Metamediation

How technologies affect their appropriation

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Summary

This thesis examines the role of technology design when recognising that technologies influence their users. Over the past decades, several user-influencing design methods interpreted this influence as the responsibility of designers to influence users deliberately. However, these methods face two challenges to this role: the risk of ineffectiveness and the critique of manipulation. These challenges reveal that understanding the role of design requires an understanding first, of how users may deal with influences, and second, of the reflexive role of technology in such dealing. What makes some influences ineffective and others manipulative?

The problem that this thesis addresses is that interaction design methods and the philosophical field of postphenomenology do not offer a sufficient answer. User-influencing design methods lack a recognition of how their designs may also influence user's dealing with its influence, beyond allowing a user to resist. Postphenomenology offers a richer way to understand user's dealings with influences as appropriating their mediating roles. However, it does not yet explain the technologically mediated character of technology appropriation itself.

So, in this thesis I question: *how to understand the role of technology design in technology appropriation?* To answer, I follow the postphenomenological method of testing conceptual development with an empirical analysis of case studies. First I examine how the role of technology design in appropriation can be analysed. Appropriation implies a relation to a mediated relation. To be able to analyse this process, I propose an extension of the postphenomenological framework with a *metarelation*. I then apply this extended framework to an analysis of two case studies from design research. The cases of the 7 ½ alarm clock and Capsule Camera show that technology can support appropriation. An analysis of how their design aspects mediate the metarelation helps explain how constraints and ambiguity may invite appropriation.

This leads me to propose the concept of *metamediation* to explain the role of technology design in technology appropriation. This concept may contribute to an understanding of technology appropriation in postphenomenology, and help design methods avoid manipulation and invite appropriation.

Introduction

This thesis examines the role of technology design when recognising both that technologies influence their users and that users can deal with such influences deliberately. User-influencing design methods see it as a responsibility of designers to make the influence of technology part of their design work. With "nudges", "persuasive technologies" or "designs with intent", designers try to make users behave in line with certain goals, norms or ideals (Thaler and Sunstein 2008; Fogg 2003; Lockton 2013). However, such methods have come to face challenges from two sides. On one end, many user-influencing designs turn out ineffective in achieving a change in behaviour (cf. Brynjarsdóttir et al. 2012; Caraban et al. 2019). Some methods may try to solve that (cf. Tromp, Hekkert, and Verbeek 2011; Lockton 2013), but end up facing a challenge on the other end. User-influencing design has received criticism for being manipulative, both by influencing users to behave against their intention and by subverting consent (cf. Hansen and Jespersen 2013; Soe et al. 2020; Spiekermann and Pallas 2006).

These challenges suggest, first, that to understand the role of technology design it is not enough to recognise how technologies may influence users. It should also include how users may deal with these influences. Users could make influences ineffective when going against them, while an influence could subvert such dealing when it goes against users' intentions. Secondly, the challenges suggest that there is another dimension left to explain in the role of technology. What makes some influences ineffective and others manipulative? I will refer to this role as the reflexive role of technology: how it affects how a user deals with it.

The domain of design focused on this role is interaction design. Yet the problem is that methods within this field do not have a sufficient understanding of the reflexive role of technology in relation to its *influences*, as I will argue. Even when user-influencing methods address this role in criteria to avoid manipulation, they tend to rely on assumptions about the ability of users to resist influences that contradict the inescapability of influences at the basis of their methods (Dorrestijn and Verbeek 2013, 52). This renders the criteria unfit to distinguish a consented influence from manipulation.

The philosophical field of postphenomenology studies how technologies structure our relation with our lifeworlds (Ihde 1990; Verbeek 2005), and can provide an understanding of how users deal with technological influences that is consistent with being influenced. Rather than separating active subjects from passive objects, like a creative writer from their 'neutral' pen, postphenomenology can explain how the pen helps to shape the text that is written, and thus co-constitutes creativity. Its theory of technology appropriation explains how this mediating role of technologies is not just a result of design, but also of the appropriation by their users (Verbeek 2011; Dorrestijn 2012). For instance, a writer may choose to use their pen over their keyboard precisely because of how it influences how they write.

However, postphenomenology does not yet suffice to explain the reflexive role of technology. While it explains how users deal with how technologies influence them in use, it only explains a passive, instrumental, role of technology in this dealing, as I will demonstrate. The practical problem within interaction design thus helps reveal a theoretical gap in postphenomenology. Like user-influencing design methods lack a recognition of how their designs may also influence how users deal with it, postphenomenology does not yet explain the technologically mediated character of technology appropriation itself.

In this thesis I question: *how to understand the role of technology design in technology appropriation, in postphenomenology and interaction design?*

In answering this question I hope both to contribute to the project of understanding technology appropriation in postphenomenology (Verbeek 2016), and to help interaction design methods avoid manipulation and potentially even invite users in appropriation. To answer this question, I employ a combination of conceptual development and empirical analysis. Specifically, I will propose an extension of the postphenomenological framework and test this by applying it in an analysis of two case studies from design research. This will lead me to propose the concept of *metamediation*, which describes a reflexive type of mediations that can help explain the role of technology design in technology appropriation, and thus technology appropriation and the role of technology design in general.

The research question breaks down into four sub-questions, each dealt with in a subsequent chapter:

1. How does interaction design understand the reflexive role of technology design?
2. How does postphenomenology conceptualise technology appropriation?
3. How to analyse the role of technology design in technology appropriation?
4. How does technology design play a role in technology appropriation?

Thesis outline

Chapter 1 introduces the practical context of this thesis and the problem it will address. To answer how interaction design understands the reflexive role of technology design, I will evaluate two main methods. I start with Norman's influential method of user-centered design (1988), which explains how design can facilitate users in making use of the functionality of a technology, but does not take into account its influence on users. Then I discuss how user-influencing design methods fill this gap, focusing on Thaler and Sunstein's theory of nudging (2008). I review how the risks of ineffectiveness and manipulation (Caraban et al. 2019; Hansen and Jespersen 2013) reveal an insufficient understanding of how users can deal with influences. While nudging proposes criteria for how design can reflexively allow a user to resist influence, these rely on a contradictory account of user agency.

In chapter 2, I introduce the theoretical framework of technology appropriation this thesis builds upon. I discuss how Verbeek and Dorrestijn's theory of technological self practices provides an explanation of technology appropriation compatible with being influenced (2011; 2012). While a user may always be subject to technological mediation, they can deliberately relate to those influences, styling how they are mediated. To allow for an analysis of how such appropriation may be affected by technology, I then examine the conditions for appropriation. Integrating fragments from Verbeek's *Moralizing Technology* (2011), I propose the concept of *mediation fluency* to explain how appropriation requires an ability to recognise and style influences. In drawing design implications however, Verbeek and Dorrestijn remain limited to an instrumentalist explanation of the reflexive role of technology. How does technology design affect mediation fluency?

In chapter 3, I address the theoretical challenge of how to analyse the role of technology design in appropriation, by evaluating how mediation-styling fits the postphenomenological framework. Verbeek's theory of technological mediation (2005) provides a vocabulary to analyse different aspects of how technology influences users. However, mediation-styling does not fit within the usual postphenomenological framework of the human-technology-world relation, as it implies what I call a *metarelation* to a mediated relation. I propose to extend the postphenomenological framework to this metarelation, to be able to analyse how technology may *metamediate* appropriation.

In chapter 4, I analyse how technology design plays a role in appropriation by applying a metamediation analysis to two empirical case studies. These are centered around two design research artefacts that feature in participant studies in academic interaction design research. For the *7 ½* alarm clock by Anne Spaa (Spaa et al. 2019), I analyse how the intentional limits in its design may affect the recognition of its mediation. For the *Capsule Camera* by James Pierce and Eric Paulos (2014), I focus on how the ambiguity in its design may affect the ability to style mediations. I evaluate how a metamediation analysis helps explain the reflexive role of technology.

Chapter 5 draws the conclusions from the thesis and discusses its limitations and implications. If the role of technology design in technology appropriation can be analysed by extending the postphenomenological framework to the metarelation, and if this role can be explained in terms of mediation, I propose that this role can be conceptualised as *metamediation*. After addressing the limitations of this study and possible objections, I will discuss how metamediation reflects back on the field of interaction design and postphenomenology.

1. Reflexive design

This chapter introduces the domain of interaction design this thesis focuses on, and establishes the practical problem it aims to address: that current interaction design methods, to navigate the challenges of manipulation and ineffectiveness, need a better understanding of how users appropriate and how technologies affect this.

The practical context of this thesis is the design discipline that is explicitly concerned with the reflexive role of technology: interaction design. Interaction design is a subfield of design that focuses on how design affects how a user *interacts* with a technology. While other disciplines, like infrastructure design or service design, may acknowledge how things affect user behaviour, interaction design allows for an analysis of how the properties of a technology reflexively affect how a user deals with it. This chapter will unpack: *how does interaction design understand the reflexive role of technology?*

The main academic field that studies interaction, Human-Computer Interaction, or HCI, has gone through a shift in the understanding of what it means to design interactions (Fallman 2011). As its name suggests, HCI was born from a need to study how humans can operate computers, as these 'devices without a predefined function' required a dialog-like interaction between user and technology for its functionality to be revealed. Now computation has left the domain of desktop devices in offices, and entered many kinds of electronic devices in daily life, from the alarm clock to the fridge to the light switch, that affected HCI's view: "technology changed from being a tool for work to something through which the world could be experienced" (Fallman 2011). With it, the understanding of interaction design changed from a practice aimed at usability to one involving ethics and influencing user behaviour, according to Fallman.

To answer how interaction design understands the reflexive role of technology, I will review two main methods: the classic method of user-centered design by Don Norman (1988), and the newer method of nudging by Richard Thaler and Cass Sunstein (2008). The reflexive role of technology refers to how a technology affects how a user deals with the role of technology in use. So for each

method, I will analyse how it understands the role of technology in use, how a user deals with that role, and how technology affects this.

Section 1.1 reviews user-centered design, which explains how interaction design shapes *usability*, to what extent users can make use of the functionality of a technology. I discuss its limitations with Daniel Fallman's critique of *usability* as a goal, in light of an extended understanding of how things affect user behaviour (2011). In section 1.2, I turn to the method of nudging, which fits interaction design as it concretely outlines how designers can influence users by shaping the context of their behaviour, or "choice architecture." However, this does not yet explain the reflexive role, which risks ineffectiveness, as shown in the metastudy by Caraban and others (2019), and makes it vulnerable to the critique of manipulation discussed by Hansen and Jespersen (2013). In 1.3, I evaluate the strategy by Thaler and Sunstein that aims to avoid manipulative nudges by keeping them detectible, which I will refer to as *overt nudging*. However, this strategy encounters limitations both in its understanding of how users can deal with nudges, reducing it to the ability to *resist* influences, and of the reflexive role of technology. In 1.4 I conclude how user-centered design and nudging provide complementary elements to explain the reflexive role of technology design, but leave a gap in explaining how design affects how users can deal with the *influence* of things, which forms the practical problem the remainder of the thesis will address.

1.1 User-centered design

To understand how user-centered design explains the reflexive role of technology design, I will first introduce the method. The discipline of interaction design emerged when the functionality of many things ceased to be legible from their physical properties, and started to only reveal itself when *interacting* with it. With electronic circuitry, everyday things could house many functions. Unlike a hammer, the functionality of a smartphone is not legible from its physical properties. Its form has a temporal dimension, as Maze and Redstrom (2005) put it. Don Norman's *The Design of Everyday Things* (1988) became a standard work to navigate the challenges of this field, by introducing the method of user-centered

design. After repeatedly having failed to switch lights, tap water, and open doors, Norman recognised that it was not sufficient for design to offer a user functionality (1988, 2). A designer also has to make sure a user can *make use* of this functionality. This only became more obvious with the emergence of complex electronic devices that interaction design is concerned with, such as fax machines, TV remotes, and not the least, computers. The design challenge becomes how to facilitate a user to make use of the functionality.

The object of user-centered design (or UCD) is the *usability* of a technology. In interacting with technology, Norman distinguishes between a challenge on the levels of action and perception. "When people use something, they face two gulfs: the Gulf of Execution, where they try to figure out how it operates, and the Gulf of Evaluation, where they try to figure out what happened. The role of the designer is to help people bridge the two gulfs" (Norman 1988, 43). Execution points to the action of a user towards a technology, and evaluation to their perception of it. Norman mirrors these two dimensions when he proposes the method of "user-centered design, a philosophy based on the needs and interests of the user, with an emphasis on making products usable and understandable ... Make sure that (1) the user can figure out what to do, and (2) the user can tell what is going on" (Norman 1988, 188). Making products usable (1) bridges the gulf of execution, while making them understandable (2) bridges the gulf of evaluation.

So, UCD approaches the role of technology in use as providing functionality, and the role of the user in dealing with technology as figuring out how to operate and understand this functionality. UCD then proposes that design can play a supportive role in this dealing, so how does it understand this reflexive role?

Reflexive manual

Norman recognised that the design of things influences the "gulfs" in action and perception. He argues that most everyday behaviour is a result of automatic subconscious thought, and therefore highly influenced by context (Norman 1988, 125). Mismatches between the design of things and automatic cognitive biases lead to "slips" (108), situations where the intuitive flow of use gets interrupted by

a feature that worked opposite to what was expected. And then I find myself throwing paper in the plastic bin.

User-centered design aims to take responsibility for how design influences the usability of things, by catering for cognitive biases in design. A successful interaction design functions as its own manual; "as much as possible, it should operate without instructions or labels" (188), for instance by using intuitive "mappings" between functions and controls. Norman gives the example of the design of kitchen stoves (75). While the burners are usually arranged in a rectangle, the controls are often arranged in a line. This means that the mapping between controls and burners has to be learned or requires labels. When the controls would also be arranged in a rectangle however, the mapping would be "natural." This example can illustrate how UCD understands the reflexive role of design.

User-centered designers aim to achieve usability by shaping how the functionality of a technology appears and how it can be controlled. On the dimension of action, the rectangular arrangement of the controls makes sure that "the user can figure out what to do." The gulf of execution is bridged by shaping what actions are possible, which Norman refers to as *affordances*, "those fundamental properties that determine just how the thing could possibly be used" (1988, 9). The perceptive "gulf" is bridged when the stove shows whether it is turned on. This is obvious with a gas stove, but with an electric stove it is hard to evaluate which ceramic plate is heating up, unless it is accompanied by a signal light, for instance. Bridging the gulf of evaluation happens by shaping the *aesthetic* properties of a technology. With aesthetics I refer to the realm of how something appears to and is experienced by its user. UCD aims to shape clear aesthetics and convenient affordances, to make technologies as understandable and usable as possible.

For UCD, interaction design is about the reflexive role of technology. UCD pictures technology design as a kind of gatekeeper in between the user and the functionality of the technology. Bad design will prevent a user from making use of the functionality, while good design functions as a seamless bridge between the tasks of the user and their technologically-aided completion.

Instrumentalist limits

Yet UCD's focus on the reflexive role of design to achieve usability as the object of interaction design encounters limits. In "The new good," Fallman (2011) associates the goal of usability with the first two historical phases, or "waves," of HCI. The first wave translates 'good' as 'usable': whether a user is able to make sense of and work with the technology. The second wave extended to more complex settings, where multiple users would collaborate. The emphasis shifted from whether the technology interaction was smooth to whether the social processes went well, but still the design was evaluated on its 'usefulness' in this complex setting.

