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Philosophy of Technology x Design: the practical turn

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In this paper we explore how the collaboration between Design Research and Philosophy of technology can be profitable for both disciplines. From three case studies where Philosophy of Technology theories and methods were applied in a design context we show how these projects profited from a more reflexive perspective. Then we analyse the three cases again to show how these design projects also lead to a better understanding from a Philosophy of Technology perspective. In putting the in principle rather abstract theories in design practice, the consequences become clearer and designing actual things thus provides a laboratory to test philosophical frameworks in real life. One can say that the Philosophy of Technology, besides thinking and talking, proceeds to action. Not only Philosophy of Technology with the head, but also Philosophy of Technology with the hands. Therefore, in analogy with the empirical turn in Philosophy of Technology before, we present this collaboration with design as the 'Practical Turn in Philosophy of Technology'.

ethics of technology; practical turn; design for behaviour change; mediation theory

1 Introduction

Research in the Philosophy of Technology has led to a variety of theories and reflections about the impacts of technology and innovations on our culture and our daily lives. Bringing such philosophical and critical insights about the impact of technology to the practice of design of technology, where the purpose is to actually change things, holds the promise of developing critical and responsible approaches to the design of our future world and way of living.

This implies that philosophy of technology besides thinking and discussing concepts starts to engage more closely with practical probing. Design thinking in a most literal sense: philosophical thinking about life by way of design, by making and testing products and possible ways of doing. In philosophy of technology there has been an empirical turn, towards the study of concrete technologies in society. Our proposal is to further develop this into a practical turn, with a change from 'study and description' to 'interventions by design', with the redesign of technologies and correlated ways of doing.

We start this paper with an overview of stadia in the philosophy of technology up to the empirical and practical turn. Next, we present three different design cases where philosophy of technology tools and theories were explicitly applied. From these three cases we will argue how the philosophy of technology perspective can improve design results. After that we will show how these design projects also led to results for philosophy of technology. We conclude with discussions and a positioning of our proposal for a practical turn in the philosophy of technology.

2 Philosophy of Technology Turn by Turn

Technology is becoming an ever more important topic of philosophical reflection. This is however a relatively recent development. There are good reasons to define the human being by the use of tools, from stone tools and the control of fire in the prehistoric beginnings of human history up to today's smart phones and genetically modified crops. Still, the conscious reflection on the technical conditions of our lives long remained a marginal topic in philosophy. During the past centuries a divide has existed between the human sciences and the exact sciences, what C.P. Snow has called the "two cultures". Technology and engineering knowledge belonged to the exact sciences and philosophical contemplation had not so much to contribute there. It is of course basic knowledge in the human sciences that the Scientific and Industrial Revolutions have shaped modern Western culture. Still technology did not receive much attention, because it was only the applied form of science making progress tangible.

2.1 Early, classical, and empirical philosophy of technology

Early philosophy of technology views technology mostly in this utopian spirit of progress that leads human life from a precarious state towards completeness. In this framing technology could easily escape from attention because it appeared itself unproblematic and therefore neutral. The idea of technology as neutral instruments is still widespread in common thought, but philosophical reflection has always explored the deeper significance of technology for society. Ernst Kapp (1877) was the first to use the phrase "philosophy of technology" in the title of a book in which a theory was elaborated of how technologies are projections of capacities of their human inventors. In his view the hammer was a projection of the fist and the saw a projection of the teeth. The telegraph system could be seen as a projection of the neural network. Technology also figured in the theory of a spiritual super-structure which is determined by the material-economic base of a society by Marx and Engels. Their concern was however that most people do not profit from the advancements in production. Technology appears in early philosophy of technology as the means for the completion of human life, while the challenge remained to make everybody share in the advancements.

