Design and Ethics of Product Impact on User Behavior and Use Practices

Steven Dorrestijn

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Abstract. Smart technologies and progressive automation raise questions concerning the use of such technologies. The design challenge to enhance usability cannot be seen apart from the broader societal, and ethical concern of how technologies are accommodated in a way of living. The designer's tinkering to improve usability, is therefore an ethically relevant practice, as is the consumers engagement with new technologies. Explicit consideration and design of product impact can help to improve the accommodation of technology. The ethical problem of product impact and freedom is treated by elaborating that product impact not so much infringes on freedom but provokes specific forms of freedom.

Keywords. Smart technologies, Product Impact, Usability, Ethics.

Introduction

Designers can make better products if they do not restrict themselves to shaping products, but begin making products plus user behavior and practices the object of design. Philosophers should not immediately reject this suggestion because it smacks of manipulation of people. Instead, by actively engaging with design practice philosophers can help resolving a major design challenge of our time, namely to find ways to create ever more intelligent and active technical environments in which users feel nonetheless in control of their own actions and lives. This paper tries to combine the designer's interest to improve usability with research in philosophy of technology into the influence of products on users and the ethical evaluation of that influence. The research questions are in what way it is possible to employ product impact (behavior influencing effects of technology) to improve usability, and how this employment of product impact can be ethically accounted for. Smart technologies serve as examples, in particular Intelligent Speed Adaptation.

1. Smart Technologies

A smart refrigerator which monitors the quality and storage life of supplies, automatic regulation of lightning and heating, communication of computers with audio and video equipment – these are all examples of "domotics", also referred to as "home automation", the "smart home" (and closely related to notions such as ubiquitous computing and Ambient Intelligence). It has been claimed long ago that robots were going to relieve us

from household work. This promise has not been kept. The project of domotics as a whole develops slower than was sometimes expected. As Wim Poelman has stated: "Actually, everybody agrees that until now it hasn't been a big success. People don't need a microwave which can be turned on from within the car or lights that turn of automatically when one leaves the room" [1].

As a reason for this, Poelman and other authors in the Domotics special of the Dutch design magazine *Product* remark that domotics is very much technology driven. Inventions originate from dreams of what may be technically feasible rather than from concerns about realistic use practices of those inventions. Poelman suggests that engineers have wrongly conceived the nature of human needs. There has been too much emphasis on efficiency, while the needs for domotics application that may exist are rather determined by values, or life orientation. This claim is supported in the thesis of Somaya Ben Allouch who claims that engineers think that prospective users share their enthusiasm about making everyday life easier. As empirical research turns out, they hardly do. Ben Allouch concludes that engineers do not only react on existing user needs, but that the engineering profession and the vision of progress that drives it contributes to shaping peoples needs [2].

While some expectations such as the domestic robot may not have become reality yet, still home automation is rapidly developing and is permeating the house in many ways. The computer and the Internet have by now got a central place in every home. Connections will be set up wit all the other appliances. (As a publicity slogan for "@home", a Dutch internet provider, states: "Internet, TV en telephone all in one – just like it is meant to be!") And if many appliances may not yet have become interconnected, they still are progressively becoming computerized. Heating systems are getting smart. Lightning progressively reacts on sensors. Sunshades move automatically, etcetera.

Automation is a key notion in domotics applications, as also in other technology domains such as notably automotive technology or aircraft operation [3]. It will be a design challenge to address the theme of automation not only in technical and efficiency related terms, but also in terms of usability and ethics. To what degree and in what form do people want their way of living to be automated? To what degree and what mode of control can they and are they willing to adapt? These questions become pressing now that designers try to come up with feasible product concepts in domains like domotics.

2. Between Usability and Ethics of Smart Technologies

As noticed above with reference to Poelman and Ben Allouch, the enthusiastic acceptation of smart domestic technologies by users is not guaranteed. The mismatch between technology and users can be framed in different ways. From a marketing perspective technology will be successful when it is commercially profitable. Therefore a technology must satisfy a market demand, which calls for research into user needs. It is also possible to give a more qualitative account of the relation between users and technology in terms of reliability, safety and of usability, of which the latter is of central importance for this paper. Since the 1980's the video recorder has become something like an icon for difficult to use appliances. Domotics promises the advent of many more buttons and displays in our homes. The usability of these products therefore is becoming a major concern for technology developers. In addition, an ethical perspective will not restrict itself to checking the safety or usability in the light of the intended product function, but will question and

assess the ends to which the technology is a means. Smart technologies and progressive automation may make peoples lives easier, but is that the same as better? When does automation infringe too much with freedom of users or does it repress meaningful interaction between people?

