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The Product Impact Tool
Designing for user-guiding and user-changing*

Steven Dorrestijn

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Summary

Research on human-product relationships often focuses on user research. Designers perform user research to identify user needs and characteristics, knowledge that enables them to design products that fit people. But products are not only adjusted to people, products also change people. To improve usability, we have to look at how products guide and change people.

The aim of our study, was to investigate the impact of technology on users and how this knowledge can be applied in the design process. Can Product Impact knowledge help to anticipate and avoid use problems? Is it possible to design products that deliberately guide and change user behaviour? As part of our project we specifically considered the ethical dimensions of this view on technology and the design profession: is it acceptable that products constrain users, and what does it mean when designers influence users in this way?

The focus in this chapter is on the Product Impact Tool which was developed to make the research findings applicable in practice. It consists of a Product Impact Model and a format for executing a Product Impact Session. The tool aims at a change of mindset, to 'think the other way around': to not only consider how products serve user needs, but focus on how technologies guide and change users.

< The pitched roof of the trash bins at Dutch railway stations guides people towards its desired use: it prevents people from leaving rubbish on top of the bin.

YouTube
Watch a 3 minute animated summary of this research:
http://**bit.ly/pi-summary**

Author bio

Steven Dorrestijn followed a two-year program in Mechanical Engineering and Design History. He holds a Master's in Philosophy of Science, Technology and Society from the University of Twente, and an additional Master's in Philosophy from the University of Paris, Nanterre. His interest in product design and social aspects of technology were combined in his research on Product Impact, for which he was awarded a PhD from Twente University in October 2012.

Steven's PhD was supervised by Professor Peter-Paul Verbeek and Professor Hans Achterhuis.

Introduction

In order to design useful and user-friendly products, it is important to understand user needs and characteristics. However, it is equally important to see how technologies guide and change users. Clever use of these effects can improve usability and product acceptation whereas neglecting them often leads to product failure [1, 2].

A good case is the new electronic payment system introduced by Dutch public transport carriers (OV chip card). The system has been introduced nation-wide in the Netherlands by all the public transport carriers in all busses,

Figure 1: If the extraordinary curve in this bicycle lane in Paris makes you smile, this may also suddenly make you aware of to what a great extent our everyday movements are guided and constrained by technology.

trams, the subway, and trains.. There have been many issues since its introduction some of which have been made news headlines, for example privacy issues concerning travellers' data and hacking of the RFID chips by university researchers. When the public at large was introduced to the system in 2009, practical user problems also attracted a great deal of critical attention, especially the problem of forgetting to check out, a new and extra procedure compared to the old paper ticket system.

The problem of forgetting to check out can be illustrated by my own experiences. Being curious about the OV chip card, I was happy to try it as soon as the system was first introduced in Rotterdam and Amsterdam in 2009. At first, the standard procedure for charging the card, and getting on and off a bus or tram seemed self-evident and easy. However, all the rest seemed to be quite difficult: extra subscription procedures for first use on the trains, very unclear installation of automatic money recharge, etcetera. Later on, I also found that the basic procedures for checking in and out caused major problems. After I had used the card a few times, I no longer felt confident about its use and was far from sure that I was using the card correctly. When I got a printout of my travel log at a machine, it appeared that I had made mistakes checking out and changing trams on all the four occasions that I had used the card. Every time people check in, a deposit is taken from the card. I had lost the 4 euros deposit on four occasions. My clumsiness was no exception. In September 2010 it appeared that the public transport companies had received half a billion Euros in deposit money as a result of these 'incomplete transactions' [5].

The case of the OV chip card is a clear example of a mismatch between the technical possibilities and characteristics and the consumer needs and practices. Partly, this mismatch stems from technical setbacks that can be overcome. However the OV chip card case also demonstrates the implications of technology on the way of travelling, and how the efforts required from consumers to learn new routines were completely underestimated.

Figure 2: Extra signage placed during the introduction of the OV chip card system.

Technology should not simply be considered as a neutral means to fulfil needs that were always already there. Instead, technology can change users: it affects their behaviour, as well as their attitudes, needs, their vision on life, and way of living. The user-guiding and user-changing effects of technology form an important research topic in reflexive research fields – from philosophy and history to psychology [6, 7, 8]. To date, design practice has made little use of this knowledge, but there is a growing awareness of the possible advantages of combining these research fields [9, 10, 11]. This combination of both perspectives is innovative and promising for enhancing human-technology interaction and usability.