With the spread of technology during the twentieth century also the dangerous impacts of technology on humans, society and the environment became more manifest. This became a major topic in the work of prominent philosophers, such as Martin Heidegger, Herbert Marcuse, Jacques Ellul, and Lewis Mumford. In this period of "classical philosophy of technology" the tone reversed from utopian to dystopian. What if social inequality was a problem inherent to technology itself? In the twentieth century the Marxist struggle was no longer between classes of people, but between humanity on the one side and all the technology accumulated into a system gone out of control on the other side. The most emblematic event was the explosion of the two nuclear bombs in Japan. An awareness suddenly struck that a humanly construed thing was so dangerous and powerful that it could even annihilate humanity. Classical philosophy of technology analysed the threat of technology dominating humanity and called for limits to the rush of technology.

From the 1970s onwards new approaches were developed with more detailed, differentiated and ambivalent views on technology. This new wave is characterized by a revaluation of the concrete adventures of humans and technology as opposed to the abstract and generalising claims of the classicists. This concreteness was then reflected in the term "empirical turn" (Achterhuis, 2001; Verbeek, 2005). To break out of the framework of technology as a massive and dangerous system philosophers of technology began to incorporate more case studies and collaboration with

historians, sociologists, and anthropologists (in the new field of Science and Technology Studies). Don Ihde (1990, 1993) analysed the variety of relations between humans, technology and world. Bruno Latour (1992) began to describe how technical products give a twist to our way of living, under the general assumption that humans and technology cannot be separated but co-shape each other. Donna Haraway (1991) thought that our merger with technology has long made us cyborgs and that this puts us in need of new ideas about the human being, concerning gender for example. Contemporary philosophy of technology now acknowledges the fusion and interdependency of technology and human life, and concedes that any technology will always have both good and negative consequences.

An advantage of the empirical style of philosophical analysis is the focus on concrete products in everyday life, which appeared refreshing compared to the generalizing and abstract analysis of before. The debunking of abstract and essentialist ideas about technology, meant a kind of liberation from the dystopian fatalistic sentiment in classical philosophy of technology. It also opened the way for Technology Assessment approaches for the government of technology in society.

A disadvantage was that the ethical seriousness of before was largely lost, regretted for example by Langdon Winner (1993). The approaches of empirical description taken by Latour, Ihde, or Haraway were explicitly directed against generalising philosophical and normative claims. However, other proponents of the empirical turn aimed to renew rather than to oppose the classical studies. Albert Borgmann (1984) built upon Heidegger's work, but with more concrete suggestions for meaningful engagement with modern technology. And the critical theory of technology by Andrew Feenberg (2002) explored the possibility of alternative technology and structural change of society, better tuned to social values.

2.2 Beyond the empirical turn

Currently we see a variety of initiatives to explore and develop again the deeper critical and ethical potential of philosophy of technology after the empirical turn. Robert Scharff (2012) questioned if empirical philosophy of technology does not suffer from "too much concreteness" and promotes a reappraisal of the work of Comte and Heidegger (early and classical philosophy of technology). Others plea for a stronger political dimension with a revaluation of resistance and societal change (e.g. Rao et al., 2015). There has been an increase in engineering ethics studies, and recently an appeal for an axiological turn (Kroes & Meijers, 2016). Even Latour who so strongly promoted the empirical orientation has recently been expanding his approach by a profound philosophical framework with a prominent place for the notion of values (Latour, 2013). All in all there is a reconsideration of more critical stances: an "ethical turn" (Brey, 2010; Verbeek, 2010).

At this point we want to bring to the fore a "practical turn", which we see as a different branch for further development of contemporary empirical philosophy of technology. Although the empirical turn led to instant practical success with Technology Assessment and governance of innovation, the collaboration of philosophy and design seems another obvious way to make philosophy of technology practical. This is in line with Peter-Paul Verbeek's (2010) proposal that philosophers "accompany" technology development. Verbeek suggests an approach where philosophers do not act as ethical border guards who say yes or no to new innovations, but where instead they collaborate in the design process, adding philosophical and ethical reflection, and aim to contribute to better designs.