The marketing perspective and issues of reliability and safety will not be treated here. The focus will be on the relation between usability, as an important engineer's notion for addressing how technology and users match, and the ethical perspective concerning the effects of smart technologies on freedom and human interaction.

Following a much referred to definition of ISO usability means "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use" [4]. This definition narrows down the application scope of usability by demanding a specification of users, goals and context of use. This seems convenient for application of the concept in a design context where it is standard procedure to start by analyzing and specifying the requirements for the product. Comparing the actual use of the product to the specifications renders a degree of achieved usability. One can doubt however that this engineering conceptualization is adequate. Many usability problems are caused by the fact that products are used in unexpected ways or by people who do not belong to the intended target group.

The fact that product functions or use situations change, may be out of the scope of mainstream design theory, but it is an important finding of historical and sociological research into the development and diffusion of technology. Historian Wiebe Bijker, for example, has promoted the notion of "social construction of technology", stressing that technologies often only gradually get a more or less stable definition and function under influence of different social groups of users during a period of early adoption [5]. Stewart and Williams have coined the term "innofusion", equally expressing the idea that the phase of technology diffusion cannot be seen apart from the phase of innovation [6]. Lastly, by addressing "dynamic use situations" in relation to design methodology, Mieke Brouwer expresses the difficulty of specifying use situations from a designer's perspective. These researches support the idea that the use situations that engineers need to specify in order to decide on the best design solution, in reality have a dynamic, changing character [7].

It seems therefore in accord with the process of technology adoption to broaden the narrow ISO definition of usability. The question if a product fits to the user needs and capabilities is deeply related to the question if and how a product fits to the user's way of living in society. Usability in this sense is not just the rate of success of use following the design specifications, but becomes to refer more generally to the possibility of a product to become accommodated or domesticated by consumers.

Use aspects that have influenced the diffusion of the mobile phone, for example, include narrow usability issues such as button size and display design. But equally important are a range of broader usability issues such as the acceptance of speaking loud in public spaces like trains, the change of habits concerning appointment making, privacy issues, etcetera [8]. Another example is electronic voting, which had been in use in the Netherlands for more than ten years, before it was recently abandoned. Action groups had claimed that the voting machines were unsafe with respect to privacy and manipulation of election results. The political decision to abandon the machines was taken after it became clear that the public at large had lost trust in the system. The issue of trust could not be separated anymore from the calculation of risks and security [9]. Usability problems are often referred to as "soft problems" as opposed to "hard" technical problems. With respect

to societal acceptation of the electronic voting system the same distinction could be made: the "soft" issue of trust was equally important as the "hard" computations of security and risks.

When the ends to which a technology serves are clear, computations of safety, reliability and even usability are possible. These ands, however, are often not clear. They can change over time in the process of the accommodation of new technologies. It is hardly ever the case that a technology perfectly fits existing human ends. Most of the time an adaptation of routines, values etcetera is necessary. Usability in the broad sense of the possibility of societal accommodation is concerned with the relation between technologies and ends. In this way usability is linked to ethics, which has the task of reflecting on the ends.

3. Product Impact on User Behavior and Practices

Design research to improve usability mostly focuses on improving the analysis of user needs and the intensification of use tests. The use of technology is however not only determined by pre-existing user preferences. User practices and user preferences can be transformed in process of product accommodation. How such changes are in part caused by the technical products, is a research topic in the philosophy of technology, which will be introduced in this paragraph.

Technology is normally considered a means that serves a user to fulfill some preconceived task. A technical tool makes it possible to perform a specific task more effectively than without. In the course of the twentieth century with the advent of the atom bomb, environmental problems, and technocratic bureaucracy, it was discovered that technology is not always neutral. Technology has effects that cannot or can hardly be accounted for as "bad use" of technologies which in itself are "neutral". Jacques Ellul, for example, asserted that technology was getting an autonomous system. Important questions in the philosophy of technology were if and how the rush of modern technology could be stopped, or how technology could be changed to restore its human face [10].