For the third wave however, usability is insufficient, according to Fallman. When computational things started to integrate into more diverse contexts, including leisure, social life and the home, a third wave emerged in HCI that focused on the quality of experiences, meaning-making, and ethics. "With the third wave's more radical interest ... usability becomes problematic as an underlying 'good'" (Fallman 2011). Usability can explain how convenient design supports the user in fulfilling a need, but not situations where those useful tools seem to change the needs, or even work against them. For instance, while a smart thermostat can give users convenient control and clarity over their energy consumption, that does not mean it will always lead to less consumption. The user may be seduced by other temptations, including from the design itself. Its offered functionality may 'backfire', which describes how resource-saving devices may lead to more energy consumption by relieving guilt, functioning as a licence for using the resource (Caraban et al. 2019, 10).

These limits seem a result of an instrumentalist understanding of the role of technology in use. In the philosophy of technology, instrumentalism is the view that technologies are neutral 'tools' that merely have a passive role as 'instruments' in fulfilling the needs and wishes of their users. As Fallman argues: "The absence of ethical concerns can ... be explained by the rather strong commitment in HCI to the idea of technology as a 'tool', a thriving perspective to this day, which tends to make ethical concerns irrelevant as ethical agency is then solely placed in the hands of the user" (2011). Seeing technologies as neutral prevents from analysing

how they would alter behaviour, like seducing users to use more heating, and thus from considering the ethics of that influence. Fallman's analysis also applies to UCD. In his method, Norman explicitly takes the goals of the user as the starting point of design, UCD is "based on the needs and interests of the user" (Norman 1988, 188). If the goal of an action is taken to originate in the user, ethical concerns seem theirs as well, rather than the realm of designers.

UCD thus remains a selective explanation of the role of technology design. It can explain how technology design reflexively affects how a user relates to the functionality of technology; how easily they can achieve their task, by shaping aesthetics and affordances. Yet its instrumentalist approach of technology's role in use limits it in taking into account how technology design can affect what task the user sets out to do in the first place. It is this limit that user-*influencing* design methods attempt to overcome.

1.2 Nudging

Thaler and Sunstein's (2008) theory of nudging provides a clear account of how things influence the user, and it has been taken up in fields of design as a more general term for user-influencing design, encompassing techniques that overlap with other methods like persuasive technology (Caraban et al. 2019). To evaluate how nudging explains the reflexive role of technology, this section will first discuss how user-influencing design redefined this role of technology in use.

User-*influencing* design methods can be read as an extension of user-*centered* design. Like UCD, methods of "persuasive technology," "design with intent" and nudging start from a realisation that everyday behaviour largely happens subconsciously and is influenced by context (Fogg 2003, Lockton et al. 2013, Thaler and Sunstein 2008). For UCD however, this influence is limited to the *execution* of a task, and not what task the user would set out to do. UCD recognises the influence of things *negatively*: how design could prevent the successful execution of a task. But what about how things influence the user *positively*? Could design make the user do things?

User-influencing design methods like nudging start from a recognition that behaviour is not just hindered but also steered by context. In their book *Nudge*,

economist Richard Thaler and law professor Cass Sunstein (2008) argue for a recognition and conscious design of the way our environment structures our choices. In contrast to ruling ideas about rational and free choice in their respective fields of economics and law, Thaler and Sunstein pose that most choices are a result of automatic behaviour (2008, 19). Phenomena like lotteries (33) or a peak in earthquake survival gear sales after an earthquake (25) would not make sense if humans were purely rational agents as assumed by classic economics, but do make sense when recognising behaviour as guided by cognitive biases like loss aversion and availability bias. Thaler and Sunstein conclude that "people are ... nudge-able. Their choices, even in life's most important decisions, are influenced in ways that would not be anticipated in a standard economic framework" (2008, 37). Their nudge approach tries to use this insight to influence behaviour in a desirable direction. Then, how does nudging explain the role of technology in use?

Choice architecture

According to Sunstein and Thaler, behaviour is structured by what they call "choice architecture," the organisation of "the context in which people make decisions" (2008, 3). They recognise that any situation where you have to make a choice is not neutral; there will be unavoidable aspects that promote some options over others, like visibility, hierarchy and familiarity. If these aspects affect the outcome of the choice, suddenly the arrangement of the options becomes a choice *itself*. A classic example is the default printer setting. Whether you decide to print single-sided or double-sided is not just a result of the reason you might give when someone asks you about it; to a great extent it is shaped by the default setting (Egebark and Ekström 2016). If the preselected option is one-sided, more people will print one-sided, and vice versa.

Nudging tries to use this insight to influence behaviour deliberately, for instance by making double-sided printing the default option. Thaler and Sunstein define a nudge as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (2008, 6). Recognising the influence of the context of a choice thus opens up a seductive regulatory technique in politics and economics – exerting power without taxes or restrictions – but has also proven

very applicable to design. Nudging illustrates the mechanism of how user-influencing designs aim to *positively* influence the user towards certain behaviour. In their meta-study of nudges in the context of HCI, Caraban and others give a positive definition of nudging as "a deliberate change in the choice architecture with the goal of engineering a particular outcome, and that leverages upon one or more cognitive biases" (2019, 3). This highlights the element of cognitive biases from Thaler & Sunstein's analyses. Nudge designers use knowledge of how the aesthetics and affordances of things affect automatic user behaviour, not just to make interaction more intuitive like UCD, but to steer it towards "a particular outcome."

That seemingly subtle extension of influence implies a radical shift in the understanding of the role of technology in use. User-influencing design implies a recognition that the needs and intentions of users cannot be taken as a starting point separated from their interaction with a technology. Instead, these needs and intentions are co-produced by the context that a user finds themselves in. Take the example of how decreasing the plate size in a cafeteria also reduces food consumption (Hansen and Jespersen 2013, 15). This works by limiting the amount of temptation in front of you that may trigger mindless eating even when full. So, it affects a user not just by limiting the fulfilment of a need, but rather by giving shape to that need. User-influencing design methods like nudging thus reinterpret the role of technology in use, from facilitating functionality to influencing behaviour.

Acknowledging technologies as influential opens the door to reinterpret design as an ethical endeavour. As Fallman (2011) argues in "The New Good," when designers influence the behaviour of users, it requires a redefinition of what constitutes "good" interaction that goes beyond usability and enters ethics. UCD may have just been allowing users to do bad things really well. Nudge design aims to bridge a gap between user's behaviour and higher values, ideals and beliefs.

Yet what about the role of the user? When the needs of a user can't be taken as the starting point, is it still relevant to include how they deal with nudges? UCD primarily focused on the reflexive role, but nudging seems primarily concerned with the role of technology in use. When taking designers to be morally responsible for the behavioural influence of technology, like Fallman does, it seems

to imply that the role of users dealing with this influencing role of technology is irrelevant. If so, there would also be no need to explain the reflexive role of technology in such dealing.

Challenging users

Yet two challenges to user-influencing design help illustrate the relevance of the reflexive role of technology design.

First, there is the practical challenge that user-influencing designs often turn out to be ineffective. For instance, a metastudy of sustainable design noticed that many persuasive technologies and nudges for sustainability ironically are not sustainable in their effects (Brynjarsdóttir et al. 2012). In their metastudy of nudges in HCI, Caraban and others notice similar patterns, and analyse how such ineffectiveness can be a result of users disagreeing with the influence, noting that "nudges work best ... when individuals do not have strong preferences for particular choices" (2019, 11). Even Sunstein admits as much when he claims that "if choosers ignore or reject it, it is because they know best" (Sunstein 2017, 5). If users can reject a nudge, the role of users seems crucial in understanding the effectiveness of user-influencing designs. At the same time, the analysis of Caraban and others showed that ineffectiveness could also be the result of their effect fading over time (like with graphic warnings on cigarette packaging), backfiring effects, or just design flaws in timing or effect (2019, 10–11). So, to distinguish a rejected nudge from a design flaw, it would help to understand what enables a user to reject, in other words, the reflexive role of technology. Otherwise, increasing effectiveness runs into the second challenge.

User-influencing design methods, and the nudge approach more broadly, are vulnerable to a critique of manipulation. Even though nudges by definition would not "forbid any options" to preserve freedom of choice, if users are pushed towards certain options, how free is that choice? In "Nudge and the Manipulation of Choice," Hansen and Jespersen survey a range of critiques, and summarise it as:

> Insofar as nudging turns out to work by manipulating people's choices, it seems that citizens are not really free to choose differently, since behavioural change that comes about by nudging will occur, if not necessarily against

> the will of citizens, then at least without their active consent and knowledge. (2013, 12)

This highlights two kinds of challenges to the nudge approach: that it may influence people to behave "against their will," and "without consent." I will refer to these as respectively pressure and manipulation. Pressure refers to being influenced to behave in a way not agreed with, while manipulation describes being influenced without being aware. The possibility that users may be manipulated or pressured means that the effectiveness of a nudge does not warrant its desirability. It emphasises that the role of a user in dealing with the influence of technologies is relevant to user-influencing design, and by extension how the reflexive role of technology affects to what extent a user can consent to or resist a nudge. For instance, increasing the effectiveness of a nudge without risking manipulating users, requires understanding what makes a nudge prone to subverting consent.

In conclusion, in order to navigate the challenges put forward by the potential ineffectiveness and manipulation of nudges, user-influencing design would need an understanding of the reflexive role of its design. Although nudging offers a broader recognition of the effect of aesthetics and affordances on users than UCD, it seems to lack its reflexive dimension. UCD focuses on reflexively shaping the relation to a thing, while nudging focuses on shaping the way a user behaves in a certain context, regardless of whether they reflexively relate to the nudging thing. How could nudging take into account how users can deal with its influence? One area where Thaler and Sunstein discuss a reflexive role of technology is in their defense of nudging against manipulation.

1.3 Overt nudging

Thaler and Sunstein acknowledge that influences can be manipulative, but hold that nudges could avoid this by addressing users on a conscious level. Sunstein considers a nudge manipulative "if it attempts to influence people subconsciously or unconsciously, in a way that undermines their capacity for conscious choice" (Sunstein 2015, 35), so when it doesn't engage users' reflective capacities. Even if a subliminal ad would have been consented to, for instance to help quit smoking,

Thaler and Sunstein discount them as manipulative, because the influence cannot be "monitored" (2008, 244–6). Even though nudges by definition do not enforce specific choices but leave an "opt out," covert influence of automatic behaviour would still risk influencing one to behave against one's intentions.

Instead, a nudge should remain "overt" (Sunstein 2015, 47), or consciously detectable.[1] Nudges could address conscious thought directly, like a "look right" warning on British streets. If nudges address automatic behaviour, they could still be obvious enough to be detectable by the reflexive system. Unlike a 'covert' subliminal ad, a graphic warning on a pack of cigarettes influences emotional responses in an overt way: its intention is not hard to decipher (Sunstein 2015, 39). The claim is that manipulation would be avoided by addressing reflective thought. Automatic behaviour might be always at the whims of the context one finds oneself in, the reflective system can still resist temptations – "opt out" — as long as it is consciously addressed with a detectable nudge.

Keeping nudges detectible may at first seem like a mere qualification of nudging, but it implies an understanding of the reflexive role of technology design. Overt nudging recognises that designers shape not just how things influence behaviour, but also whether users can deal with that influence. Just like UCD functions like a manual to the *functionality* of a thing, an overt nudge would overtly point to the *influence* of the thing. A design can use aesthetics to make its influence detectable (or not) and tweak affordances to keep it resistible. Overt nudging thus implies an explanation of how users deal with the influencing role of technologies, and how technology design affects this dealing: users can deal with technological influence by resisting it or consenting to it, and technology design can reflexively allow for this by keeping the influence detectable and resistible. Akin to UCD, the roles of the user and technology seem to be approached as a kind of gate-keeping. Like the usability of a technology can enable a user to make use of functionality, an overt nudge would enable a user to decide whether they enable the technology to influence their behaviour.

[1] This rationale is mirrored in other user-influencing design methods. Persuasive technology aims for transparency, and a metastudy in interaction design notes how most user-influencing designs avoid manipulation by being transparent (Fogg 2003; Caraban et al. 2019).

Resistible but unresisted

To evaluate whether overt nudging sufficiently explains the reflexive role of technology, I will first measure it up to the challenge brought up in manipulation. Are the criteria of detectability and resistibility sufficient to distinguish manipulation from a consented nudge? This encompasses two types of challenges: whether the influence subverts consent, and whether it pressures one to behave against one's intentions. Hansen and Jespersen think that overt nudging could avoid both, considering it "plausible that such transparency offers an immediate filter on behavioural changes not supported by the citizens nudged" (2013, 19). Here they seem to assume that avoiding manipulation would also avoid pressure. It indeed seems plausible that keeping a nudge detectible avoids the risk of influencing a user without them being aware – if not their "active consent," at least their "knowledge" and passive consent. However, is this sufficient to filter pressuring "behavioural changes not supported"?

Sunstein's example of the graphic warning on a pack of cigarettes is detectible and seems quite easily resistible. Yet these criteria not only describe the influence of the graphic warning, but also of the cigarettes in the pack. With a graphic warning, a 'user' is aware of its influence (that cigarettes are addictive and 'kill'), so they must be able to resist it, according to overt nudging. Yet claiming that graphic warnings would warrant that anyone who buys cigarettes "supports" this behaviour would deny the phenomenon of addiction, which makes people indulge in practices even when they prefer not to. Detectability as an aesthetic principle seems insufficient to allow a user to resist. Like with cigarettes, even after learning about nudges, they do not stop exerting pressure. Thaler and Sunstein's own example of a bowl of cashew nuts confirms this (2008, 40–42). When discussing temptations, they use it to illustrate the irresistibility of influences (e.g. taking another cashew nut) when in a "hot state," ruled by automatic thinking. Their criterion of making a nudge detectible ("These cashews are addictive") does not warrant resistibility. Knowing that cashew nuts are addictive doesn't make them less so. If reflected disagreement can be insufficient to resist a resistible nudge, there is more to explain.

An overt nudger may counter that this is beyond their influence; they cannot warrant that a user takes the responsibility to resist. What else can a designer do when a user just would not take responsibility? Yet that would dodge responsibility too easily, as if a nudge does not affect the probability to resist. It is *possible* to resist buying cigarettes, but tobacco does not make that more *probable*. Even if an overt graphic warning would make cigarettes not 'manipulative' because their influence is overt, that explanation does not exhaust the reflexive influence of cigarettes on how a user can deal with them. Curiously, while explaining the role of technology in use as influencing, overt nudging seems to explain the reflexive role of technology instrumentally.