A practical turn suits the contemporary view of ambivalent technology in which there are no predefined and overarching answers to what is good and what is not (utopian and dystopian views). Reflection by ourselves on our own situation and circumstances must lead to a self-defined ethical vision on how to live with technology. In this respect, of determining future ways of living, the design and ethics of technology merge. The reluctance to give a hard yes or no, may be unsatisfactory from the side of the "ethical turn". From a normative ethical viewpoint, the idea of co-evolution of technology and morality, as is assumed in the accompaniment framework, might lead to a sort of

accommodation and justification of shifts of moral values in any direction. From a practical viewpoint however, the advantage of actual influence in the real world contrary to firm but ineffective theoretical moral standpoints is deemed more relevant.

Such considerations about the (ethical) justification in theory of the philosophical accompaniment of technology are important, but what does it actually mean in practice? What are good examples and what are good approaches for bringing philosophy of technology and design together? In the following we will discuss examples of how design may improve by the use of philosophical tools. Afterwards we will also reflect on the question what the philosophy of technology gains by a practical turn.

3 Philosophy of Technology in Design Practice

In the following paragraphs we present three design cases where Philosophy of Technology theories and methods were explicitly used in an attempt to improve the design outcomes. In particular mediation theory by Verbeek (2005, 2015) and the Product Impact Tool by Dorrestijn (2012, 2017; Dorrestijn & Eggink, 2014). Verbeek's mediation theory offers a structured account of human-technology relations in order bring to the fore how technologies mediate human perceptions of the world and actions in the world (figure 1, left). Dorrestijn's Product Impact Tool is a more practical implementation of theories like Verbeek's into a model intended to be helpful in the design process. It offers a repertoire of exemplary types of impact of technology on humans, presented in a model with different sides or levels of affection (figure 1, right).

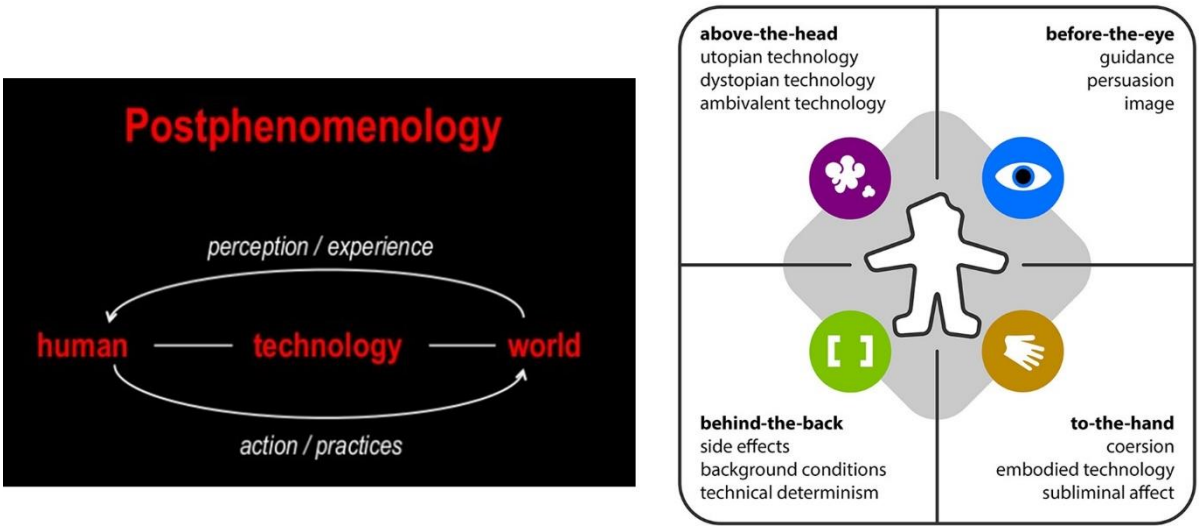

Figure 1 (left) Schematic depiction of Mediation Theory (after Verbeek, 2014) and visual model of the Product Impact Tool (Dorrestijn & Eggink, 2014). See also: http://stevendorrestijn.nl/tool/english.html

