

Moralizing Technology: on the morality of technological artifacts and their design

paper for workshop

*'Methodologies for the moral evaluation of technology development',
Ethics Institute, Utrecht University, The Netherlands, March 24-25, 2006*

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This workshop paper is based on the articles mentioned below. I apologize for accidental overlaps and duplications in the text, but I preferred to merge the three articles rather than to send only one of them.

- Verbeek, P.P. (forthcoming May 2006), 'Materializing Morality – design ethics and technological mediation', in: *Science, Technology and Human Values - special issue on Ethics and Engineering Design*, ISSN 0162-2439
 - Verbeek, P.P. (forthcoming 2006), 'The Morality of Things – A Postphenomenological Inquiry'. In: Evan Selinger (ed.), *Expanding Phenomenology: A Critical Companion to Ihde*. New York: State University of New York Press, ISBN 0-7914-6787-2
 - Verbeek, P.P. (in review), 'Morality in Design – Design ethics and the morality of technological artifacts' (to be published in: *Designing: from philosophy to ethics, from engineering to architecture* (tentative title), edited by Pieter E. Vermaas, Peter Kroes, Andrew Light, Steven A. Moore, Springer Academic Publishers, 2006
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1. Introduction: Morality and Materiality

Ethics appears to be at the eve of a new Copernican revolution. A few centuries ago, the Enlightenment, with Kant as its major representative, brought about a turnover hitherto unequalled by moving the source of morality from God to humans. But currently there seem to be good reasons to move the source of morality one place further. It increasingly becomes clear that we should not consider morality as a solely human affair, but also as a matter of *things*. Just like human beings, material objects appear to be able to provide answers to moral questions. The artifacts we deal with in our daily lives help to determine our actions and decisions in myriad ways. And answering the question how to act is the ethical activity *par excellence*. This 'material turn' in ethics raises many questions, though. Is the conclusion that things influence human actions reason enough to actually attribute morality to materiality? Can things be considered moral agents, and if so, to what extent? And is it morally right to go even one step further and try to explicitly shape this morality of things, by consciously steering human behavior with the help of the material environment?

The ethics of engineering design is perhaps the best place to start analyzing the moral dimension of technological artifacts, since this is also the place where human beings can take responsibility for the moral aspects of their products. In its current form, though, the ethics of engineering design tends to follow a somewhat externalist approach to technology. It mainly focuses on the importance of taking individual responsibility ('whistle blowing') to prevent technological disasters, and on methods to assess and balance the risks accompanying new technologies. Favorite cases studies concern technologies which have caused a lot of problems that could have been prevented by responsible actions of engineers, like the exploding space shuttle "Challenger", or the Ford Pinto with its rupturing gas tank in crashes over 25 miles per hour. Case studies like these merely address technologies in terms of their functionality: technologies are designed to do something, and if they fail to do so properly, they were badly designed. What such case studies fail to take into account are the impacts of technologies on our moral decisions and actions, and on the quality of our lives.

When technologies are used, they always help to shape the context in which they fulfill their function. Technological artifacts help to shape human actions and perceptions, and create new practices and ways of living. Cell phones, e.g., contribute explicitly to the nature of our communications and interactions. And technologies like ultrasound play active roles in our decisions regarding unborn life. Functionality is too limited a concept for engineering ethics. Mediations transcend functionality: they form a surplus to it, which occurs once the technology is functioning. When technologies fulfill their functions, they also help to shape the actions and experiences of their users. This phenomenon has been analyzed as 'technological mediation': technologies mediate the experiences and practices of their users (Latour 1992; Ihde 1990; Verbeek 2005).

Up to now, the concept of mediation has mainly functioned in *descriptive* settings: in analyses of the role of technologies in their use contexts. In this article, I investigate how it can be deployed in a *normative* setting. The concept of mediation lays bare ethical questions regarding technology design that transcend the common sense idea that technologies only need to be morally evaluated in terms of the goals for which they are designed or of the quality of their functioning. Technological mediations have at least as much moral relevance as technological risks and disaster prevention, which are dominating the ethics of technology. By mediating human experiences and practices, technologies help to shape the quality of our lives and, more importantly, our moral actions and decisions. In order to address this moral dimension of technologies adequately, therefore, the ethics of technology should expand its approach to include technological mediation and its moral relevance, enabling designers to take responsibility not only for the quality of the functioning of their designs, but also of their built-in morality.

In order to cover all relevant aspects of the role of technological artifacts in their use contexts and to provide a vocabulary for analyzing these aspects, I will first elaborate the notion of 'technological mediation'. After this, I will investigate the implications of this mediation approach for ethics. First, I will investigate to what extent the moral relevance of mediation can be reason to attribute (a specific form of) moral agency to technology. Moral agency requires at least some form of intentionality and some degree of freedom, which artifacts do not seem to possess. There are good reasons, though, to approach technological mediation as a specific form of intentionality, and to rethink the role of freedom in moral agency. I will show that this makes it possible to elaborate a specific notion of moral agency, which does justice to the moral relevance of technological mediation.

Second, I will investigate how the concept of mediation can be made fruitful for design ethics. Integrating mediation in engineering ethics is a complex task, however. Firstly, the ambition to design technologies with the explicit aim to influence human actions raises moral questions itself. It is not self-evident, after all, that all attempts to steer human behavior are morally justified, and steering human beings with the help of technology raises associations with the totalitarian technocracy of Orwell's Big Brother. Moreover, if some forms of behavior-steering technologies can be seen as morally acceptable – and I think such technologies do exist – it is very complicated to design them, since there is no linear connection between the activities of designers and the mediating role of the artifacts they are designing. As I will make clear, this mediating role also depends on the unpredictable ways in which the technologies are used. For this reason, I will suggest some ways to cope with this unpredictability.

2. Technological mediation

For analyzing the role of technologies in the daily lives of human beings, the concept of *technological mediation* is a helpful tool; especially in the way it was developed in 'postphenomenological' philosophy of technology (cf. Verbeek 2005). Phenomenology – in my elementary definition – is the philosophical analysis of the structure of the relations between humans and their lifeworld. From such a phenomenological perspective, the influence of technology on human behavior can be analyzed systematically, in terms of the role technology plays in human - world relations. Technological mediation then concerns the role of technology in human action (conceived as the ways in which human beings are present in their world), and human experience (conceived as the ways in which their world is present to them).

human-technology relations

A good starting point for understanding technological mediation is Martin Heidegger's classical analysis of the role of tools in the everyday relation between humans and their world. According to Heidegger (1927), tools should be understood as 'connections' or 'linkages' between humans and reality. Heidegger indicates the way in which tools are present to human beings when they are used as 'readiness-to-hand.' Tools that are used for doing something typically withdraw from people's attention; the attention of, e.g., a person who drives a nail into a wall, is not directed at the hammer, but at the nail. People's involvement with reality takes place *through* the ready-to-hand artifact. Only when it breaks down, it asks attention for itself again. The artifact is then, in Heidegger's words, 'present-at-hand' and is not able to facilitate a relationship between a user and his or her world anymore.

