What people are realistically able to do and be in their lives, their capabilities, are of central moral importance according to the capability approach (CA) of Amartya Sen and Martha Nussbaum. Examples are the capabilities to be healthy or to be part of a community. The CA has become an influential normative framework for reflecting on justice, equality, well-being and development. In the past decades it has been successfully applied to areas such as education and health care. Only quite recently have scholars started to use the CA to reflect on technology, for example on the contribution of ICT to development in the South (ICT4D). Much of this work is empirical. This dissertation contributes to the theoretical foundations for future empirical and ethical work by providing a philosophical exploration of how the CA can be brought to bear on technology. It discusses the applicability and added value of the CA for the design of technical artifacts ('capability sensitive design'), for the evaluation of technological development projects, and for the assessment of technology from the perspective of the good life.

One main question addressed in this dissertation is which technology theories and design approaches could fruitfully supplement the CA, in order to 'operationalize' it in this new area. For this purpose participatory design, value sensitive design, the use plan account of technical artifacts, inclusive/universal design, actor-network theory, appropriate technology, pluralist theories of technology and the system/network view of technology are discussed. Another guiding question is what the exact nature is of (a) human capabilities as discussed in the CA, and (b) technology in the sense of technical artifacts, and how we can then conceptualize the relation between them. It is argued that we need to regularly move back and forth between 'zooming in' and 'zooming out'. The former allows us to see the details of design of technical artifacts, the latter how exactly technical artifacts are embedded in broader socio-technical networks. Both, it is claimed, are crucial for the expansion of human capabilities.

'Wonder en is gheen wonder'

3TU. Centre for Ethics and Technology

TU Delft
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Enschede - The Netherlands

Taking a Capability Approach toTechnology and Its Design

Ilse Oosterlaken

Simon Stevin Series in the Ethics of Technology

Taking a Capability Approach to Technology and Its Design

A Philosophical Exploration

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The abstracts included here are the original abstracts, whereas in the introduction the abstracts have been re-written in order to better bring out the threads that run through this dissertation.

I. ZOOMING IN: HUMAN CAPABILITIES & THE DESIGN OF TECHNICAL ARTEFACTS

Chapter 2

Oosterlaken, I. (2009) 'Design for Development – A Capability Approach', in: *Design Issues* 25(4):91-102

Abstract In this article I suggest a capability approach (CA) towards designing for society, and particularly the world's poor. I will explain that the CA assigns a central place to human capabilities in our discussions of justice and development, and criticizes a focus on utility or preference satisfaction. In the literature on the CA, technical artifacts have hardly been acknowledged as an input for human capabilities, although Sen and some other authors sometimes refer to the example of a bicycle that expand one's capabilities to move about. Using Bijker's analysis of the history of the development of the bicycle, I argue that the details of design are very important for an artifact's impact on human capabilities. In current design practice the focus is, however, too much on things like usability and user satisfaction. Where Buchanan has argued that design should rather find its ultimate ground in human rights and human dignity, I propose human capabilities as an alternative. Due to the functionalistic orientation of the CA, this alternative may be more fruitful and appealing to designers. Analogue to 'value sensitive design' – an emerging approach in the ethics of technology - we should thus look into the possibility of 'capability sensitive design'. What this entails exactly should be investigated, but it is likely that it will turn out to have commonalities with existing design movements like participatory design and universal design. The article will end with some suggestions for further research on a CA of design.

Chapter 3

Oosterlaken, I. (forthcoming) 'Design and Individual Human Capabilities - A Capability Approach of Design for Values', in: Van den Hoven, J., Van de Poel, I. & Vermaas, P.E. (eds.), *Ethics and Values in Technological Design*. Dordrecht: Springer.

Abstract Technology and the expansion of human capabilities are intimately related. This chapter discusses an influential philosophical framework that attaches central moral importance to human capabilities, namely the so-called 'capability approach' (CA), and explains in which ways it has relevance for design. A distinction will be drawn between two different, although related design applications of the CA. Firstly, in the 'narrow' usage the CA is seen as presenting a proper conceptualization of individual well-being, namely in terms of the capabilities that a person has. The aim of design is then to contribute to the expansion of these capabilities, to which I refer as 'capability sensitive design'. I will discuss two challenges for capability sensitive design, namely an epistemological and an aggregation challenge. Secondly, in the 'broad' usage the CA is seen as a source of insight and inspiration for taking a broader range of values and concerns into account in design, such as inclusiveness, agency, participation and justice. From this perspective, so it is argued, strong parallels can be drawn with participatory design and universal design. In reality both the narrow and the broad usage of the CA in design should go hand in hand. The chapter ends with some reflections on the challenges ahead in making the philosophical literature on the CA accessible to and usable by designers.

II. ZOOMING OUT: HUMAN CAPABILITIES & THE EMBEDDING OF TECHNICAL ARTEFACTS

Chapter 4

Oosterlaken, I. (2012) 'Inappropriate Artefact, Unjust Design? Human Diversity as a Key Concern in the Capability Approach and Inclusive Design', in: Oosterlaken, I. & Van den Hoven, J. (eds.), *The Capability Approach, Technology & Design*, Springer, Dordrecht.

Abstract Human beings differ from one another in countless ways, both in their personal characteristics and circumstances. Within political philosophy this fact of human diversity has been emphasized by the capability approach (CA) of Nussbaum and Sen, within engineering by social design movements like universal/inclusive design. Capability theorists reflect intellectually on the importance of human capabilities and recognize the fact that resources do not always expand them. For example, the possession of a bicycle does not expand what a disabled person can do or be. Social design movements seek practical solutions for challenges of human diversity by creating products that do expand the capabilities of formerly excluded user groups, for example a manually operated tricycle for disabled people in developing countries or building that are accessible by wheelchairs. Using insights from analytical philosophy of technology I will first argue that the commonalities between both perspectives run deeper than one might think; the concern for human capabilities is something deeply engrained in the nature of technical artifacts and engineering design. Secondly and more importantly, I will give a philosophical account of the meaning of and grounds for statements like 'this bicycle is inappropriate for disabled users'. This has been lacking in the literature so far and one might say that the CA and the inclusive design movement offer a forceful reminder to philosophy of technology of the importance of human diversity, which often necessitates us to make such statements. However, to judge that inappropriateness implies injustice – as we do in the case of wheelchair-unfriendly buildings – requires further normative principles. The capability is able to offer this, considering its arguments for the normative value of human capabilities.

Chapter 5

Oosterlaken, I. (2011) 'Inserting Technology in the Relational Ontology of Sen's Capability Approach', in: *Journal of Human Development and Capabilities* 12 (3):425-432.

Abstract In the July 2009 issue of the Journal of Human Development and Capability, Smith and Seward set out to explicate a philosophical ontology of human capabilities that, they say, is implicit in the work of

Sen. In the resulting critical realist ontology human capabilities are contextual and relational in nature, as (p.214) - "a particular capability is the outcome of the interaction of an individual's capacities and the individual's position relative to others in society" [i.e. within the existing social structures]. Using insights from philosophy of technology / science and technology studies, it is argued that the ontology of Smith and Seward can and should be extended; not only individuals and social structures, but also technological artifacts should be recognized as important constituents of human capabilities.

Chapter 6

Oosterlaken, I., Grimshaw, D.J. & Janssen, P. (2012) 'Marrying the Capability Approach with Appropriate Technology and STS; The Case of Podcasting Devices in Zimbabwe', in: Oosterlaken, I. & Van den Hoven, J. (eds.), *The Capability Approach, Technology & Design*, Springer, Dordrecht.

Abstract 'Kamuchina kemombe' is what the people in the Mbire district in Zimbabwe have started to call the mp3 players which were introduced by the NGO Practical Action. The literal translation of this is 'a machine with knowledge of cattle management'. Using this case, this chapter aims to illustrate both (a) what the added value of the capability approach (CA) for reflecting on technological development projects could be and (b) how the CA so applied could benefit from insights of existing theories and approaches with respect to technology, more in particular the appropriate technology movement and science and technology studies. Such connections are necessary in order to effectively apply the CA to the domain of technology, as it is a conceptual framework that on its own does not offer much insight into the interaction between technology, individuals and society. However, the CA does have its added value for ICT for development (ICT4D). For example, Ratan and Bailur have shown that it allows us to conceptualize possible tensions between well-being and agency goals in the usage of so-called 'telecentres', a popular ICT4D project type. A further aim of this paper is to show – by discussing the mp3 players in comparison to other possible technology choices - that questions about agency and well-being are not only raised by ICT usage, but also by technological design and technology choice.

Chapter 7

Oosterlaken, I. (under review) 'Technology, Individual Freedom and the Good Life – A Capability Approach', submitted to *Philosophy & Technology*.

Abstract Philosophers of technology have recently argued for more public deliberation about technology and the good life. One reason is that technologies cannot be confined to the private realm, considering that they tend to strongly transform the socio-technical systems/networks in which they become embedded. I propose using the capability approach (CA) as a conceptual framework or moral vocabulary that can facilitate such debates. I will explain that one can see the concept of 'human capabilities' as providing the link between more concrete technical artefacts and more abstract ideas about the good life. In this paper I compare the CA to the current dominant vocabulary in liberal societies, which emphasizes self-determination and limits public debate about technology to issues of harm. Swierstra (2002) already criticized this vocabulary, identifying two problems: (I) that technological alternatives remain opaque and (II) that people's preferences are not debatable. The CA, so I argue, does not suffer from those ills. An additional advantage of the CA is that it is able to take the system/network effects of technology into account as indirect influences on people's capabilities to lead the lives they have reason to value. Yet, as I will briefly discuss, the existence of such system/network effects does seem to strengthen doubts that critics have expressed on the possibility of applying the CA in public policy while remaining largely neutral towards the good life. Using the CA as the common vocabulary for public debates about technology and the good life will thus be controversial, despite its advantages.

