

# Bridging the 'Theory-Practice Gap': Design-Experts on Capability Sensitive Design

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# Bridging the Theory-Practice Gap: Design-Experts on Capability Sensitive Design

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## ABSTRACT

Many of the choices that designers and engineers make during a design process impact not only the functionality, usability, or aesthetics of a technology, but also impact the values that might be supported or undermined via the technology design. Designers can actively design for values, and this awareness has led to the development of various ‘ethics by design’ approaches. One such approach is capability sensitive design (CSD). Thus far, CSD is only developed from a theoretical-ethical point of view. This article aims to bridge the theory-practice gap by entering into dialogue with various design-experts on ethics by design in general and CSD in particular. An empirical study, consisting of thematic interviews with nine design-experts, was conducted in order to explore design-experts’ experiences with designing for values, what they regard as the strengths and weaknesses of CSD, and if CSD could be of practical use to their design (research) practice.

## KEYWORDS

Capability Approach, Capability Sensitive Design, Capability Theory, Design Approach, Design for Values, Design-Experts, Ethics by Design, Martha Nussbaum, Value Sensitive Design

## INTRODUCTION

Designers and engineers love to create new things, and by creating new things they are giving shape - in small or large ways - to the world we live in. Examples of technological innovations that have impacted the world and our daily lives are endless and their scope seems all-encompassing; ranging from the innovation of the steam engine, to household appliances such as the vacuum cleaner or smart home devices like Alexa and Siri, to the innovation of glasses, the MRI scanner, and AI-driven chatbots for mental health support. These are just a *very few* examples of technological innovations that have impacted the world we live in. Nowadays, many people are aware of the far-reaching impacts that technologies have on their daily lives. Lately, the awareness that designers and engineers can *actively shape* the societal and ethical effects of their designs seems to have increased as well (see e.g., literature on designing for the future by Reeves, Goulden and Dingwall 2016; Mazé 2016. As well as literature on designing for values by e.g., Flanagan and Nissenbaum 2014; Friedman, Kahn and Borning 2013; Winkler and Spiekermann 2018; Friedman and Hendry 2019). Many of the choices that designers make during design processes impact not only the functionality, usability or aesthetics of a technology, but also reflect and impact the values that might be represented, supported or undermined via the technology design. Designers can actively *design for values*. This increasing awareness has led to the development of multiple ‘ethics by design’ approaches (see e.g., Van den Hoven, Vermaas and Van de Poel 2015). These ethics by design approaches meet a growing need in

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the design and engineering community: a need for practical advice on how to consciously take into account the ethical implications of innovations during the design process.

The most prominent ethics by design approach is Value Sensitive Design (VSD): a design methodology that aims to address and account for values in a “principled and systematic manner throughout the technical design process” (Friedman and Hendry 2019, p.4; Friedman, Kahn and Borning 2013). However, despite being a highly promising approach to ethics by design, VSD has been criticized for not providing enough practical guidance in actual design processes; as well as for taking stakeholder values as leading values in design processes without questioning whether these stakeholder values *should* be valued; and for not being able to provide normative justification for making value prioritizations and trade-offs in the design process (Jacobs 2020; Jacobs and Hultgren 2018; Borning and Muller 2012; Davis and Nathan 2015; Manders-Huits 2010).

Now, although there are some very promising examples of VSD applications (see e.g., Iversen et al. 2020; Maathuis et. al. 2019; Oosterlaken 2014), the challenges that VSD currently faces make it a rather difficult approach to apply to concrete design processes. In the literature on VSD, various authors have argued that, in order to overcome its challenges, VSD should be complemented by an ethical theory (Jacobs 2020; Cenci and Cawthorne 2020; Jacobs and Hultgren 2018; Manders-Huits 2010). Jacobs and Hultgren (2018) have argued that VSD can best be complemented by a mid-level ethical theory, because mid-level action guiding principles are able to converge differences that occur on the highest level of moral theory, and because these mid-level principles are able to give action-guidance in concrete cases. The thesis that VSD should be complemented by a mid-level ethical theory, as argued for by Jacobs and Hultgren (2018), is accepted at face value in this article.

In recent years, multiple scholars have set out to complement VSD with various mid-level ethical theories. Examples include Van Wynsberghe who has complemented VSD with an account of care ethics (Van Wynsberghe 2012) and Cawthorne and Van Wynsberghe (2019) who have complemented VSD with the theory of principlism. Furthermore, Cenci and Cawthorne (2020) aimed to refine VSD with a capability-based procedural ethics approach, and Jacobs (2020) has merged VSD with Martha Nussbaum’s capability theory. Now, an in-depth analysis of which mid-level theory complements VSD “best” would exceed the scope of this article. Moreover, we hold the opinion that it depends on the context of application which mid-level theory is best to complement VSD. That is, in the context of technology design for care robots, e.g., the theory of care ethics seems a very suitable companion to complement VSD (Van Wynsberghe 2012), while in the context of design for health and wellbeing technologies, Nussbaum’s capability theory appears particularly well-suited (Jacobs 2020).