Even though ready-to-hand artifacts withdraw from people's attention, they do play a constitutive role in the human-world relation that arises around them. When a technological artifact is used, it facilitates people's involvement with reality, and in doing so it co-shapes how humans can be present in their world and their world for them. In this sense, things-in-use can be understood as *mediators* of human-world relationships. Technological artifacts are not neutral intermediaries, but actively co-shape people's being in the world: their perceptions and actions, experience and existence.

The positions of the North American philosopher Don Ihde and the French philosopher and anthropologist Bruno Latour offer concepts for building a vocabulary to gain a closer understanding of this mediating role of technologies. In order to build this vocabulary, I discern two perspectives on mediation: one that focuses on perception and another one on praxis. Each of these perspectives approaches the human-world relationship from a different side. The hermeneutic or 'experience-oriented' perspective starts from the side of world, and directs itself at the ways reality can be interpreted and be present for people. The main category here is *perception*. The pragmatic or 'praxis-oriented' perspective approached human-world relations from the human side. Its central question is how human beings act in their world and shape their existence. The main category here is *action*.

mediation of perception

The central hermeneutic question for a 'philosophy of mediation' is how artifacts mediate human experiences and interpretations of reality. Don Ihde's philosophy of technology is a good starting point for answering this question, because of its focus on the technological mediation of perception. Ihde elaborated Heidegger's tool-analysis into analysis of the relationships between humans and technological artifacts (Don

Ihde 1990). He discerns several relationships human beings can have with technologies. Two of these can be indicated as relations of mediation¹.

Firstly, Ihde discerns the 'embodiment relation,' which is his equivalent to Heidegger's 'readiness-to-hand.' In the embodiment relation, technologies are 'incorporated' by their users, establishing a relationship between humans and their world 'through' the technological artifact. This embodiment relation, for instance, occurs when looking through a pair of glasses; the artifact is not perceived itself, but it helps to perceive the environment. Technological artifacts become extensions of the human body here, as it were. Secondly, Ihde discerns the 'hermeneutic relation.' In this relation, technologies do not provide access to reality because they are 'incorporated,' but because they provide a representation of reality, which requires interpretation (hence the name '*hermeneutic* relation.'). A thermometer, for instance, establishes a relationship between humans and reality in terms of temperature. Reading off a thermometer does not result in a direct sensation of heat or cold, but gives a value which requires interpretation in order to tell something about reality.

Ihde shows that technologies, when mediating our sensory relationship with reality, transform what we perceive. According to Ihde, the transformation of perception always has a structure of amplification and reduction. Mediating technologies amplify specific aspects of reality while reducing other aspects. When looking at a tree with an infrared camera, for instance, most aspects of the tree that are visible for the naked eye get lost, but at the same time a new aspect of the tree becomes visible: one can now see whether it is healthy or not. Ihde calls this transforming capacity of technology 'technological intentionality:' technologies have 'intentions,' they are no neutral instruments but play an active role in the relationship between humans and their world.

These intentionalities are no fixed properties of artifacts, however. They get shape within the relationship humans have with these artifacts. Within different relationships technologies can have a different 'identity'. The telephone and the typewriter, for instance, were not developed as communication and writing technologies, and but as equipment for the blind and the hard of hearing to help them hear and write. In their use context they were interpreted quite differently, however. This phenomenon Ihde calls '*multistability*:' a technology can have several 'stabilities,' depending on the way it is embedded in a use context. Technological intentionalities, therefore, are always dependent on the specific stabilities that come about.

¹ Ihde also distinguishes two relations which do not directly concern mediation. Firstly, he identifies the 'alterity relation,' in which technologies are the terminus of our experience. This relation – which mirrors Heidegger's 'presence at hand' – occurs when interacting with a device as if it were another living being, for instance when buying a train ticket at an automatic ticket dispenser. Secondly, Ihde discerns the 'background relation.' In this relation, technologies play a role at the background of our experience, creating a context for it. An example of this relation is the automatic switching on and off of the refrigerator.

Ihde's analysis of the transformation of perception has important hermeneutic implications. In fact, it shows that mediating artifacts help to determine how reality can be present for and interpreted by people. Technologies help to shape what counts as 'real'. This hermeneutic role of things has important ethical consequences, since it implies that technologies can actively contribute to the moral decisions human beings make. Medical imaging technologies, like MRI and ultrasound, are good examples of this. Obstetrical ultrasound makes visible aspects of a living fetus in the womb, which cannot be seen without them, and which inform us about the health of the unborn child. But the specific way in which ultrasound scanners represent what they 'see' helps to shape how the unborn child is perceived and interpreted, and what decisions are made. In this way, technologies fundamentally shape people's experience of disease, pregnancy, or their unborn child. The very fact of having an ultrasound scan made lets the fetus be present in terms of health and disease, and in terms of our ability to prevent children with this disease from being born (cf. Verbeek 2002).

mediation of action

Within the praxis-perspective, the central question is how artifacts mediate people's actions and the way they live their lives. While perception, from a phenomenological point of view, consists in the way the world is present for humans, praxis can be seen as the way humans are present in their world. The work of Bruno Latour offers many interesting concepts for analyzing how artifacts mediate action (Cf. Latour 1992; 1994). Latour points out that what humans do is in many cases co-shaped by the things they use. Actions are not only the result of individual intentions and the social structures in which human beings find themselves (the classical agency-structure dichotomy), but also of people's material environment. The concept introduced by Latour and Akrich to describe the influence of artifacts on human actions is 'script.' Like the script of a movie or a theater play, artifacts prescribe their users how to act when they use them. A speed bump, for instance, has the script 'slow down when you approach me;' a plastic coffee cup 'throw me away after use.'

This influence of artifacts on human actions is of a specific nature. When scripts are at work, things mediate action as material things, not as immaterial signs. A traffic sign makes people slow down because of what it signifies, not because of its material presence in the relation between humans and world. And we do not discard a plastic coffee cup because its user's manual tells us to do so, but because it simply is physically not able to survive being cleaned several times. The influence of technological artifacts on human actions can be of a non-lingual kind. Things are able to exert influence *as material things*, not only as *signs* or *carriers of meaning*.

As is the case with perception, in the mediation of action *transformations* occur. Following Latour, within the domain of action these transformations can be indicated as 'translations' of 'programs of action.' Latour attributes programs of actions to all entities -- human and nonhuman. When an entity enters a relationship with another entity, the original programs of action of both are translated into a new one. When somebody's action program is to 'prepare meals quickly,' and this program is added to that of a microwave oven ('heating food quickly'), the action program of the resulting, 'composite' actor might be 'regularly eating instant meals individually.'