III. ADDENDUM:
HUMAN CAPABILITIES & THE QUESTION OF THE METRIC OF JUSTICE

Chapter 8

Oosterlaken, I. (2012) 'Is Pogge a Capability Theorist in Disguise? A Critical Examination of Thomas Pogge's Defence of Rawlsian Resourcism', accepted for publication in: *Ethical Theory and Moral Practice,* published on-line on 22 February 2012 (DOI 10.1007/s10677-012-9344-9).

Abstract Recently Thomas Pogge's article (2002) 'Can the Capability Approach be Justified?' was reprinted in an abridged version in an edited volume on Rawlsian primary goods versus human capabilities as the metric of justice. In his essay Pogge answers the question that he poses with a distinct 'no' and he defends the Rawlsian resourcist approach against the capability approach (CA). In this debate contribution I would like to argue two things. Firstly, making use of Pogge's own example of certain types of traffic lights not being appropriate for blind people, I will argue that he is actually implicitly relying on the idea of capabilities in his defense of primary goods. And secondly, when reading Pogge's article carefully, it becomes clear that his apparent rejection of capabilities as the evaluative space for justice is masking something else. What Pogge, on a more fundamental level, seems to disapprove of is the widening by many capability theorists of the scope of justice beyond institutional design, to include things like social practices and culture as well.

1 Introduction

As mundane as some technological artifacts may seem to be, there is sometimes a rich story to be told about their meaning for or impact on human lives. Take for example a lamp. It has a rather straightforward function: to give light. Since lamps are ubiquitous in modern, western society, we rarely stop to reflect on them. Yet due to factors such as low income or the absence of an electricity infrastructure, having light is not self-evident for everyone. In 2008 I met an industrial design engineer who had worked on several design projects for poor communities in the global South, including the design of different types of lamps. The experiences gained during that work, so he told me, made him realize that lamps are ultimately not about light. The importance of a lamp lies in the fact that it enables you to do things that contribute to the overall quality of life, for example to go to the outdoor toilet at night without being afraid, or to complete your homework in the evening after having looked after your family's cattle all day. Getting this broader perspective, he felt, is important for a designer.

Let's switch from lamps to mobile phones. These artifacts have in the past decade become popular as a 'weapon against poverty'. An example that has regularly featured in the popular media is that of small farmers who – thanks to their mobile phones – can now acquire information on crop prices at different markets. In that way they are allegedly able to cut out the middle men and sell their crops for a better price. What also received a lot of attention at some point are so-called telecenters, where people in rural areas could go to get access to the internet. Farmers would, for example, be able to get information on better farming methods. The idea is that these ICTs lead to a better income for the farmers. In turn this could lead to other improvements for rural families, expanding what they can do and be in life: to be healthy, because medicines are now affordable, or to be educated, because school fees can now be paid. In short, ICT became very popular in development cooperation in the late 1990s – there nowadays exist even several specialized academic journals on 'ICT for Development', or ICT4D for short. This led to a counter-movement that criticized 'mainstream' ICT4D in different ways, for example pointing out that a technology does not always, everywhere and for everyone automatically lead to

changes that are real improvements in one's life. Just to give one example: the information available on the internet may not be suitable for the local farming system, and the literacy of the farmer could be insufficient for accessing it.

Technology has, so these simple examples illustrate, the potential to contribute to the quality of life by expanding what people can do or be, their capabilities – yet it is not self-evident that technology indeed succeeds in this. This doctoral dissertation reflects on the relation between technology and human capabilities, working from a general philosophical, evaluative framework that attaches central moral importance to certain human capabilities, namely the so-called 'capability approach' (CA). In this approach - for which Amartya Sen and Martha Nussbaum have done much of the ground work – human capabilities are often described as the real opportunities or positive freedoms for a person to do and be what he/she has reason to value. Often mentioned examples of valuable capabilities are the capability to be healthy, or to be part of a community. The CA acknowledges that a multitude of such incommensurable capabilities matter for well-being or the quality of life. The approach has become quite successful and influential in development studies, but there is nothing inherent in the CA that limits its applicability to the context of poverty reduction and underdevelopment. It has indeed also been applied in Western countries. One could even argue that its acknowledgement of the multidimensionality of well-being softens the distinction between 'developed' and 'developing' countries, as countries can score better or worse on different dimensions. For example, many will agree that the USA, although one of the richest countries in the world, does quite poorly in guaranteeing for all its citizens the capability to be healthy.[1] So the CA focuses on human capabilities, but for what purposes? According to a recent introduction to the CA;

> "is generally understood as a conceptual framework for a range of normative exercises, including most prominent the following: (1) the assessment of individual well-being; (2) the evaluation and assessment of social arrangements; and (3) the design of policies and proposals about social change in society." (Robeyns 2011)

[1] Since the 1980s questions have arisen anyway about the right of existence for development studies as a separate discipline (Schuurman 2008). One question that arose was how much sense the opposition developed-developing (still) makes, considering the lack of homogeneity amongst countries in either category.

The articles in this dissertation – which have previously been published elsewhere or are currently under review - together explore, from a philosophical and theoretical perspective, how the CA can be brought to bear on (2) the evaluation and assessment of technology and (3) the design of technical artifacts as one way to bring about a positive change in people's life. Although some of the articles specifically mention and discuss technology and design in the context of 'developing' countries and poverty reduction, there is no specific or exclusive focus on this context of application. The main reason is that at the abstract level of theory formation and philosophical reflection on human capabilities, technology and design – on which this dissertation focusses, but more about that later - this difference in context is not that important.[2]

In this introduction I will discuss a number of things in order to put the various chapters into a broader perspective and clarify the threads that run through them. Firstly, I will sketch the theoretical and practical developments, challenges and opportunities that have induced me to take up this specific project (§1.1). Secondly, I will describe the state-of the-art of research on the CA, technology and design (§1.2). Thirdly, I will explain the main guiding questions and reflect on what 'operationalizing' the CA in a new domain implies (§1.3). Fourthly, I will discuss the view that I developed on the nature of the relation between technology and human capabilities, which has given this dissertation its main structure (§1.4). Fifthly, I will present a reading guide and give a preview of the different chapters (§1.5). Finally, I will end by looking ahead at future research that could be done on the CA, technology and design (§1.6). Throughout this introduction I will assume that the reader of this doctoral dissertation is already familiar with the most central concepts and ideas of the CA (but if not, I recommend reading annex I before continuing).

1.1. Project background: developments, challenges and opportunities

Interesting research generally does not appear in a vacuum, but is initiated in response to developments, challenges and opportunities elsewhere, be it theoretical or practical. In this section I will briefly acknowledge the most important influences on this dissertation, in order to put it into context. The

[2] Of course this does not imply that there may not be specific ethical issues that arise once one moves into concrete cases of technology being transferred to or implemented in a development context.

shoulders on which I stand include those of many contemporary philosophers of technology. A central, common view in this field is that technology is value-laden rather than value neutral, meaning that from an ethical perspective the characteristics of the technology itself matter, and not only how people decide to use it (Franssen, Lokhorst, and Van de Poel 2009). An immensely important development in this field has been the "empirical turn" which took place at the end of the 20th century. Classical philosophers of technology had a tendency to talk about 'Technology' in general, often developing a negative view on this perceived monolithic phenomenon – for example, with technology supposedly being an alienating force. Contemporary ethicists of technology, however, hold that "philosophical reflection should be based on empirically adequate descriptions reflecting the richness and complexity of modern technology" (Kroes and Meijers 2000). This approach allows us to acknowledge and distinguish problematic as well as positive aspects of different technologies.

Against the background of these broad developments in the field, three important umbrella concepts nowadays guide a lot of research in the ethics of technology – within the 3TU.Centre for Ethics of Technology (3TU.Ethics), but also elsewhere – are 'Ethical Parallel Research', 'Value Sensitive Design' and 'Responsible Innovation'. The idea of Responsible Innovation is that we should not only regulate the usage of technology in light of the values that we have as a society, but we should first and foremost take important ethical issues and stakeholder views already pro-actively into account during the development phase of technology, right from the start (see e.g. Van den Hoven et al. forthcoming). Value Sensitive Design (VSD) can be seen as one aspect or way of doing Responsible Innovation.[3] The idea of VSD is that we should explicitly, thoroughly, and systematically reflect on relevant values, their operationalization and trade-offs during the design phase of technical artifacts (see e.g. van den Hoven 2007). The idea of Ethical Parallel Research is that ethicists take on a role of 'embedded researchers' within real-life, on-going R&D and design projects, thus bringing in their expertise while closely collaborating with scientists and engineers.

[3] The term Responsible Innovation is from fairly recent origin – it emerged only a couple of years ago, but has quickly gained popularity. However, the ideas that are central to the concept have been around much longer. Although the term VSD has been around much longer, it makes sense to link them in this way.