A similar problem appears when evaluating whether overt nudging sufficiently understands the role of users in dealing with influences. Even if detectability and resistibility would succeed in enabling users to resist or consent to influences, this gatekeeping role hardly seems to exhaust how users can deal with influences. Thaler and Sunstein themselves give many examples of such behaviour in "self-control strategies" (2008, 44–52), but a mundane one is the piggy bank. It restricts access to money put in, which helps a non-rational "nudge-able" person to deal with their temptations and save. Here a user is 'nudged by themselves', through a piggy bank. Or consider the use of Night Shift, an application that warms the hues of a computer screen in the evening to help the body prepare for sleep, effectively nudging its user to to bed early. Overt nudging could explain how once the user detects the influence, they could still decide to resist it and stay up late, or tacitly consent to it by letting it be. Yet that seems to miss much. What if the user wanted to go to bed early and chose to turn on Night Shift? That is a form of agency outside resistance. Even if the user does not want to sleep early, would their dealing with Night Shift's influence not be supported simply by allowing them to turn it off, rather than to resist it? Just like UCD could only explain the influence of things negatively, as hindering use, overt nudging explains user agency only in the negative direction of being able to *resist* influences. Resistibility does not describe a reflexive relation to how you are influenced, but rather presumes a first-order ability to go against influences.

Overt nudging is therefore still an insufficient method to explain the reflexive role of technology. It makes a step in the right direction, offering an

interpretation of technology design as enabling users to deal with their influencing environment. However, in doing so it falls back into an instrumentalist logic, providing the possibility to resist without the probability, while relying on a reductive idea of user agency pitted against influence. This not only limits explanation, but also contradicts its justifying assumption that users are always already influenced, as resisting a pressuring nudge seems to rely on a possibility to cancel out the influence.

1.4 Beyond resistance

To find out how interaction design understands the reflexive role of technology, I evaluated two main methods: the older method of user-centered design and nudging from the new "wave." The methods seem to give reversed answers. While UCD can explain how the aesthetics and affordances of a technology influence how a user can deal with the functionality of a technology (its "usability"), it turned out to be limited in recognising the extent of this influence, by its instrumentalist understanding of the role of technology in use. While nudging can explain how technologies in use influence the behaviour of their user, even making that the focus of the approach, it seems to resort to instrumentalism when addressing the reflexive role of technology. It thus leaves a gap in explaining how technology may also *influence* how a user deals with the influencing role of technology in use.

This gap leaves nudging, even when overt, vulnerable to the critique of influencing users to behave against their intention. Even when making it less likely that users would be influenced unknowingly, the option to resist cannot warrant that users are able to, as it does not diminish the influence. So, if left unresolved, overt nudging may allow (choice) designers to pressure users under the guise of preserving freedom of choice, thereby avoiding responsibility for that influence while burdening users with resisting temptations.

Yet how to explain the role of the user in a way that is compatible with being influenced? Answering this could help interaction design to avoid manipulation, and may open up a new design space of including users in dealing with influence. The phenomenon of 'self-nudges' hinted at this possibility. When

recognising that users can relate to influences, taking designers to be morally responsible is a strange conclusion drawn from the realisation that things influence. Instead of consolidating the relation between designer and user as nudger and nudged, where now at least the designer is consciously dealing with nudges, could designers include users in giving shape to influences?

This brings us back to the research question of this thesis: how to understand the role of technology design in technology appropriation? In the context of interaction design, technology design can be understood as the practice of shaping the aesthetics and affordances of a technology. Yet to see how this affects appropriation requires a better understanding both of appropriation and the reflexive role of technology, which is what the remainder of this thesis will explore.

2. Mediation fluency

In this chapter I turn to the sub-question of: *how does postphenomenology conceptualise technology appropriation?* Answering this will both establish the theoretical framework this thesis will build upon and expose the theoretical gap it will address.

The philosophical field of postphenomenology offers an understanding of technology appropriation that is relevant to explain the reflexive role of technology. While appropriation in design discourse and science and technology studies may refer to adopting a technology for a new function (Eglash 2004; Dix 2007), like using a chair as clothing hanger or hammer as paperweight, the appropriation this thesis is concerned with is relating to the *influence* of a technology. Postphenomenology studies how technologies affect the relation of humans to their environment. Within this field, Steven Dorrestijn and Peter-Paul Verbeek developed a theory of appropriation to explain how users deal with these effects. In this interpretation, appropriation does not depend on going against the designer's intentions, but on the deliberate dealing with technological influences.

The reflexive role of technology would then refer to how technology affects this type of appropriation. For explaining this reflexive role it is not enough to explain *that* a user can deal with the influence of technology. Without further specification this would confuse the role of design. If users can appropriate by choosing how to be influenced, are designers still responsible for user behaviour, like user-influencing design methods claim? Or are users now responsible for how they are influenced? To clarify, we would need to understand in what *conditions* users are able to take part in shaping the influencing role of technologies. Although Verbeek and Dorrestijn do not discuss these conditions in detail, they do address elements throughout their discussions, which I will integrate in this chapter. This fits within a larger project within postphenomenology to examine the process of appropriation. As Verbeek writes: "in order to develop a full understanding of processes of mediation, we should not only study 'what things do' ... but also how humans give meaning to these mediations – both empirically and conceptually" (2016, 191). The explanatory gap left in interaction design,

however, suggests that this may also require understanding 'what things do' for appropriation.

To understand how postphenomenology conceptualises technology appropriation, I will first reconstruct in 2.1 how Verbeek (2011) and Dorrestijn (2012) apply Michel Foucault's redefinition of subjectivity in the context of technology use. Foucault argued that even when subjects are formed by their context, they can take part in shaping that context through a process of *self practices*. Verbeek and Dorrestijn translate this to the practice of styling the mediating roles of technologies in one's life. In section 2.2, I start to analyse the conditions of such appropriation by unpacking what it requires from a user, on the basis of fragments from Verbeek's *Moralizing Technology*. I introduce the concept of *mediation fluency* to capture how mediation-styling requires the ability to recognise and style influences. In section 2.3 I review Verbeek and Dorrestijn's recommendations of how mediation styling can be brought about. This section aims to highlight the (material) gap in the theorisation of technology appropriation that the remainder of this thesis will address.

2.1 Technological self practices

Verbeek and Dorrestijn's theorisation of technology appropriation resulted from an attempt to explain moral agency within the framework of postphenomenology. In the philosophy of technology, postphenomenology is a field that studies how technologies structure the relation between humans and their lifeworlds. Don Ihde laid the groundwork for this perspective when theorising how technologies affect our experience (1990). Building on phenomenology's study of our relation with our surroundings – which Ihde formalised as I - world (1990, 23) – postphenomenology studies how technologies influence and structure that relation: I - technology - world (1990, 85). For instance, shoes change how we experience the street, and video-calling changes the relation to the person we communicate with.

Peter-Paul Verbeek further theorised the nature of this structuring as *technological mediation*. Mediation theory explains technologies as the 'medium' of the relations to our surroundings, inviting and inhibiting us to do certain

things; amplifying and reducing elements in the perception of our surroundings (Verbeek 2005). Mediation theory explicitly introduces a relational ontology in the relationship between humans and technologies. Rather than an essentialist worldview that separates active subjects from passive objects, it explains subjectivity and objectivity as mutually constituted in a mediated relation. "Humans and the world they experience are the *products* of technological mediation, and not just the poles between which the mediation plays itself out" (Verbeek 2005, 130, emphasis in original). When communicating through a video call, mediation theory can explain how this is not a neutral intermediary, but constitutes me as a video caller, with specific ways of communicating bound to that role, and affects my experience of the person on the other end. This structuring may manifest as an 'influence' to a user, but mediation theory helps explain how this is more than a resistible suggestion, but rather an aspect that co-constitutes how a user experiences and exists in a particular context.

Yet this challenges classic notions of moral agency. Conventionally, assigning moral responsibility requires a moral subject to be able to exercise their freedom.

> Only when somebody acts purposively and freely can he or she be held morally responsible for his or her actions. Such freedom and intentionality are two elements of human agency that seem quite complicated in the case of technologically mediated action. (Verbeek 2011, 108)

I can be held morally responsible for wastefully throwing plastic in the paper bin because I would have the freedom to act otherwise. However, if things do not just 'function' as neutral tools to fulfil users' needs, but shape behaviour, can we speak of free choice? If the design of the bin was confusing, was it really me who is morally responsible, or does this counter the condition of intentionality? If we are always already influenced by things, it may seem that moral agency dissolves. Yet Verbeek and Dorrestijn develop an alternative way to think about the agency of a technology user.

Technological self practices

Verbeek and Dorrestijn find in Foucault's later work a redefinition of freedom that is compatible with being always already mediated. In his earlier work, Michel Foucault has argued how a subject is a product of power relations. This rhymes with the situation implied by mediation theory: that subjects are always already mediated (Verbeek 2011, 70). However, Foucault shows how a subject can still play a role in how it is produced, by relating to those influences. In the volumes of the *History of Sexuality*, Michel Foucault develops an account of how people can take part in forming themselves.[2] He analyses how the ancient Greeks dealt with sexual pleasures not through abstinence but by cultivating a relation to them, to be able to enjoy without being ruled by desires. Foucault analyses these *self practices* as:

> a process in which the individual delimits that part of himself that will form the object of his moral practice, defines his position relative to the precept he will follow, and decides on a certain mode of being that will serve as his moral goal. And this requires him to act upon himself, to monitor, test, improve, and transform himself. (Foucault 1992, 28)

In self practices, a subject tries to shape their behaviour to accord with a certain ideal – for instance, moderating sexual encounters in light of norms of fidelity – through several ways of working on oneself. Self practices reveal a form of agency compatible with being influenced, rather than in opposition to it. When styling sexual conduct, that does not mean abstaining from it altogether, but rather to be deliberate about relating to pleasures, "to monitor, test, improve, and transform" one's conduct.

For Verbeek and Dorrestijn, Foucault's model of subject formation enables an explanation of appropriation with technological mediations. In this adaptation, technological meditations, rather than sexual desires, feature as the object to be styled. Here I will focus on Verbeek's translation as worked out in *Moralizing Technology*: "in a technological context, self practices consist in using

[2] For the purposes of this thesis I only discuss Foucault to reconstruct Verbeek and Dorrestijn's interpretation.

technology deliberately by anticipating and modifying its mediating role in our existence, realizing that each way of using it also helps to shape our subjectivity" (2011, 84). If mediations co-constitute who you are, changing your interactions effectively changes how you are; how you act and perceive the world. Technological self-practices are then ways of monitoring, testing, improving and transforming – in short, *styling* – how you are mediated. I will refer to this self practice as *mediation-styling*.[3] How does this help to explain the role of users in dealing with technologies?

Styling users

Technological self practices provide an explanation of the role of users that does not rely on resisting influence. Instead, mediation-styling is about interacting with technology to be influenced in a desirable way. 'Self-nudges', like the example of using Night Shift to sleep earlier, can be explained as mediation-styling. A user deliberately styles their interaction with Night Shift to become an 'early-bird' subject. Mediation-styling can explain many of our everyday dealings. Consider getting dressed. If clothes mediate the man, mediation-styling is picking the right clothes. This not only changes how one comes across, but also how one acts (whether one goes outside, sits on the grass, gets sweaty) and how one perceives the world (as small, a dirt pit, a playground). When we pick clothes, play music, or compose a meal, we arrange the things around taking into account how they influence how we feel, perceive and act. You could try to explain these activities instrumentally as the ability to order one's environment into a desired state. Yet that would miss how they can be reflexive, trying to bring about a desired state of *oneself*, like 'relaxed' or 'focused' or 'celebratory', *through* one's surroundings.

This interpretation of appropriation explains a form of user agency entangled with being influenced. No matter how many influences mediate me, I can reflexively fold back onto 'my-mediated-self'; evaluate how I am influenced and style the interaction with those influences accordingly. Mediation-styling opens a way to reinterpret user agency *positively*: from 'being free of unwanted influence' to 'being deliberately influenced'. Dealing with the role of technology

[3] "Mediation" to distinguish it from self-styling that is not (explicitly) technological, and "styling" to distinguish it from subject-formation practices that are not deliberate.

for a mediation-styling user does not consist of resisting or passively consenting to an overt nudge, but, as Dorrestijn and Verbeek put it, "in dealing creatively and critically with the visions of the good life that are implicit in many designs" (2013, 54).

Ambiguous responsibilities

Without elaboration however, it remains ambiguous to what extent mediation-styling makes a user responsible for the influence of a technology. This ambiguity shines through when Verbeek discusses responsibility. If users can indeed take part in shaping how they are influenced, what does that mean for how the responsibility over the influence is distributed between user and designer?

When discussing design implications in *Moralizing Technologies*, Verbeek interprets the moral influence of technologies as a responsibility for designers. Since mediating technologies affect the behaviour of their users, it "burdens designers with a specific responsibility" (Verbeek 2011, 90). This rhymes with how user-influencing design methods interpret the recognition that things influence their users as a responsibility for design. Verbeek goes on to argue, in line with Fallman, that this turns design into an ethical activity. "If ethics is about how to act and designers help to shape how technologies mediate action, designing should be considered a material form of doing ethics" (Verbeek 2011, 91). However, when users can also play a role in shaping, the moral relevance of the designers' shaping seems to hinge on what exactly it means to "help to shape how technologies mediate." The responsibility of designers depends on the extent to which the resulting mediations can be attributed to design, rather than user appropriation.

When Verbeek discusses the responsibility of users, he indeed points at their ability to style mediations. "Rather than being a mere product of technological mediations, the mediated subject becomes responsible for the form its mediated subjectivity takes" (Verbeek 2011, 87). Mediation-styling then becomes a way of taking responsibility for how you are influenced. Yet this seems to contradict the responsibility of the designer. If users can simply choose how to be influenced, the role of designers would merely be one of creating 'ingredients'. Yet it seems inaccurate (and unfair) to completely hold users responsible for

mediations. As argued in chapter 1, not any nudge allows for relating, some may influence their user without them being aware.

If both users and designers cannot be taken to carry full responsibility, that suggests a balance. This seems to be what Verbeek has in mind when he describes how a mediation is a result of the shared agency between user, designer, and technology (Verbeek 2011, 99). Still, assigning responsibility requires qualifying that balance: being able to say when and how designers and users would be responsible. The role of users and designers seems to depend on what constitutes the actual technological mediations that play out.

The key to untangle this seems to be an understanding of the conditions in which a user is supported to style mediations, and when they aren't. This would make a first step to explaining the reflexive role of technologies. The framework of technological self practices is yet insufficient to specify the extent to which users are able to form themselves. Then, how to understand the conditions of appropriation?

2.2 Mediation fluency

In this section I start analysing the conditions that make it possible for a user to style mediations. This will later on help explain how technologies affect appropriation, by enabling an analysis of how technologies affect the conditions. What makes it possible for a user to style mediations?

To answer, I take cues from Verbeek's *Moralizing Technology*.[4] Although Verbeek does not discuss the conditions of technological self practices separately, in several places he does identify certain elements that are necessary for a user to style mediations. I split the analysis into a perceptive and active dimensions of mediation-styling: evaluating and modifying relations with things. For each dimension I develop an account of what is required from a user, based on the elements from Verbeek.

To help clarify and test these elements, I will apply them to an illustrative case: the technological self practice of wearing a camera. I sometimes like to wear my camera around my neck to help make me notice beauty in my surroundings. I

[4] For reasons of brevity I leave out a discussion of Dorrestijn, as the elements in his discussion mostly double Verbeek's.

may use it to take photos, but I also may not. Yet the possibility of taking a photo seems to make me more alert at spotting a potential shot. Wearing the camera thus mediates my relation to my surroundings, by amplifying certain elements in my perception of it. To be sure, it affects me in more ways than as a 'beauty filter'. It also makes me more cautious in my movements to not damage my camera, for instance. These effects can all be reasons to wear or not to wear my camera. If so, this decision is an example of mediation-styling: I deliberately style my relation to the camera based on how it structures how my-mediated-self perceives and acts in the world.