The context wherein the authors of this article operate, is the context of technology design for health, wellbeing and behavior change. As argued by Jacobs (2020), it is the capability approach (CA) (Sen 1985; 1992; 1999; 2009; Nussbaum 2000; 2006; 2011) that is especially well-equipped to ethically assess technology design for health and wellbeing. In short, that is because the CA has as its prime aim to expand people’s capabilities, which corresponds particularly well with Lennart Nordenfelt’s influential conceptualization of health as a person’s ability to realize one’s vital goals (Nordenfelt, 1986). As well as with the later refinement of that definition by Sridhar Venkatapuram (2013) of health as a person’s ability to achieve or exercise a cluster of basic human activities or capabilities. Given these influential conceptualizations of health, the CA seems well suited to normatively assess health and wellbeing technology designs.<sup>1</sup>

The CA is an “open-ended and underspecified framework, which can be used for multiple purposes” (Robeyns 2017, p.29). When one specifies the approach and applies it for use with a particular purpose, we should speak of a capability *theory* (Robeyns 2017). What all capability theories have in common is that they understand wellbeing not in terms of the number of resources a person has, but instead by looking at what people are able to do and be, and thus the kind of life that they are effectively able to lead (Sen 1985; 1992; 1999; 2009). That is because quantities of, or access to, resources or goods don’t tell us much about what a person is actually able to be and do in one’s life and the real opportunities available to a person (Sen 2009). The freedoms and valuable opportunities

that a person can choose from, are called *capabilities*. What people are *actually* achieving in terms of beings and doings, are referred to as *functionings*. Furthermore, it should not be taken for granted that resource provision leads to increased capabilities or functionings. Instead, the *conversion* of goods and services into what people are actually able to be and do is influenced by personal, social, and environmental *conversion factors* that determine the extent to which a person can transform a resource into a functioning (Robeyns 2017, p.45).

This article takes ‘Capability Sensitive Design’ (CSD) under review. CSD is a merging of VSD with Martha Nussbaum’s capability theory (2000; 2006; 2011). Oosterlaken (2013) has analyzed the applicability and potential added value of Nussbaum’s capability approach for the design of technical artifacts, which she dubbed ‘Capability Sensitive Design’ (CSD). This work was recently developed further by Jacobs (2020), explicitly merging VSD (Friedman and Hendry 2019) with Nussbaum’s capability theory (Nussbaum 2000; 2006; 2011).

Now, why have we chosen to review CSD and not the complementation of VSD with another capability theory, such as the capability-based procedural ethics approach by Cenci and Cawthorne (2020), for example? The main reason we chose to reflect on CSD, is because Nussbaum’s capability theory clearly and explicitly indicates a substantive normative foundation.<sup>2</sup> This substantive normative foundation entails that all people are morally equal and deserve a life worth living, which entails that there are ten capabilities which are entitlements for every human being. In CSD, Nussbaum’s list of ten capabilities forms the normative foundation together with the two moral principles of respecting human diversity and diminishing (structural) injustices in technology design (Jacobs 2020). As argued for by Jacobs and Huldtgren (2018) and Jacobs (2020), VSD needs complementation of a substantive ethical theory that provides grounds of justification and argumentation for moral claims and considerations, because without such substantive ethical commitments, VSD faces the challenges of obscuring the voice of its practitioners and thereby claiming unfounded moral authority; taking stakeholder values as leading values in the design process without questioning whether what *is* valued by stakeholders also *ought* to be valued; and not being able to provide normative justification for making value prioritizations and trade-offs in the design process. By explicitly complementing VSD with this substantive normative foundation of Nussbaum’s capability theory, the CSD framework is able to provide sources of justification and argumentation for moral claims and considerations, which are needed to make principled judgments, to attend to a set of bounded and principled values, and to avoid conflating facts with values. The capability-based procedural ethics approach by Cenci and Cawthorne (2020) is -just like VSD- a procedural approach that doesn’t make substantive ethical commitments, and therefore is not able to meet the challenges that VSD faces, like CSD is able to (Jacobs 2020).

As mentioned, CSD takes Nussbaum’s list of ten capabilities as its normative foundation, together with the moral principles of respecting human diversity and diminishing (structural) injustices in technology design (Jacobs 2020). The ten capabilities on Nussbaum’s list include:

*Being able to live a normal length of lifespan; having good health; maintain bodily integrity; being able to use the senses, imagination, and think; having emotions and emotional attachments; possess practical reason to form a conception of the good; have social affiliations that are meaningful and respectful; express concern for other species; being able to play; have control over one’s material and political environment. (Nussbaum 2000, p.33)*

The aim of CSD is to proactively pay attention to the expansion of one or more of these capabilities from the start of a design process. CSD provides a clear normative foundation for design practices, with practical ethical guidance on what capabilities matter and why, and how these capabilities can be expanded in concrete technology design.

The added value for designers adopting CSD, is that (1) it enables them to overcome the abovementioned challenges that VSD faces, as well as that (2) CSD provides them normative guidance

and justification in designing for justice and diversity in design processes, and (3) CSD provides designers with Nussbaum's list of capabilities that functions as input -as an "awareness tool"- into the design process, directly engaging designers with the ethical implications of their design.