When I joined 3TU.Ethics as its communication/policy officer shortly after its establishment at the end of 2006, I was greatly inspired by the work going on there in the area of responsible innovation and value sensitive design. Having some background in - amongst others - technology and development studies, I found it a pity though that the work being done there did not at all address the context of poverty and underdevelopment in the global South. I started exploring this and quickly discovered that this reflected a general lack of attention for the topic amongst philosophers and ethicists of technology more broadly (as also noted by Selinger 2007, 2009).[4] Around the same time I met Prabhu Kandachar, a professor at TU Delft's Faculty of Industrial Design Engineering (IDE), who was leading a group working on 'design for development' and had already inspired dozens of master students to execute projects in this area (see Kandachar et al. 2007; Kandachar, De Jongh, and Diehl 2009). Kandachar told me that although these projects are often quite successful, they sometimes also raise questions which have philosophical and ethical components: How should we understand 'good development' and 'poverty reduction', and how can we conceptualize the role of design in this? If it concerns a process of increasing people's well-being: how should we in turn understand this term and what implications does that have for designers and the way they go about doing their work? The work of the IDE Faculty thus seemed to provide an opportunity for collaboration on research into 'value sensitive design and innovation for development.' Fortunately, the Netherlands Organization for Scientific Research (NWO) launched a grant program called Responsible Innovation in that period. Supported by Jeroen van den Hoven, scientific director of 3TU.Ethics, I started writing a project proposal for this program.

The process of preparing the grant application led to a working paper (Oosterlaken 2008) and shortly after to a journal article titled *Design for Development – A Capability Approach* (Oosterlaken 2009, included in this dissertation as chapter 2), which sets out the basic motivation for and ideas behind the resulting research project. A core idea in this research proposal is that of 'capability sensitive design', analogous to that of 'value sensitive design'. The idea of capability sensitive design is that the conceptual and normative

[4] The same applies to the related field of science and technology studies (STS), so I realized when attending a major conference in this field in mid-2008 (4S/EASST, August 2008, Rotterdam). At this conference several sessions were organized that acknowledged this gap and explored how STS-scholars could start addressing 'development' and non-Western contexts more often and more systematically.

framework that the CA offers can help designers to explicitly and systematically reflect on their work in relation to social change and development, which should ultimately lead to designs that contribute more to the realization of the values at stake, like well-being, agency and justice. Central in such a process would of course be that which is also so central in the CA itself: human capabilities. Review reports were positive and in June 2009 my co-applicants[5] and I received an NWO grant of €550.000 euro for our project. In September 2009 I started as one of the three PhD students in this project, which has led to this dissertation. The other two PhD students are designers, one working at the IDE Faculty in Delft and the other at the Indian Institute of Science in Bangalore. In their work – which will continue until September 2014 - the context of developing countries plays a larger role than it does in my own project, which explores the theoretical and philosophical foundations for applying the CA to technology and design.

Having sketched some theoretical developments and practical opportunities that led to this research project, the reader may still wonder about one important question: why the CA? Why did we choose that as our main theoretical and conceptual framework? An important reason was that intuitively, it simply seemed to make sense to suppose that there is a close link between the nature of technical artifacts and what people are able to do and be, in other words: their capabilities. I have clearly not been the only one perceiving this and in recent years philosophers of technology have expressed, clarified and discussed this thought in different ways (i.e. Lawson 2010; Van den Hoven 2012; Illies and Meijers forthcoming). Because of the existence of this intuitive link between technology and capabilities, a normative approach that attaches central moral importance to human capabilities becomes attractive for ethicists of technology. That the literature on the CA engages so extensively with the issue and context of poverty and underdevelopment of course also made it attractive for the NWO project as a whole. A first superficial exploration of the CA in preparation of the project proposal also revealed many other aspects that seemed promising. One such aspect is that the body of literature on the CA includes both normative and descriptive work, which makes it in principle very suitable for ethics of technology after the empirical turn. Furthermore, discussions taking place within the CA on notably the role of participation, 'conversion factors' and the status of people's preferences seemed relevant for challenges in 'design for

[5] These are Jeroen van den Hoven and two design scholars: Prabhu Kandachar (TU Delft) and Monto Mani (Indian Institute of Science).

development.' Finally, the CA has already been successfully applied to a range of areas and issues, including health, education, disability and gender (Robeyns 2006). This too seemed to make it worthwhile to explore what the CA could mean for yet another area of application: technology and design – an area that was until recently largely ignored in the literature on the CA, as the next section will explain.

1.2. Research on the CA and technology: the current landscape

That technology is - in various ways - relevant for human development, justice, equality, well-being and empowerment is almost too obvious to mention. Yet until recently the CA had, despite being an influential framework for critical engagement with such issues, hardly been applied as a theoretical and normative lens to look at technology. The only example of a technology found in the mainstream literature on the CA was a bicycle, which Sen used to illustrate a limited point, namely how a focus on capabilities differs from a focus on either resources or utility. It may also be telling that technology is not mentioned in an enumeration of possible capability inputs that Robeyns (2005) gives in her much cited 'theoretical survey' of the CA:

> "For some of these capabilities, the main input will be financial resources and economic production, but for others it can also be political practices and institutions, such as the effective guaranteeing and protection of freedom of thought, political participation, social or cultural practices, social structures, social institutions, public goods, social norms, traditions and habits. The CA thus covers all dimensions of human well-being."

In other words: technology has for a long time not been on the radar of core capability scholars, but in the margins of the mainstream literature on the CA some people started to explore its relevance for reflecting on technology. Although the first specialized publication on the CA and ICT appeared already at the end of the 1990s (Garnham 1997), up to 2007 less than a dozen publications focusing on the CA and technology appeared, spread over different disciplines and journals. This has, however, quickly changed since roughly 2007. Just to give an indication: a bibliography that I compiled in early 2012 on the CA and innovation, technology and design contained 79 publications that substantively

engage with the topic, 91% stemming from 2006 or later and 53% originating from 2010 or later. Parallel to this steep increase in the number of publications on the topic, a research community has formed itself in the past couple of years.

In these developments I have played a role as a catalyst; I was initiator and co-founder, at the 2009 conference of the Human Development & Capability Association (HDCA), of a thematic group 'technology & design'. The HDCA thematic group 'technology & design' now counts more than 30 members. The community building process and visibility of the topic recently received an extra boost at the 2011 HDCA conference, which I organized in The Hague with 'innovation, development and human capabilities' as that year's theme. Subsequently I was guest editor of an issue of the HDCA's e-bulletin Maitreyee – appearing twice a year, each time giving an overview of state-of-the-art work on a different topic – on the CA and innovation, technology, and design (Oosterlaken 2012c). Four other publications, two of which I initiated, have recently also contributed to the development of this research area and community by bringing together the work of different authors:

- The journal *Information Technologies & International Development* published an issue on the human development paradigm as promoted by the United Nations Development Program (UNDP), which is based on the CA (2010; special issue in vol. 6).
- I took the initiative for a special issue of the journal *Ethics and Information Technology* (2011; 13:2) on the CA (Oosterlaken and Van den Hoven 2011a).
- The journal *Information Technology for Development* (2012; 18:1) recently also published a special issue on the CA (Anderson et al 2012).
- I took the initiative for the edited volume *The Capability Approach, Technology and Design*, which was recently published by Springer (Oosterlaken and Van den Hoven 2012).

Most scholarly work on the CA, technology and design thus originates from the last couple of years. For those interested in an overview I have included one in annex II, in which I have also indicated where my own papers fit in with the

current landscape.[6] Of course in the different chapters in this dissertation I refer to the work of others whenever useful or appropriate.

One way of mapping the research landscape on the CA, technology and design would be to try and distinguish between research that focuses on developing or on developed countries. The publications that have appeared on the CA and ICT4D – on the latter several specialized journals exist, see also the bullet list above - would clearly fall into the former category (e.g. Zheng 2009; Kleine 2010). Some work addresses issues that seem to have particular relevance and urgency for developed, Western countries (e.g. the work of Coeckelbergh 2009; 2012, on the CA and the usage of sophisticated robots in health care). Yet other work again transcends this distinction, being about general issues with potential relevance to both developed and developing countries (e.g. the work of Murphy and Gardoni 2006, on the CA, hazards and engineering risk analysis). As I already explained before, I would consider my work to fall into this last category, although the usefulness of the whole distinction can be questioned.

There are at least three other ways in which this dissertation could be characterized and compared to the work of others on this new and emerging research topic. Firstly, an overwhelming majority of the work done focusses on ICT, and more specifically on ICT4D, while I address technology more broadly. Secondly, most of the work done focuses on technology assessment or the evaluation of projects implementing a certain technology, while I also specifically address the design of technical artifacts. Thirdly, many scholars working on this topic come from the empirical sciences, while I have a philosophical/ethical outlook. Taking the latter perspective is important because the topic raises important normative and conceptual issues that cannot be addressed by purely empirical research. That being said, I should acknowledge that none of these three things separately make my work truly unique and there are certainly many commonalities to be found with other recent work. For example, some authors have used the CA to discuss energy technology rather than ICT (Fernández-Baldor, Hueso, and Boni 2012; Mathai 2012). Some people have also written about the CA and design (e.g. Toboso 2011; Nichols and Dong 2012). And some scholars share my philosophical/ethical take (Coeckelbergh

[6] Two early publications on the topic, both exploring the possible added value of the CA for reflecting on ICT and both sketching a research agenda are highly recommendable as a first introduction. The first is an article of Johnstone (Johnstone 2007) on the CA and computer ethics, the second is a paper of Zheng (2007; rewritten version published in 2009) on the CA and ICT4D.