3.1 Design Case – eBike interface

In 2008-2009 the Dutch design agency Indes worked on the (re)design of a Dutch bicycle with hybrid traction – as it was at that time called. Specifically it concerned the design of the electrical kit of the bicycle. The electric kit would contain battery, motor and a user interface to control the several functions such as the amount of support of the electric motor. One of us authors collaborated as a researcher in philosophy and technology and usability with the design agency, in fact much like the "accompanying technology" approach, as proposed by Verbeek later (Verbeek, 2010). Because of the focus on usability and interaction design the researcher was assumed to advise on the design of the user interface: the amount, characteristics and functionality of the buttons and display of the user interface. However, analysing the hybrid bicycle from a perspective of mediation theory (and the Product Impact Tool in development), the advice turned out differently (Dorrestijn, 2011).

A display with buttons is particularly an example of a human product relation in the cognitive realm. The user experiences the product through interpretation of the information that is provided to him

or her through the user interface. The user interface thus mediates between the bicycle and the cyclist. However, cycling in itself is exemplary for a direct physical relation. The act of cycling becomes part of our physical routines by practice and is, once learned something one does unconsciously. In this embodiment relation (Verbeek, 2015) the user becomes one with the technology and experiences the world together, so to speak.

The hybrid bicycle concept by Indes stood out with a patented drive train that provided for a fluent adaptation of the electrical support to the movements of the cyclist. The better this works, the better the bicycle will be perceived as a part of the cyclists own body. In the best case the electric motor support would not be noticeable as a device that reacts on the input of the user, but the cyclists would rather have the experience of miraculously extra strength coming out of his or her own legs.

On the basis of these considerations the concept of the "perfectly embodied eBike" was formulated, where the display was completely left out and the interaction with the bicycle stayed purely physical, based on electronically sensing the force of the user. A consequence is that the bike can have less electric functions, however the concept is attractive because of its natural interaction. This could serve ease of use. And while the reduction of functions could harm a high tech image, it could add to an image of pureness and sportive strength and fitness.

3.2 Design Case – Solving a littering problem at a secondary school

A second design project concerned an attempt to influence user behaviour, in particular the waste disposal behaviour of students at a secondary school in Deventer, the Netherlands. Central problem for the school was the large amount of litter that remained every day after lunchtime in the central canteen. The school had already experimented with an installation that should encourage the students to throw away their waste by making it more attractive and playful. The installation that mimicked a basketball ring however lead to an even bigger mess (figure 2, left). Industrial design student Paul de Waard proposed several alternative solutions from which the converted lunch table with a trash bowl directly in the middle was the most successful (figure 2, right).

Figure 2 (left) Playful design of a waste bin didn't work (right) Mock-up of the alternative solution with a waste bowl integrated in the middle of the lunch table (de Waard, 2012).

Although this reduces the effort of throwing away your waste to a minimum, one would say intuitively that having your lunch directly around a waste bin in front of you is not very desirable. A user test however showed that the students had no problem with this solution whatsoever and moreover, it indeed showed that it solved the problem of waste throwing on the ground (figure 3).

On a sidestep it is interesting to mention that a simplified pre-test with waste bowls that were not integrated in the table but just placed on top of it was not so successful. The waste bowls ended up thrown away on the ground themselves (see also figure 3; here the green bowl is visible surrounded by waste on the ground just left of the middle). This shows that it is very important with these kind of intended influence of user behaviour to be precise in testing the designed solutions in context.

Figure 3. Image of the lunch area of the secondary school after one of the tests. The area around the converted table (in the front, with the bowl in the middle full of waste) is free from litter on the ground (de Waard, 2012).

