and relational characteristics of technology.

Case study: windows and surveillance

To exemplify my criticism of VSD and other design theories based on what has been defined as positivism and essentialism, I will turn to some of the projects by the VSD Research Lab that involves surveillance-enabling technology. I choose this as an example instead of e.g. technologies that are designed specifically for purposes of targeted surveillance such as military spying devices and traffic cameras, since the VSD-developed technology is intended for other uses, but at the same time have the potential functionality of being surveillance technology. Thus, it is possible to emphasize the ''hidden'' aspects of design that becomes clear in the phenomenological analyses of technology. A wide variety of technologies can be surveillance-enabling, especially IT, and it seems to me that such devices in a future of ubiquitous computing are one of the greatest challenges for ethically sound designing.

Windows as surveillance-enabling technologies

Some of the projects undertaken by the VSD Research Lab that deals with the design of surveillance-enabling technologies are ''Room with an Augmented Window'', ''Office Window of the Future'' and ''The Watcher and the Watched'' (cf. Friedman et al. 2004; Friedman et al. in press). These three connected projects aim at designing in a way that utilizes display technology to make a better office environment while minimizing possible unwanted effects.

The idea to put a ''fake'' window in an office stems from the perception that the experience of nature has a number of beneficial effects for body and soul. Of course, this seems to be common sense which has as well been substantiated by numerous other research projects and this is also a conclusion from the project undertaken by the VSD Research Lab (Friedman et al., 2004). Thus, the ambition is to find out if a display technology emulating a window can bring some of these beneficial effects to the people working in the office. The experiment involves a comparative study of two offices: The first one has a beautiful view of a nature scene, while the second one has the same view, however, the view is shown on a large video plasma display covering the wall area corresponding to the window in the first office. The projection on the screen is a live feed from a High Definition TV (HDTV) camera placed on the outside of the building. The research team collected data from a number of sources (Friedman et al., 2004; Kahn and Friedman, 2006): Psychological data from electrocardiograms (ECG); behavioral data from the test people's performance on cognitive and creativity tasks; video and audio data of each participant as they engaged in the experiment; social-cognitive data from interviews at the conclusion of the experiment. The findings from the project was that the display technology actually improved the work conditions for the people in the office, however, the ''real thing'', the window with the view of a beautiful nature scene, was – not surprisingly – even more beneficial. It is still an important result, since the augmented window is better than the blank wall, and it must be concluded that while display technology cannot replace real nature, the video plasma displays can improve offices that do not have windows.

The benefits from the augmented window, as described by the VSD Research Lab, have the potential to improve offices and similar environments. However, another finding from these projects was the concern expressed by the people in the offices that the live feed from the video plasma displays would invade the privacy of the people captured by the outside camera (Kahn and Friedman 2006). The aim of the display technology is to improve the environment for the people in offices, but the video plasma display connected to the outside camera is also a potential surveillance technology. In this context, the people in the office become watchers, the screen and camera becomes surveillance technology, and the people outside are being watched.

The VSD Research Lab has included this surveillance perspective in their work (Friedman et al., in press; Kahn and Friedman, 2006). In the project ''The Watcher and the Watched'' the research team studies the video plasma display and the outside camera as a surveillance-enabling technology with particular reference to privacy concerns. Besides the direct stakeholders, which are the people in the offices that are able to watch the people randomly captured by the outside camera, the investigation includes so-called ''indirect'' stakeholders, namely the people who by chance pass by the camera and are thus being displayed inside on the video plasma displays. The

focus of the project is the opinions of direct and indirect stakeholders' on the boundaries of privacy in public spaces and the question of informed consent. In summary, the result of the investigation was that both the people watching and the people being watched expressed concerns regarding the possible invasion of privacy.

Windows and multistability

At a first reflection, it can be difficult to understand why an augmented window can be considered a possible invasion of privacy. The video plasma display and the outside camera are, of course, advanced technology which is emulating a basic technology, the window, and the question is where the privacy problem comes into existence. Under normal circumstances, the installation of a window in an office building hardly gives rise to privacy concerns, even though people in the office are able to watch people randomly passing by the window; so why the privacy concerns with the augmented window? Some would argue that this is a symptom of excessive interest in privacy in connection with computer and information technology, and even though there might be some truth to this statement, it is not the whole truth.

It is interesting that the potential privacy problem in connection with the augmented window does not have anything to do with the technology functioning as a *window*. When the video plasma display is constituted as a window, the privacy concerns must, logically, be exactly the same as with any other window, and privacy is normally not a concern in that context. Of course, it *could* be the cause of such concerns, since windows can be used for surveillance, watching and spying, and a good example from popular culture that treats this theme is the classic Alfred Hitchcock movie *Rear Window* (1954) in which James Stewart and Grace Kelly solve a crime by looking through a window. However, remembering the character of technology as discussed in the previous part, the video plasma display in combination with the outside camera opens new possibilities for multistability compared to a traditional window.