2011; Clague 2006). However, the combination of these three things – looking at technology in general, including engineering design and taking a philosophical/ethical perspective - might be considered to give this dissertation a quite distinct character.

1.3. Main guiding question: 'operationalizing' the CA for technology

In the previous section I emphasized the newness of the specialized research area to which this dissertation belongs. One reason to do so is that this at least partly explains its exploratory nature. If it had already been a well-established area, I might have chosen instead to focus on a small issue or specific question in need of more work, building on an existing research tradition and body of literature. My work in the past couple of years has, however, been more of an attempt to explore the area, rather than to give a detailed answer to precise questions formulated in advance. The main guiding question has simply been: *How can the CA be brought to bear on technology, and what is the potential added value?* The chapters in this dissertation illustrate that there are different ways to answer this question: the CA is argued to be applicable to and to have added value for the design of technical artifacts (chapter 2, 3), for the evaluation of technological development cooperation projects (chapter 6), and for the assessment of technology from the perspective of the good life (chapter 7). One might initially think that the main guiding question concerns merely a matter of 'operationalizing' the CA in yet another domain. However, often one cannot simply and straightforwardly apply the CA to a new issue or domain. As Robeyns (2005) has pointed out:

> "The CA is not a theory that can explain poverty, inequality or well-being; instead, it rather provides a tool and a framework within which to conceptualize and evaluate these phenomena. Applying the CA to issues of policy and social change will therefore often require the addition of explanatory theories."

Without additional explanatory technology theories one can still use the CA to assess – for example - how well an ICT4D project contributes to human development. The CA would recommend making the expansion of valuable capabilities of different categories of individuals a central element in the project evaluation. However, without additional 'technology theories' from fields like

Philosophy of Technology (PoT) and Science and Technology Studies (STS) the technology in question can and will then only be discussed in a generalizing or superficial way, it remains a black box. This means that there would be an important limitation on one's ability to explain the project's outcome. One would then not be able to investigate if the choice of the technology, or the way in which it was designed, or its embedding in socio-technical networks, plays an explanatory role in achieving the project outcomes (for an example of all this, see the case in chapter 6). One might not even think of asking these things, as without any technology theories one might not even be able to fully see their relevance.

The main guiding question thus implies the following question: *Which technology theories and design approaches could fruitfully supplement the CA?* In order to answer this question, one needs to draw on existing disciplines reflecting on technology, like PoT and STS. Indeed, as I also pointed out in my introduction to the volume *The Capability Approach, Technology and Design* (Oosterlaken 2012a), this integration of the CA with technology theories is exactly what a number of scholars are nowadays working on. For example, Zheng and Stahl (2011, 2012) have extensively discussed that combining the CA with critical theory, as employed in STS and information systems research, would enable the CA to come to grips with the power dimension of technology, which is of course relevant considering the CA's commitment to empowering people to lead the lives they have reason to value. Which technology theories or design approaches one chooses will of course in part depend on one's purpose, but also on things like the general merits of these theories and approaches. Table 1.1 gives an overview of ones that are mentioned or discussed in some detail in the diverse chapters. The sheer amount of them already shows that there is no one single way to 'operationalize' the CA in the domain of technology and design, and certainly there exist more theories and approaches that could fruitfully supplement the CA, but have not been discussed in this dissertation.

Making a connection between the CA and some technology theory or design approach may sometimes not only be needed to 'operationalize' the CA, but may actually also be beneficial for the technology theory or design approach in question. For example, the CA has arguably something of value to offer to the movements promoting participatory design (chapter 2), inclusive/universal design (chapter 3) and appropriate technology (chapter 6). In all these cases, generally speaking the added value of the CA lies – not surprisingly - in its ability to facilitate a coherent and systematic *normative* reflection on the values at stake

in the approach in question. Values like agency, justice and well-being become more tangible for engineers and designers by relating them, as the CA does, to concrete capabilities and the conversion factors relevant for certain technologies. Likewise, Zheng and Stahl (2011) assert that the CA has added value for critical theory. They feel that critical theorists sometimes get stuck in their attempt to "debunk positive myths" about technology by continuously pointing out how technology is implied in the distribution of power and sometimes even in outright oppression. The CA, however, "by seeing ICT as a means to development and asking questions about what conversion factors need to be in place to facilitate the achievement of potential freedom that technology provides" provides a counterpoise to that tendency. It does so by drawing attention to the potential positive role of technology in the expansion of valuable capabilities.

With respect to the choice of technology theories and design approaches supplementing the CA, two general issues are worth highlighting. The first is that it may not be inconsequential which 'supplements' one chooses. Although making such a choice will generally speaking be unavoidable to 'operationalize' the CA, it may sometimes also be a choice that becomes a topic of disagreement and debate. For example, Robeyns (2008) has shown that one may arrive at different capability analyses or normative evaluations of certain gender cases, depending on whether one supplements the CA with a conservative or feminist gender theory. It is thus not only the CA that does all the work in such analyses. Something similar holds when applying the CA to technology cases. An example of this can be found in chapter 7, in which 'pluralist technology theories' are contrasted with a 'system/network view of technology'. This chapter illustrates that when reflecting on technology and the good life, what one sees through the lens CA will also depend on which of these filters one adds to this lens. The second issue is that one should of course be aware that different theories and approaches may, in more or less subtle ways, not be compatible – for example, because underlying assumptions or the understandings of certain notions are clashing. An illustration of this can be found in chapter 5, which draws on Actor-Network Theory (ANT) in order to explain how technology can be given a place in the philosophical ontology underlying the CA. In annex I to this chapter I explore the compatibility of the CA and ANT in some more detail, in this case with the conclusion that one should explicitly drop or selectively accept certain parts of either approach to ensure coherence.

Title of paper	Discussed in some detail	Mentioned
I. ZOOMING IN: HUMAN CAPABILITIES & THE DESIGN OF TECHNICAL ARTEFACTS		
2. Design for Development – A Capability Approach	Participatory design	Appropriate technology Inclusive/universal design Value sensitive design
3. Design and Individual Human Capabilities – A Capability Approach of Design for Values	Value sensitive design	Participatory design Inclusive/universal design
4. Inappropriate Artifact, Unjust Design? - Human Diversity as a Key Concern in the Capability Approach and Inclusive Design	Use plan account of artifacts Inclusive / universal design	---
II. ZOOMING OUT: HUMAN CAPABILITIES & THE EMBEDDING OF TECHNICAL ARTEFACTS		
5. Inserting Technology in the Relational Ontology of Sen's Capability Approach	Actor-network theory	---
6. Marrying the Capability Approach with Appropriate Technology and STS - The Case of Podcasting Devices in Zimbabwe	Appropriate technology movement Actor-network theory	Critical theory
7. Technology, Individual Freedom and the Good Life – A Capability Approach	'Pluralist' technology theories System/network view of technology	Instrumentalism
III. ADDENDUM: HUMAN CAPABILITIES & THE QUESTION OF THE METRIC OF JUSTICE		
8. Is Pogge a Capability Theorist in Disguise? – A Critical Scrutiny of Thomas Pogge's Defence of Rawlsian Resourcism	---	---

Table 1.1 - Technology theories and design approaches supplementing the CA

[7] To avoid confusion: despite the title, chapter 4 does not discuss the appropriate technology movement. Rather, it develops a certain theoretical notion of appropriateness based on a philosophical account of technical artifacts.

1.4. The technology-capability relation: zooming in, zooming out

In the process of thinking through and investigating in detail the main guiding question – how can the CA be brought to bear on technology and design, and what is the potential added value? - lots of different additional questions of course arise. I will not list and discuss them all here, but instead refer the reader to the different chapters. However, one of the most fundamental questions that was raised during this research is the following: *What is the nature of the relation between technology and human capabilities?* Answering that question requires, of course, that one gains a good understanding of both the nature of human capabilities within the context of the CA and the nature of technology. Some of the explanatory technology theories listed in table 1 have actually been used for the latter. There is, however, no agreement or single dominant view concerning what is the nature of technology. Throughout history and in different disciplines 'technology' has been defined and understood in a range of ways, for example as a product, a process or a form of knowledge (Mitcham and Schatzberg 2009). This introductory chapter is not the place to discuss this in any detail, but broadly speaking the view of technology adopted in this dissertation is that it concerns a set of material artifacts, or systems of such artifacts, designed to perform a certain function. On the nature of human capabilities one could of course also have different views, but within the CA concept has been understood in a quite specific way, which is most explicitly addressed in chapters 4 and 5. These chapters make clear that within the CA 'human capabilities' have a relational and contextual nature and that the term is used as an ethical category.

Based on this starting point, the basic view that emerged during this doctoral research project – which then became, see the table of contents, the structuring principle for this dissertation – is that understanding the relation between technical artifacts and human capabilities requires us to regularly move back and forth between 'zooming in' and 'zooming out':

- 'Zooming in' (part I of this dissertation) allows us to see the specific features or design details of technical artifacts;
- 'Zooming out' (part II of this dissertation) allows us to see how exactly technical artifacts are embedded in broader socio-technical networks and practices.