In the translation of action, a similar structure can be discerned as in the transformation of perception. Just as in the mediation of perception some aspects of reality are amplified and others are reduced, in the mediation of action one could say that specific actions are 'invited,' while others are 'inhibited.' The scripts of artifacts suggest specific actions and discourage others.

The nature of this invitation-inhibition structure is as context-dependent as the amplification-reduction structure of perception. Ihde's concept of multistability also applies within the context of the mediation of action. The telephone has had a major influence on the separation of people's geographical and social context, by making it possible to maintain social relationships outside our immediate living environment. But it could only have this influence because it is used as a communication technology, not as the hearing aid it was originally supposed to be.

An important difference with respect to the mediation of perception, however, is the way in which action-mediating artifacts are present. Artifacts do not only mediate action from a ready-to-hand position but also from a present-at-hand position. A gun, to mention an unpleasant example, mediates action from a ready-to-hand position, translating 'express my anger' or 'take revenge' into 'kill that person.' A speed bump, however, cannot be embodied. It will never be ready-to-hand; it exerts influence on people's actions from a present-at-hand position.

vocabulary

The STS concept of 'scripts,' indicating the influence of technological artifacts on human actions, can be seen as part of a more encompassing framework for understanding the role of technologies in the relation between humans and reality. The main concepts of this framework together form a 'vocabulary for technological mediation,' which could be helpful to analyze the role of technologies in their use contexts. Artifacts mediate perception by means of technological *intentionalities*: the active and intentional influence of technologies. They mediate action by means of *scripts*, which prescribe how to act when using the artifact. This latter form of mediation is most important for the ethics of engineering design, since it concern human

actions, and ethics concerns the moral question 'how to act?'. Technological mediation appears to be context-dependent, and always entails a *translation* of action and a *transformation* of perception. The translation of action has a structure of *invitation* and *inhibition*; the transformation of perception a structure of *amplification* and *reduction*.

experience	praxis
mediation of perception	mediation of action
technological intentionality	script
transformation of perception	translation of action
amplification and reduction	invitation and inhibition
delegation: <i>deliberate inscription</i>	
multistability: <i>context-dependency</i>	

table 1: a vocabulary for technological mediation

3. Do artifacts have morality?

The phenomenon of technological mediation has important implications for ethical theory and for the ethics of engineering design. I will address these implications separately. In this section, I will investigate to what extent the technological mediation of human actions and interpretations of reality can be reason to attribute a specific form of moral agency to technological artifacts. In the next section, I will investigate how engineering could benefit from incorporating the notion of mediation, and of 'material moral agency'.

The question of the moral significance of technological artifacts has been playing a role on the backbenches of the philosophy of technology for quite some time now. Already in 1986 Langdon Winner asked himself "Do artifacts have politics?" This question was grounded in his analysis of a number of 'racist' overpasses in New York, which were deliberately built so low that only cars could pass beneath them, but not buses, thus preventing the dark-skinned population – unable to afford a car – from accessing the beach (Winner 1986). Bruno Latour (1992) subsequently argued that artifacts are bearers of morality as they are constantly taking all kinds of moral decisions for people. For example, he shows that the moral decision of how fast one drives is often delegated to a speed bump in the road with the script 'slow down before reaching me'. Anyone complaining about deteriorating morality, according to Latour, should use their eyes better, as the objects around us are crammed with morality.

As elaborated above, many of our actions and interpretations of the world are co-shaped by the technologies we use. Telephones mediate the way we communicate with others, cars help to determine the acceptable distance from home to work, thermometers co-shape our experience of health and disease, and prenatal diagnostic technologies generate difficult questions regarding pregnancy and abortion. This mediating role of technologies also pertains to actions and decisions we usually call 'moral' – ranging from the speed we find morally acceptable to our decisions about unborn life. If ethics is about the question 'how to act', and technologies help to answer this question, technologies appear to do ethics, or at least help us to do so. Analogously to Winner's claim that artifacts have politics, therefore, the conclusion seems justified that artifacts have morality: technologies play an active role in moral action and decision-making.

But how to understand this material morality? Does it actually imply that artifacts can be considered moral agents? In ethical theory, to qualify as a moral agent at least requires the possession of *intentionality* and some degree of *freedom*. In order to be held morally accountable for an action, an agent needs to have the intention to act in a specific way, and the freedom to actually realize this intention. Both requirements seem problematic with respect to artifacts - at least, at first sight. Artifacts, after all, do not seem to be able to form intentions, and neither do they possess any form of autonomy. Yet, both requirements for moral agency deserve further analysis.

3.1 technological intentionality

At a first glance, it might seem absurd to speak about artifacts in terms of intentionality. A closer inspection of what we mean by 'intentionality' in relation to what artifacts actually 'do', however, makes it possible to attribute a specific form of intentionality to artifacts. In order to show that, it is important to make a distinction here between two aspects of 'intentionality.' Firstly, intentionality entails the ability to *form intentions*, and secondly, this forming of intentions can be considered something *original* or *spontaneous* in the sense that it literally 'springs from' or is 'originated by' the agent possessing intentionality. Both aspects of intentionality will appear not to be as alien to technological artifacts as they might seem.

First of all, the 'mediation approach' to technology, as elaborated above, makes it possible to attribute to artifacts the ability to actually form intentions. In this approach, technologies are analyzed in terms of their mediating roles in relations between humans and reality. The core idea is that technologies, when used, always establish a relation between users and their environment. Technologies do not only enable us to perform actions and have experiences that were scarcely possible before, but in doing so, they also help to shape *how* we act and experience things. They are not neutral instruments or intermediaries, but active mediators that help shape the relation between people and reality. This 'technological intentionality' can be

illustrated by further elaborating the example of obstetrical ultrasound, which was introduced in the previous section. Ultrasound is not simply a functional means to make visible an unborn child in the womb. It actively helps to shape the way the unborn child is given in human experience, and in doing so it informs the choices his or her expecting parents make. Because of the ways in which ultrasound mediates the relations between the fetus and the future parents, it constitutes both fetus and parents in specific ways.

Ultrasound brings about a number of 'translations' of the relations between expecting parents and the fetus, while mediating their visual contact. First of all, ultrasound isolates the fetus from the female body. In doing so, it creates a new ontological status of the fetus, as a separate living being rather than forming a unity with his or her mother. This creates the space to make decisions about the fetus apart from the pregnant woman in whose body it is growing. Secondly, ultrasound places the fetus in a context of medical norms. It makes visible defects of the neural tube, and makes it possible to measure the thickness of the fetal neck fold, which forms an indication of the risk that the child will suffer from Down's Syndrome. In doing so, ultrasound translates pregnancy into a medical process; the fetus into a possible patient; and congenital defects into preventable suffering. As a result, pregnancy becomes a process of choices: the choice to have tests like neck fold measurements done at all, and the choice what to do if anything is 'wrong'. Moreover, parents are constituted as decision-makers regarding the life of their unborn child. To be sure, the role of ultrasound is ambivalent here: on the one hand it may encourage abortion, making it possible to prevent suffering; on the other hand it may discourage abortion, enhancing emotional bonds between parents and the unborn child by visualizing 'fetal personhood'.