However, while CSD may be a promising approach to ethics by design, it has so-far only been developed from a theoretical point of view (Oosterlaken 2013; Jacobs 2020). We have yet to explore whether the framework is able to bridge the 'theory-practice gap', that is, whether CSD is practically applicable and of value in actual design practice. The current paper explores the perceptions of design-experts with regard to CSD and in relation to their own design practices. In this way, we aim to critically assess the extent to which CSD may be successful in bridging the theory-practice gap, and are seeking ways in which to improve the value of CSD to designers. To this end, the authors have conducted interviews with various design-experts to explore what these design-experts think of designing for values, what methods -if any- they use for incorporating values in their current design practices, what they regard as the strengths and weaknesses of CSD, and, most importantly, whether they think CSD could be of practical use to their design (research) practices.

## METHODOLOGY

For this study, nine design-experts were interviewed. The selection of these nine design-experts was based on having a balance between experts on design *practice* and design *theory*, having mid-career experts as well as senior experts, and including experts with knowledge on health technology and/or behavior change theory, since the CSD framework was initially developed for health-related behavior change technologies (Jacobs 2020). Six experts were female and three were male. The backgrounds of the experts range from a mid-career designer at a medium-sized design agency, to a senior design-researcher at a health technology company, to a professor in design. Seven out of the nine experts were explicitly working on design (theory) for behavior change and seven out of nine experts have worked on technology design for health and wellbeing. Furthermore, seven design experts explicitly indicated that they conduct stakeholder analyses or employ other forms of end-user involvement including user-centered or participatory design methods during design (research) trajectories (see Bekker & Long 2000). All design-experts were working in the Netherlands at the time of the interviews. The interviews were conducted 'one-on-one' and lasted approximately one hour. The interviews took place in the spring of 2020, during the height of the Covid-19 pandemic, and were therefore all conducted online, via teleconferencing software. The interviews were semi-structured, which means there was an outline of interview questions (i.e., the interview guide) that formed the basis for the interviews with all the experts. However, each interview was flexible to an extent in order to adapt to the conversation and probe for underlying motivations. Between interviews, some gradual changes were introduced to gain more information on particular topics of interest, whereas less fruitful or saturated avenues of questions were truncated. The interview started with short introductions. Subsequently, the interviewer introduced the purpose of the interview, asked whether audio recordings could be made of the interview, and obtained informed consent. The first set of questions were warmup questions, where participants were asked to tell about their design research and experience. The interview guide furthermore addressed the following topics: encountering ethical dilemmas in design practice, actively designing for values, ethics in design education, and CSD and its practical applicability.

The data gathered from the interviews are thematically analyzed by the authors. Thematic analysis is a method for identifying, analyzing and reporting themes within the gathered data (Braun and Clarke 2006). The semi-structured interviews were recorded, transcribed, and then coded by the authors, after which the codes were collated into potential themes. The authors then extensively discussed and refined the potential themes in order to specify the overall story that the analysis tells. The final analysis is presented in this article.

Important to note is that the author who conducted the interviews is also the one who developed the CSD framework (Jacobs 2020). The design-experts were aware that the author was also the

developer of CSD and that the author stands favorably towards CSD. The design-experts were also aware that the author was theoretically committed to CSD, as well as that the author believed in the added value of ethics by design approaches and encouraged mutual exchange between the domains of ethics and design. Having said this, the author did explicitly invite constructive criticisms that would allow a critical assessment of CSD.

The main objective of the study was to let the design-experts reflect upon the question whether the CSD framework could be of practical value in their design (research) practice. At the time of the interviews, CSD was a new framework within the field of ethics by design. The design-experts did not have any prior knowledge or experience with the CSD framework, nor were they familiar with Nussbaum's capability theory. None of the participants in the study had reflected on the CSD framework prior to the interview, and were introduced to CSD for the first time by the interviewer.

The way in which the design-experts were introduced to CSD was first by a very brief introduction into the basic rationale of Nussbaum's capability theory (2000; 2006; 2011), as also mentioned in the introduction of this article. The experts were then introduced to specific aspects of the framework, namely Nussbaum's list of ten capabilities, followed by an excerpt of the capability hierarchy (Van de Poel 2013; Oosterlaken 2015; Jacobs 2020) which is a tool to help translate the abstract capabilities into tangible design requirements.

As a general reflection on the conversations with the design-experts, all design-experts easily engaged with questions on the social impact technology design can have, on the role that values play in design practices, and on the necessity for designers and engineers to have ethical awareness in their design practices. When it came to introducing the various aspects of CSD; all experts were responsive to the CSD framework. There were sometimes short pauses in the conversations where the design-experts had to take a moment to reflect on how aspects of the framework might relate to certain aspects of their own practices. Next, we will present a detailed analysis of the main themes that emerged from the interviews with the design-experts. These themes are characterized as three interconnected questions: (1) 'Can We Design for Values?', (2) 'Can We Apply CSD Flexibly?', and (3) 'How to Give Guidance and Avoid (Too Many) Restrictions?'. After discussing these themes in detail, the article concludes with a discussion on the insights drawn from the themes in relation to the question how CSD can be of practical value to design practice.