Both the details of design and the socio-technical embedding of technical artifacts, so the chapters to this dissertation taken together show, are relevant factors in the expansion of human capabilities. The latter perspective also takes on board cultural norms, collective usage practices and other 'soft', non-material factors. If one were to adopt the view of technological determinism[8], one would arguably be inclined to adopt mainly or exclusively the zooming-in-perspective. If one were to adopt the view of social determinism, one would arguably be inclined to adopt mainly or exclusively the zooming-out-perspective, be it that one would speak of *social* instead of *socio-technical* networks, structures and practices. Just like much contemporary work in philosophy of technology, this dissertation thus steers a middle course, one could say, between the extremes of technological determinism and social determinism (for an elaboration see annex II with chapter 5). It suggests two basic, complementary strategies if e.g. a development organization aims to effectively expand the human capabilities of marginalized groups with the help of technology. On the one hand one may make the design of a technical artifact appropriate – to the degree possible - for the relevant socio-technical network or usage environment as it exists (see chapter 4). On the other hand one may make sure – to the degree possible - that the introduction of a technical artifact is accompanied by appropriate changes in the surrounding socio-technical networks (see chapter 5). Preferably both strategies should be combined – as illustrated by the analysis of a quite successful ICT4D project in chapter 6.

By discussing the 'zooming out' perspective in Part II of this dissertation, I have – so the reader may note - cast my net wider than just thinking through the idea of 'capability sensitive design' that was, analogue to that of 'value sensitive design' (see §1.1), originally the direct cause of starting up this research project. In my view there is value in the comprehensive, integrated investigation of the topic that I have undertaken. Capability sensitive design should, so I believe, ideally be based on a thorough understanding of the CA, relevant PoT/STS insights and theories, and the understanding that this gives us of the relations between technical artifacts and human capabilities. These relations are multiple and complex. In making that clear, part II has some relevance to designers. For

[8] With technological determinism I do not mean the view that technology develops autonomously, without human influences, but the view that "the physical materiality of technology plays a [determining] causal role in social change" and its social impact (Smith, 2006).

example, chapter 7 discusses the intimate relation between technology, human capabilities and the good life. It proposes that human capabilities can be seen as the implicit or 'missing link' between more comprehensive ideas of the good life and concrete technical artifacts. The chapter talks about the assessment of technology and does not address its design so much, but this discussion could also feed back into design processes; Swierstra and Waelbers (2012) argue that designers should reflect on the good life implications of their work, amongst others by asking questions like "will the technology support or limit our freedom?" The CA, so part I of this dissertation can be taken to argue, makes this question more tangible and concrete for designers, by inviting them to think about it in terms of concrete valuable capabilities and relevant conversion factors. Chapter 7 could provide additional input in such a reflection process by encouraging designers to also take possible long-term, wider network/system effects, which may have indirect effects on people's capabilities, into consideration in their design decisions. The view on the technical artifact – human capability relationship set out in part II thus has relevance for the idea of 'capability sensitive design' posed in part I.

That being said, I realize that some readers might want to raise some skeptical doubts at this point. Part II makes clear that human capabilities to a large extent depend on the wider socio-technical networks in which technical artifacts are embedded. Whether somebody has certain 'human capabilities' is within the CA to a large degree a matter of 'all things considered' – human capabilities are contextual and relational in nature (see chapter 5), and institutions, additional infrastructure, cultural norms and practices, personal characteristics and so on all matter as inputs, or alternatively as constitutive elements. Technical artifacts are but one element in this constellation, and their effect on human capabilities to a large degree depends on this larger context of implementation and usage. Chapter 4 discusses that – at least to some degree – effective engineering design almost per definition means taking a relevant part of the environment, first and foremost the physical environment, into account in design choices, in that way ensuring that a design is effective in this environment. Yet it seems undeniable that there are substantive limits to the degree to which designers can take responsibility for the wider socio-technical environment in which their products will be embedded, and thus for the effective creation of valuable human capabilities. This seems to be even more the case when we take into account the long-term and systemic effects of the introduction of new technologies, which may – as is argued in chapter 7 – have

an indirect effect on a range of valuable capabilities. One may therefore wonder if 'capability sensitive design' is not just a very nice idea that is very difficult, if not impossible to put into practice.

Within the limits of this introduction I can only give a tentative, sketchy answer to such skeptical questions. That the details of design often matter to some degree for the capabilities that technical artifacts do or do not expand, seems to me just as undeniable as the limitations to the influence of design, and some examples in different chapter (in e.g. chapter 2 and chapter 6) illustrate this. *To what degree*, so we can learn from the empirical turn in philosophy of technology (Kroes & Meijers, 2000), is not something that we can resolve in the abstract, for Technology in general. This therefore requires further study in real-world cases. In addition, I think that this skeptical response raises a further issue, namely about how we understand, organize and practice design. Earlier I said that the 'zooming in – zooming out' distinction suggests two basic, complementary strategies if e.g. a development organization aims to effectively expand the human capabilities of marginalized groups with the help of technology. One is to get the design right; the other is to effectuate socio-technical change. But instead of strongly contrasting them or seeing them as complementary, we should perhaps rather think about merging them by thoroughly re-thinking design itself and expanding its scope. The need to do so and take a 'systems view of design' is perhaps most salient in the context of developing countries, where even basic socio-technical networks and infrastructures are lacking (Sklar & Madsen, 2010), but even in the North this may sometimes be needed – an obvious example probably being electric cars, the introduction of which requires an integrated approach of both product design and socio-technical system development.

'Capability sensitive design', in order to become reality, may thus need to connect to current discourses on systems and design, like perhaps 'whole systems design' (e.g. Blizzard and Klotz, 2012), or the design of PSS, or Product/Service Systems (e.g. Morelli, 2002) – in which the availability of tools, methods and design principles is still one of the challenges. Also against the background of VSD or 'value sensitive design' it has been noted (Nathan, Friedman et al, 2008) that "a scarcity of methods exists to support long-term, emergent, systemic thinking in interactive design practice, technology development and system deployment." Philosophers of technology may also have a contribution to make to such a system-oriented endeavor to give the idea of capability sensitive design more substantive content (see e.g. Kroes, Franssen

et al, 2006; Krohs, 2008). But here I am already extending the ideas dealt with in this dissertation, brainstorming about possible interesting future research – which I will continue in §1.6. Next I would first like to introduce the reader in more detail to the chapters included in this dissertation.

1.5. Reading guide and preview of papers included

Having explained the main questions and structure of this dissertation, I will now introduce in more detail the papers included in it. As became clear in the previous sections, this dissertation draws on a variety of disciplines, including design studies and philosophy of technology. Naturally, it is very difficult if not impossible to address people from these different disciplines all at once, considering their very different backgrounds. What will be obvious and needs no explanation for people from one discipline may require elaboration for people from another discipline. And what is interesting or new from people from one discipline may not be so for people from another discipline. This is one reason why I have found a paper-based dissertation suitable, as it allows one to address different audiences with different papers. Some papers are primarily meant for designers, others for capability scholars and so on – which does, of course, not exclude the possibility that the papers could be of interest to people not belonging to the primary target group.

Take for example chapter 5 – originally written for the *Journal of Human Development and Capabilities*. This paper argues that technical artifacts can and should be inserted as a constitutive element of human capabilities in the relational ontology explicated in that journal by some capability scholars. Philosophers of technology may be interested in the details, but may not find the general message of the paper very surprising or new. Designers – to give another example – may be interested in the discussion in chapter 4 on the commonalities between universal/inclusive design and a CA of design. Yet the paper is primarily aimed at philosophers of technology and the account given of the nature of technical artifacts and engineering may be too philosophical and theoretical for the likings of many practice-oriented designers.

Title of paper	Published in	Primary target group	Possibly also of interest to
I. ZOOMING IN: HUMAN CAPABILITIES & THE DESIGN OF TECHNICAL ARTEFACTS			
2. Design for Development – A Capability Approach	Journal *Design Issues*(2009)	Designers	Capability scholars
3. Design and Individual Human Capabilities – A Capability Approach of Design for Values	Book *Ethics and Values in Technological Design* (forthcoming)	Designers	Philosophers of technology
4. Inappropriate Artifact, Unjust Design? - Human Diversity as a Key Concern in the Capability Approach and Inclusive Design	Book *The Capability Approach, Technology and Design* (2012)	Philosophers of technology	Designers
II. ZOOMING OUT: HUMAN CAPABILITIES & THE EMBEDDING OF TECHNICAL ARTEFACTS			
5. Inserting Technology in the Relational Ontology of Sen's Capability Approach	*Journal of Human Development and Capabilities* (2011)	Capability scholars	Philosophers of technology
6. Marrying the Capability Approach with Appropriate Technology and STS - The Case of Podcasting Devices in Zimbabwe	Book *The Capability Approach, Technology and Design* (2012)	Philosophers of technology, STS and development scholars	Designers
7. Technology, Individual Freedom and the Good Life – A Capability Approach	Journal *Philosophy & Technology* (under review)	Philosophers of technology	Political philosophers
III. ADDENDUM: HUMAN CAPABILITIES & THE QUESTION OF THE METRIC OF JUSTICE			
8. Is Pogge a Capability Theorist in Disguise? – A Critical Scrutiny of Thomas Pogge's Defence of Rawlsian Resourcism	Journal *Ethical Theory & Moral Practice* (forthcoming)	Political philosophers	Capability scholars

Table 1.2 – Reading guide: suitability of chapters for different disciplines

Table 1.2 is meant to help readers identify which paper may be most interesting and suitable for them. Naturally, one can also read all papers in this dissertation in the order of their inclusion. However, one will then quickly find that there is sometimes a substantial overlap – e.g. the CA is explained extensively in several papers. This is the unavoidable drawback of a paper-based dissertation. After the table I have included the abstracts of the different chapters. This should give the reader a more detailed impression of the contents of each paper, providing further guidance on what to read. I have re-written the original abstracts in such a way that the links between different papers come to the fore more closely, and sometimes I have written a few sentences to connect them. The original abstracts can be found in the overview before this introductory chapter. Unless indicated otherwise in a footnote with the title, each chapter in this dissertation is an unchanged re-print of the original publication. Each chapter will be preceded – where available - by a picture of the first page of the original article or book chapter.