Wearing it to notice beauty was not something I always did; I had to learn it. In other words, the ability to style my camera interactions requires a certain fluency. I refer to this ability as *mediation fluency*. Echoing how language fluency implies both listening and speaking, I will unpack how relating to mediations requires both a perceptive and an active component.

Evaluating mediations

What does a user need to evaluate mediations? In *Moralizing Technology*, Verbeek gives some directions to start analysing the perceptive conditions of when a user can be expected to engage in mediation-styling. When discussing "ambient intelligence" technologies that may influence users subconsciously, Verbeek acknowledges that mediation-styling requires a specific relation towards those technologies.

> Only when people consciously take a position with respect to the ways these technologies help to shape their moral substance will it become possible to take responsibility for them. But in order to do that, people do have to see their mediating roles. (Verbeek 2011, 134)

So, to evaluate to what extent one identifies with the influence ("take a position"), one has to recognise how a technology influences them. This seems rather straight-forward – to start wearing a camera as a beauty filter one needs to be able to recognise that wearing a camera can influence perception in such a way. Yet what does it mean to recognise a technology's "mediating role"?

Recognising a mediation implies a certain interpretative framework that allows one to perceive a technology as an influence and oneself as influenced. Either one of them alone is insufficient. It is not enough to only recognise oneself as subject to influence, as that still allows for treating oneself as an entity separate from technology, rather than mediated. This may capture for instance the experience of pushing oneself in sports. A "styling I" tells a "sporting I" to run faster. However, this does not yet describe mediation-styling, rather 'unmediated self-styling'.

Similarly, it is not enough to recognise a technology as an influence, as this could still allow for thinking part of oneself as essentialist, immune from influence. Don Norman's user-centered design also recognised that things influence, but this was limited to influences on the execution of a task rather than on how you behave. It is possible to accept that the layout of a stove influences the speed with which you can handle it, without accepting that it influences what you cook. User-centered design may then recognise how the camera strap makes the camera more quick to use, for instance. Yet this is insufficient for mediation styling; it does not explain how the improved access structures one's relation to one's surroundings. Recognising a mediating role means recognising not just the technology as an influence, but one's own subjectivity as influenced. Hanging my camera around my neck as a beauty filter not only admits a recognition of the camera as an influence, but also a (tacit) understanding of myself, specifically my experience of beauty, as being a product of influence.

Recognising mediations, then, implies a relational - rather than an essentialist - interpretation of the relation between oneself and one's surroundings. While influence on task-execution is still compatible with an essentialist view where the user as 'subject' is the sole source of a task, influence on behaviour seems to require recognising an active role for the 'object' being used, which implies a view of one's subjectivity as the product of relations to things around. However, for a user to embrace such a relational understanding does not have to be a conscious nor ideological commitment. It may not even be consistent with how one views oneself in other situations, like in their job or a voting booth. Yet in the situation of recognising a technology as mediating, the interpretative frame implied can be explained as a relational view of at least the part of oneself

under influence, like the ability to notice beauty. Just like a smith not only understands how to smith silver, but first that silver is a malleable substance, a mediation-styling user not only understands *how* they are influenced, but also *that* they are so.

The perceptive element of mediation-styling, evaluating mediations, thus requires the mediation-fluency to recognise a technology as a mediator and oneself as mediated.

Modifying mediations

Recognising a technology as mediating does not yet mean that a user is able to modify this mediating role. A user may recognise a camera as a mediator that will influence them, without knowing *how* it will influence them in a particular situation, let alone how to modify this influence to achieve a certain mediation. What makes it possible for a user to style a mediation?

When discussing technological self practices, Verbeek stresses a practical condition that hints at the kind of knowledge that is required for a user to engage in mediation styling practices, here referred to as 'techniques'.

> "Techniques of technology use" require *experimentation*. The distance needed to gain a free relation to technology and to modify and shape its impact on our existence can be obtained only by deliberately allowing technologies to play their mediating roles in different settings. (Verbeek 2011, 84, emphasis in original)

The ability to style mediations would thus require trying out different relations with a technology, or "experimentation." This implies a kind of knowledge that a user needs for styling. If styling *requires* experimentation, learning about it theoretically, for instance, is not sufficient.

The need for experimentation seems a result of the context-dependent character of mediations. In postphenomenology, this is referred to as the "multistability" of technologies. Don Ihde introduced this term to name the "structured but essential ambiguity of technology" (1990, 144); even though technologies structure the relation between humans and their lifeworlds, there is

no fixed way in which they do so. Rather, there are multiple 'stabilities' in which a technology can structure relations, depending on the context of the encounter. A simple example is how a chair can function both as a seat and a clothing hanger, depending on the context, structuring one's relation to for instance a table or clothing in different but relatively 'stable' ways. This multistability makes it difficult to predict how a technology will mediate in a particular situation. It is not enough to read or hear about its influence, because it may turn out to influence differently. When someone else wears a camera, they may not experience the beauty-filter effect, and I may not experience it when it rains and I care to protect the camera. Multistability explains why styling mediations would require experimentation to confirm or discover how a technology mediates.

Styling a mediation then requires a type of knowledge grounded in experience, which can be called embodied knowledge. In the camera example, wearing it to notice beauty implies that I have experienced how the camera influences my noticing. Perhaps I had heard about it before, or speculated. Yet before being able to call myself fluent I need to have experienced the influence to know if it works for me and in what situations. The mediation fluency required to style mediations thus includes embodied knowledge of how changing relations affect mediation.

Relational responsibilities

In conclusion, for a user to style a mediation they need to have acquired a mediation fluency, both in recognising, to be able to evaluate the mediation, and in styling, to be able to purposely modify that mediation. Without specifying its conditions, mediation-styling is still vulnerable to being 'appropriated' in an essentialist interpretation of agency, where a user would be responsible for how they are styled. Yet this section highlighted how mediation-styling is not self-evident. The fluency required goes beyond being able to "detect" an influence, but requires being able to recognize how it structures one's subjectivity. Mediation fluency also goes beyond the ability to "resist" an influence, but rather involves the experienced ability to modify one's relation with a technology to achieve a certain influence. It reveals mediation-styling *itself* as a relational practice. This may allow for a qualification of the responsibility of users, but for

the relevance of this thesis mostly allows for an analysis of how technology reflexively affects the conditions.

2.3 Becoming fluent

How do we become fluent with the mediation of technologies? So far I have analysed how postphenomenology conceptualises technology appropriation – which I interpreted as mediation-styling – and its conditions – which I integrated in the concept of mediation fluency. What does postphenomenology have to say about the reflexive role of technology herein?

Although this role is not discussed elaborately, technology does feature in Verbeek and Dorrestijn's recommendations for how to support appropriation. In "Technology, Wellbeing, and Freedom," they summarise it as follows:

> Designs should allow for ... appropriations, and at the same time users should be educated and equipped to understand the mediating roles of designed products in their lives, by learning to understand the phenomenon of technical mediation and recognizing it in their everyday environment. (Dorrestijn and Verbeek 2013, 54)

This paints complementary roles for education and design, but education has to do most of the heavy lifting. Users would have to be educated to be able to recognise and understand mediations. Then design should just "allow for" users to put these lessons into practice, to "make it possible for users to develop an active and critical relationship with these influences" (ibid.). To what extent can this explain the reflexive role of technology?

The opt in

The theme that appropriation requires design to "allow" for it recurs when Dorrestijn and Verbeek discuss design implications,[5] but what exactly this would entail is not elaborated. Yet a clue is given when Verbeek discusses freedom.

> Except in cases of complete domination, where technological mediation makes room for force and compulsion, the mediated character of actions and decisions appears not to obstruct moral agency at all. (Verbeek 2011, 87)

Verbeek seems to mean that users are able to style mediations, as long as these mediations do not compel, or "*enforce* specific behaviours" (2011, 111). This makes intuitive sense. Recognising the way a strong influence like a speed bump slows you down is not enough to change its influence. A speed bump (2011, 107) does not allow for many creative appropriations from a driver (unlike for a skater or chalker). However, this also sounds a lot like the requirement of overt nudges to remain 'resistible', which was insufficient to explain why resistible influences may still be unresisted.

Here we have to distinguish between the "force" and "compulsion" Verbeek mentions. What Verbeek calls "complete domination" indeed sounds forceful, but may be about something else than the *force* of the mediation, understood as the felt strength of an influence. A soft influence may be compulsory, as in hard to avoid, while a strong influence may be styleable. A hallucinatory drug, for instance, strongly influences how one sees and acts in the world. The influence is so strong it can be called coercive, resisting its influence is out of the question. However, its force does not *compel* one to take the drug. The strength of the influence may actually help one to be rather deliberate about using it.

What seems critical for mediation-styling then is not the force of a mediation but to what extent one's relation to it can be altered. Limiting force is

[5] Most of these implications are drawn from the perspective that design itself is a technological self-practice, see (Verbeek 2011, 48). In this interpretation, self-practice has lost its reflexivity, and rather reverts to what I would call 'other-styling'. These implications remain mostly in line with the logic of nudge design, aiming to influence users in a responsible way. This is less relevant when trying to understand how technology affects appropriation, like in this thesis.

relevant when wanting a user to be able to resist a nudge, but limiting compulsion is relevant when wanting a user to be able to modify their relation with a mediation. In "Technology, Wellbeing, and Freedom," Dorrestijn and Verbeek refer to this second type of choice as an 'opt in': "rather than designing possibilities to opt out, it is important to think about multiple ways to opt in" (2013, 54). In the case of the printer default, opting in is not about the ability to resist (or 'opt out' of) the suggestion of two-sided-printing-default, but rather the ability to *set* the default.

However, the mere possibility for a user to change their interactions with a technology is not enough to enable them to style. A user also requires the mediation fluency to do so. The opt in risks repeating instrumentalist simplifications of the role of technologies. To "allow for appropriations," "equip with the means," and "make it possible" (Verbeek & Dorrestijn 2013, 53–54) remains within an instrumental frame. It frames the role of things in mediation-styling as a 'styling-tool' for a user, as if styling is a 'human' activity that things just need to enable. As if mediation fluency remains unaffected by technology within the boundaries of possibility.

Although it may be possible that this would exhaust the reflexive role of technology, it does not seem probable. It cannot explain the role of design elements like detectability or force in differences between the appropriation of technologies ranging from dark patterns to Night Shift, as long as they do not force a user into a particular relation. If overt nudging could not explain situations where users were able to opt out but did not, designing "possibilities to opt in" seems to fall in a similar trap. And just like UCD left open the question of what motivates certain use, design for opting in does not yet explain how it affects mediation fluency. Most pressingly, it would contradict postphenomenology's framework if appropriation would be a practice that was exempt from technological mediation.

Verbeek and Dorrestijn's theorisation seems to leave a gap in explaining what material conditions can support a user in technological self practices. While it explains how technology appropriation involves styling mediations, it does not explain how styling itself may be mediated. One way this shows is that even if teaching about mediations may help to educate users about *that* they are mediated

and technology designs would allow them to discover *how* they are mediated, there is another question. Why would users need to be taught in the first place? Why did technological things ever *allow* themselves to be thought of as mere tools? If technology is so biased and influential, why does it often *feel* so objective and neutral? To help see how technology design may affect such gaps in mediation fluency, the next chapters will further develop the reflexive role of technology design in appropriation.

3. Metamediation analysis

In the first two chapters I layed out the practical and theoretical background of this thesis. Chapter 1 introduced the context of interaction design, and established the problem that it lacked a consistent understanding both of how users can deal with the influence of technologies, and how technology design reflexively affects this. Chapter 2 discussed how the postphenomenological understanding of technology appropriation could explain how users deal with the influence of technology, yet still lacks a sufficient understanding of how appropriation itself is affected by technology design.

Having established the practical problem and theoretical background of this thesis, this chapter will begin addressing the research question of how to understand the role of technology design in technology appropriation, by first taking up the theoretical challenge. Specifically, this chapter will address the sub-question: *how to analyse the role of technology design in technology appropriation*? To answer this I will propose a theoretical contribution, which will establish the framework for the empirical analysis of the reflexive role of technology in the next chapter.

I will approach this sub-question from within postphenomenology. Since postphenomenology studies how technologies structure human experience and behaviour, I will review how its frameworks can offer a method to analyse the role of technology design. In section 3.1, I discuss how Verbeek's mediation theory (2005) offers a framework to analyse the influence of technology design. However, this framework runs into challenges when trying to analyse the reflexive process of mediation-styling. In section 3.2, I unpack the relations involved in mediation-styling, to be able to specify a kind of mediation analysis that fits the reflexivity of mediation-styling. I will propose an extension of the postphenomenological framework with the concepts of a *metarelation* to explain the relation involved in mediation-styling, and *metamediation* to explain the role of technologies in this relation. In section 3.3, I discuss the selection of case studies that will be subject to such a metamediation analysis, and how they fit the aim of examining how technologies affect appropriation.

3.1 Mediation analysis

What kind of method would allow for analysing how technologies affect their appropriation? Within the context of this thesis, it has to fulfill two criteria. First, the method has to allow for an analysis on the individual scale of the domain interaction design. Within the frame of technology design as shaping aesthetics and affordances – so how a technology appears and reacts to an individual user – the method should be able to analyse the physical properties of a technology. It would not be enough to primarily analyse, for instance, its functionality, or the network of relations it establishes. Secondly, the method has to be able to acknowledge how things influence users. As argued in the previous chapter, it is insufficient to describe how technology could instrumentally 'allow' for appropriation. Rather than describe what technologies would enable or make impossible, the method should allow for an analysis of how things affect users, even within the realms of possibility. So, the project of this thesis would need a method that allows for an analysis of the effects of aesthetics and affordances of technology on an individual user.

I will attempt to approach this problem from within the field of postphenomenology this thesis is grounded in. Although this thesis aims to examine an explanatory gap within postphenomenology, the scope and nature of the problem rhyme with existing frameworks within the field. Postphenomenology studies how technologies structure the relations between humans and their lifeworlds, which fits an analysis of the effects of technology design on the scale of an individual. Yet how can postphenomenology offer a method of analysis?

In "A Field Guide to Postphenomenology," Robert Rosenberger and Peter-Paul Verbeek outline how postphenomenology can serve as a method. Although there is no "strict postphenomenological methodology" (Rosenberger and Verbeek 2015, 31), they draw on patterns in studies within the field of postphenomenology. "Work in the postphenomenological perspective most often proceeds through the application of its framework of original concepts to specific cases of human-technology relations" (Rosenberger and Verbeek 2015, 13). In line with the "empirical turn" in the philosophy of technology, postphenomenology

usually builds on empirical case studies to develop its theoretical framework. These empirical studies function "not as a positivist basis of philosophical "knowledge," but as a concrete starting point for philosophical reflection" (30). Case studies can thus help postphenomenology proceed by challenging existing frameworks, prompting revisions.