### **Can We Design for Values?**

All of the interviewed design-experts showed themselves aware of the far-reaching impact that technologies have on society and daily life. All design-experts furthermore showed an increasing awareness of the role designers have in shaping the societal impacts of their technology designs. One design-expert remarked:

*It is absolutely necessary that designers start to think about and reflect upon the effect that their designs might have on people, society and wellbeing; on the bigger picture. (director at a university-wide design lab)*

Many of the design-experts (five out of nine) indicated that they have worked on design projects wherein they explicitly designed for one or more ethical values. Examples mentioned by the design-experts include e.g. a large design project for ambient assisted living that aimed at increasing the value of social connectedness among the people who would eventually be using the ambient assisted living technology. Other examples include the design of a smart bedside lamp that aimed to increase the values of creativity and social empowerment in interaction with the user, and the design of a digital platform that aims to increase the autonomy of people who experience mental health difficulties. The majority of the design-experts easily recalled one or several design projects they had worked on that explicitly aimed to increase one or more ethical values by means of the technology design,

without explicitly indicating that they were conducting some form of *ethics by design* (Van den Hoven, Vermaas and Van de Poel 2015).

Six out of nine of the design-experts was explicitly asked whether they had ever encountered an ethical dilemma during a design (research) project, and all six participants who were asked the question could recall encountering one or more ethical dilemmas in their design practices. An example of an ethical dilemma encountered by a designer working at a medium-large design agency revolved around the question how much autonomous decision-making power people with serious mental health difficulties should be given by the digital platform the design agency was designing, since *too much* autonomous decision-making power could potentially cause these people to harm themselves or others. An assistant professor in industrial engineering working on a digital platform for people to exercise more recalled encountering the ethical dilemma of whether or not they could ‘trick’ users of the platform with false ratings in order to persuade those users to try harder and exercise more. As a third example, an ethical dilemma mentioned by both a psychologist working at a health technology company, as well as by an associate professor in design, is the dilemma of what authority a team of designers and researchers has to determine what a healthy lifestyle consist of and what is ‘healthy’ and ‘good’ for other people. One of them remarked:

*Who are we [...] to prescribe to others what is healthy or what is good for them? (associate professor in design)*

What the above seems to show is that the interviewed design-experts are aware that technology design can have social and ethical implications. In addition, many of the experts indicate that designers can deliberately support certain values in a technology design process. Many of the experts indicate to have actively supported one or more ethical values in a design process. Without, however, explicitly making use of an existing approach or framework for ‘ethics by design’ (Van den Hoven, Vermaas and Van de Poel 2015). Furthermore, the experts that were asked ever encountering an ethical dilemma in their design (research) practice could all recall one and showed themselves aware of the fact that such ethical dilemmas form a part of design processes. Although none of the experts indicated to be explicitly working with an approach for ‘ethics by design’, and none of the experts used an ethical theory or an ethical framework in their design (research) practices, all of the experts showed themselves aware of, and sensitive to the ethical aspects of design practice.

### **Can We Apply CSD Flexibly?**

After having discussed various ethical aspects of design practice, the experts were given a very brief introduction into the basic rationale of Nussbaum’s capability theory (2000; 2006; 2011). None of the experts were familiar with Nussbaum’s capability theory prior to the interview. After the brief introduction, the design-experts were asked whether they thought if ‘thinking in terms of expanding capabilities’ would be applicable to their design (research) practice? All nine design-experts indicated that thinking in terms of ‘expanding capabilities’ fits well with their views on design practice, saying:

*It’s kind of a ‘direct match’ in a way. (professor in design)*  
*It is an exciting idea. (designer working at a medium-sized design agency)*

However, when the design-experts were introduced to the list of ten capabilities developed by Nussbaum (2000) that forms the basis of CSD (Jacobs 2020), the reactions were a lot more diverse. The design-experts were shown the list of ten capabilities and were asked whether they think this list could form a starting point for a design process. The initial reactions of the design-experts ranged from recognition, to pointing out the demanding and intellectual character of the list, to raising the

issue of whether or not the list is (sufficiently) complete, and to questioning who has the authority to decide what capabilities are -and should be- on the list.

For example, a designer working at a medium-sized design agency recognized many of the ten capabilities from a similar list that she works with at the design agency<sup>3</sup>, a senior design-researcher at a health technology company noticed that the list of ten capabilities is familiar to a list of twelve human needs and values that she uses at her company, and an associate professor in design recognized elements from behavior change frameworks that she makes use of in her design research practice. However, what she also noted is that the list of ten capabilities is highly intellectual and demanding, and that it requires a lot of people if you want them to be capable of doing all these things. Another expert responded that the capabilities on the list sound good, but questioned where the authority comes from to decide what capabilities should be on the list.

*Who decides who decides what capabilities are actually on the list and how the capabilities should be interpreted? Who decides what a 'normal' length of lifespan is. (professor in design research)*

The director of a university-wide design lab made a similar remark, questioning who decides what having 'good' health actually entails? The same expert then remarked that the list of ten capabilities is perhaps too paternalistic, because it prescribes what capabilities are good for people and constitute their wellbeing. Perhaps people themselves thinks otherwise, the expert remarked:

*I think some of the capabilities on the list are too paternalistic...saying 'this is good for you', while people themselves might think otherwise. (director of a university-wide design lab)*

In addition, the same expert pointed out that some of the capabilities on the list are formulated in a way that might be way too abstract and difficult to understand for most people. This can make it difficult to engage these people in reflection on the capabilities, the director of a university-wide design lab remarked.