I. ZOOMING IN: HUMAN CAPABILITIES & THE DESIGN OF TECHNICAL ARTEFACTS

2. **Design for development – a capability approach**
   Originally published in 2009 in journal *Design Issues* 25(4):91-102

   This chapter, a spin-off of preparing the grant application with NWO (see §1.1), proposes adopting a CA towards designing technical artifacts for poverty reduction, i.e. in a development context. I argue why this would be a good idea and I briefly sketch a research agenda. In this chapter I note that in current design practice the focus seems to be very much on things like achieving usability or satisfying user's preferences. Buchanan (2001) has, however, forcefully argued that design should find its ultimate ground in human rights and human dignity. 'Human capabilities' provide an alternative yet related concept that may be more fruitful for design and appealing to designers, because of their concreteness and the 'functionalistic' orientation of the CA. I explain the CA to the reader and use the example of a bicycle to illustrate that the details of design greatly matter for the realization of human capabilities. Analogously to 'value sensitive design' – an emerging approach in the ethics of technology – I label the proposed approach 'capability sensitive design.' It is, so I admit, a matter of further investigation

what 'capability sensitive design' entails exactly and what its added value is. I suggest, however, that it will turn out to have commonalities with universal/inclusive design, as both this design movement and the CA attach central importance to human diversity. Commonalities can also be expected with participatory design, considering the importance of participatory processes according to the CA. It is argued that the CA might contribute to reviving some of the original ideas of participatory design, in which according to some usability instead of empowerment is increasingly the goal.

3. **Design and individual human capabilities – a capability approach of design for values**
   Contribution to volume *Ethics and Values in Technological Design* (forthcoming), edited by Jeroen van den Hoven, Ibo van de Poel and Pieter Vermaas. Dordrecht: Springer.

This chapter is a direct follow-up on the article in Design Issues from 2009 (chapter 2). It presents the same ideas in a more systematic way and elaborates on them in several ways. It uses the distinction of Robeyns (2012) between a narrow and a broad usage of the CA and extends this to design. In the broad design usage the CA is used as a source of insight and inspiration for taking into account the values of inclusiveness, justice (linked to inclusive/universal design), agency and participation (linked to participatory design). In the narrow design usage the CA is seen as presenting a proper conceptualization of individual well-being, namely in terms of the capabilities that a person has (capability sensitive design). This narrow usage is the central focus of the chapter. The CA literature is presented as relevant to the conceptual and possibly also the empirical investigation phase of value/capability sensitive design. It is argued that the distinctions resources-capabilities, functionings-capabilities and utility-capabilities invite designers to reflect on respectively applicable conversion factors, the behavior-steering aspects of technology and adaptive preferences. Based on Van de Poel (2012) two challenges for 'capability sensitive design' are discussed: an epistemological challenge and an aggregation challenge. Van de Poel's proposal to make the construction of 'value hierarchies' a part of value sensitive design is adopted and 'translated' to capability sensitive design more specifically. Finally, the chapter reflects on the challenge of making a complex conceptual framework like the CA accessible to designers without resorting to

simple check-lists and tools that would disguise the philosophical intricacies and the need for critical reflection.

4. **Inappropriate artefact, unjust design? - Human diversity as a key concern in the capability approach and inclusive design**
   Originally published in 2012 in volume *The Capability Approach, Technology & Design*, edited by Ilse Oosterlaken & Jeroen van den Hoven. Dordrecht: Springer.

Whereas the previous two chapters were primarily aimed at designers, this chapter is more geared towards philosophers of technology. It picks up on two claims made in chapter 2 and discusses a third issue. Firstly, it gives some philosophical underpinning to the claim that human capabilities are a more suitable normative focal point for designers than human rights or human dignity. It does so by arguing - based on the use plan account of technical artifacts (Houkes and Vermaas 2010) - that a concern for the human capabilities of users is inherent to the nature of engineering design. The latter may, however, sometimes merely address instrumentally valuable or morally undesirable capabilities, while the CA focusses on a more limited category of intrinsically valuable human capabilities. Secondly, the chapter elaborates on the postulated link between 'capability sensitive design' and universal/inclusive design by drawing on the use plan account of technical artifacts. This account implies that good design means taking into account the characteristics of intended users and their usage environment. The inclusive/universal design movement can be interpreted as explicitly acknowledging this and subsequently embracing user diversity. And the better relevant facts of human diversity are taken into account by designers, the more different user groups will see their capabilities – ceteris paribus - expanded by the artifact in question. If on the other hand a certain design is not fully universal or inclusive, the artifact in question will be inappropriate for certain user groups and not contribute to their capabilities – for example, a traffic light without audible signals is inappropriate for blind people. The third issue that the chapter discusses is how such judgments of inappropriateness are related to judgments of injustice – the latter being a key concern of the CA.

II. ZOOMING OUT:
HUMAN CAPABILITIES & THE EMBEDDING OF TECHNICAL ARTEFACTS

5. **Inserting technology in the relational ontology of Sen's capability approach**
   Originally published in 2011 in the *Journal of Human Development and Capabilities*. 12 (3):425-432.

This chapter is a comment on a paper in the *Journal of Human Development and Capabilities* in which Smith and Seward (2009) explicate the philosophical ontology of human capabilities that, they say, is implicit in the work of Sen. In this ontology human capabilities are contextual and relational in nature, as "a particular capability is the outcome of the interaction of an individual's capacities and the individual's position relative to others in society" [i.e. within the existing social structures]. Using insights from Philosophy of Technology and STS – in particular Actor Network Theory - I argue that Smith and Seward's ontology can and should be extended; Not only individuals and social structures, but also technical artifacts should be recognized as important constituents of human capabilities. The chapter can also be read as shedding more light on the nature of the relationship between technical artifacts and human capabilities. This relationship is less straightforward than one might initially think, as according to this ontology technical artifacts need to be embedded in a suitable socio-technical network in order to expand human capabilities. For example, a car will not durably and substantially expand an individual's capability to go places until gas stations, traffic rules, roads, driving schools and so on are also present.

6. **Marrying the capability approach with appropriate technology and STS - The case of podcasting devices in Zimbabwe**
   Co-authored with David Grimshaw and Pim Janssen. Originally published in 2012 in volume *The Capability Approach, Technology & Design*, edited by Ilse Oosterlaken and Jeroen van den Hoven. Dordrecht: Springer.

This chapter reflects, using the CA, on a development project in which development organization Practical Action introduced podcasting devices in a rural area in Zimbabwe. The organization, which has its roots in the appropriate technology movement, used two complementary strategies; On the one hand it paid attention to the design of the technical artifact in question, in response to the cultural and physical characteristics of the area. On the other hand it paid

attention to the socio-technical embedding of the devices. The latter is extensively discussed in the chapter, so that the case can serve as an illustration of the relational and contextual nature of human capabilities (as was discussed in chapter 5). Together these strategies seem to have led to a quite successful project. The chapter illustrates how such a project would be evaluated from the perspective of the CA, namely by investigating whether or not the outcome is the expansion of intrinsically valuable human capabilities, whether this holds for different categories of individuals and whether the process which led to this outcome was sufficiently participatory and respectful of human agency. The case is, however, also used to illustrate the limitations of the CA, namely that it concerns a general philosophical / conceptual framework that does not help us to understand the details of how technical artifacts and human capabilities are related in the real world. For this one needs to resort to supplementary theories and knowledge, both from practice (like the appropriate technology movement) and theory (like resulting from STS). It is argued that the CA and the appropriate technology movement share their emphasis on human diversity and could thus fruitfully complement each other.

7. **Technology, individual freedom and the good life – a capability approach**
   Submitted to *Philosophy & Technology* (under review)

Given recent pleas for more public deliberation about technology and the good life, I propose using the CA as a conceptual framework or moral vocabulary that can facilitate such debates. Technical artifacts can be seen to expand what people are able to do and be, their freedom to lead the lives they have reason to value. One could see the concept of 'human capabilities' as providing the link between more concrete technical artifacts and more abstract ideas about the good life. In this chapter I compare the CA to the current dominant vocabulary in liberal societies, which emphasizes self-determination and limits public debates about technology to issues of harm. Swierstra (2002) already criticized this vocabulary, identifying two problems, namely (I) the opaqueness of technological alternatives and (II) the supposed sanctity of preferences. The CA, so I argue, does not suffer from those ills. One thing that generates a need for public deliberation on technology and the good life is, according to some philosophers of technology, that technologies tend to strongly transform the socio-technical systems / networks in which they become embedded. An additional advantage of the CA is that is able to take such effects into account as indirect influences on

people's capabilities to lead the lives they have reason to value. Yet the existence of such system/network effects does seem to strengthen, so I will briefly discuss, doubts that critics have expressed on the possibility of applying the CA in public policy while remaining largely neutral towards the good life.