In all of these examples, artifacts are active: they help to shape human actions, interpretations, and decisions, which would have been different without the artifact. To be sure, artifacts do not have intentions like human beings do, because they cannot *deliberately* do something. But their lack of consciousness does not take away the fact that artifacts can have intentions in the literal sense of the Latin word 'intendere', which means 'to direct', 'to direct one's course', 'to direct one's mind'. The intentionality of artifacts is to be found in their directing role in the actions and experiences of human beings. Technological mediation, therefore can be seen as a specific, material form of intentionality.

With regard to the second aspect of intentionality, the 'originality' of intentions, a similar argumentation can be given. For even though artifacts evidently cannot form intentions entirely on their own, again because of their lack of consciousness, their mediating roles cannot be entirely reduced to the intentions of their designers and users either. Otherwise, the intentionalities of artifacts would be a variant of what Searle indicated as 'derived intentionality' (Searle 1983), entirely reducible to human intentionalities. Quite often, technologies mediate human actions and experiences without human beings having told them to do so. Some technologies, for instance, are used differently than their designers had envisaged. The first cars –

which only made 15 km/h – were used primarily for sports, and for medical purposes; driving at a speed of 15 km/h was considered to create an environment of ‘thin air’, which was supposed be healthy for people with lung diseases. Only after it got interpreted as a means for long distance transport could the car get to play its current role in the division between labor and leisure (Baudet 1986). In this case, unexpected mediations come about in specific use contexts. But unforeseen mediations can also emerge when technologies are used as intended. The very fact that the introduction of mobile phones has led to changes in youth culture – such as the fact that young people appear to make ever less appointments with each other, since everyone can call and be called at any time and place – was not intended by the designers of the cell phone, even though it is used here in precisely the context the designers had envisaged.

It seems plausible, then, to attribute a specific form of intentionality to artifacts. This ‘material’ form of intentionality is quite different from human intentionality, in that it cannot exist without human intentionalities supporting it. Only within the relations between human beings and reality can artifacts play their ‘intending’ mediating roles. When mediating the relations between humans and reality, artifacts help to constitute both the objects in reality that are experienced or acted upon and the subjects that are experiencing and acting. This implies that the subjects who act or make decisions about actions are never purely human, but rather a complex blend of humanity and technology. When making a decision about abortion on the basis of technologically mediated knowledge about the chances that the child will suffer from a serious disease, this decision is not ‘purely’ human, but neither is it entirely induced by technology. The very situation of having to make this decision and the very ways in which the decision is made, were co-shaped by technological artifacts. Without these technologies, either there would not be a situation of choice, or the decision would be made on the basis of a different relation to the situation. At the same time, the technologies involved do not *determine* human decisions here. Moral decision-making is a joint effort of human beings and technological artifacts.

Strictly speaking, then, there is no such thing as ‘technological intentionality’; intentionality is always a hybrid affair, involving both human and nonhuman intentions, or, better, ‘composite intentions’ with intentionality distributed over the human and the nonhuman elements in human-technology-world relationships. Rather than being ‘derived’ from human agents, this intentionality comes about in associations between humans and nonhumans. For that reason, it could be called ‘hybrid intentionality’.

3.2 technology and freedom

But what about the second requirement for moral agency we discerned at the beginning of this paper: freedom, or even autonomy? Now that we have concluded that artifacts may have some form of

intentionality, can we also say that they have *freedom*? Obviously not. Again, freedom requires the possession of a mind, which artifacts do not have. Technologies, therefore, cannot be free agents like human beings are. But nevertheless there are good arguments not to exclude artifacts entirely from the realm of freedom that is required for moral agency. In order to show this, I will first elaborate that human freedom in moral decision-making is never absolute, but always bound to the specific situations in which decisions are to be made, including their material infrastructure. Second, I will argue that in the human-technology associations that embody hybrid intentionality, freedom should also be seen as distributed over the human and nonhuman elements in the associations.

Even though freedom is obviously needed in order to be accountable for one's actions, the thoroughly technologically mediated character of our daily lives makes it difficult to take freedom as an absolute criterion for moral agency. After all, as became clear above, in virtually every moral decision we make, technologies play an important role. The decision of how fast to drive and therefore how much risk to run harming other people is always mediated by the lay-out of the road, the power of the engine of the car, the presence or absence of speed bumps and speed camera's, et cetera. And the decision to have surgery or not is most often mediated by all kinds of imaging technologies, blood tests et cetera, which help constitute the body in specific ways, thus organizing specific situations of choice.

To be sure, moral agency does not necessarily require complete autonomy. Some degree of freedom can be enough to be held morally accountable for an action. And not all freedom is taken away by technological mediations, as the examples of abortion and driving speed made clear. In these examples, human behavior is not determined by technology, but rather co-shaped by it, with humans still being able to reflect on their behavior and making decisions about it. This does not take away the fact, however, that most mediations, like those provided by speed bumps and by the presence of ultrasound scanners as a common option in medical practice, occur in a pre-reflexive manner, and can in no way be escaped in moral decision-making. The moral dilemmas of whether or not to have an abortion and of how fast to drive would not exist in the same way without the technologies involved in these practices – such dilemma's are rather *shaped* by these technologies . Technologies cannot be defined away from our daily lives. The concept of freedom presupposes a form of sovereignty with respect to technology that human beings simply do not possess.

This conclusion can be read in two distinct ways. The first is that mediation has nothing to do with morality whatsoever. If moral agency requires freedom and technological mediation limits or even annihilates human freedom, only non-technologically mediated situations leave room for morality. Not only are technological artifacts unable to make moral decisions, but also does technology-induced human behavior have a non-moral character. A good example of this criticism are the often-heard negative reactions to explicit behavior-steering technologies like speed limiters in cars. Usually, the resistance against such technologies is

supported with two kinds of arguments. First, there is the fear that human freedom is threatened and that democracy is exchanged for technocracy. Should all human actions be guided by technology, the criticism goes, the outcome would be a technocratic society in which moral problems are solved by machines instead of people. Second, there is the charge of immorality or, at best, amorality. Actions not the product of our own free will but induced by technology can not be described as 'moral'. And, which is worse, behavior-steering technologies might create a form of moral laziness that is fatal to the moral abilities of citizens.