This chapter presents the Product Impact Tool which was developed as part of the Product Impact research project. The OV chip card (Figure 2) case serves to illustrate how an analysis of behaviour guiding and changing effects of technology can contribute to increasing understanding and to reducing problems of usability and technology acceptation.

Research method

An important part of the project was a literature review and a philosophical analysis of the different theories for understanding user-guiding and changing effects of technology. The ethical implications and challenges were extensively discussed. The connection between this theoretical approach and design practice was established by incorporating the knowledge in a design tool. The applicability of the tool was optimized during workshops with product development professionals.

Result: Product Impact Tool

The theoretical outcome of the project is an interdisciplinary, design and use-oriented perspective on the relationship in today's society between humans and technology.
The Product Impact Tool was developed to make this perspective applicable to design and product development practice. The tool comprises a model (see Figure 2) that sums up and visualizes the basic ideas of how technologies guide and change users and a workshop session format (Figure 3) that provides concise advice on the application of the model. Both are explained below.

Product Impact Model

The Product Impact Model consists of a human figure, surrounded by four quadrants reflecting different modes of interaction: physical, cognitive, environment (indirect), and abstract (Figure 4). The model is based on the questions: what kinds of effects do technologies have on humans, and how do these effects reach the user?

I will illustrate the model with modes of interaction and product impacts using examples from workshops in which an assessment and redesign of the OV chip card system was the subject (notably at the 2010 Design for Usability Symposium on Product Impact).

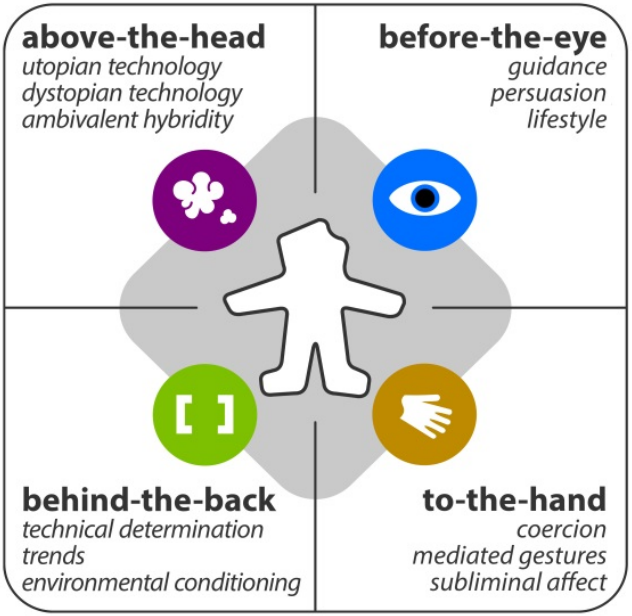

Figure 3: In the product impact model a human being (user) is represented receiving influences from different sides, through different modes of interaction. (updated model with more effects than mantioned in the text)

Cognitive - Before the eye

In the case of cognitive influence, technology is used to steer user behaviour through the user's cognition. Cognitive interaction is about the perception and processing of information. In this quadrant of the model, products influence user behaviour through signs (e.g., arrows, texts, light signals, beeps). Behaviour-guiding through cognitive interaction means giving suggestions for use. Two variations of influence in this category are 'guidance' and 'persuasion'.

Examples

Guidance: The OV chip card system could 'guide' travellers towards the correct procedures much more

than it currently does. Though the massively employed pink colour coding attracts the attention of OV chip users to guide them to the check-in poles, the, at times, illogical placement of these checkpoints has a negative influence, making people forget to check in and out. Better placement from the traveller's perspective would help people not to forget. This design intervention could enormously reduce the numbers of check out 'omissions'.

Persuasion: The OV chip card system currently tries to persuade travellers (not just guiding actions, but teaching a lesson, adjusting people's attitudes) by placing advertising campaigns and messages from the speakers in trains and busses. Persuasion could however also be attempted by more direct use of interaction with the system. In the workshop, we considered how the card and gates themselves could persuade travellers to check in and out by making the interaction more challenging: for example, introducing a game element, 'every tenth passenger travels free', was one of the ideas.