III. ADDENDUM: HUMAN CAPABILITIES & THE QUESTION OF THE METRIC OF JUSTICE

8. **Is Pogge a capability theorist in disguise? – A critical examination of Thomas Pogge's defense of Rawlsian resourcism**
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This chapter makes a contribution to a debate within political philosophy on the question voiced by Sen as "equality of what?"[9] The focus is on the comparison between human capabilities versus primary goods as a possible metric/space of justice. Thomas Pogge has defended the latter, but I argue that he has good reasons to prefer the former. One central element in my argument is Pogge's own insistence that as a matter of justice we should not design our institutions with the average human in mind, but rather take into account relevant aspects of human diversity. In the language of chapter 4 of this dissertation: the design of institutions should be inclusive or universal, so that they become appropriate for all citizens. In my argument I use Pogge's own example of the design of traffic lights as one element of the total institutional order. These can be designed with or without audible signals and only in the former case will they be appropriate for blind people. Whether or not 'universal appropriateness' or justice is achieved, so I argue amongst others, cannot be determined without resorting to the concept of 'human capabilities'. Pogge is thus a capability theorist in disguise.

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9 For the purposes of this introduction to my dissertation, this re-written abstract highlights that part of the argument that has a clear link with chapter 4. However, the argument is more elaborate and the c is clearly different from the previous six chapters in that neither technology nor engineering design is a central topic in it.

1.6. Taking stock and looking ahead

In any new domain of application of the CA it is a challenge to, as Alkire (2005) puts it, "trace the implications [...] all the way through", both in theory and practice. For the domain of technology and its design this is a process that has only just begun (see also the literature review in annex II). The papers in this dissertation make a small contribution to this process by exploring from a philosophical and theoretical angle how the CA can be brought to bear on technology and design and what its potential added value is. This includes addressing the questions what the nature of the relation between technology and human capabilities is, and which technology / design theories can be fruitfully integrated in the CA. Within the scope of this doctoral dissertation project I have only been able to a very limited extent to really apply the CA in practice, to actual technology and design cases. Yet it's a start and a basis on which to continue ethical and empirical work in this area.

Let me in this final section of the introduction briefly reflect on future research. Johnstone (2007) and Zheng (2009) were the first to sketch a research agenda on the capability approach and technology, and I would like to summarize it here before elaborating a bit on it. Philosophy of technology is able, so this dissertation hopefully illustrates, to contribute to the execution of such a research agenda on the CA and technology. Zheng (2009) has formulated a number of general questions with respect to ICT4D and the CA, which she has categorized in four groups: (a) means and ends of development, (b) commodities, capabilities and human diversity, (c) agency and situated agency, and (d) evaluative spaces. Johnstone (2007) discusses a CA research agenda for computer ethics more broadly. She points out that focal points for research could be particular (1) groups or individuals, (2) capabilities, (3) situations or contexts and (4) technological interventions (or a combination thereof). One challenge is the identification and specification of specific capabilities that certain technologies enable, including instrumental capabilities. The research agenda should, she says, take up both descriptive and normative issues, investigating the contribution of technology to both justice (distribution of capabilities) and ethics (capability expansion). It should aim for the development of general theories with respect to technology and the CA, investigate specific domains (such as ICT4D or technology in health care), and conduct case studies.

What is also needed, according to Johnstone (2007), are *methods* to evaluate technology from the perspective of the CA, both at the micro and macro level – a

suggestion that has already been taken up by several researchers in the past years. Kleine (2010), for example, has operationalized the CA in the form of the so-called 'Choice Framework', which can amongst others be used by researchers to evaluate ICT4D projects. Putting the idea of 'capability sensitive design' as put forward in this dissertation in practice outside the walls of the university would require looking into methods and tools that are suitable for the purposes, constraints and context of designers. As I briefly discuss in chapter 3, one challenge is to make a rich and complex approach as the CA accessible - without simplifying too much or losing its critical edge - to designers, who are practical-minded and often working under time and finance constraints. One step in this direction was recently taken in a master thesis written by Van der Marel (2012), who was co-supervised by Annemarie Mink, a PhD candidate that is – like me – part of the NWO-funded project *Technology & Human Development – A Capability Approach* (see §1.1). Van der Marel has, inspired by the CA and based on Kleine's Choice Framework, developed a tool kit that can be used to quickly evaluate, together with users, the capability impact of new technological products. He has tested - and refined - it by means of an evaluation of the Philips Chula stove as implemented in rural India. This evaluation process, Van der Marel says, already led to the identification of several design opportunities. He is thus quite hopeful that the tool kit can also have value in more prospective design applications, although this has not yet been investigated. It is an optimism that I share, as a part of his tool kit bears resemblance to the 'Envisioning Cards' (see www.envisioningcards.com) that have been developed and successfully applied in design projects by the research group of Batya Friedmann, an acknowledged expert in Value Sensitive Design (VSD). Inspired by VSD, part of this dissertation explores the idea of 'capability sensitive design' from a theoretical angle. Yet there is still work to be done in developing the means to put this into practice, testing these and assessing the added value of such capability sensitive design as compared to on the one hand VSD and on the other hand existing design-for-development toolkits (like the IDEO toolkit, to be found at www.ideo.com). Furthermore, as I already discussed in §1.4, it would be good to pay attention – both theoretically and practically - to the implications of the 'zooming out' perspective for the idea of 'capability sensitive design'. Fortunately, the larger research project in which this dissertation is embedded will continue to run until August 2014. Within that project I hope to continue collaboration with design scholars on these and other design related issues.

Two general philosophical issues concerning the CA are, it seems to me, of particular interest to philosophers and ethicists of technology interested in the CA, and I hope to have opportunities to work on them in the future. Both of these issues, which are also briefly mentioned in chapter 7, are of relevance to debates about paternalism that sometimes arise concerning Western involvement in technology and design for development (see e.g. Nussbaum 2010).[10] One is the notion of 'adaptive preferences', which is repeatedly invoked in justifications of the moral superiority of a focus on human capabilities rather than utility. The idea is that some preferences are so distorted or otherwise flawed that we are not required to honor or respect them, indeed that from the perspective of justice we should disregard them. Sen and other CA scholars discuss extreme poverty and deprivation as a main cause of adaptive preferences. However, people's unreflected preferences may also for other reasons provide poor guidance for action. Johnstone (2007) suggests, for example, that not only "severe deprivation or oppression may undermine people's ability to make proper determinations of value", but that "such issues are [also] particularly salient in the case of technology, since users may have a very limited informational basis on which to make value determinations." Designers, however, generally attach a lot of value to the satisfaction of user's preferences or similar indications of subjective well-being (see chapter 2 and Van de Poel, unpublished draft book chapter). It should be noted, however, that the CA also highly values human agency. In light of this value labeling a preference as 'adaptive' or flawed too easily is undesirable – and may give rise to unjustifiable paternalism. The CA, however, does not contain a specific theory of choice or way of distinguishing those preferences that are problematic from a normative perspective from those that are not (Robeyns 2000). This issue has, to my knowledge, so far not received a lot of attention within the CA literature, although some interesting work has recently been published on it (see e.g. Clark 2012). It seems worth investigating what implications recent thinking about adaptation, poverty and development may have for design for development.

A second general philosophical debate between capability scholars and critics that seems highly relevant for the area of technology is that about the practical tenability of the theoretical distinction made in the CA between 'capabilities' and 'functionings', where the former concerns what is effectively possible for a

[10] Note that the reference is to a blog from Bruce Nussbaum, not to be confused with Martha Nussbaum!

person to do and be, and the latter concerns what a person has actually realized in her life. The idea is that policies focus on expanding people's capabilities, leaving them the choice of whether or not to realize the corresponding functionings, in that way avoiding paternalism. Deneulin (2002), however, has forcefully argued that the capability-functioning distinction is – for several reasons - impossible to consistently maintain in policy practice. It cannot always be avoided, she says, that policies based on the CA target functionings instead of capabilities and therefore, she says, they are sometimes unavoidably paternalistic. One reason for this is that there are a lot of interdependencies between all sorts of functionings and capabilities, both at the individual and the collective level. As I argue in chapter 7 and its annex, two features that technology sometimes has may be seen to contribute to the fuzziness of the capability-functioning distinction in practice. The first is that technology sometimes leads to strong socio-technical changes that are beyond the individual's influence, but suggest or enforce certain ways of doing and being. The second is that technology is sometimes explicitly designed to be behavior steering, a phenomenon which has recently become a topic of investigation by ethicists of technology. In these ways technology may then be seen to aggravate the challenge that Deneulin raises. [11] Both this problem of the capability-functioning distinction and of adaptive preferences deserve, so I believe, further attention from ethicists of technology.

One further topic that seems worth investigating for ethicists of technology, which is not at all addressed in this dissertation, is that of the capability approach in relation to human enhancement. Only a few publications have – to my knowledge - addressed this so far (Coeckelbergh, 2011; Cooke, 2003; Nussbaum, 2008). On the one hand the increasing technical possibilities to alter 'human nature' may be seen to undermine one way of justifying a universally valid list of value human capabilities, namely by appealing to an Aristotelian notion of the good human life.[12] At the same time one may also question, as both Nussbaum (2008) and Coeckelbergh (2011) do, whether a clear distinction between human

[11] How problematic any paternalism resulting from an untenable capability-functioning distinction really is from a moral perspective, is however a further topic of debate. Thaler and Sunstein (2008) have for example argued that 'nudging' people to behave in certain ways is – under certain conditions - compatible with liberalism and not a problem.