A postphenomenological study of how technologies affect appropriation would then analyse case studies of appropriation with frameworks that seem most applicable, to study if those frameworks would need revision. Within postphenomenology, Verbeek's theory of technological mediation (2005) provides a framework to analyse different dimensions of how technology influences users. Building on the work of Don Ihde, Bruno Latour and Albert Borgmann, Verbeek developed a vocabulary to describe how technologies structure both human actions and their perception of their lifeworld. Verbeek follows Ihde in analysing the mediation of perception and interpretation as a process where things *amplify* certain aspects of the lifeworld and *reduce* others (2005, 131). On the dimension of action, Verbeek distinguishes two levels. Mirroring the distinction between 'perception' and 'interpretation,' things mediate both human 'action' and 'engagement'.[6] Whereas action is about what particular acts are encouraged over others, engagement is about what kinds of acts are considered meaningful, effectively establishing the "existential space in which human beings can realize their existence" (Verbeek 2005, 192). On the dimension of action Verbeek analyses mediation by looking at how technologies *invite* and *inhibit* certain actions and engagements (196).

The vocabulary of mediation theory can be applied in a mediation analysis to study how technologies affect their users. This may help understand the role of technology in human practices, but as a method in postphenomenology, applying mediation theory is also a test of the framework, where the case studies can help further theory by challenging the framework. A mediation analysis fits the scope of interaction design – a specific relation on an individual basis – and allows for describing influences that do not determine users. However, what would it mean

[6] Verbeek includes "engagement" as only one of the two forms of "involvement", next to "effort." However, I exclude effort from the analysis because I interpret it as a variation of the mediation of action, rather than involvement. If something, like "dental equipment" requires effort to function, it seems to me that it would merely invite the action of cleaning, rather than "open up existential space".

to apply it as a method to analyse the phenomenon of appropriation? If appropriation implies dealing with a mediation, how can that dealing itself be analysed as mediated?

3.2 Metamediation

In this section I explore how mediation theory can be applied to analyse the role of things in the practice of mediation-styling. A mediation analysis typically examines how a technology structures a relation between human and world. Yet it is not self-evident how the practice of appropriation fits within this I-technology-world framework. To understand what relation to apply a mediation analysis to I start by investigating what kind of relation is implied in the practice of mediation-styling.

The metarelation

In the phenomenological I-world scheme mentioned above, "world" refers to what is experienced and acted upon by the "I." In the case of mediation-styling, there are two relevant features to this 'object' of the relation. First, mediation-styling implies a reflexive relation to oneself. Like Foucault's self practices, styling mediations is a self-referential activity, where a mediated subject is experiencing and acting upon a part of themselves. Mediation-styling thus involves a kind of I-I relation, where "I" becomes the object of the relation. Secondly, styling a mediation involves a relation to a technology. When styling one's bedtime by using Night Shift, or one's vision by wearing a camera, one is deliberately relating to the Night Shift application or camera as a behaviour-influencer. Mediation-styling then also involves a kind of I-technology relation, where the technology is the thing being experienced and acted upon.

However, both of these options by themselves do not completely capture what is at stake in mediation-styling. A mediation does not comprise of just a technology or a human "I." Rather, a mediation implies a relation, where one's experience of and actions upon something are mediated by a technology: I - technology - world. It is this mediated relation which is experienced and being acted upon by a styling subject. Mediation styling thus implies a kind of

I-mediation relation. Since a mediation refers to a relation itself, the mediation-relation can be called a *metarelation*. Mediation-styling implies a second order relation *to* a relation. This metarelation can be schematised as follows: I - [I - technology - world].

Here, the brackets represent a hierarchy, unlike the parentheses in Ihde's formalisations that indicate whether a part of a relation becomes "enigmatic" or "semi-opaque" (Ihde 1990, 86). The mediated relation within the brackets is the first order relation, and the mediation-styling relation between the I and the bracketed mediated relation is the second order metarelation.

Two-dimensional postphenomenology

Mediation-styling thus involves two kinds of relations: a mediated relation to the world, and a metarelation to that mediation. When I wear my camera with the hopes of seeing scenery in my surroundings, I reflexively relate to my-camera-mediated-self. In this metarelation, it is the relation of my camera, the world and I that is the object of the relation.

In postphenomenological frameworks, however, this metarelation does not have a place yet. The I-technology-world relation does allow for descriptions of a relation to the individual elements of 'I' and 'technology'. An "alterity relation" describes a relation to a thing. When Don Ihde introduces this term in *Technology and the Lifeworld*, he discusses situations like spinning a top, seeing a robot, or playing a video game "against the computer," where a 'user' explicitly relates to what Ihde calls a "quasi-other" (1990, 100). Although an alterity relation does explain a relation to a technology, analysing mediation-styling requires a specific kind of I-technology relation, where the thing is not approached as a terminus, but as part of a relation itself. When relating to how a camera mediates me, I am relating to the thing not as a quasi-other, which I can admire, or clean, or play against, but as a potential part of my-mediated-self.[7]

A reflexive I-I relation has been analysed in postphenomenology as well. In "To-Do is to Be," Jan Peter Bergen and Peter-Paul Verbeek explore how technologies may support self practices, noting that "somewhat surprisingly given mediation theory's Foucaultian ethics of subjectivation, the structure of such

[7] A quasi-self, if you will.

technologically mediated, confronting relations has not received much attention in the literature" (2020). They explore this gap by analysing how a gamified productivity app mediates the process of self practices. Yet the technology of the app here plays a procedural role in self practices rather than a substantive one: it does not feature in the behaviour being styled. Bergen and Verbeek describe technologically-mediated self practices, but not *technological* self practices, or mediation-styling. Their "I-technology-I" relation could be applied to analyse how my camera may influence how I perceive myself through an attempted selfie, but not yet how I perceive my-camera-mediated-self. So, while Bergen and Verbeek describe the role of technology in the relation to *oneself*, they don't yet describe a metarelation to a mediation.

It seems the metarelation does not fit the scope of the postphenomenological framework, because it is limited to analyse one relation at a time. If technologies also affect the metarelation to mediations, that would challenge the current framework, as it would require a way to include two relations at the same time.

To be able to analyse if and how this is the case, I propose to extend the postphenomenological field of analysis with a *postphenomenological analysis of the metarelation*. Specifically, I propose a kind of fold where I apply postphenomenology's mediation theory to analyse the role of a technology in the process of styling *its own* mediations. To distinguish these reflexive mediations of the metarelation from the mediations being related to, I will refer to them as *metamediations*.

These second-order metamediations can be formalised in a second dimension in the I-technology-world relation. If this conventional relation is mapped horizontally, the metarelation of mediation-styling can be mapped on a 'vertical' relation to how one is mediated:

I

|

[I – technology – world]

A mediation analysis focuses on how technologies mediate the I-world relation, so performing a metamediation analysis means looking at the role of technologies in the vertical I-mediation relation. This can be mapped as:

I
|
technology
|
[I – technology – world]

The vocabulary and framework of mediation theory can still be used for metamediations. In analysing mediations, Verbeek distinguishes between a perceptive ("hermeneutic") and active ("existential") dimension (2005, 119). The hermeneutic dimension is about how I experience and interpret the world. For the metarelation, that captures how I experience and interpret how a technology structures my relation to something ('world'). This relates to the mediation fluency of being able to recognise mediation. A metamediation analysis looks at how technology affects how one experiences the influence of a specific mediation, and how one interprets this influencing – as being mediated or merely 'hindered', for instance?

On the existential dimension, technologies mediate how I act in and am engaged with the world. For mediation-styling, this dimension concerns the action of modifying the mediating roles of technologies, and the engagement I have with these mediations. Here a metamediation analysis examines how things affect the mediation fluency of being able to style my relations with things. How does a technology influence how one is able to deal with a certain mediation, and how one is engaged in such styling?

These questions will lead the metamediation analysis of how technologies affect appropriation in the next chapter. I will examine if the role of technology can be described and clarified within the vocabulary of amplification and reduction of perceptions, and invitation and inhibition of actions. Now I've defined the lens for the analysis, what technologies will be the object of analysis?

3.3 Case studies

In the "Field Guide," Rosenberger and Verbeek discuss how empirics are an integral part of the postphenomenological approach. The "post" in postphenomenology partly signifies a move to go beyond the simplified or "romantic" role of technologies in earlier phenomenology (Rosenberger and Verbeek 2015, 11). Instead, postphenomenology focuses on concrete technologies in specific context, aligning itself with the "empirical turn" in philosophy of technology. Empirics often enter postphenomenological studies in the shape of case studies, either "on the basis of empirical work by others, from self-conducted studies, or from an analysis of first-person experiences that involve specific technologies" (31).

To analyse the role of technology design in appropriation, I will discuss two case studies that are based on existing empirical work in HCI. To explain the selection of these studies, it helps to review how Rosenberger and Verbeek further specify the role of these case studies:

> Postphenomenological case studies play a dual role for this philosophical perspective. First, they instantiate the concepts and commitments of the postphenomenological framework. (...) Second, case studies are at the same time the laboratories within which postphenomenological ideas are interrogated and refined. (2015, 32)

So, case studies at the same time embody and work to develop the concepts being studied. In the selection of case studies, I looked for studies with objects that may embody the concepts of mediation and appropriation, to be able to examine if the framework would need to be refined.

The selected objects for the metamediation analysis are two experimental design research objects, featured in studies that research how participants deal with them. These design research studies are conducted in the context of Human-Computer Interaction, but rather than study usability, they fit within a larger counterwave within HCI that explores alternative aims. I particularly selected case studies related to two design approaches that aim to leave part of the

design to users. *Reflective design* and *design for appropriation* use ambiguity and restriction to invite users in the process of giving things meaning (Hallnäs and Redström 2001; Sengers et al. 2005; Dourish 2003; Gaver, Beaver, and Benford 2003). Studies in these areas typically create design research artefacts that counter conventional interaction design aims of offering clear aesthetics and convenient affordances. These artefacts are then confronted with research participants to study the effects of design choices. In other words, these studies often embody the process of appropriation, while their unconventional research artefacts may foreground mediating roles.

The two specific cases I will analyse are the *7 ½* alarm clock by Anne Spaa and the *Capsule Camera* by James Pierce and Eric Paulos (Spaa et al. 2019; Pierce and Paulos 2014). I will further contextualise these cases in the next chapter. These cases will enable a metamediation analysis as they can both be analysed to embody mediations – explicitly and implicitly – and their studies reveal elements of technology appropriation in participant reactions. At the same time, the empirical results may challenge the existing framework of mediation and help develop the perspective of metamediation. In the metamediation analysis in the next chapter, I will analyse design elements and participant reactions that may help understand how design plays a role in appropriation, and whether the extension of the postphenomenological framework to the metarelation can help explain this role.

4. Metamediated appropriation

In this chapter I address the sub-question, *how does technology design play a role in technology appropriation*, by applying a metamediation analysis to two design research studies that feature aspects of appropriation. In chapter 2, I elaborated how appropriation in postphenomenology can be understood as the practice of mediation-styling, which requires *mediation fluency*: the ability to recognise and style relations with mediations. So in this analysis I will look at how aesthetics and affordances affect how research participants are able to recognise and style mediations.

To analyse this role, I apply the framework of *metamediation* proposed in chapter 3. I argued that the role of technology in appropriation can be analysed by extending postphenomenology to include the metarelation implied in appropriation. A metamediation analysis allows for distinguishing the qualities of design that affect the 'horizontal' relation to my lifeworld (mediation), from its qualities that affect the 'vertical' metarelation to this horizontal relation.

I
|
metamediaton
|
[I – mediaton – world]

I will apply this metamediation analysis to two case studies from design research: the 7 ½ alarm clock and the Capsule Camera. For each, I examine appropriations that surface in their studies, what role technology plays, and how a metamediation analysis helps explain the role in ways that goes beyond a conventional mediation analysis.

I start in section 4.1 by contextualising these case studies in the field of HCI research and elaborating on their selection. In section 4.2, I analyse the case of the 7 ½ alarm clock, which is part of a study that explores the experience of explicitly embedding a moral norm into a technology, and works by constraining the usual affordances of an alarm clock (Spaa et al. 2019). I examine how a metamediation

analysis can help explain how these design choices affect the way research participants relate to the 7 ½. In section 4.3, I discuss the case of the *Capsule Camera* by James Pierce and Eric Paulos. This object aligns with design for appropriation approaches in its use of ambiguity, by combining aspects of a camera and a piggy bank. I explore how a metamediation analysis can help explain how such design choices affect the mediation fluency shown by research participants. I conclude the analysis in section 4.4 by evaluating how metamediation helped explain the role of technology design on mediation-styling, while taking into account limits of the analysis.

4.1 Designing appropriation

In academic interaction design research in the field of HCI, there are some research areas that study aspects of user appropriation. There have been different approaches within interaction design that aim to support user agency. While many do so by including users in the design process through participatory design (cf. Muller and Druin 2002), some try to support user agency during *use*. With the approaches of *design for appropriation* and *reflective design*, researchers aim to develop design methods to engage users in actively shaping how a technology comes to play a certain role in their life (Hallnäs and Redström 2001; Sengers et al. 2005; Dourish 2003; Gaver, Beaver, and Benford 2003). Although these methods do not explicitly distinguish the mediation or influence of things, some studies related to these approaches reveal how design aspects affect how a user can recognise and style their relations with mediations. I will contextualise how the selected case studies relate to reflective design and design for appropriation.

Reflective design

The goals of reflective design approaches may overlap with the perceptual dimension of mediation-styling, which involves recognising how a technology mediates. Reflective design usually aims to induce a user to relate to the technology used. With "slow technology," for instance, Lars Hallnäs and Johan Redström (2001) aim to go against dominant design developments aimed at immediacy and efficiency, which they call "fast technology," (2001, 166) and

instead propose to make things that invite users to reflect on them. They illustrate how with an example:

> Imagine an electronic doorbell that plays short fragments of a very long melody each time we press the doorbell button. To fully grasp the doorbell through its behaviour, we have to stop and reflect for a moment each time it rings and only over time [can we] grasp the whole melody. (Hallnäs and Redström 2001, 165)

This speculative doorbell invites the user to relate to it by confronting them with a restriction: the user cannot perceive the whole melody at once. Reflection is achieved by combining convenient affordances with constraint in its aesthetics: "use simplicity in material in combination with complexity of form" (Hallnäs and Redström 2001, 185). While this restriction may invite reflection, it is not necessarily directed at the mediation. If I recognise a partial melody in the doorbell, that makes me notice the doorbell as a musical object. It may amplify its aesthetics over its function to reflect on, but that doesn't necessarily reveal it as a mediating object.

The case study selected to examine the role of technology in the perceptive dimension of appropriation embodies the spirit of reflective design but also acknowledges mediation. The 7 ½ alarm clock by Anne Spaa is explicitly designed for users to recognise the moral position it embodies: namely, to sleep for 7 1/2 hours.