A professor in design pointed out that the list of capabilities could form a nice lens to reflect on a design process, but also indicated that the list doesn't seem suitable as a starting point for a design process.

*I wouldn't start a design from that. But perhaps use it to take a step back and reflect on it. (professor in design)*

Furthermore, the same expert questioned whether the list is complete, i.e., whether there are capabilities that are not on the list that should be. The expert then quickly added that 'completeness' should never be the aim of designers in a design process. A psychologist at a health technology company also questioned whether the list of ten capabilities is complete and covers all relevant capabilities. Furthermore, she questioned whether all of the ten capabilities are as relevant in every design process.

*The list of ten capabilities could form a starting point. However, if it would cover everything... and if it would always be these ten capabilities...I find it hard to say. It also depends, say if you look at the health solutions that I work on, helping chronically ill patients to manage their condition and their health, well than these type of capabilities are really important. But when you design, I don't know, a shaver... [...] than it might be a bit over the top. (psychologist at a health technology company)*

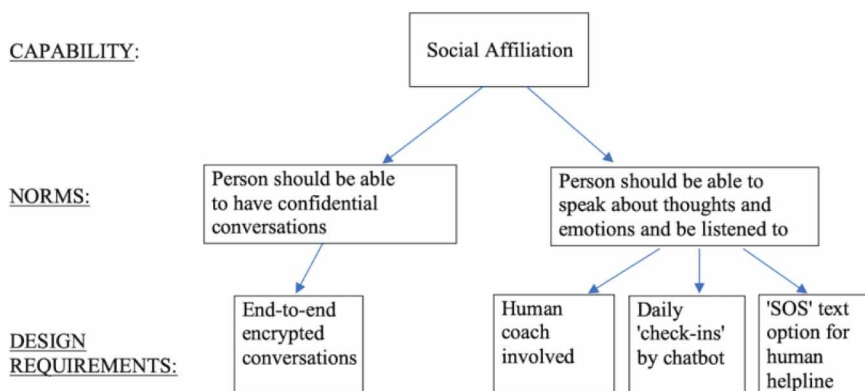
The issues raised by some of the design experts on the paternalistic, intellectual and elitist character of Nussbaum's list, as well as the issue of authority and the question of completeness of the list, mirror some of the main criticisms that Nussbaum's capability list has received in scholarly



literature (see e.g., Claassen 2011). How Nussbaum has responded to these criticisms, and how CSD deals with these criticisms, is discussed in Jacobs (2020).

After presenting the design-experts with the list of ten capabilities, the experts were introduced to the tool of the ‘capability hierarchy’ (Van de Poel 2013; Oosterlaken 2015; Jacobs 2020)<sup>4</sup>. The capability hierarchy is a tool to help translate the abstract capabilities into tangible design requirements. The capability hierarchy aims to assist designers to translate an abstract capability first into prescriptive norms and from there into concrete design requirements. The following excerpt from a capability hierarchy derived from Jacobs (2020) was presented to the participants. The excerpt shows a detail of the capability hierarchy applied to a hypothetical design case of an AI-driven mental health chatbot (Figure 1).

Figure 1. Detail of capability hierarchy (Jacobs 2020)



Even though most design-experts felt that the capability hierarchy can go some ways in bridging the gap between abstract capabilities and more concrete ethical norms, they were more skeptical with regard to the direct applicability of the capability hierarchy in a design process. The experts indicated that the capability hierarchy remains a very abstract tool that doesn’t directly match with their own design practices or design tools used. For example, one expert remarked that:

*Such a capability hierarchy can help designers on their way, to make that translation [...] but this is not typically how designers work. (associate professor in design)*

Another expert indicated that a tool such as the capability hierarchy can be very useful in order to make a translation from abstract capabilities to concrete design requirements, even stating that such a tool is “*a must*”. However, the expert questions how norms will eventually resonate with the needs of end-users.

A designer at a medium-sized design agency indicated to find the capability hierarchy an interesting tool, but pointed out that it is a very abstract tool that requires a lot of design skills in order to be applied satisfactorily.

*Such a capability hierarchy looks like an interesting translation process [...] But I think it does require considerable design qualities to translate those abstract capabilities into norms. I think that’s a tough step. (designer at a medium-sized design agency)*

Many other experts indicated as well that the capability hierarchy remains an abstract tool that doesn't directly match to their own design practices. Many experts seemed to find it difficult to see how the capability hierarchy could provide concrete guidance in a design process. For example, an assistant professor in human-technology interaction mentioned that the translation from norms to design requirements still seems very complex.

*I find it very complicated. [...] I find it difficult to know where those norms exactly come from? (assistant professor in human-technology interaction)*

A professor in design remarked that there is again -as with the list of ten capabilities- a matter of exhaustiveness and completeness. That is, how do designers know that they have mapped all the norms that correspond with a certain capability? A similar remark was made by another expert, who wondered how a designer can guarantee to have executed the hierarchy completely and exhaustively?