Yet, these criticisms are deeply problematic. After all, the analyses of technological mediation given above show that human actions are *always* mediated. To phrase it in Latour's words: "Without technological detours, the properly human cannot exist. (...) Morality is no more human than technology, in the sense that it would originate from an already constituted human who would be master of itself as well as of the universe. Let us say that it traverses the world and, like technology, that it engenders in its wake forms of humanity, choices of subjectivity, modes of objectification, various types of attachment." (Latour 2002). And this is precisely what opponents of speed limitation forget. Also without speed limiters, the actions of drivers are continually mediated: indeed, as cars can easily exceed speed limits and as our roads are so wide and the bends so gentle as to permit driving fast, we are constantly being invited to further explore the space between the accelerator and the floor. Therefore, giving the inevitable technological mediations a desirable form rather than rejecting outright the idea of a 'moralized technology' in fact attests to a sense of responsibility.

The conclusion that mediation and morality are at odds with each other, therefore, is not satisfying. It is virtually impossible to think of any morally relevant situation in which technology does not play a role. And it would be throwing out the child with the bathwater to conclude that there is no room for morality and moral judgments in all situations in which technologies play a role. Therefore, an alternative solution is needed of the apparent tension between technological mediation and ethics. Rather than taking absolute freedom as a prerequisite for moral agency, we need to reinterpret freedom as an agent's ability to relate to what determines him or her. Human actions always take place in a stubborn reality, and for this reason, absolute freedom can only be attained by ignoring reality, and therefore by giving up the possibility to act at all. Freedom is not a lack of forces and constraints; it rather is the existential space human beings have to realize their existence. Humans have a relation to their own existence and to the ways in which this is co-shaped by the material culture in which it takes place. The material situatedness of human existence *creates* specific forms of freedom, rather than impeding them. Freedom consists in the possibilities that are opened up for human beings to have a relation to the environment in which they live and to which they are bound.

This redefinition of freedom, to be sure, still leaves no room to attribute freedom to technological artifacts. But it does take them back into the realm of freedom, rather than excluding them from it altogether. On the one hand, after all, they help to *constitute* freedom, by providing the material environment in which human existence takes place and gets its shape. And on the other hand, artifacts can enter associations with human beings, while these associations – consisting partly of material artifacts – are the places where freedom is to be located. For even though freedom is never absolute but always gets shape by technological and contextual mediations, these very mediations also create the space for moral decision-making. Just like intentionality, freedom too appears to be a hybrid affair, most often located in associations of humans and artifacts.

4. Moralizing Technology

This analysis of the moral agency of technological artifacts has important implications for the ethics of technology and technology design. First of all, the mediation approach to technology makes clear that moral issues regarding technology development comprise more than weighing technological risks and preventing disasters, however important these activities in fact are. What is at stake when technologies are introduced in society are also the ways in which these technologies will mediate human actions and experiences, thus helping to shape our moral decisions and our quality of life. The ethics of technology design, therefore, should also occupy itself with taking responsibility for the future mediating roles of technologies- in-design.

Moreover, the analysis of technological mediation shows that, even without explicit moral reflection, technology design is inherently a moral activity. By designing artifacts that will inevitably play a mediating role in people's actions and experience, thus helping to shape (moral) decisions and practices, designers 'materialize morality'; they are 'doing ethics by other means' (cf. Verbeek 2006). This conclusion makes it even more urgent to expand the scope of the ethics of technology in order to include the moral dimensions of the artifacts themselves, and to try and give shape to these dimensions in a responsible way.

4.1 taking mediation into ethics

There are two ways to take mediation analyses into the ethics of technology and design. First of all, they can be used to develop moral assessments of technologies in terms of their mediating roles in human practices and experiences. Secondly, the conclusion that artifacts do have a specific form of morality also shifts ethics from the domain of language to that of materiality. When artifacts have moral relevance and even embody a specific form of moral agency, ethics cannot only occupy itself with developing conceptual frameworks for moral reflection, but should also engage itself with the actual development of the material

environments that help shape moral action and decision-making. Hans Achterhuis has called this the 'moralization of technology' (Achterhuis 1995).

The first way to take mediation into ethics is closest to common practices in the ethics of technology. In fact, it comes down to an augmentation of the current focus on risk assessment and disaster prevention. Rather than focusing on the acceptability and preventability of negative consequences of the introduction of new technologies, it aims to assess the impact of the mediating capacities of technologies-in-design for human practices and experiences. When an action-ethical approach is followed here, moral reflection is directed at the question whether the actions resulting from specific technological mediations can be morally justified. This reflection can take place along deontological or consequentialist lines. But in many cases, a virtue-ethical or life-ethical approach is at least as fruitful to assess technological mediations, focusing on the quality of the *practices* that are introduced by the mediating technologies, and their implications for the kind of life we are living. Not only the impact of mediation on specific human actions is important then, but also the ways in which mediating technologies helps to constitute human beings and the world they are experiencing and in which they are acting. To return to the example of ultrasound again: rather than merely assessing the impact of routine ultrasound scans in obstetrical health care in terms of safety and abortion rates, a life-ethical approach would try to assess the quality of the practices that arise around ultrasound scanning, in which the fetus and its expecting parents are constituted in specific ways (as possible patients versus decision-makers) and in specific relations to each other (situations of choice).

The second way to augment the ethics of technology with the approach of technological mediation is to not only assess mediations, but to also try to help *shape* them. Rather than working from an external standpoint *vis-à-vis* technology, aiming at rejecting or accepting new technologies, the ethics of technology then aims to *accompany* technological developments (Hottois), experimenting with mediations and finding ways to discuss and assess how one could deal with these mediations, and what kinds of living-with-technology are to be preferred. This direction was taken by the Dutch philosopher Hans Achterhuis (1995; 1998), who translated Latour's analysis of scripts into a plea for an explicit 'moralization of technology.' Instead of only moralizing other *people* ('do not shower too long;' 'buy a ticket before you enter the subway'), humans should also moralize their *material environment*. To a water-saving showerhead the task could be delegated to see to it that not too much water is used when showering, and to a tourniquet the task to make sure that only people with a ticket can enter the train.

Achterhuis' plea for a moralization of technology received severe criticism (Cf. Achterhuis 1998, 28-31). In the debate that arose around this issue in The Netherlands, two types of arguments were brought in against his ideas. Firstly, human freedom was thought to be attacked when human actions are explicitly and consciously steered with the help of technology. This reduction of human freedom was even perceived as a

threat to human dignity; if human actions are not a result from deliberate decisions but from steering technologies, people were thought to be deprived from what makes them human. Moreover, if they are not acting in freedom, their actions cannot be called 'moral.' Human beings then simply show a type of behavior that was desired by the designers of the technology, instead of explicitly choosing to act this way. Secondly, Achterhuis was accused to jettison the democratic principles of our society, because his plea for developing behavior-steering technology was considered an implicit propagation of technocracy. When moral issues are solved by the technological activities of designers instead of democratic activities of politicians, these critics hold, not humans but technology will be in control.