Design for appropriation

Approaches to design for appropriation may, as the name suggests, overlap with the active dimension of appropriation. However, in HCI appropriation refers not to styling mediations, but usually to ways of using technologies in ways not planned for by their designers, which are invited by using ambiguity or keeping systems open-ended (Dix 2007; Gaver, Beaver, and Benford 2003). An example of how design researchers achieve this is the *table-non-table* developed by the Everyday Design Studio. It consists of a stack of paper sheets around an aluminium rod hovering slightly above the ground, with an electrical cord

attached. Very seldomly, very slowly, and very slightly, it moves. In crafting this *table-non-table*, the design researchers Wakkary, Desjardins and Hauser aimed for it to be lived with yet without a predefined use; a quality they call "purposefully purposeless" (2015). It embodies an attempt to overcome the division between 'design' and 'use', acknowledging "the constant knowing and unknowing adjustments to furniture, household items and other objects to create a room that fits the patterns of our everyday life and subjective needs" (Wakkary, Desjardins, and Hauser 2015, 1). To invite the users to appropriate, the researchers deliberately balance ambiguity with familiarity in their design (2015, 14). Its size still refers to a coffee table, it still looks like a stack of paper, and its affordances sit somewhere in between. The ambiguity is achieved not through vagueness, but precisely by its clear references to two disparate things. Through a balance between graspable and ungraspable, the table-non-table invites users to experiment.

However, this experimentation is not necessarily focused on how it mediates. During deployments with research participants, the *table-non-table* consistently leads users into processes of interpretation, but mostly considering its function (Hauser et al. 2019). The ambiguity of functionality may invite users to engage, but it does not necessarily present itself as an influence. If ambiguity can open up functionality, can it work similarly in mediations?

The design research case selected to study the role of technology in styling mediations aligns with the principles of design for appropriation, and its study features users relating to its influence. The Capsule Camera by James Pierce and Eric Paulos (2014) makes use of ambiguity, by combining the functionality and aesthetics of a camera and a piggy bank. The reactions of research participants reveal clear signs of a mediation fluency of how these features may influence them.

In the next two sections I discuss the analysis of the 7 ½ and Capsule Camera, focusing on signs of appropriation, the role of their design and how this role can be explained as metamediations.

4.2 The expressive 7 ½

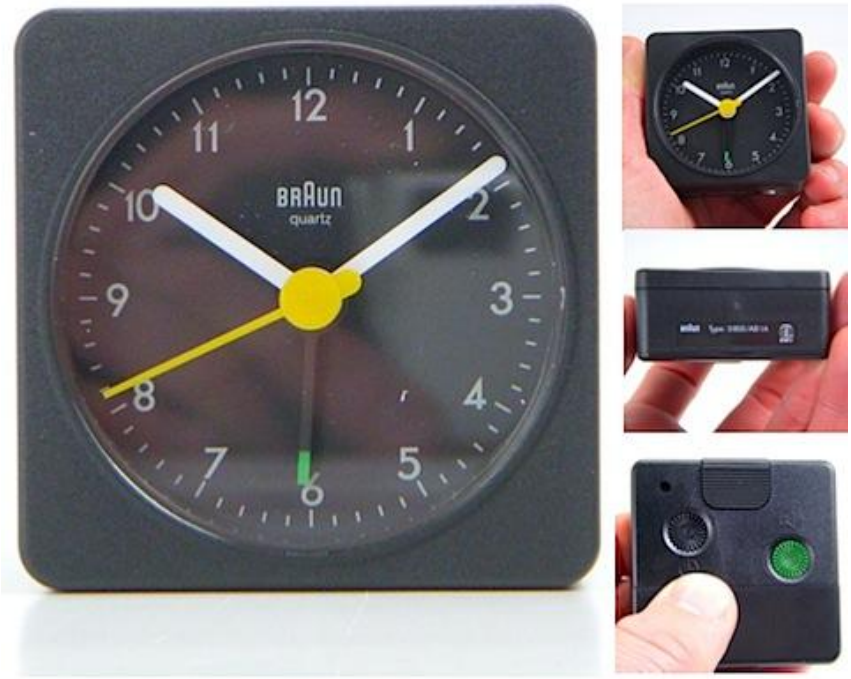
This section examines how the case of the 7 ½ alarm clock helps clarify the role of technology design in appropriation, with an emphasis on the perceptive dimension of *recognising* mediations, and whether this role can be understood in terms of metamediation. I will introduce the 7 ½ and its design research study, discuss what research participant reactions tell about recognising mediations, and then analyse how these effects can be understood with metamediation.

The 7 ½ alarm clock

The 7 ½ is a design research artefact from the design research study by Anne Spaa and others that explores how design could explicitly embody a moral position (2019). The study builds on postphenomenology, responding to how "Verbeek calls for the development of design practices where technologies are moralised explicitly" (Spaa et al. 2019, 4). It explores how this can be done through a method of "material speculation" (Wakkary et al. 2015), by crafting design artefacts that embody a certain concept, and deploying them in encounters with research participants to study their reactions. In designing these artefacts, the authors were guided by the approach of *counterfunctionality* as introduced by James Pierce and Eric Paulos (2014), the researchers of the following case study. This approach studies the potential of redesigning existing objects by altering or subverting their expected functionality. Here, Spaa and others applied this approach to design two counterfunctional clocks, a longcase clock and an alarm clock, the latter of which is the 7 ½.

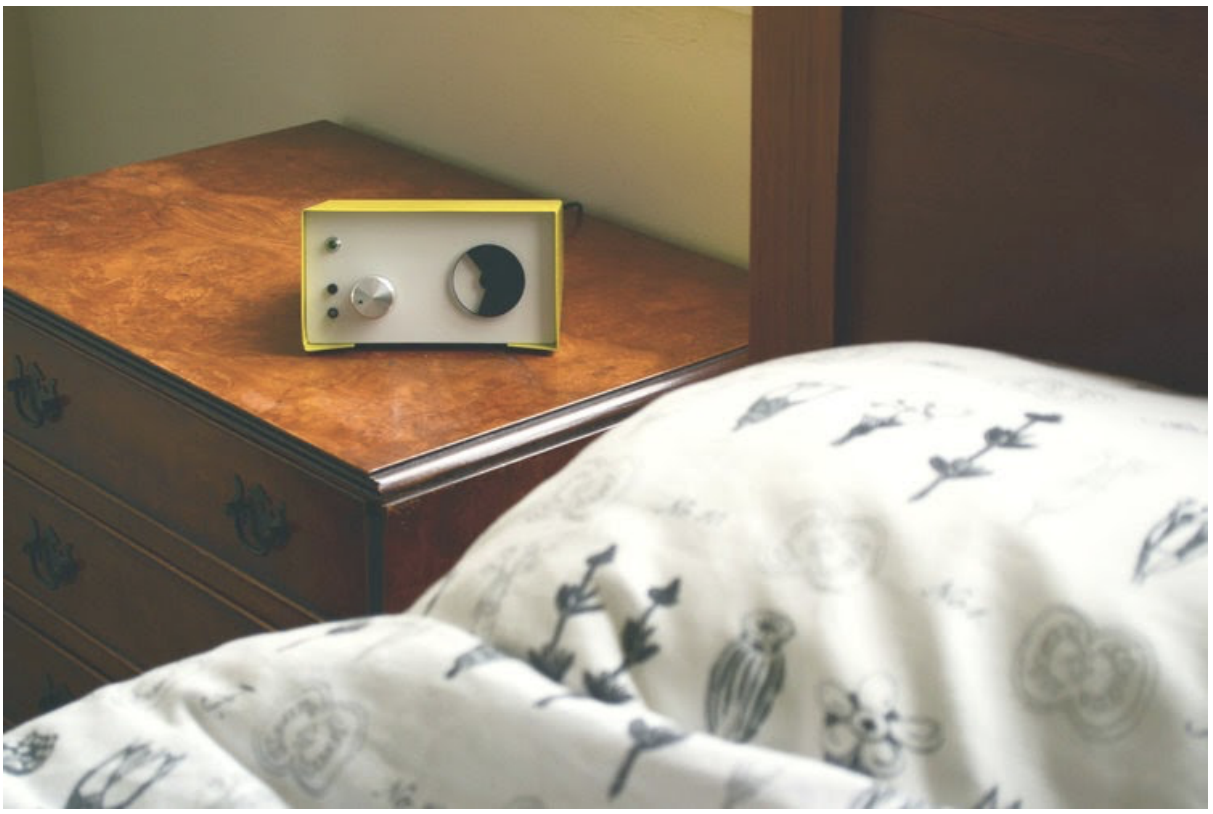
The 7 ½ aims to embody a moral position by countering its expected functionality. A conventional alarm clock, like the *Braun AB1* (see image below), has two main functions: to show the current time, and to set an alarm at a specific time. The researchers recognise that these aspects don't just function; they also influence their user, mentioning how clocks contribute to "experiences of working late, sleeping little, and working at the weekends" (Spaa et al. 2019, 4). From a perspective of mediation, such behaviour may be invited by the possibility to set the moment when you wake up regardless of sleep time. The clock face can be analysed to amplify how one relates to the rest of the world, while reducing where

one might be in one's biological day rhythm. Consider how reading that it is already past 9am might wake you up abruptly, only before realizing it is a Sunday.



Braun 'AB1' alarm clock, 1987

The 7 ½ is an alarm clock that counters these two functions, and instead affords only one action: once you set it, an alarm will go off after 7 ½ hours. Instead of showing the time, it displays a round dial with a portion blocked off equivalent to 7 ½ hours on a conventional dial. The 7 ½ aims to be "a clock that motivates to get 'enough' sleep" (Spaa et al. 2019, 6), and to amplify the needs of your body over how you sync with the 'actual time' or obligations to others. "In making the moment of setting the alarm significant, there is a design intent to trigger reflection by its owner on the period of sleep rather than the time of waking" (ibid.). How do these design choices affect the mediation fluency of their users?



The 7 ½, an alarm clock for design research, by Anne Spaa.

As part of the study, two research participants lived with the 7 ½ for three weeks. In interviews afterwards, both "discussed at length the clarity of its intentions through the simplicity of its design and how they appropriated these and were able to work around it in simple ways" (Spaa et al. 2019, 12). The participants seem to have developed a mediation fluency. The first participant used the alarm clock almost every day, while the second rarely used it. As expected, their reflections reveal a recognition of the influence. The first participant notes how even when they found a workaround during deadline times by setting the alarm earlier, they could relate to the effect. "*I started setting the alarm at like 11[pm] and still be working at 2 or 3 in the morning. ... it was in the back of my mind now. ... I feel without setting the alarm at that point I might just have kept on working"* (Spaa et al. 2019, 12). According to the researchers, the second participant "found the moral impulse projected by the technology as irreconcilable with his need to deliver his work" (2019, 13). Both ways of dealing with the 7 ½ can be explained as appropriations, since the participants actively modify the relation to the clock. One 'positively' by using it as extra motivation to not work too long, one

'negatively' by not using it because of its moral influence. What was the role of technology design here?

Metamediated recognition

In a metamediation analysis of the role of the design of the 7 ½ we can separate the 'horizontal' mediations from the 'vertical' metamediations. Horizontally, it can be analysed how the 7 ½ influences sleeping behaviour, for instance by inviting one to get 'enough' sleep. Here, we are interested in how the design affected the vertical relation to this horizontal mediation. Specifically, how does the design of the 7 ½ affect the experience of its mediation?

Tromp, Hekkert and Verbeek (2011) provide a classification for the experience of mediations. They distinguish two dimensions in how influences are experienced by users: "a design can exert influence that can vary from weak to strong (force), and a design can exert influence that can vary from an implicit to a more explicit manner (salience)" (Tromp, Hekkert, and Verbeek 2011, 11). The horizontal mediations of the 7 ½ can be characterised as *strong* and *explicit*. The restricted control of sleeptime is not a 'soft influence' that affords you with an opt out, like if the 7 1/2 hours would merely be the 'default' alarm time. To avoid missing appointments in the morning, the user must set the alarm early. Of course one can cheat by continuing to stay up, like one of the participants did, and even then the influence remains felt. Working late becomes a conscious decision instead of automatic behaviour enabled by the 'self-control' offered by a conventional Braun *AB1*. For Tromp, Hekkert, and Verbeek, strong and explicit influence means that the 7 ½ would fall into the "coercive" quarter of their classification (2011, 12). This does not yet help to explain how the 7 ½ supported styling; it rather sounds like it would not. However, here we may recall the confusion discussed in chapter 2 between what could now be cast as 'horizontal' force and 'vertical' compulsion.

A metamediation analysis gives an alternative reading. From a perspective of metamediation, salience and force are design aspects that indicate metamediations: they describe how one's metarelation to a mediation is affected by design. Although the horizontal mediations may be strong and explicit, this does not mean that the 7 ½ is vertically compelling a user to use it. As the study

participants show, users are still able to style their relations with the 7 ½ in different ways. Rather, the restricted affordances supported the users in recognising the influence: "it was clear that it is this reduction of functionality that brought into focus the moral stance of the artefacts and the underlying intent of the designers" (Spaa et al. 2019, 14). So, by limiting the affordances of the alarm clock, the technology not only influences the sleeping behaviour of the user, but affects appropriation, by playing a supporting role in helping the user recognise this influence. This can be explained as a metamediation. The salience of the restricted affordances vertically *amplifies* the perception of how the 7 ½ mediates one's behaviour. Besides, the force of the influence to actually make you sleep for that long makes it easier to both perceive this influence and *interpret* the 7 ½ as a mediator.

The analysis of the 7 ½ shows that design choices can support the recognition of mediations, and a metamediaton analysis helps explain how its design *invites* such recognition. The salience and force of the influence amplify its experience, making it easy to evaluate whether the 7 ½ is a desirable companion in one's lifeworld. The 7 ½ can be called expressive of its mediation: like UCD helps a user to deal with the functionality of itself, the explicit restriction helps a user relate to its mediation.

A metamediation analysis of the role of things in the perception of mediations can thus help explain how the ability to recognise their mediation is structured by their design. I highlighted the role of salience and force, but this is not an exhaustive overview of design elements that influence perception. Still, it suggests that hidden and weak influences, like many nudges, may be harder to recognise, while stronger or more apparent ones, like fitness trackers, may make it easier for a user to style their mediations. In their paper, Tromp, Hekkert and Verbeek make a similar point when they argue that soft and implicit ("seductive") influences may be effective as "people who are being seduced by design are not aware of the influence and most probably regard the behavior as internally motivated" (Tromp, Hekkert, and Verbeek 2011, 12). This strategy can be explained as a metamediation where the perception of the influence is *reduced*.

This does not yet explain how the design of the 7 ½ invited styling; that is what the next case study focuses on.

4.3 The ambiguous Capsule Camera

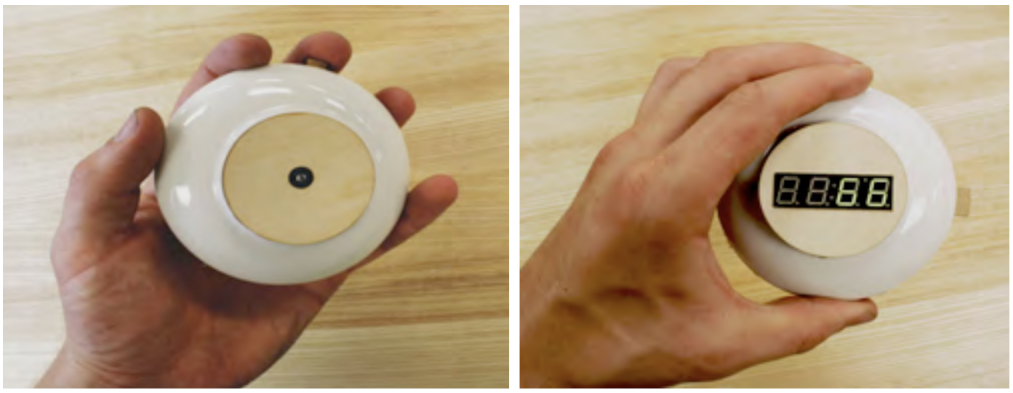
In this section I examine how the case of the Capsule Camera helps to understand how technology affects mediation-styling, with an emphasis on the active dimension, and whether a metamediation analysis can help explain this role. I first introduce the Capsule Camera and the aspects of styling apparent in the participants' reactions, before analysing its metamediation.