In reaction to the totalizing views on technology of Ellul, scholars as Don Ihde [11] and Bruno Latour [12] have promoted research that was more orientated on historical and empirical facts. While accepting that technologies are not neutral, they do not frame the challenge of a philosophy of technology as a struggle between a human and a technical sphere. Instead they are interested in how concrete examples of technologies mediate the way people live. The same notion of technical mediation has also been promoted by Marshall McLuhan's famous studies into the effects of media on humans and society [13]. Peter-Paul Verbeek has characterized this empirical approach by a focus on "what things do" – the effects of concrete technical products on culture, society and users [14]. Building on the work of Ihde and Latour, Verbeek analyzes the role of concrete technologies as mediators of human experience and action. In this way, he outlines an empirical philosophy of technology with technical mediation as its main theme.

The approach of technical mediation allows for an analysis of product impact on user behavior and practices. In a trivial way the growth of the user's capacity can be seen as the first instance of product impact. More specifically, what is meant by product impact are secondary effects on users and society, often unintended. For example, a car facilitates rapid displacement, but has also reshaped the need for displacement in the course. Furthermore cars cause traffic jams, environmental problems, and they reflects status.

These are all side effects beyond the "primary" product function of rapid displacement. In this research project the notion of product impact focuses particularly on the behavior steering effects caused by the specific design of products. This is the type of product impact that is of primary importance when designers aim at improving product usability.

4. Towards a Product Impact Tool for Designers

The consideration and anticipation of product impact may contribute to design practice in two ways, depending on the level of impact. Color coding on buttons for example can be seen as a use cue that guides or directs the user's behavior (immediate use impact). The design of use cues by applying the right colors, the right forms, adding the right signs etcetera is way of applying product impact to guide the user [15]. The product impact is a rather direct result of specific product characteristics. This type of product impact has long been employed for example for safety reasons, in the form of al kinds of protective measurements, for example to prohibit people to get their hands close to dangerous parts of machines. B.J. Fogg employs the term "persuasive technology" to make clear that cues can also be used to "influence human beliefs and behaviors" in order not to prohibit them but to motivate them for action [16].

There are however also rather indirect effects of products. The effect that record labels and music stores have to close down because of the Internet and new music storage media is an impact of technological innovation on a much broader societal level (indirect cultural impact). Product impact theory will not yield a tool that is strong enough to control such societal changes. It can, however, study how the consideration of this broader form of product impact can inform and improve scenario making.

Whereas product impact on the first level is to some degree taken into account in current ergonomic and usability approaches, the second level is not explicitly accounted for. The philosophical research into technical mediation can in particular contribute to design by addressing the second level of product impact (that goes beyond the triggering effect of a red button).

5. Practical Obstacles to Designing for Product Impact

There are several reasons why the consideration of product impact in design may raise questions, practical and ethical. To begin with the practical problems, it proofs difficult to integrate ideas from social sciences with a designer's way of thinking. This difficulty has become clear from earlier attempts of integration of ideas about product impact into a design method, supported by SenterNovem, a Dutch agency for the development of sustainable technology [17]. Evaluation of the design method turned out that engineers were enthusiastic about the idea of directing the user by considering product impact. They noticed that the method could in principle find wide application, not only for sustainability as in that particular case but also for improving usability. But they also remarked that they had great difficulties to understand how they themselves should use the vocabulary of product impact in their design practices [18].

Taking into account product impact would change the role of designers. It seems that designers do not often think about how they change the behavior of people through behavior steering effects of their designs. Applying behavior steering techniques implies an

involvement of the designer with the way of living of the consumer. This task brings along social and ethical responsibilities that engineers seem reluctant to accept, according to the practical experience at SenterNovem. Design critic Victor Margolin, however, promotes a vision that design should not be concerned with products only, but should take "the way we organize possibilities for human action" as the object of design [19, p. 228]. This seems exactly the kind of task which product impact theory can help to address, for it investigates how products play a role in the organization of action.

Margolin also asserts the pertinence of the broadened design definition for consumers: "A greater awareness of how products contribute to personal experience will help everyone act more consciously and decisively within the product milieu as we seek to improve the quality of our lives" [19, p.55].