Having seen this big difference in results from just slight differences in design solutions, de Waard chose to analyse the effects of his intervention with the Product Impact Tool. This tool presents the possible effects and affects in the interaction between users and technology, divided in four quadrants. These quadrants represent the physical “to-the-hand”, the cognitive “before-the-eye”, the environment “behind-the-back” and the abstract “above-the-head”.

The analysis showed that the proposed solutions were mainly to be found in the before-the-eye quadrant, with persuasion and suggestion as the most important influencers. The waste bowl seduces the user to dispose waste because it is right in front of his or her eyes. This lead to a whole new strand of possible behaviour influencing measures targeting at changing the attitude of the students towards waste disposal.

Based on the views on technology in the above-the-head quadrant de Waard developed teaching materials for classes in Social Science and Society, and a Facebook Application (figure 4). The teaching materials were in the first place targeted at learning about more sustainable alternatives for the target group, like for instance using a bicycle instead of a scooter. This is based on the view of “utopian technology” from the above-the-head quadrant of the Product Impact Tool, meaning a positive view on the use of technology as the way to better the future. On the other hand, the teaching materials showed the consequences of littering behaviour like in the example of a deformed tortoise due to plastic waste (figure 4, mid). This is related to the idea of “dystopian technology” of the above-the-head quadrant, that reflects on the negative aspects of technology. The Facebook Application was targeted at directly influencing the opinion about littering by promoting likes and dislikes for desirable and undesirable behaviour (figure 4, right).

Figure 4, Examples of alternatives for influencing littering behaviour; Scooter vs. bicycle teaches students about sustainable choices; image of distorted tortoise shows consequences of littering; facebook post influences opinion about littering.

In a questionnaire evaluation, a large proportion of the target group responded that they would change their littering behaviour, influenced by the concepts. Especially more than half of the 100 respondents indicated that they would change their behaviour after having seen the images of the negative consequences. In this way, the teaching materials can strengthen the effect of the before-the-eye based integrated waste-bowl concept.

3.3 Design Case – Digital Camera evolution

The third design case concerns the design of a next generation digital camera. In this project students Sven Deinum and Tom Feij investigated the evolution of the photo camera in order to come to an improved future design concept (Deinum & Feij, 2017). The analysis of the historical development of the photo camera showed that since the introduction of the first commercially successful rangefinder camera, the Leica II from 1932, the appearance of the photo camera hardly changed until the present day. The students then applied a mediation theory analysis to a set of typical cameras derived from the historical analysis, in order to find out more detailed differences and developments. This analysis revealed that the introduction of the digital camera, although not very visible on the outside of the camera design, had a huge impact on the human-product relation with cameras.

Formerly, with the analogue rangefinder camera the user would look through the camera objective onto the subject of the photograph. This is a pure example of an embodiment relation, where the user is not focused on the technology, but perceives the world through the technology. As Verbeek puts it: "In embodiment relations, technologies form a unity with a human being, and this unity is directed at the world: We speak with other people *through* the phone, rather than speaking to the phone itself, and we look through a microscope rather than *at* it." (Verbeek, 2015, p. 29).

With the introduction of the digital compact camera, with a large screen display at the back showing a preview of the photograph to be taken, this completely changed. When busy taking a photograph, the user watches the screen of the camera where one sees a preview of the picture to be taken, rather than the subject out there which one wants to make a picture of. The direct embodiment relation is changed into an indirect alterity relation, where the user interacts with the technology while the real world is a sort of hidden behind the technology in the background. With the attention of the user confined to the camera display, the user is also shut off from the environment, which is in particularly influential when taking pictures in the company of other people, or taking portraits.

Based on this analysis, two major use aspects where included in the requirements for the future camera concept: "If possible, the camera should communicate openness to people around the user", and "While using the camera, the attention of the user should not lie with the camera, but with the subject." (Deinum & Feij, 2017, p. 47). The students solved this by introducing a cleverly redesigned range finder, which serves as a window to the world (figure 5).