The Capsule Camera

The Capsule Camera is part of a study by Pierce and Paulos (2014) that explored the potential of countering expected functionality, with so-called "counterfunctional things." They situate their study amongst other efforts within HCI that use the strategy of countering functionality while aiming for alternative uses, critique, or fun, but state that their study doesn't have such a distinct aim (Pierce and Paulos 2014, 376). For this analysis, however, I look at the counterfunctional things from a perspective of usage, where they establish relations between a user and their lifeworld, rather than when they themselves merely function as the object to reflect on or be entertained by.

In a similar setup to the 7 ½ study, Pierce and Paulos aim to study a conceptual starting point by designing objects that counter expected functionality and encountering research participants with them. They designed ten counterfunctional variations of the digital camera. Instead of a device to capture high resolution shots to view, share and keep, the variations included an ultra-low-res model, one where the photos would fade upon viewing, and one where the photos could be viewed but not exported from the camera. Pierce and Paulos then discussed the prototypes with eight participants "to investigate participants' initial reactions to our camera prototypes" (2014, 379). Even though the study did not involve actual usage and was not explicitly aimed at inviting appropriation, it did investigate overlapping processes with questions like: "How do [you] envision using or not using these things? Would [you] consider adopting such things?" (Pierce and Paulos 2014, 380). Besides, one of the design variations turned out to show particularly well how the ambiguity of design for

appropriation mentioned above could play a role in the context of mediation-styling.



Capsule Camera by James Pierce and Eric Paulos

The Capsule Camera is a redesigned camera that can take up to 1000 photos, but on the backside it only shows a counter. To view the photos, the camera would need to be destroyed by breaking its porcelain outer shell. Of all ten variations, the Capsule Camera was most desirable: "participants tended to be very drawn to the Capsule Camera. 5 participants expressed a strong desire to use it, and it was the favorite choice of 4 participants" (Pierce and Paulos 2014, 380). Besides, the kinds of uses reveal a certain mediation fluency. "Participants all envisioned using the Capsule Camera only for special events such as trips, weddings, and family gatherings" (ibid.). They had an idea of how the camera would affect their dealings with the photos and in what situations this would suit. When asked to suggest design alterations, participants even suggested lowering the maximum amount of photos that could be taken, both "to avoid being overwhelmed by having to look through 1000s of images upon breaking open the camera" and "to be more thoughtful and judicious in the process of capturing photos" (Pierce and Paulos 2014, 380). This admits a mediation fluency, recognising that such a limit in functionality actually changes the way they use the camera. What was the role of technology design here?

Metamediated styling

The active dimension of a metamediation analysis looks at how a technology may invite or inhibit engagement with the mediating roles of technologies, and actions of purposefully modifying relations based on those. Can certain aspects of the Camera's design be analysed as metamediating the dealing with its mediation?

When only analysing horizontal mediations, these effects are hard to explain. The restricted access to photos can be analysed as a rather strong mediation to inhibit a user from viewing the photos. The only way to "opt out" is to destroy the camera. The ambiguous aesthetics of the Capsule Camera can be analysed as inhibiting smooth interaction. They don't act as a manual that bridges a gulf of execution, but rather create a gulf of understanding what the thing is. From a horizontal level then, it may seem like the Camera's mediations would make it hard to style interactions with it. It seems it doesn't "allow" many appropriations, as it almost forces you to follow its 'script' of 'waiting to view the photos'.

Again, a metamediation analysis on the vertical dimension provides a different perspective. The particular use of ambiguity in the Capsule Camera seemed to succeed in drawing users into the unknown. The references to two incompatible kinds of objects creates a tension that violates the conventional clarity sought for in user-centered design. Yet it did seem to contribute to its attraction. When Paulos and Pierce discuss reasons to explain the reactions to the Capsule Camera they highlight its aesthetics. Its popularity regardless of its unfamiliarity seemed to be explained partly by its reference to a familiar object. A participant remarked: "Maybe I'm more okay with [the limitation of the Capsule Camera] because [...] breaking this [Capsule Camera], is like breaking a piggy bank" (ibid.). Secondly, the authors observed in participant reactions that "the new form factor and materials helped communicate that the inability to immediately view images was a defining positive feature of the device" (Pierce and Paulos 2014, 383). The time-capsule-like quality of the Camera fits its piggy-bank-like ceramic body, as it seemed to frame the limited functionality as an advantage.

These effects can be explained as a metamediations. On a vertical level, the ambiguity of the Camera can be said to *invite* a user to relate to how it influences. Its aesthetic ambiguity opens up an explorable space that requires experimentation to discover what it does, while references to familiar objects hint at what may be found. Although the ambiguity may inhibit quick operation on the horizontal relation, it could thus plausibly be explained as inviting experimentation, or "opting in," on the vertical relation. However, this is not unique to mediation-styling; it describes design for appropriation in general. The *table-non-table* similarly mixes two product genres (coffee table and paper stack). For the Capsule Camera however, participants were not drawn to explore how it *functions* – that was relatively clear from the outside or clarified by the researchers – but how it would affect taking photos during "events such as trips, weddings, and family gatherings." In other words, they were drawn to experiment with its mediations.

This difference may be explained by a second aspect of the design, which shows when classifying the mediations of the Camera. While the *table-non-table* also employs ambiguity in its functionality and aesthetics, the Capsule Camera features strong and explicit mediations. The mediations of a coffee table or stack of paper seem rather soft and implicit. Yet a piggy bank that requires its own destruction inhibits taking money from it so strongly that the moment you do so becomes very deliberate. Similarly the Capsule Camera has a strong influence on one's access to the photos taken, and through its porcelain shell this mediation becomes more salient as well. This aligns the Capsule Camera with the analysis of the 7 ½. The force and salience of the horizontal mediation make it vertically easier to recognise its mediation by amplifying one's interpretation of it as a mediator. That the Capsule Camera achieved this status is exemplified by the desire from participants for an even stricter limit of the amount of photos it could take. The aesthetic expression of the Camera through its explicit piggy bank allusions can help explain why the research participants were able to express a desire for experimentation that showed mediation fluency.

A metamediation analysis of the Capsule Camera helps show how technology could support a user in the mediation fluency of styling mediations. By integrating the ambiguity of design for appropriation with forceful

mediations, the Capsule Camera supports its users in their ability to purposefully modify their interactions. Not just by making it easier to recognise, but also by *inviting* the user to experiment with different relations to it. Metamediation can thus help to explain the role of the design of the Capsule Camera in styling mediations.

4.4 Metamediated appropriation

In this chapter I explored how technology design affects appropriation and how metamediation can help explain this role. In the cases of the 7 ½ alarm clock and Capsule Camera I investigated two ways in which technology design can support the recognition and styling of their mediations. On the dimension of perception, the 7 ½ supports the recognition of its mediations through constraints in its affordances; on the dimension of action, the Capsule Camera supports the styling of its mediations through its ambiguous but hinting aesthetics. Besides, the Capsule Camera confirmed the supporting role of explicit constraints in recognising its mediations. I argued that metamedation analysis helped to explain this role of technology design, both on the perceptive and active dimension of mediation-styling. Metamediation appears to be able to analyse the role of design elements that a horizontal mediation analysis did not explain. For instance, it helped explain how the design aspects of constraint affordances and ambiguous aesthetics not only inhibit certain actions, but also structure the metarelation to how the technology mediates, amplifying its experience and inviting experimentation with interactions. Separating horizontal from vertical relations enables us to see how, as long as technologies vertically do not fix a user into a particular relation, strong mediations could rather support appropriation.

While the analysis does serve to suggest more general implications for design – like the use of constraint affordances and ambiguous aesthetics to design for mediation fluency – it does not suffice as an empirical base to be able to claim such implications. The analysis featured two design research case studies with an accumulated total of ten participants, which I interpreted to show that technology could support appropriation. This poses a few relevant limits.

Since I only discussed examples where technology played a supportive role in appropriation, the analysis can only suggest but not yet show how things could also hinder appropriation, by reducing the experience of a mediation and inhibiting experimentation. Even for the supportive role of constraints and ambiguity, the context of a research study and the number of participants limit the generalisability of the findings. The context of a design research study is different from a situation outside research. In a design research test where participants are asked to reflect on technology, it may for instance be more likely that they will show signs of relating to how it influences them than in 'real-life' contexts. Since I based the analysis on existing research, I relied on interpretations and reports by design researchers instead of direct input from participants. This also meant that the analysis could only highlight the aspects of technology design that were presented in the studies. On top, the number of participants is not substantial enough to make generalisable claims within that context.

Therefore, the analysis can function only as a grounding of the concept of metamediation in these specific contexts, and a suggestion that opens up new research and design space. It only gives a partial understanding to how technology design affects appropriation. Elaboration on the process of metamediation, how technology design elements affect it, and applicability in other contexts would require further research. However, it does show that the role of technology design in technology appropriation *can* be explained as metamediation. The effects analysed go beyond or even against instrumentalist explanations of soft mediations that "allow for appropriation."

I will now return to the main research question and conclude how the analysis may contribute to the explanatory gaps in interaction design and postphenomenology.

5. Metamediation

In this thesis I aimed to understand the role of technology design when recognising both that technologies influence their users and that users can deal with such influences. Specifically, I researched *how to understand the role of technology design in technology appropriation?*

I started by demonstrating how in both design theory and postphenomenology, this role has so far been limited to an instrumental one. In chapter 1, I discussed how current interaction design methods, while able to explain the influence of technologies on their users' behaviour, could not sufficiently take into account their reflexive influence on appropriation. I argued that this limitation was a result of a lacking understanding of how users can positively relate to the influences of things, rather than merely resist them. In chapter 2, I discussed how in postphenomenology, Verbeek and Dorrestijn's theory of technological appropriation can explain user appropriation positively, as a process of styling mediations, while acknowledging that appropriation is conditional on users' ability to recognise and style mediations, which I called *mediation fluency*. However, in drawing out design implications, Verbeek and Dorrestijn limit technology to an instrumental role of "allowing for appropriations."

For both contexts, this instrumental view of the role of technology design in technology appropriation is limiting. It keeps design methods from acknowledging their influence on user appropriation beyond making it 'possible,' leaving a risk of designing manipulative influences. Most importantly, it keeps design methods from leveraging active appropriation, by supporting users to relate to designs as influences, rather than work against them. In postphenomenology, an instrumentalist understanding of the role of technology design in technology appropriation prevents a deeper understanding of the processes of appropriation, for instance, in explaining differences between how users appropriate different technologies. This complicates assigning responsibility to designers, as it suggests that within the realms of possibility, users are responsible. If understanding technology mediation requires understanding technology appropriation (Verbeek 2016), it also needs to include the

technologically mediated character of such appropriation, which is what I set out to explain.

In 5.1, I will draw the conclusions from the research. In 5.2 I will discuss how the domain, theory and method limit these conclusions, and possible counterarguments. I conclude in 5.3, by drawing out the implications for both postphenomenology and interaction design methods, and proposals for follow up research.

5.1 Conclusion

To research *how to understand the role of technology design in technology appropriation*, I followed the postphenomenological method of testing and challenging conceptual development with an empirical analysis of case studies.

In chapter 3, I developed a theoretical extension of postphenomenology, to be able to analyse the role of technology in appropriation. I argued that the conventional human-technology-world frame limits such an analysis, since appropriation involves what I called a *metarelation* to this relation. I proposed to extend the framework with a second 'vertical' dimension to analyse how a user may relate to how they are mediated. This two-dimensional framework allows for a mediation analysis of the role of technology on the metarelation. To distinguish these types of mediations I introduced the concept of *metamediation*.

In chapter 4 I applied this framework to analyse two empirical case studies, to test how the framework of metamediation could help explain the role of technology design in appropriation. The cases of the 7 ½ alarm clock and Capsule Camera showed that technology can support users' mediation fluency of being able to recognise and style relations with it. A metamediation analysis could help explain the role of technology design in these cases with the vocabulary of mediation, by highlighting aspects that a 'horizontal' mediation analysis would not recognise. Although the results are not yet generalisable, the analysis did demonstrate the explanatory potential of metamediation.

How do these insights contribute to answering the research question of *how to understand the role of technology design in technology appropriation*? In the context of interaction design and postphenomenology, answering this question

means explaining how the aesthetics and affordances of a technology affect how its user styles its mediations. I argued that the process of mediation-styling can be analysed by extending postphenomenology with a metarelation; that the aesthetics and affordances of technology can support the process of mediation-styling; and that this role can be explained in terms of mediation. Aesthetics and affordances can thus be understood to mediate the metarelation. Therefore, I argue that the role of technology design in technology appropriation can be conceptualised as *metamediation*.

5.2 Discussion

Limitations

Before considering possible counterarguments and drawing out the implications for interaction design and postphenomenology, the limits of this conclusion have to be taken into account. Apart from the limitations of the analysis, discussed in the previous chapter, the choice of domain and theoretical background pose relevant limits to the conclusion.

The domain of interaction design helped to focus on how details in aesthetics and affordances affect the relation between an individual and a technology. Yet this focus also meant that other ways technology design may affect technology appropriation remained outside consideration. For instance, choices about the functional capabilities of a camera may also affect how a user relates to it. If a new model is able to make photos at night, this may prompt reflection on how that would affect usage. Interaction design also excludes indirect effects on appropriation outside use. Aesthetics and affordances do not yet explain how even implicit design choices may influence user appropriation via a detour, such as inspiring a documentary like The Social Dilemma, which may end up educating many users. Besides its focus, the context of interaction design locates the thesis in a cultural context where the dominant way of understanding technologies is not relational. In a cultural context where a relational worldview is more common, the role of technology design in supporting the recognition of its mediation will be less pronounced.

The theoretical background of postphenomenology also poses relevant limits. First, it shares the shortcomings of interaction design with its focus on the individual, making it harder to analyse the effect of technology on a social or systemic scale. Secondly, postphenomenology's relational ontology makes it difficult to describe how technological influences may transfer to other situations. When no technology is neutral and nothing can be described to be essential to a person, it is harder to distinguish between influences that are specific to a context and ones that may carry over to other situations. This difficulty applies both to describing the technology – does a certain (meta-)mediation result from certain 'stabilities' or is it contingent? – and to describing the user – is their displayed mediation-fluency a result of metamediation or 'characteristic' of their subjectivity? For this thesis, the difficulty to distinguish what remains stable manifests as an explanatory gap as to what extent the metamediation of a technology in one situation affects the mediation fluency in other contexts, rather than requiring to be repeatedly reinstigated. When does mediation fluency enter into one's "worldview," helping to recognise other mediations? And when may it do the opposite by making other objects seem more 'instrumental' by contrast? For instance, does the 7 ½ make the AB1 alarm clock seem more neutral?