Physical - To the hand

The most obvious influence that technologies have on humans is that of physical behaviour steering effects. A characteristic of this influence is that the decision making process is largely cut short. Influences by physical interaction are obvious and widely applied in the form of technical obstructions such as fences, locks, et cetera. This interference in a user's bodily gestures seems to be perceived as being more intrusive than product impacts that address a user's cognition. Two effects in this category are physical 'coercion' and 'technically mediated gestural routines'.

Examples

Coercion: The gates for the OV chip card system, applied in many subway stations, are obvious examples of physical 'coercion' where the technology makes sure that travellers exercise the correct procedures for checking in and out. The design challenge of this type of system is to combine coercion with sufficient user-friendliness.

Technically mediated gestural routines: Ultimately, the OV chip card and other components of the system should become part of the 'user routines'. In routine-like behaviour, users have an intuitive relation with technology, so that they do not have to think about how to use this technology. At the moment, the system has been introduced but users are still learning to use it, users need extra help. Checking out with the OV chip card is not yet part of user routines, and apparently this is harder to achieve than the developers had assumed.

Environment – Behind the back

In the case of effects listed in the environment quadrant, it is technologies in the environment in which users reside that influence them. For example heating systems that increase comfort and allow us to live in cold regions. However undesired system effects can also be considered part of the environment: cars allow for fast transportation, but with too many cars, roads can get congested thereby limiting the possibility for fast transport. The environment we live in also shapes our moral standards: placing trashcans everywhere is a signal that throwing your trash on the ground is an undesirable action.

Changing and designing the environmental setting is only possible to a limited degree. However, an exploration of the indirect effects of technology does help designers to grasp 'trends' that may converge or conflict. It can help them understand how experiences related to concepts such as privacy and freedom are co-constituted by the technical environment ('environmental conditioning').

Example

An analysis of the routines of travel in relation to the technical environment reveals different trends that the public transport chip card interferes with. The OV chip card promises ease of use: fast and easy check in and check out, jumping on and off trains, switching between train and subway, etcetera, while payment proceeds automatically. This flexibility indeed matches a 'trend' of our time, conditioned by all kinds of network technologies in our 'environment': we have permanent access to the Internet for the weather forecast, banking, e-mailing etcetera.

As soon as people become used to the e-payment card, the activity structure of pre-planning a trip for the whole day, buying a ticket, and then sticking to the plan for the day, will very soon begin to feel outdated. The old paper ticket was, as much as the new chip card now is, part of a regime that structures our behaviour, and that 'conditions' particular experiences of freedom and privacy. Nowadays, freedom is increasingly associated with flexibility.

Abstract – Above the head

The three preceding interaction modes, physical, cognitive and environment are about concrete relation between humans and technologies. This means that there are always concrete cases and examples at the base of the analysis. In contrast, an abstract approach results in generalizing theories and claims about the relations between humans and technologies. What is the nature, or the essence, of technology? Can we determine the course of technological developments, or does technology determine the course of human history?

Obviously it is not in the power of designers, nor of users, to change how technology influences humans throughout history, on a global scale. Still, this abstract dimension is important, because generalizing conceptions about the interdependencies between humans and technology marks people's visions on technology. Discussions and controversies about technology often get bogged down in the extreme positions of 'utopian technology' and 'dystopian technology'.

Example

In the case of the OV chip card this is very clear regarding the privacy issue. The security and privacy debate induced by the card hackers constantly alludes to the fear of a 'definitive demise of privacy' and the need for an 'absolutely secure chip'. This idea that technology can be completely secure and controllable is a 'utopian' conception of technology. Its counterpart, the belief that the OV chip card system is the next big step toward Big Brother, is a 'dystopian view'.

The Product Impact Session

In addition to the model, the tool contains a format with directions for conducting a Product Impact Session which helps to apply the product impact model to discover user-guiding and user-changing effects of a product, and generate ideas for redesign.

Step 1: Preparation

The first step of a product impact session is to answer some preparatory questions in order to focus on the specific design challenge.

There are many aspects of a design assignment, so focus is a necessary and unavoidable step. This step helps identify critical behaviours, for example in the case of the OV chip card, the problem of 'forgetting to check out' is a critical use procedure.