These arguments can be countered, though. First of all, human dignity is not necessarily attacked when limitations of freedom occur. Our legal constitution implies a major limitation of freedom, after all, but this does not make it a threat to our dignity. Human behavior is determined in many ways, and human freedom is limited in many ways. Few people will protest against the legal prohibition of murder, so why protest to the material inhibition imposed by a speed bump to drive too fast at places where children are often playing on the pavement? Secondly, the analysis of technological mediation made clear that technologies *always* help to shape human actions. Therefore, paying explicit attention to the mediating role of technologies should be seen as taking the responsibility that the analysis of technological mediation implies. When technologies are always influencing human actions, we had better try and give this influence a desirable form. Besides, as will become clear below in the example of a Dutch industrial design initiative, the 'moralizing' role of technologies does not necessarily have the form of exerting *force* on human beings to act in specific ways. Technologies can also *seduce* people to do certain things; they can invite specific actions without forcefully exacting them.

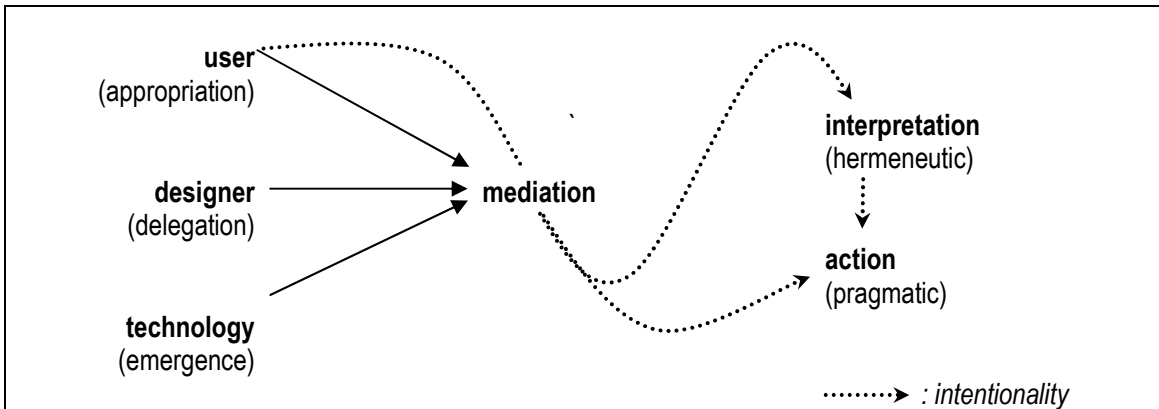
These counterarguments, however, do not take away the anxiety that a technocracy would come about when technologies are explicitly moralized. It might be true that technologies do not differ from laws in limiting human freedom, but laws come about in a democratic way, and the moralization of technology does not. Yet, this does not justify the conclusion that it is better to refrain from paying explicit attention to technological mediation during the design process. If technologies are not moralized explicitly, after all, the responsibility for technological mediation is left to the designers only. Precisely this would amount to form of technocracy. A better conclusion would be that it is important to find a democratic way to 'moralize technology.' In the following, I will elaborate a way to do this.

4.2 Designing mediations

The moral impediments to the moralization of technology can be countered much easier than the practical impediments. The moralization of technological artifacts is not as easy as it might seem to be. In order to 'build in' specific forms of mediation in technologies, designers need to anticipate the future mediating role of the technologies they are designing. And this is a complex task, since there is no direct relationship between the activities of designers and the mediating role of the technologies they are designing. As became clear above, the mediating role of technologies comes about in a complex interplay between technologies and their users.

Technologies are 'multistable,' as Don Ihde calls it. They have no fixed identity, but only get defined in their context of use. If this were not the case, accepting the idea of technological mediation would take us back to technological determinism; technologies would then be able to determine the behavior of their users all by themselves instead of being part of a sociotechnical network. This multistability makes it difficult to predict the ways in which technologies will influence human actions, and accordingly to evaluate this influence in ethical terms. Technologies can be used in unforeseen ways, and therefore have an unforeseen influence on human actions. The energy-saving light bulb is a good example here, having actually resulted in an increased energy consumption since such bulbs often appear to be used in places previously left unlit, such as in the garden or on the façade, thereby canceling out their economizing effect (Steg 1999; Weegink 1996). Moreover, unintentional and unexpected forms of mediation can arise when technologies do get used in the way their designers intended. A good example is the revolving door which keeps out not only cold air but also wheelchair users. In short, designers play a seminal role in realizing particular forms of mediation, but not the only role. Users with their interpretations and forms of appropriation also have a part to play; and so do technologies, which give rise to unintended and unanticipated forms of mediation.

Designers thus help to shape the mediating roles of technologies, but these roles also depend on the ways in which the technologies are used and on the ways in which the technologies in question allow unforeseen mediations to emerge. The suggestion that 'scripts' are a result of 'inscriptions' (Akrich) or 'delegations' (Latour), therefore, does not do enough justice to the complex way in which mediation comes about. Designers cannot simply 'inscribe' a desired form of morality into an artifact. The mediating role of technologies is not only the result of the activities of the designers, who inscribe scripts or delegate responsibilities, but also depends on the users, who interpret and appropriate technologies, and on the technologies themselves, which can evoke 'emergent' forms of mediation. The figure below illustrates these complicated relations between technologies, designers, and users in the mediation of actions and interpretations.



The figure makes clear that in all human actions and all interpretations informing moral decisions, three forms of agency are at work: (1) the agency of the human being performing the action or making the moral decision (in interaction with the technology), but also appropriating the technological artifact in a specific way; (2) the agency of the artifact mediating these actions and decisions, sometimes in unforeseen ways; and (3) the agency of the designer who – either implicitly or in explicit delegations – gives a specific shape to the artifact used, and thus helps to shape the eventual mediating role of the artifact. Taking responsibility for technological mediation, therefore, comes down to entering into an interaction with the agency of future users and the artifact-in-design, rather than acting as a ‘prime mover’ (cf. Smith 2003).

The unpredictability of the mediating role of technology that follows from this does not imply, however, that designers are by definition unequipped to deal with it. In order to cope with the unpredictability and complexity of technological mediation, it is important to seek links between the design context and the future use context. Design specifications should be derived not only from the product’s intended function but also from an informed prediction of the product’s mediating roles and a moral assessment of these roles. A key tool to bring about this coupling of design context and use context, however trivial it may sound, is the designer’s moral imagination. By trying to imagine the ways technology-in-design could be used and by shaping user operations and interpretations from that perspective, a designer can include the product’s mediating role in his or her moral assessment back during the design phase. Performing a mediation analysis (cf. Verbeek, 2006) can be a good basis for making an *informed prediction* of the future mediating role of a technology. As an example of this approach I will briefly discuss the work done by the Dutch industrial designers collective *Eternally Yours*. A second way to formulate an informed prediction of the future mediating role of technologies is a more systematic one. It consists in an augmentation of the existing design methodology of *Constructive Technology Assessment* in such a way, that it becomes an instrument for a democratically organized moralization of technology.