Figure 5. Future digital compact camera concept with two possible views through the new rangefinder; an overview when the camera is held close to the eye and a detailed cut-out of the scene when the camera is held far off (Deinum & Feij, 2017)

The rangefinder is a simple glass rectangle on top of the camera through which the user directly looks at the subject of the photograph. The camera would at the same time measure the distance and position of the eye with respect to the camera. When the camera is held close to one's eye the rangefinder shows the whole scene and when held with stretched arms the rectangle encompasses only a tiny detail of the environment (figure 5, right). The photographer in this way uses the glass rectangle to literally *frame* the subject, while at the same time still overseeing the whole scene. In this way the embodiment relation is restored. At the same time, while the user is no longer focussed on the camera, it also enables an openness to the world. This aspect is even stronger than with

conventional analogue cameras, because the open frame of the new rangefinder allows the user to see the whole environment. And from the perspective of the subject, the photographer is also more visible because the camera is held more at a distance (figure 6).

Figure 6. User interface of the future camera concept and a typical use situation holding the camera at a distance (Deinum & Feij, 2017).

4 Better Design by Use of Philosophy of Technology?

In all three design cases the incorporation of Philosophy of Technology theories and tools had informed the design outcomes. It is difficult to decide if these outcomes were better than without the influence of the Philosophy of Technology perspective, but at least one can say that there were new and different ideas.

In the case of the eBike interface the mediation analysis showed that the addition of a traditional cognitive interface would compromise the embodiment relation that is natural to the bicycle. Without this analysis the designers would have simply placed a display and knobs on the bicycle steer. Resulting in a more indirect interface, that could even distract users from their primary task of cycling. Especially in heavy traffic this can be potentially dangerous. The concept of the perfectly embodied eBike means a retrieval of natural interaction with possible gains for usability and safety in traffic and a different positioning qua image. The philosophical reflection enabled the designers to take distance and to rethink what an eBike can be on a conceptual level.

In the case of influencing the littering behavior, the influence is not so much visible in the proposed solution itself. The Product Impact Tool analysis of the converted lunch table provided the designer with more insight in the working of his concept, but it did not change the concept so obviously. The added value of the use of the Product Impact framework in the project lay more in the additional options that were explored to influence the target group. The four quadrants showed the potential to influence in different ways on different levels. In this way the behavior change is potentially strengthened because it impacts the user from multiple sides. And if the user is not so vulnerable for a particular type of influence, he or she can still be affected on another level.

In the case of the camera redesign the mediation theory analysis revealed the ‘problem’ of the interaction with camera and subject-to-be-photographed, even if there did not seem to be a design problem in the first place. The narrow functionalist idea of a taking a picture of a scene is broadened with details about the photographer’s gestures and posture in respective to the camera and the environment or people that make the scene. Moreover, this use of the Philosophy of Technology perspective revealed ways for improvement. Especially when a long product history is limiting innovative solutions because of the image of what a good product should be is influenced by strong archetypes (Eggink & Snippert, 2017).

5 Better Philosophy of Technology by Collaboration with Design?

Is the collaboration with design also beneficial for philosophy of technology? We will now concisely review the three cases again to see which kind of philosophical reflection can be evoked through the philosophical accompaniment of design practice.

In the case of the eBike it appeared that the old phenomenon of embodied technology (e.g. Heidegger 1996 [1927]; Ihde 1990) remains valuable in a high-tech world. In classical philosophy of technology in the wake of the later Heidegger (1977 [1954]) embodied technology is linked to traditional tools and romanticized. Modern machine technology, and contemporary digital and interactive technology would not allow this natural relation of embodiment, and instead cause estrangement of people. The eBike gives practical proof for the claim in empirical philosophy of technology that the estrangement thesis is one-sided, and shows that against a certain trend, embodied technology can be retrieved in an era of smart technology.