*Are these all the norms, or are there also many other norms? And where do these norms exactly come from? [...] And then the design requirements [...] is this the right design requirement? Or are there more? Where do they come from and who decides that it is those? And in addition: how can you guarantee that the norm is met when you fulfill these design requirements? (professor in design research)*

In reaction to the capability hierarchy, many of the design-experts raised questions concerning the completeness and exhaustiveness of the capability hierarchy, and many emphasized that the translational steps between capabilities, norms and design requirements require considerable design qualities. Furthermore, another issue that was stressed by various experts in response to the capability hierarchy concerned iteration. Many of the experts emphasized the importance of iteration in design processes and in tools such as the capability hierarchy. A professor in design research e.g., stated that design processes should always enable to critically re-examine all of the choices made thus-far, and possibly even come back to choices made earlier in the design process if it turns out that something doesn't quite work out as planned or works out *even better* than planned. Such re-examination and iteration should take place on all levels of the design process and is a crucial aspect of a design process. Another expert argued along similar lines and remarked that the subdivision of the capability hierarchy looks really good, but questioned where the required iteration would come in.

*How does it account for iteration? Now it seems as if you move from top to bottom. [...] But you can't go from norms to design requirements and 'there you are'. You have to continuously move back and forth. (director of a university-wide design lab)*

Another expert pointed out the importance of flexibility in design practices, and indicated that it is important to apply the capability hierarchy in a flexible manner.

*The most important thing is to be flexible about the moment you introduce this into the design process. When you look at design processes, they can come about in many ways and an idea may develop in various ways until you say 'this is what we are going to make'. It now seems that the capability hierarchy tool is mainly theoretical and to be applied when you don't really know yet what you will design, so you start thinking about what design requirements you could have. But that isn't always how it works of course. [...] A design doesn't always start with a blank piece of paper, so when will you introduce this hierarchy then? (associate professor in design)*

## How to Give Guidance but Avoid (Too Many) Restrictions?

During the interviews, various design-experts brought up the issue of making value prioritizations and value trade-offs in design processes, as well as how to deal with value dynamics and with value change. The experts addressed that these complicated ethical issues are highly relevant in the context of design practice, but at the same time indicated that they have no clear-cut guidelines on how to make such difficult choices concerning value prioritization or trade-offs, or how to deal with value dynamics and change in practice. The experts pointed out that at first glance, CSD doesn't seem to provide clear guidelines on how to deal with these issues. One of the experts explicitly indicated it as a weakness of CSD that it doesn't seem to provide clear guidance on the issue of value/capability prioritization, stating that:

*The fact that you can't clearly prioritize one capability over another makes it very hard to use. (assistant professor in human-technology interaction)*

Another expert wondered how the various capabilities on Nussbaum's list relate to each other, and what effect that would have on iterative design processes.

*I wonder, do these capabilities also have effect on each other? How do I find out if a capability has effect on other capabilities in the design process and how do I deal with that in an iterative design process? Value dynamics... changing values, how does that work with capabilities, are they independent of each other? (associate professor in design)*

Both design-experts seemed to indicate that it would be desirable if CSD provided clear ethical guidance on these issues; i.e., indicating how designers should prioritize between capabilities in a design process, as well as how designers should deal with capability dynamics in an iterative design process. However, this need for direction and guidelines on how to make value/capability prioritizations and how to deal with value dynamics and value change in design processes seems to be somewhat at odds with the emphasis that almost all design-experts put on the importance of flexibility, and context-dependent interpretation and decision-making for design processes during the interviews. One expert e.g. clearly stated that designers should be made aware of the issues of value/capability prioritizations, trade-offs, value change and dynamics, but should not be prescribed what to do in cases such an issue occurs.

*It is more important that you make designers aware [of value change, capability dynamics and prioritization etc.] and that they have to find ways to deal with that, than that you would prescribe designers how they should do that. (associate professor in design)*

What the interviews with the design-experts seemed to lay bare is somewhat of a tension between a need for clear ethical guidelines in design processes on the one hand, and the fear of interference with the necessary flexibility, iteration, context-adaptability and creative freedom that are crucial to successful design processes on the other hand. In relation to the CSD framework, many of the design-experts seemed to regard the list of ten capabilities and the capability hierarchy-tool as welcome and inspiring ethical guidance, however they were also seen as somewhat rigid aspects of the CSD framework that might restrict, or even form a threat to, the flexible and iterative process that is necessary for design practice. This tension seems to be well-captured in the following quote by one of the design-experts:

*The ways in which people value things changes continuously, you have to anticipate that if you want your innovations for the future to make sense. [...] However, the fact that the list by Nussbaum is always very stable makes it a good starting point for a design process. (senior design researcher at a health technology company)*

## DISCUSSION AND CONCLUSION

The authors have entered into dialogue with various design-experts in order to explore designers' take on ethics by design, the strengths and weaknesses of CSD, and the practical usefulness of CSD to their design (research) practices. With this study, by entering into dialogue with design-experts, the article aims to contribute to bridging the 'theory-practice gap' between ethics of technology and design practice.

One insight from the study is that all of the experts showed themselves aware of, and sensitive to, the ethical aspects of design practice. All experts indicated to have worked on at least one design (research) project wherein one or more ethical values were actively supported in the design process. None of the experts, however, made use of an ethical framework in order to actively support ethical values in their design (research) practices. Nevertheless, the interviews made clear that a genuine need for some sort of practical ethical guidance exists in current design practice. Practical guidelines or directions on how to account for the ethical implications of innovation in a design process seemed to be welcomed by the experts, specifically with regards to making value/capability prioritizations in a design process, and how to deal with value dynamics and value change.