A traditional window is, of course, a vertical opening in the wall covered with a transparent material such as glass or plastic, and this is also a multistable technology. Most often, the traditional window functions as a so-called "background" technology – to put it in the terminology of Don Ihde's philosophy of technology – which means that it obviously has an influence (it provides a view of the outside and, in the daytime, lights up the room, etc.) which is, however, seldom explicitly noticed. The window, along with a wide range of other background technologies, makes up a technological background, a "technosphere", for human relations. Yet, traditional windows can enter into a number of other relations, and to mention a few besides surveillance, watching and spying as illustrated in *Rear Window*, traditional windows can be constituted as a technology of stealing, because a thief can enter as well as escape a crime scene through windows, and, furthermore, a window can, tragically, even be used as a technology of suicide as Gilles Deleuze (1925–1995) has demonstrated.[8] The multistability of augmented windows is, obviously, very different from traditional windows; though some human–technology relations remain similar, e.g., the worker–window–nature relation, which the VSD Research Lab aims at recreating. It might be possible to commit suicide using the augmented window, but it is certainly impossible to enter or escape a crime scene through a video plasma display.

Returning to the privacy issue, the central problem to be addressed relates to the new possible relations that an augmented window can enter into. This new technology is designed to emulate a traditional window, but it brings about a wide range of possible human–technology relations of which some might lead to privacy concerns. An important limitation when trying to foresee these potential relations is the fundamental openness implied in the concept of multistability; it is in principle impossible to make a comprehensive list of potential human–technology relations. The consequence of this limitation is that future use contexts of technology cannot positively be fully predicted in the design phase, and this calls for a moderation of ambitions. However, some relations *can* be foreseen, e.g. from the knowledge that a video plasma display facilitates storage and zooming in the mediated view. This is, evidently, a potential privacy invasion, since images of people randomly captured by the outside camera can be reproduced, enlarged, manipulated and widely distributed. These characteristics, which the augmented window shares with a number of other digital technologies, pose a topical challenge for information and computer ethics. One possible way to go in order to oppose these privacy problems could simply be to remove the possibilities for storage and zooming and thus at least minimizing the concerns.

The challenge to designers of ethically sound technology is thus to imagine potential use contexts

[8] It has been discussed whether Deleuze's suicide should be considered a human tragedy or an active affirmation of life, taking his life (and the end of it) into his own hands A.P. Colombat. "November 4, 1995: Deleuze's death as an event". Man and World, 29, 235–249, 1996.

and the ethical scenarios they create. In other words, it is necessary to envision as many multistabilities as possible while designing technology in order to anticipate future ethical problems and dilemmas. This way of designing is very demanding, since it requires creative thinking to imagine the near-unimaginable. As the phenomenology of technology discussed in this article shows, the possible use contexts are inexhaustible, which suggests that the distance between designers' intentions and the manifold trajectories of use contexts are far greater than often imagined, and this can be confirmed by the history of technology.

Conclusion

Technology is not only about serving functions designed by engineers, since there is a necessary value dimension implied in the context of use. This value dimension puts a certain responsibility on the designers, as the value-related implications, including the possible ethical scenarios, can to a certain extent be anticipated in the design process. Many theories have approached this issue, as discussed in the above, and VSD is in my opinion a promising way to go, though, not without problems.

I suggest that any design theory must draw a clear line between intentions in design and the eventual use of technology. By clearly separating designers' intentions and the context of use, it is possible to acknowledge that these two contexts are, in fact, very different; in other words, the power of the designers to control the user is limited. I consider this point – emphatically expressed in the Socratic theory of knowledge – to be very important when developing a design theory, since overestimating the reach of designing can, at worst, cause more problems than it solves. A theory of design ethics that does not distinguish between intentions and future practice might give users, legislators and others the impression that technology developed under certain guidelines are somehow certified ''foolproof'' with regards to future ethical problems and dilemmas. Of course, such an ethical guarantee is not possible, as the multistability of technology shows, and the failure to realize this could have the effect that people develop a false sense of security. This can lead to less evaluation of technology, and, again at worst, the ethical scenarios will not only be unknown but misunderstood.

Paradoxically, designers must pay special attention to the potential uses *not* intended in the design process, as these might be ethically undesired. The creativity of the designers to imagine these future scenarios are, of course, also limited; I am not suggesting that Graham Bell could and should have foreseen the ethical scenarios of today's text message youth culture, when he was transmitting the sound of plucked steel reeds using electromagnet instruments in the nineteenth century. Designers should be aware of the limits of foresight, but still anticipate as many multistabilities and ethical scenarios as possible in a process of ethical imagination.

In the case of VSD, the combination of theoretical studies and ''hands on'' practice can, in my opinion, be improved by implementing the understanding of technology as multistable and relational as well as rooting the design process in a substantiated ethical theory. Furthermore, the ambition to account for human values in a principled and comprehensive manner must be limited to the more modest goal of anticipating use contexts and ethical scenarios – well aware that the anticipation is, in principle, incomprehensive.

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