4.3 Anticipation by imagination: 'Eternally Yours'

An interesting example of anticipating mediation by imagination is the work of the Dutch industrial designers collective *Eternally Yours*. Eternally Yours is engaged in eco-design, but in an unorthodox way (Cf. Van Hinte 1997; Verbeek 2005). It does not want to address the issue of sustainability only in the usual terms of reducing pollution in production, consumption, and waste. The actual problem, Eternally Yours holds, is that most of our products are thrown away far before actually being worn out. Meeting this problem could be way more effective than reducing pollution in the different stages of products' life-cycles. For this reason, Eternally Yours focuses on developing ways to create product longevity. It does so by investigating how the coming about of attachment between products and their users could be stimulated and enhanced.

In order to stimulate longevity, Eternally Yours seeks to design things that invite people to use and cherish them as long as possible. *'It's time for a new generation of products, that can age slowly and in a dignified way, become our partners in life and support our memories,'* as Eternally Yours approvingly quoted the Italian designer Ezio Manzini in its letterhead. Eternally Yours investigates what characteristics of products are able to evoke a bond with their users. According to Eternally Yours, three dimensions can be discerned in the lifespan of products. Things have a technical, an economical and a psychological lifespan. Products can turn into waste because they simply are broken and cannot be repaired anymore; because they are outdated by newer models that have appeared in the market; and because they do not fit people's preferences and taste anymore. For Eternally Yours, the psychological lifespan is the most important. The crucial question for sustainable design is therefore: how can the psychological lifetime of products be prolonged?

Eternally Yours developed many ideas to answer this question. For instance, it searched for forms and materials that could stimulate longevity. Materials were investigated that do not get unattractive when aging but have 'quality of wear.' Leather, for instance, is mostly found more beautiful when it has been used for some time, whereas a shiny polished chromium surface looks worn out with the first scratch. An interesting example of a design in this context is the upholstery of a couch that was designed by Sigrid Smits. In the velour that was used for it, a pattern was stitched that is initially invisible. When the couch has been used for a while, the pattern gradually becomes visible. Instead of aging in an unattractive way, this couch renews itself when getting old. Eternally Yours does not only pay attention to materials and product surfaces, however. It also investigated the ways in which services around products can influence their lifespan. The availability of repair- and upgrading services can prevent people from discarding products prematurely.

The most important way to stimulate longevity that should be mentioned in the context of this article, however, consists in designing products that evoke a bond with their users by engaging users in their

functioning. Most technologies ask as little attention for themselves as possible when people are using them. Technologies, after all, are often designed to disburden people: a central heating system liberates us from the necessity to gather wood, chop it, fill the hearth, clean it, et cetera. We only need to switch a button and our house gets warm. But this disburdening character also creates a loss of 'engagement' with technological products. Ever fewer interactions are needed to use them (cf. Borgmann, 1992). One of the downsides of this development is that this also affects the attachment between human beings and technological products. The product as a material entity has become less important than the function it fulfills. In many cases, human beings are not invited to interact with the technological artifact they are using, but only to consume the commodity it procures.

The work of *Eternally Yours* shows that this loss of engagement can be countered in a playful way. Technological products could invite users to interact with them without being so demanding that nobody would be prepared to use them. An interesting example in this direction is an engaging 'electric/ceramic heater' that was designed by Sven Adolph. It consists of a heating element with several concentric, cylindrically shaped ceramic shells of different height around it, that all have a vertical aperture. The shells can be arranged in several ways, so that they radiate their warmth in specific directions. This artifact is not a purely functional heater that withdraws into pure functionality like common radiators, which are hidden under the windowsill and are only turned on and off. It is an engaging product that asks for attention and involvement in its functioning, much like a campfire. You cannot hide it under the windowsill but have to put it in the middle of the room. You cannot escape it if you need warmth: you have to sit around it. Its shells have to be arranged if we want it to function. Simply turning the heater on and off is not enough: you actually have to be involved in its functioning if you want it to work.

The activities of *Eternally Yours* can be seen as a form of 'anticipating mediation by imagination.' Sigrid Smits' couch and Sven Adolph's heater were designed explicitly from the perspective of their possible mediating role in the interactions and affective relationships their owners will have with them. They mediate the behavior of their users in such a way that they are likely to get attached more to these artifacts than to other couches or heaters. These products were not only designed as functional objects, but as artifacts that actively mediate the behavior of their users. The products of *Eternally Yours* embody an 'environmental ethics:' they seduce their users to cherish them rather than throwing them away prematurely.

4.4 Augmenting Constructive Technology Assessment

A second way to make an 'informed prediction' about the mediating role of a technology-in-design is a more systematic one. To establish a connection between the context of use and the context of design, designers

could also employ a method that was developed precisely for making such a connection: the method of Constructive Technology Assessment (CTA) (cf. Schot 1992; Rip, Misa and Schot 1995). CTA creates a link between the contexts of design and use in a practical way: it aims to involve all relevant stakeholders in the design of technologies. In order to make use of the CTA methodology within the context of technological mediation, it needs to be augmented, though.