A second insight from the study is the importance all experts attributed to flexibility, iteration, and context-adaptability for a successful design process. All experts stressed how crucially important an iterative and flexible process is for a satisfactory design result. This, however, seemed to be somewhat at odds with the previous outcome, i.e.; designers' need for clear ethical guidelines in design processes. There exists a tension between the need for ethical guidance on the one hand, and stressing the importance of flexibility and adaptability on the other hand. This tension played out clearly in relation to certain aspects of the CSD framework. With regards to CSD, many of the design-experts seemed to understand the list of ten capabilities and the capability hierarchy-tool as a welcome and inspiring form of ethical guidance for a design process, however, they also understood these aspects to be somewhat rigid. Many of the experts seemed to think that the list of capabilities and the capability hierarchy tool might restrict, or even threaten, the flexible and iterative process that is necessary for design practice.

It seems appropriate at this point to clarify the role of the list of ten capabilities and the capability hierarchy within CSD. The list of ten capabilities within CSD is intended as an adaptive, dynamic and open-ended list that foremost functions as an 'awareness tool' and as input into the design process to enable the design team to engage with the ethical implications of their design. The list of ten capabilities should thus not be interpreted as static, but instead as a dynamic tool between the design team and the object or system that is being designed. However, considering the feedback from the design-experts, one might wonder whether Amartya Sen's procedural account of the CA (Sen 1985; 1992; 1999; 2009) would not be more useful to designers than Nussbaum's capability theory? As often discussed in the scholarly literature on the CA (see e.g. Robeyns 2017), one of the main differences between Sen's procedural account and Nussbaum's capability theory, is that Sen doesn't provide a list of capabilities, but instead leaves the selection of capabilities open to the deliberation process. Nussbaum's list -in contrast to Sen's open, procedural approach- is then often presented in the literature as being static and definite (for this discussion, see e.g., Claassen 2011. For a recent endeavor wherein VSD is complemented with Sen's procedural capability account, see Cenci and Cawthorne 2020). However, Nussbaum has always emphasized that her list is open for discussion and revision (Nussbaum 2000, p. 77) and therefore is not to be understood as static nor definite. Capability-scholar Claassen (2011) e.g., has argued that Nussbaum's list can best be understood as

a piece of input into the deliberation process. In the context of design i.e., as a stimulus for debate in the design process.

Taking the feedback from the design-experts into account, it becomes apparent that the CSD framework should emphasize more clearly that Nussbaum's list is intended as an adaptive, dynamic and open-ended list that foremost functions as input into the design process to enable the design team to engage with the ethical implications of their design. As pointed out by Jacobs (2020), Nussbaum deliberately formulated the ten capabilities on her list at an abstract level, precisely in order to make room for the activities of specification and deliberation (Nussbaum 2000, p.79) by citizens, stakeholders and designers. Designers, together with the various stakeholders involved, need to provide context-specific specification of the capabilities, adding content to the abstract capabilities on the open-ended list (Jacobs 2020). A practical tool to assist this endeavor is the set of "capability cards" developed by Marc Steen (2016) which provides input to designers and stakeholders to discuss, select and specify the capabilities from Nussbaum's list on which to focus specifically in the design context at hand (Jacobs 2020). In this way, Nussbaum's list of ten capabilities thus offers a piece of input into the deliberation process, providing us with a stimulus for debate in the design process (Claassen 2011; Jacobs 2020).

With regard to the capability hierarchy, its primary aim is to function as a tool to help designers become aware of the relationship between capabilities, norms and design requirements, and subsequently assist them to make the translational steps between the three dimensions. Designers should be free, however, to creatively adapt the tool as they deem necessary and implement the tool in a flexible way that gives way to an iterative design process.

A related outcome of the study was that various designers indicated a need for ethical guidance on how to make value prioritizations in a design process, and how to deal with value dynamics and value change. Nussbaum has argued that the capabilities on her list are all equally important and incommensurable (Nussbaum 2006). In the case a capability conflict occurs, Nussbaum has stated that "it becomes a purely practical question what to do next" (2006, p. 175); a practical question that depends on the specificities of the context at hand. Important to keep in mind is that Nussbaum's list is intended for setting the basic requirements of a society that allows for all humans to live a dignified life. When CSD places Nussbaum's list in the context of design, the list functions as an instrument to assure that designers expand capabilities via their technology design that contribute to people's wellbeing. There is no reason, however, to suppose that a technology design should promote *every* capability that is on the list, since that would not be feasible. Instead, when applying CSD, a design team can choose one or more capabilities from the list (and if needed, even add capabilities that are not yet on the list) that they will design for in the specific design context at hand. The design team should choose which of the chosen capabilities they expect to be most relevant to the design context, and which ones will be most likely less relevant. Of course, the relevance of capabilities may change during the design process due to findings from e.g., stakeholder analyses, and designers should be able to be flexible on the matter. Also, some of the chosen capabilities might turn out to be very explicitly endorsed in the design, while others may be more implicitly present in the eventual design. In light of the occurrence of a capability conflict in design, it is with context-specific weighing and balancing that a design team should decide which capability to prioritize in the design over another. Although it might not be feasible for a design to support *all* capabilities on the list, designers should aim to never seriously undermine one of the capabilities.