6. The Ethical Problem of Freedom and Product Impact

Complementary to the practical problems that designers may have with applying product impact, such applications also raise ethical question. How must designers, users and society cope with product impact? Fundamental ethical problems of product impact on behaviour are the interference with human freedom and human interactions. Moral philosophy has not traditionally paid much attention to the technical conditions of human existence, or at least not in the concrete way as in the philosophy of technical mediation does. With emphasis on freedom as a prerequisite for moral action, constraining action via technical products is per definition undesirable.

The philosophy of technical mediation, however, fundamentally challenges the presupposition of freedom and autonomy (in a Kantian sense). Relevant in this respect is Michel Foucault's critique of the notion of the subject [20]. Foucault asserts that freedom is not a prerequisite for moral action, but instead he promotes the notion of a "practice of freedom", always dependant on the concrete constraints people are confronted with. The subject in this view is the experience of self, of a certain degree of freedom and self-mastery in the situations that form one's milieu. In accord with his notion of the subject, Foucault promotes an ethics as care of the self, which he opposes to modern code-based ethics. Instead of founding universal and eternal rules, Foucault stresses the importance of attention for the conditions of one's existence, and the accompanying practice of giving style to one's own way of being.

Always dependant on a milieu the question is not if this environment (also of technical equipment) respects human freedom in a fundamental sense, but what form of freedom it allows for and helps shaping by way of its impact. Technology is not so much interfering with a free and genuine form of subjectivity, but it is part of the concrete conditioning milieu in which humans become subjects, through the interplay of product impact and accommodation by users. An ethics focusing on subjectivation allows to envision the ends and values that humans strive for, not in connection to unconditioned freedom, but instead in terms of use practices which are elaborated through the interplay of users and technology.

These processes of accommodation and subjectivation in interaction with new technologies happen all the time. Also people who may have philosophical doubts about the growing influence of technology, still in their daily lives fully engage in the gradual transformation of their existence by appropriating ever more technologies. It seems

therefore that an ethics of subjectivation by means of technologies is a valuable complement to ethical theory.

7. Becoming a Better Driver by Accommodating Intelligent Speed Adaptation

In the Dutch town of Tilburg a pilot was carried out with a system for Intelligent Speed Adaptation, which provides a concluding example [21]. This system automatically locates cars by means of GPS and limits the driving speed to 80, 50 or 30 kilometers per hour. Most volunteers participating in a pilot estimated beforehand that this technology would interfere too much with their freedom. Compelling technologies like speed limitation are not popular. Also, such systems seem to support the claims that technology is taking control and humans loose their freedom. To their surprise, after some experience, the system proved to enhance the driving practice in a way that the participants found helpful and convenient. It was noted for example that one's attention for the environment was pleasantly increased.

It seems that the ultimate acceptation or rejection of the technology was not so much determined by theoretical considerations about the respect for the driver's freedom. Instead, it was by on-hands experience and practice that participants turned themselves into driver subjects of a new kind in a milieu of smart technologies.

The possibility of accommodation of speed adaptation is without doubt related to its intelligent form. The system has a compelling direct impact on the user's behavior, but the intelligent, adaptive form makes it acceptable for today's users. The impact of the system allows for an experience of being an active and attentive driver. The system apparently employs a good balance between automation and user's activity, in way that it allows for a form of fusion where the human driver feels in control, and not the victim of technological constraints. Explicit consideration of the impact of technology may help designers in to anticipate the interaction with such a product. In addition, during testing it appears important not only to check the technical soundness, but also to do qualitative research into how people manage to become user-subject of the product.

The accommodation of such a speed adaptation system is also connected to broader cultural issues. Until now people have had more difficulties to accept fatalities resulting from machine failure than from driver's failures. With the intensification of traffic, of regulation of driver's licenses, changed sensibilities about alcohol use by drivers etcetera, this may well change. It May be that in the future reliance on individual's driving capacities will be considered as a provocation of accidents, as incomprehensible as the acceptation of dangers and fatalities in the early factories seem to people of today. If not a task of designers, than it seems appropriate for an ethics of technology to take into consideration such historical and cultural factors, when assessing new technology.

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