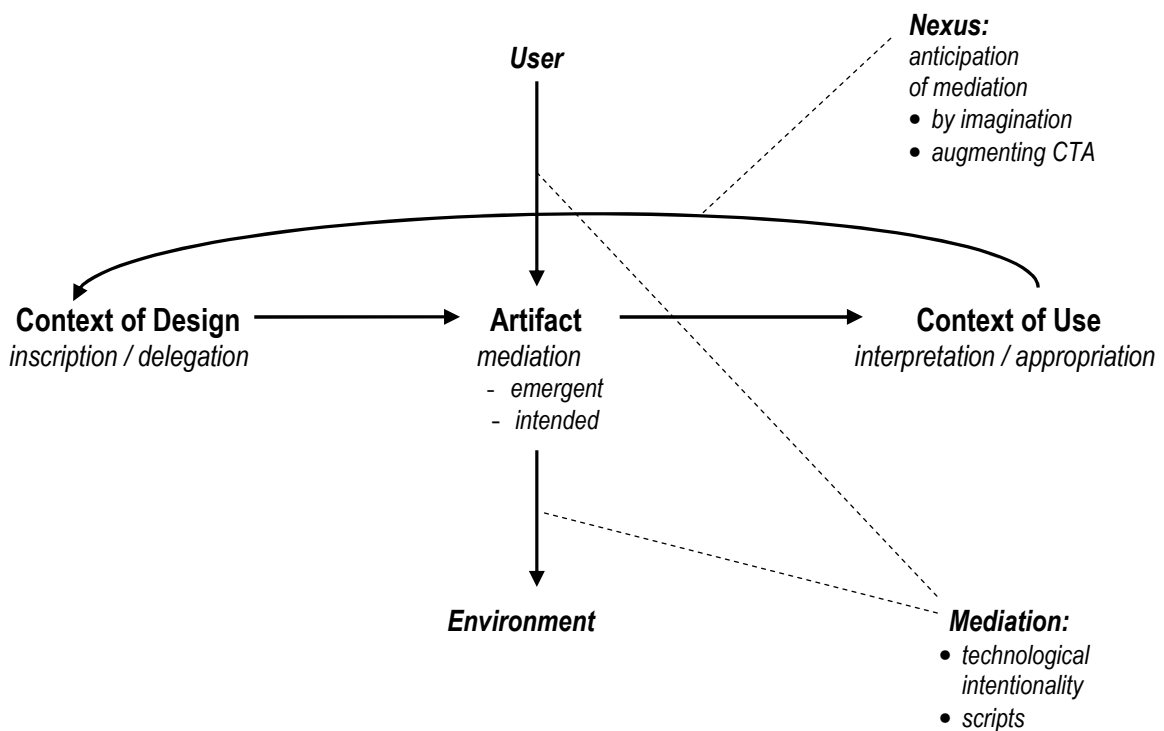
CTA is based on an evolutionary view of technology development. The process of technology development is seen as generating 'variations' that are exposed to a 'selection environment,' which is formed by entities like the market and government regulations. In this selection environment, only the 'fittest' variations will survive. There is an important difference between the generation of technologies and the generation of biological species, though. Contrary to biological evolution, in technology development there is a connection or 'nexus' between variation and selection. After all, designers can anticipate the selection environment when they are designing technologies, in order to prevent that much effort is put in developing technologies which will not be accepted by consumers or by government regulations.

CTA is a method to employ this nexus in a systematical way, by feeding back assessments of the technology-on-design by all relevant actors -- like users, pressure groups, designers, companies et cetera -- into the design process. It does so by organizing meetings of all relevant actors in which the aim is to reach consensus about the design of the technology that is 'constructively assessed.' This form of technology assessment is called 'constructive' because it does not assess technologies after they have been developed, but during their development, so that these assessments can be used to modify the original design. Besides this, CTA can be seen as a democratization of the designing process. When a CTA design methodology is followed, not only designers determine what a technology will look like, but all relevant social actors. Following this method, therefore, could take away the fear for technocracy that was discussed above.

Seen from the perspective of technological mediation, however, CTA also has limitations that need to be overcome. CTA primarily focuses on *human* actors, and pays too little attention to the actively mediating role of the *nonhuman* actor that is at the center of all activity: the technology-in-design. CTA claims to open the black box of technology by analyzing the complex dynamics of technology development. It bases itself on the constructivist notion that technologies are not 'given,' but the outcome of a process in which many actors are involved. Other interactions between the actors might have resulted in a different technology. But by analyzing the dynamics of *technology development* the black box of technology is only opened half way. It reveals how technologies emerge from their *design context*, but their role in their *use context* remains blackboxed. Therefore, organizing a democratically, domination-free discussion between all relevant actors is not enough to lay bare all relevant aspects of the technology in question. The mediating

role of the technology-in-design is likely to remain hidden during the entire CTA process if it is not put explicitly and systematically on the agenda.

For this reason, participants in the CTA process should not only be invited to integrate assessments of users and pressure groups in product specifications, but also to anticipate possible mediating roles of the technology-in-design. The vocabulary for analyzing mediation, as presented in section 2 of this paper, could be a helpful for doing this. As the figure below illustrates, approaching the artifact-in-design in terms of mediation offers a perspective that can be used when creating a nexus between the contexts of design and use.



When the CTA method is augmented in this way, the method of ‘anticipation by imagination’ is given a more systematic character. Creating space for all relevant stakeholders to anticipate the possible mediating role of the technology-in-design enhances the chance that as many possible mediating roles are taken into account. To be sure, this augmentation of the CTA methodology does not guarantee that all mediating roles of the technology in design will be predicted. It creates a connection between the ‘inscriptions’ within the context of design and the ‘interpretations’ or ‘appropriations’ within the context of use, but this cannot possibly cover all ‘emergent’ mediating roles of the technology. Yet, it might be a fruitful way to give shape to the responsibility of designers that becomes visible from the analysis of technical mediation.

5. Conclusion

The analyses of technological mediation, which have been elaborated over the past years in STS and philosophy of technology, have major implications for the ethics of engineering design. The insight that technologies inevitably play a mediating role in the actions of users, makes the work of designers an inherently moral activity. Ethics is about the question how to act, and technologies appear to be able to give material answers to this question by inviting or even exacting specific forms of action when they are used. This implies that technological mediation could play an important role in the ethics of engineering design. Designers should not only focus on the functionality of technologies but also on their mediating roles. The fact that technologies always mediate human actions charges designers with the responsibility to anticipate these mediating roles.

This anticipation is a complex task, however, since the mediating role of technologies is not entirely predictable. But even though the future cannot be predicted with full accuracy, ways do exist to develop well-informed and rationally grounded conjectures. In order to cope with the uncertainty regarding the future role of technologies in their use contexts, designers should try to bridge the gap between the context of use and the context of design.

One way to do so is by carrying out a 'mediation analysis' with the help of the designer's imagination, which can be facilitated by the vocabulary developed in this article. Such an analysis will not allow designers to predict entirely how the technology they are designing will actually be used, but it will help to identify possible use practices, and the forms of mediation that might emerge alongside with it.

Designers could also make use of an augmented form of constructive technology assessment, in which the connection between design and use is not only made in imagination but also in practice. In this case, a mediation analysis is carried out not by the designer individually, but by all stakeholders together, who engage in a democratically organized debate in order to decide how to feed back the outcomes of this analysis into the design process. Following this method could take away part of the fear that deliberately designing behavior-steering technology would lead to technocracy, since the inevitable mediating role of technology is made subject to democratic decision-making here.

To be sure, this anticipation of technological mediation introduces new complexities in the design process. Designers, for instance, might have to deal with trade-offs: in some cases, designing a product with specific desirable mediating characteristics might have negative consequences for the usefulness or attractiveness of the product. Introducing automatic speed influencing in cars will make sure that drivers keep to the speed limit, but at the cost of the experience of freedom – which appears to be rather important to some car

drivers, judging by the fierce societal resistance against speed limiting measures. Also, when anticipating the mediating role of technologies, prototypes might be developed and rejected because they are likely to bring about undesirable mediations. Dealing with such trade-offs and undesirable spin-offs requires a separate moral decision-making process.

Technology design appears to entail more than inventing functional products. The perspective of technological mediation, which has been developed in STS and in the philosophy of technology, reveals that designing should be regarded as a form of materializing morality. This implies that the ethics of engineering design should take more seriously the moral charge of technological products, and rethink the moral responsibility of designers accordingly.

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