What significance do these study's outcomes have for design practice and ethics by design in general, and the further development of CSD in particular? Most importantly, the interviews with the design-experts laid bare that CSD's systematic and orderly ethical guidelines are at odds with the nature of the design process, which is iterative, interactive, flexible, non-linear, and messy at times. It therefore seems important to clearly distinguish between (1) the process of design and (2) the outcome of that process (the actual design) and its justification. While the process of design is iterative, interactive, flexible, non-linear, and messy at times, the justification of the actual design can

be, on the other hand, systematic, orderly, reflective and could be conducted in terms of adherence to rules and guidelines.

From the interviews, CSD seems primarily relevant for the justification of the final design; to provide designers with tools to increase awareness of the relevant ethical issues that could be at stake in the design, to reflect on the various steps and decisions taken so-far in the design process, and in the final justification of the design in which designers reflect upon to what extent their design lives up to the design requirements and how capabilities and values are –or could be– affected by the design, both positively or negatively. More precisely; CSD endorses the ten capabilities identified by Nussbaum (2000) as to have moral value and the list forms the normative starting point of a design process. Designers, together with multiple stakeholders and with help of e.g., the “capability cards” (Steen 2016) discuss, select and specify the capabilities from Nussbaum’s list on which to focus in the specific design context at hand. Decisions made in the design process that enable the expansion of these capabilities in the final design are normatively justified. At the same time, *if* the technology design at a certain point in the process would *fail* to expand the selected capabilities for (a part of) the intended user group, CSD signals that there is an injustice at play and the designers need to question and revise their design choices.

CSD appeared to be not so relevant for steering the design process, given the iterative, interactive, flexible, non-linear, and sometimes messy nature of that process. However, referring back to the first-mentioned insight of this study that all experts showed themselves aware of, and sensitive to, the ethical aspects of design practice, it could very well be that CSD enables designers to increase this awareness and sensitivity. That is: during the design process, CSD can help raise designers’ awareness and sensitivity to ethical tensions and choices that need to be made related to values and capabilities in the design process. This increased sensitivity brought about by CSD would then accompany designers throughout the process. CSD might thus not be so relevant for *steering* the design process, it could very well *accompany* designers in the messy, iterative and interactive process of design.

Lastly, a study of this kind has a number of inherent limitations. First of all, the perspective of the interviewer was not neutral, as one of the authors developed CSD (Jacobs 2020). We are aware of this bias, and have aimed to present CSD as objectively as possible, and have explicitly invited critical commentary and reflections from the design-experts. Nevertheless, given the nature of polite conversation, the known favorable position of the authors towards CSD may have given rise to more positive evaluations of CSD than an interviewer with a more neutral or negatively inclined stance would have otherwise elicited. Secondly, we are also aware that, although the sample of experts was intentionally drawn to be representative of different levels of experience as well as different design perspectives (e.g., academic versus industry versus design lab), our sample is limited in that all participants were employed in the Netherlands at the time of the interviews (although not all are Dutch natives), and most respondents represent a predominantly Western-European background. It would be very interesting to extend our work in the direction of cross-cultural comparison of design practices, as CSD may resonate differently across design cultures. Almost all experts had a focus on health technology and were experts in design for behavior change; this specific focus might have had effect on the experts’ positions towards the perceived importance of designing for values, since the domains of health and behavior change are domains with significant known implications for the people affected by the designs. Indeed, the experts’ focus on health technology and design for behavior change might have had an effect on their attitudes towards (the relevance of) CSD and the type of values and capabilities they understood as important.

As a reflection on method, the use of the interview method and subsequent thematic analysis allowed us to go into depth and probe topics interactively and dynamically. This yielded a rich and detailed set of insights, in the respondents’ own words, which we believe to be representative for the range of attitudes towards CSD as a potential ethics-by-design tool. At the same time, interview methods deploying a relatively small number of participants cannot be used to seek out larger trends in the population, or specify insights depending on background variables such as age or experience.

For such population-level generalizability of results, other methods, such as large-scale surveys, can be deployed. Finally, the proof of the proverbial pudding is in the eating. That is, when designers will have had hands-on experience in using CSD as a design tool in practice, they will be able to reflect on their own lived experiences, thus further shaping, enriching and contextualizing their (initial) perceptions, opinions and attitudes. Given that CSD is currently a new ethics-by-design method, we believe the insights provided in this paper are a valuable point of departure for further work in this direction.

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## ENDNOTES

<sup>1</sup> For a more detailed discussion on why the CA is especially suited for ethical evaluation of health and wellbeing technologies, we refer to Jacobs (2020).

<sup>2</sup> Of course, we must also emphasize here that one of the authors has developed CSD (Jacobs 2020).

<sup>3</sup> This is the taxonomy of human goals by Ford & Nichols (1987).

<sup>4</sup> The capability hierarchy is based on Ibo van de Poel's (2013) 'value hierarchy'. The concept of the capability hierarchy was first proposed by Oosterlaken (2015) and developed by Jacobs (2020).

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