So, the relationality of mediation-fluency both indicates that it's still unclear to what extent the metamediation of one technology affects the metarelation with another, and makes it hard to dissect to what extent mediation-fluency can be ascribed to technology, rather than other contextual factors. Still, on an individual level and regardless of the extent, this research demonstrates that design aspects can *affect* the metarelation. Besides, metamediation may contribute to understanding the transferability of postphenomenological studies. Understanding metamediation may help understand to what extent the results of a study are likely a result of appropriation, or a stability in the design that may repeat in other situations.

Taking into account these limitations, the conclusion that the role of technology design in technology appropriation can be understood as metamediation needs to be conditioned by its domain and theoretical background. Fitting the domain of interaction design, metamediation describes situations where a technology in use *directly* and *reflexively* influences how a user

appropriates the mediations of that same technology. In line with postphenomenology, metamediation describes how a technology structures the metarelation *during* an interaction, and not how it would affect the relation outside that interaction or with other technologies.

To see how follow-up research may augment the results, it will help to elaborate on the implications for interaction design and postphenomenology, but I'll first turn to possible counterarguments.

Objections

I've argued that the role of technology design in technology appropriation can be understood by extending the postphenomenological framework to include metamediation. While this may have helped understand the case studies on a 'local' scale, when drawing implications this claim is tested on its generalisability. When the conclusion is interpreted as a general claim, it first encounters conceptual challenges, most prominently the argument of infinite regress. If I claim that an understanding of a mediation not only needs an understanding of its appropriation, but also of how appropriation is metamediated, does that not need an explanation of its appropriation, and its metametamediation, and so on? Here I will discuss three ways of how the infinite regress problem appears, and how it could be responded to.

1. *If appropriation is influenced, is it still appropriation?*

If I'm arguing that appropriation is co-constituted by design, am I not countering the "relational freedom" argued for by Dorrestijn and Verbeek? For instance, when discussing the moral responsibility of users in *Moralizing Technology*, Verbeek seems to ground this freedom in the fact that "human beings are not simply determined and controlled by technology. In most cases, they can develop a deliberate relation to the ways in which technologies mediate their actions and interpretations of reality" (Verbeek 2011, 109). Metamediation suggests that, even if a user develops such a "deliberate relation," this relation is co-constituted by technologies as well. If so, is it not misguided to talk about freedom? To what

extent can this still form a grounding for moral responsibility, for instance? Let me consider three possible replies.

One option would be to argue that appropriation may indeed be *influenced*, yet there is still a margin left that grounds freedom. However, this would rely on a foundationalism – an area free of influence – that is incompatible with postphenomenology's relational ontology.

Another option would be to grant that margin in the ability for a user to relate to this metamediaiton, in what could be called 'meta-appropriation'. Even if an alarm clock may have helped me to take responsibility for how my sleep time is influenced (appropriation), thereby seemingly deserving part of the moral praise, it was still me who picked the clock for that reason in the first place (meta-appropriation). However, this line of argument would go down the dwell of infinite regress. Nothing stops this new source of 'relational freedom' from being explained by other influences.

A third option would be to interpret relational freedom in a different way. Metamediation is only a threat to freedom if we're looking for a source free of influence to ground it. If there is no such thing, as the relational ontology of postphenomenology suggests, we could either let go of any idea of freedom, or redefine it. A more radical interpretation of relational freedom interprets the very *practice* of reflexively relating to influences as "freedom." Rather than interpret Verbeek's quote as a grounding of freedom, it may now be interpreted as describing a condition of freedom. Saying that human beings "can develop a deliberate relation" does not require those human beings to act from a realm free of influences. This ability to relate may well be co-constituted, or metamediated, by technologies.

To some this may sound like an embrace of determinism. It is beyond the scope of this thesis to make the case for relational freedom within the freedom versus determinism debate.[8] However, regardless of whether humans can be said to be free or determined down the line of influences, the concept of relational freedom in appropriation seems to have pragmatic benefits. It can prove relevant for the context of design, as I aimed to show, as it opens up the potential for

[8] See for related discussions in the context of postphenomenology (Dorrestijn and Verbeek 2013) and nudging (Hansen and Jespersen 2013).

design to invite users in shaping the role of technologies (whether they are essentially free or relations all the way down).

2. *If mediation is subject to appropriation, isn't metamediation?*

The other side of the infinite regress problem concerns technology: it not only asks for a qualification of the agency of the user, but also of that of the designer. If technology appropriation explains how it is not sufficient to explain mediation from the perspective of design, does this not apply to metamediation? Does understanding the role of technology design in appropriation not also require understanding how metamediation is appropriated?

It is hard to deny that meta-appropriation plays a role. In the least controversial implication, this explains why metamediations cannot be controlled by designers. To claim otherwise would be to fall into the trap of the "designer's fallacy," assuming that a designer can control the role a technology will play in use.[9] Even the 7 ½ may not invite any user to be deliberate about how it influences their sleep time, rather than just discard it as useless. Yet this does not counter my conclusion. I am arguing that the role of technology can be understood as metamediation. Whether this metamediaiton is the (partial) result of meta-appropriation does not alter this conclusion.

However, when drawing design implications, meta-appropriation has to be taken into account. It could for instance be considered whether critiques of manipulation apply on the metarelation. If a styling-inviting metamediation does not lead to that result, is that a sign of user agency that they don't want to appropriate? If so, it seems that when metamediation does work, that could be against the intention of the user. However, even if that is the case, it helps to contextualise what behaviour we are concerned with. 'Manipulation' on the metarelation does not mean altering choices or behaviour other than reflexively relating to the influence of a thing. It is not about whether you have been seduced to scroll on your newsfeed, but whether you have been seduced to consider if you want that. Looking from a pragmatic perspective, the latter is not an issue in current debates on technology design, while manipulation of user behaviour is.

[9] See design implications below.

3. What about the goal of appropriation?

Is metamediation actually enough? There seems to be a kind of manipulation that is consistent with metamediation. This is the situation where one's ideals are influenced in a way that may not serve one's best interests. This does not only apply to situations like addictions, but may also describe cultural ideals like productivity. To clarify, someone who is addicted to drugs may be described as mediation-styling. They may know exactly how a drug influences them and arrange their interactions with it in such a way that they are influenced in a desirable way. The metamediaiton of the drug may even support such styling, by making it very easy to recognise and dose (style) the influence. In this situation, the 'vertical' level of mediation-styling seems insufficient for explaining relational freedom. It seems it would need to be complemented by a third dimension analysis of whether the person in question would deliberately endorse this 'mediation-styling': whether this behaviour accords with their 'higher ideals'.

A similar situation applies to something as mundane as cleaning one's desk in order to be productive, or delving into Instagram to be distracted. These actions can be described as mediation-styling practices, but the underlying aim to be productive or escape may not be endorsed upon deliberation. It seems that design for mediation-styling is thus compatible with designing for status quo values or nihilism. Phrased differently, designing for mediation fluency seems to repeat overt nudging's pitfall of not being able to avoid influencing users against their belief, but on the second dimension.

However, even if a mediation-styler *can* still be acting against their beliefs, designing for mediation-styling would only be futile if it would not affect this tendency. A relational perspective would not take a nihilist or capitalist desire as primary nor fixed. Part of me may want to avoid writing this thesis and scroll through Instagram, but part of me doesn't. When confronted with my scrolling behaviour, I inevitably have meta-feelings about this want. I don't really like that part of me. I rather be in conditions where that part of me is not lured out, where I am not 'invited' to play that part. Confronting the user with a mediation, whether an Instafeed, drug, or Fitbit, may not guarantee that a user will 'take

responsibility', but it does structure a relation to those influences that *invites* deliberation. Consider for instance how for the 7 ½, its restrictions "helped users to reflect on their interactions with the object and specifically on their own beliefs about what is the right or wrong thing to do" (Spaa et al. 2019, 15).

So, even though metamediation-induced mediation-styling may still lead to users acting against their deliberated interests, it may lower the chance by staging deliberation. However, it also shows that the design of metamediation cannot replace the deliberation of ideals, nor should be approached as a final solution.

A discussion of three variations of the infinite regress problem highlighted conceptual limitations that help nuance the concept of metamediation. First, metamediation relies on accepting an idea of freedom that does not depend on an original source or ground. Secondly, its design may still face a form of user agency that may reject the invitation to style or finds itself undeliberately deliberating. Thirdly, a metamedation approach would need to be complemented by a deliberation of ideals when implemented in design.

5.3 Implications

Taking into account the limitations of the conclusion and the nuances from the objections, how does this research contribute to the contexts of postphenomenology and design?

Implications for postphenomenology

In chapter 2, I argued that an instrumental explanation of the role of technology in appropriation in postphenomenology limits its understanding of appropriation, as it could not explain differences between technologies that allow for an "opt in," preventing it from specifying the responsibility of designers and users. How could metamediation contribute to filling the explanatory gap?

First, metamediation suggests a relation re-interpretation of appropriation. Rather than seeing appropriation as a process that, while it may require mediation fluency, technologies just need to 'allow' for, metamediation can explain mediation fluency as co-constituted by technology. Even though the mediating

roles of technologies may be co-shaped by users in the process of appropriation, how users do so is also 'co-shaped' by technology.

This allows for a qualification of the extent to which the design of technology contributes to the mediating role that technologies play. With a mediation-styling-inviting technology the users will likely play a bigger role in shaping the eventual mediation, while with a styling-inhibiting technology the designers have a greater role. A metamediation analysis may then help to assign responsibilities between users and designers.

Besides, it allows for an explanation of differences in the appropriation of technologies. Differences in design may translate to differences in metamediation, making some designs more likely to be deliberately styled with on the basis of their influence than others.

It also suggests that things can play the role of 'educating people' about mediation. Rather than having to introduce everyone to philosophy of technology, strong and explicit designs would become "technologies of philosophy." Of course, while educating users about mediations is laborious, so is redesigning everything. This proposal hinges on the assumption that things will continue to be made, and a hope that a reorientation of those efforts may contribute to mediation-styling. Education is a complementary companion in teaching mediation fluency, but as long as design effectively enacts the opposite, this fluency remains dependent on education.

To further develop these implications, studies could further analyse the co-constituting role of technologies in their appropriation, test the anticipatory power of metamediation to anticipate the ability to appropriate, comparatively analyse how design elements may explain differences of technology appropriation, and evaluate the educational potential of strong and explicit mediations.

Implications for design

In chapter 1, I argued that current interaction design methods are limited by a lacking understanding of active appropriation. This prevents user-influencing design methods from recognising how design may also influence how users deal with nudges, apart from only resisting them. This lack also makes it hard to explain how even 'detectable and resistible' nudges can pressure users to behave

against their reflected ideals, which renders these criteria a flawed way to avoid manipulation. If the design of technology can be explained to metamediate how users relate to its influence, how could that contribute to technology design methods?

First, metamediations opens up potential for design to support appropriation, by designing for mediation fluency. The analysis of the 7 ½ and Capsule Camera suggested how constraint affordances and ambiguous aesthetics could invite mediation-styling, in line with the phenomenon of 'self-nudges' discussed in chapter 1. At the same time, a simple inversion of the aims of user-centered design is not an option. An unclear and hard to operate device may indeed invite exploration like a puzzle, but just like a puzzle, as the terminus of the relation, rather than a technology used for something else. When things are unusable there is no mediating relation to relate to. Design for mediation fluency would have to find balances. Further research could test the validity of these aspects in other contexts and add more ways that design could support appropriation.

This would also offer another perspective on effectiveness, suggesting it not only depends on whether a user has the possibility to resist, but rather the invitation to appropriate. Ineffectiveness could be the result of an inability to engage with an influence, rather than a rejection. Effectiveness may then be achieved not merely by making a user passively consent or subverting their consent, but potentially by supporting a user in actively appropriating an influence.

Secondly, a metamediation perspective could help avoid manipulation. If the conditions for appropriation can be understood as the mediation fluency to recognise and style mediations, we can see why Thaler and Sunstein's criteria fall short. Even when detectability may help a user recognise an influence, and even if this influence is soft enough to be 'resisted', this does not say anything about whether the influence is also *styleable*. Recall the difference between being able to resist the suggested default printer setting and the ability to set the default. A metamediation perspective could both help understand why users would not resist resistible nudges and opens up possible research into how nudges could invite a user to style the relation with them.

Besides ways to practice design, metamediation may open up a way to critique design. The analysis suggested that metamediation is not a layer that is added onto a mediation in design, but rather a description of how any thing structures the relation to itself in a particular way – revealing some aspects and not others, encouraging some engagements and not others. If so, the absence of deliberate self-styling is not the absence of metamediation, but likely the result of a styling-inhibiting metamediation. A preliminary metamediation analysis of conventional design aspects may tell as much. A user-centered design like the AB1 alarm clock provides clear aesthetics and convenient affordances. Yet a metamediation analysis may explain how these aspects counter mediation fluency. The convenient ability to control time and alarm by the minute reduces the experience of an AB1 as an influence, rather presenting it as an obedient tool. Its clear aesthetics inhibit experimenting with what the alarm does, rather inviting to use it exactly how it was intended. These metamediations actually underline the aims of UCD, but from a mediation-styling perspective it seems these aims inhibit the vertical styling and recognising of mediations, effectively excluding users from the process of giving shape to how they are mediated. Metamediation suggests an answer to the question: if technologies are so influential and subjective, why do they often feel so neutral and objective? They seem designed that way. The critical potential of a metamediation points to another possible strand for further research, for instance by studying how UCD designs affect mediation fluency.

These implications for interaction design also imply a different understanding of the role of designers, which goes beyond the 'material ethics' of nudging and the 'resistance design' of overt nudging. Metamediation shows how interaction design could take responsibility for how it distributes the agency between user and designer. When design influences to what extent users are able to relate to influences, a designer can effectively aim for different kinds of user-thing relations. A convenient and clear design amplifies the relation as instrumental, but may inhibit the user from styling mediations. Just like when keeping mediations implicit, this assigns designers a bigger role in shaping the eventual mediating roles of technology. Designing an interaction with constraints and ambiguity, however, may amplify the relation as mediated, assigning the user more agency in shaping the eventual mediation. Rather than a material moralist,

this sketches the designer as a 'material manager', assigning agency and responsibilities.

Still, the design implications discussed should not be read as claiming that designers may have *control* over the extent to which users can or may appropriate. Don Ihde introduced the phrase *designer fallacy* to question "the notion that a designer can design into a technology, its purposes and uses" (2008, 51). Like the interpretation of a text is context dependent, so is the meaning and role a technology will play. There are relevant limits in what design for mediation-fluency may achieve. I am merely suggesting that a designer has *influence* on mediation-fluency, and inevitably so.

In conclusion, I argued that a two-dimensional metamediation perspective suggests a new way to understand the role of technology design. Although implications for the context of interaction design would need further empirical studies for validation and elaboration, a recognition of how things metamediate promises to not only help understand how conventional design practices may inhibit mediation-styling, but most importantly show how future design methods could instead invite relational practices.

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