The second case, about litter disposal behaviour changing design, brings out how very important actual testing is. The situation of an environment with technical products and people's behaviour is so complex and full of detail that it seems impossible to forecast exactly what people do and experience. The concepts from the Product Impact Tool helped to structure the search for solutions but also raised awareness about the occurrence of unexpected impacts. There is an alternation between conceptual thinking and practical testing which makes this a case of philosophical research with the hands as much as with thought.

The third case, about the rangefinder for digital cameras, shows the persistence of the phenomenon of the embodiment of technology again, much like the first case. What was also present in the first case, but stands out here, is how philosophical reflection helps to take distance for a reconceptualization of how pictures are made. The mediation analysis helped to become aware of the differences between cameras one looks through or looks on for the making of pictures (engagement with the whole actual scene against focus on the preview of the picture on the camera screen). Moreover, it appears that customary values and ways of doing which appeared to be affected by new cameras can still be saved or retrieved by a thoughtful redesign. This is a case for the feasibility of the idea of "alternative technology" (after Marcuse, see Feenberg, 2002) which philosophy could never make so tangible without the practical turn of collaboration with design.

6 The Practical Turn

Philosophy of technology made an empirical turn in recent decades, from abstract theories to more detailed description of concrete technologies, situations and use practices. Today there is a renewed wish to bring back a more critical perspective: an ethical turn. It would be a pity however if this would renew the gap between philosophy and practice. A feasible compromise can be to continue with philosophical reflection on questions about deeper principles and structures while simultaneously continuing with more practical and applied work in collaboration with designers. The two types of work need not be mutually exclusive. Characteristic of our proposal of a practical turn is the application of philosophical insights in actual design. This should not at all mean however that only philosophical work that can directly be put to practice is valuable.

What is then the meaning of the practical turn? The "philosophical accompaniment of technology" is a nice but very general expression for what a practical turn entails. The redesigns and reconceptualization in the three cases we discussed also illustrate Don Ihde's variant of a practical philosophy of technology when he suggested that philosophers of technology can serve in an "R&D role". His proposal is that philosophers contribute to the design process with "deep insight into both technological structure and the history of technologies", and with "a critical take", though "detracted neither by utopian nor dystopian aims" (Ihde, 2002, p. 112).

Such ideas must however be made one step more concrete and operative. There is a need for more translation of work in the philosophy of technology into philosophical tools for design research. The

Product Impact Tool is our version of such a translation. We think our proposal compares to approaches such as Critical Design, Social Design and also Persuasive Design.

Persuasive Technology (Fogg, 2003) and Social Design theories, like Tromp et al. (2011) deal with the same kind of 'user-influencing-for-the-greater good', but they are also limited to this specific focus and come with a smaller, less versatile repertoire than our approach. The classification of Tromp et al. (2011) of the intended user influence, based on the dimensions of force and salience is more or less limited to the physical and cognitive quadrants of the Product Impact Tool that encompass coercion, suggestion and persuasion. Characteristic of the Product Impact Tool is the inclusion of the environment and reflection via the quadrants "behind-the-back" and "above-the-head". Philosophical reflection is also a characteristic of Critical Design (Malpass, 2010). However Critical Design is merely limited to criticizing the status quo by stimulating critical thinking and user reflection (Markussen, 2013), therefore with limited results for everyday practice. In comparison our approach is more practical and focussed on functional and usable results. So, our approach to philosophically accompanied design compares to Critical Design, Social Design and also Persuasive Design, but characteristic and distinctive is the simultaneous orientation towards practical use and critical reflection.

7 Conclusion

In three cases presented above concepts and tools from the philosophy of technology were applied in design. This proved to have results in the sense of new, surprising, and perhaps better designs. The other way around philosophy of technology also gained from the collaboration with designers. The effects of technology are ambivalent. Estrangement and domination as may be a threat, but more desirable alternative directions are possible. These are philosophical claims, which however cannot find their ultimate form nor decisive proof in philosophical argumentation, but only in practice. In that sense philosophy of technology has to become practical if it wants to fulfil the task of answering its own questions.

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