Step 2: Assess and re-design

In the central phase of the Product Impact Session a

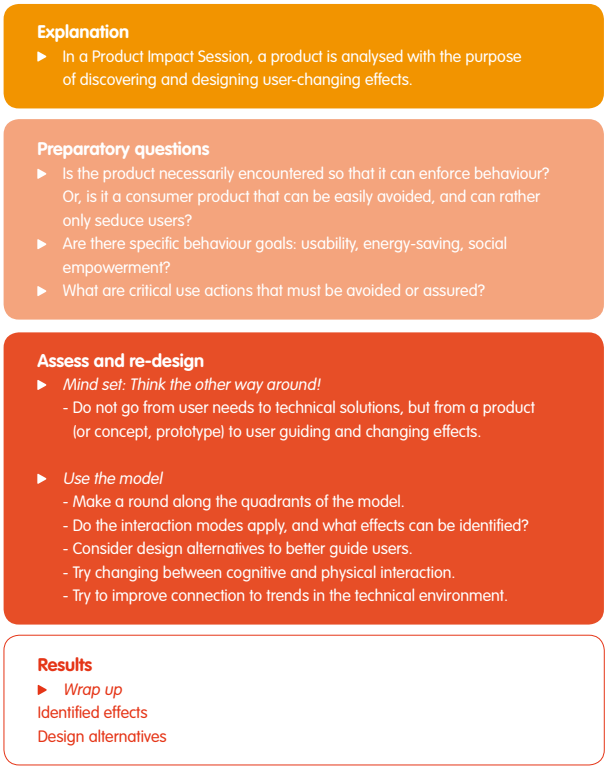

Figure 4: The steps of the Product Impact Session, a workshop conceived to provide product development teams with a reverse perspective on human-product interaction, namely not on how to design a product to fit people, but how a product could and might change people.

product is assessed to identify user-guiding effects, at the same time prompting ideas for re-design. A session can be carried out at every stage of product development, although the objectives will differ. In the early stages of product development, the tool can support the definition of use scenarios. In the final stages or in the case of redesign, it can help to identify use problems with the actual product or prototype (combined and integrated with user tests). In all cases,, what is important, is to adapt the product impact mindset of seeing what the actual behaviour effects of a product are, irrespective of the (doubtlessly good) intentions of the designer.

Step 3: Wrap-up

The final step of the Product Impact Session is to simply wrap up the findings and ideas. A product impact brainstorm session helps to assess and redesign user-guiding and user-changing effects that are behind many of these use problems. The abstract category of 'effects of technology' gives the best understanding of the debate; but for re-evaluating and improving everyday practices of user-technology interaction, the concrete quadrants of product impact analysis are crucial.

Benefits

A clearly proven benefit is the relevance of the Product Impact Tool for educational purposes. Students as well as design practitioners appreciated learning the perspective of 'thinking the other way around'; focussing on products to consider the user-changing effects.

A broader societal benefit is that the perspective of Product Impact gives new impetus to the social engagement and responsibility of designers. Product Impact research provides insights and tools to revive the social role of design on a moderate but much more concrete scale.

Validation in practice

The Product Impact Tool in its current form is the result of workshops with companies involved in the Design for Usability project, with participants at Design for Usability symposia and students in design classes. These sessions have always proved to be inspiring for participants.

Onno van der Veen
Owner/director at Zeeno Human-Centered Design

On the Product Impact Tool and grand challenges

"Design is progressively concerned with finding solutions for grand challenges. Energy consumption and sustainability, or supporting elderly people to live on their own, are examples. Stimulating desirable behaviours is an important aspect. The Product Impact Tool offers an interesting perspective for designing for behaviour adaptations."

Willem Mees van der Bijl
Account and project manager at Indes

On getting a fresh perspective through the Product Impact Tool

"The Product Impact Tool offers a fresh perspective on existing products as well as products in development. A session can lead to interesting reflections on a product, but also result in surprising new product ideas: iInnovations that are distinctive; big leap innovations. In this way it contributes to the discovery of new market opportunities."

More information

http://www.stevendorrestijn.nl

Product Impact Tool
Web-based repertoire of examples

Product Impact Tool brochure
More information on the Product Impact model and description of the workshop

PhD Thesis
Extensive theoretical background with references, explanation and discussion

Author homepage
More information on the author's research and educational activities:
http://**bit.ly/sdorrestijn**

Contact

If you are interested in learning more about the Product Impact Tool or would like to hold a Product Impact session at your organization, please contact the author.

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Core publications

> Dorrestijn S. (2012). The design of our own lives: Technical mediation and subjectivation after Foucault. PhD Thesis. Twente University, Enschede, The Netherlands.
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