[12] This is the line of defense that Nussbaum adopted in her earlier work, but which she has in recent work abandoned in favor of using Rawls' idea of an overlapping consensus to justify such a capability list.

enhancement and expanding human capabilities with conventional technologies can even be drawn. The CA might even offer a fresh, constructive perspective on human enhancement. According to Buchanan (2011) the current debate on the ethics of human enhancement has too little attention for the potential positive well-being effects of such interventions. He therefore proposes to link this debate to the enterprise of human development and to the field of development ethics. Surprisingly, however, he discusses human development mainly as a process of increasing our "productivity", in the sense of "how good we are at using existing resources to create things we value." He thus seems to have a quite limited view on development as *economic* development, something which has been forcefully criticized by Sen, Nussbaum and other capability scholars. It seems to me that the CA, as an influential approach in development ethics (see e.g. Crocker, 2008), has more to offer if one would like to take up Buchanan's proposal.

1.7. A final reflection

I would like to end this introduction with one final reflection on the importance of combining the CA with work from fields like Science and Technology Studies (STS) and Philosophy of Technology (PoT). One of the advantages of adopting a CA is, so Zheng and Stahl (2012) assert in a recent chapter about the assessment of emerging technologies, that it puts humans at the center of our critical evaluations, not technology. Likewise, Gigler (2008) says about his ICT4D evaluation framework based on the CA that it "places, in contrast to the current discourse around the digital divide, the human development of the poor and not technology at the centre of analysis." The CA is thus, he claims, to be preferred over more conventional approaches "that overemphasize the significance of technology itself for social change." It reminds me of Amartya Sen (1985, 1984) accusing economists of suffering, all too often, from a "commodity fetishism." Likewise policy makers and engineers sometimes seem to suffer from a technology fetishism, based on a one-sided, over-simplified view on what technology is and what it can do.

I share the enthusiasm of Zheng and Stahl (2012) and Gigler (2008) about the anti-dote that the CA could provide for this ailment. Yet at the same time I think that when applying the CA, we should also watch for the other extreme of leaving fully underexposed the significance of technology itself. What we can learn from contemporary STS and PoT scholars is that for the expansion of

human agency and well-being it strongly matters what technology exactly we are talking about and what the details of its design are (as e.g. the examples discussed in chapters 2 and 6 illustrate). Zheng and Stahl (2012) are, so the remainder of their chapter makes clear, well aware of that. It cannot be emphasized enough though, as it is somewhat paradoxical that in order to put humans and their lives central, we need to pay more rather than less attention to technology. It should, however, be the right kind of attention - based on a thorough understanding of the empirical details of specific technologies and how they interact with people's lives and with society. Technology should receive appropriate attention in our analyses, without ever letting out of sight that what we are ultimately interested in is not creating ever more advanced gadgets, but making sure that people are empowered to - as Sen would put it - live the lives they have reason to value.

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Annex I: The capability approach – an introduction

In this annex I will give a short introduction to the capability approach (CA), as a background to the introduction for those readers who are not familiar with the CA. It merely explains the basic concepts within and discussions on the CA.

The CA, for which Martha Nussbaum (e.g. 2000, 2006, 2011) and Amartya Sen (e.g. 1992, 1999) have done the ground work, has become an influential framework for investigating and discussing topics in the area of justice, equality, well-being and development. It has led to a body of literature that is highly inter- and multi-disciplinary, with contributors coming from fields like philosophy, economics and development studies. In addition to its popularity amongst scholars, it has also influenced policy and development practice. For example, it has provided the intellectual foundations for the work of the UN Development Program, including their well-known annual human development reports. According to the CA, the key evaluative space in these areas is neither income, resources, primary goods, utility (i.e. happiness or the sum of pains and pleasures), nor preference satisfaction. Its proponents argue that the focus should rather be on human capabilities. Capabilities are often described as what people are effectively able to do and be or the positive freedom that people have to enjoy valuable 'beings and doings'. These beings and doings are called 'functionings' by Sen. Functionings "together constitute what makes a life valuable" (Robeyns 2005) and are "constitutive of a person's being" (Alkire 2005a). Examples of functionings are such diverse things as working, resting,

being literate, being healthy, being part of a community, being able to travel, and being confident. "The distinction between achieved functionings and capabilities," so Robeyns (2005) explains, "is between the realized and the effectively possible; in other words, between achievements on the one hand, and freedoms or valuable options from which one can choose on the other." As Alkire explains, one reason to focus on capabilities instead of functionings is that we value free choice and human agency:

> "A person who is fasting is in a state of undernutrition, which may seem very similar to a person who is starving. But in the one case, the fasting person could eat and chooses not to; whereas the starving person would eat if she could." (Alkire 2005b)

The CA thus acknowledges that people pursue not only their own well-being, but may also choose to pursue other ends; for example, the well-being of others, living up to religious ideals, or following moral norms. Hence, policies should – according to the CA - aim at expanding people's capabilities and not force people into certain functionings (like being well-fed).[13]

Why should we focus on these capabilities in our developmental efforts, rather than utility or resources – including technological resources? The reason to prefer capabilities over resources is that the relationship between a certain amount of goods and what a person can do or can be varies, as Sen and others have often illustrated:

> "... a person may have more income and more nutritional intake than another person, but less freedom to live a well-nourished existence because of a higher basal metabolic rate, greater vulnerability to parasitic diseases, larger body size, or pregnancy." (Sen 1990)

Sen occasionally refers to a technical artifact to explain the same point, namely a bicycle. All bicycle owners are equal in terms of their possession of this resource, but people with certain disabilities will not gain an increased capability to move about as a result of this bicycle (Sen 1983, 1985). One could also think of other things obstructing the creation of human capabilities, such as the absence of

[13] In part because of this distinction between capabilities and functionings, it has been claimed by Nussbaum (e.g. 2011) that the CA fits in with political liberalism, although others disagree with that claim (e.g. Deneulin, 2002).

safe bicycle lanes or even mere roads – a bicycle in the Netherlands will add more to the owner's capabilities than a bicycle in the Sahara. One of the crucial insights of the CA is thus that the conversion of goods and services into functionings is influenced by personal, social, and environmental conversion factors.

The reason why capability theorists prefer these capabilities over utility or preference satisfaction is the existence of a phenomenon which Sen has called "adaptive preferences":

> "Our desires and pleasure-taking abilities adjust to circumstances; especially to make life bearable in adverse situations. The utility calculus can be deeply unfair to those who are persistently deprived [...] The deprived people tend to come to terms with their deprivation because of the sheer necessity of survival; and they may, as a result, lack the courage to demand any radical change, and may even adjust their desires and expectations to what they unambitiously see as feasible." (Sen 1999)

Thus, if the deprived are happy with their lot in life we can, according to the CA, not conclude from this that there is no injustice in their situation. Because of these and other issues, the CA conceptualizes well-being in terms of a person's capabilities and development as a process of expanding these capabilities.

It should be noted here that Sen and Nussbaum use 'human capabilities' as an ethical category – the term refers to those capabilities of an individual that are ultimately or intrinsically valuable. Of course not all capabilities that a person may have belong to this category – many capabilities will only be of instrumental importance to these valuable human capabilities. Furthermore, some capabilities may be trivial from the perspective of justice and development. Sen (1987), for example, is highly skeptical about a new brand of washing powder expanding our human capabilities, as advertisers tend to claim. Moreover other capabilities may be outright undesirable to promote – Nussbaum (2000), for example, gives the example of the capability for cruelty. In short, Sen and Nussbaum agree that an ethical evaluation of capabilities is necessary – which is good to keep in mind for the purposes of this book, as quite a number of technologies may first and foremost expand undesirable, trivial or instrumental capabilities. In the latter case we should always ask to which ultimately valuable capabilities they could contribute.

Not surprisingly, then, one important debate within the CA is about which capabilities matter and who (how, when) is to decide this. This is actually one of the main topics on which Sen and Nussbaum – the former having a background in economics and the latter in philosophy - differ of opinion.[14] Nussbaum has, after extensive discussion with people worldwide, identified a list of 10 central human capabilities that are needed for living a worthwhile life in conformity with human dignity (see the list at the end of this annex). She claims that justice requires bringing each and every human being over a certain threshold for each of the capabilities on her list. Although Sen gives plenty of examples of important capabilities in his work, he has always refused to make such a list. His reasons are that the proper list of capabilities may depend on purpose and context, and should be a result of public reasoning and democracy; not something a theorist should come up with. Democracy, public deliberation and participation are – because of the 'list debate' and because of the value attached to human agency – also frequent topics of reflection and discussion amongst capability theorists (see e.g. Crocker 2008). It is recognized by both Sen and Nussbaum that from an ethical perspective not only outcomes in terms of expanded capabilities matter, but also the process through which these changes are brought about (e.g. its fairness).

Various other topics and questions also feature a lot in the literature on the CA and in this short annex I can mention only but a few of them. One is, not surprisingly, the question of how to operationalize the CA (see e.g. Comim, Qizilbash, and Alkire 2008). As Alkire (2005a) explains, "operationalizing is not a one-time thing," but something that is dependent upon such things as country, level of action and the problem at hand. This raises important questions on how to identify, rank, weigh, trade-off relevant capabilities in policy/project applications, on which no consensus exist. One of the many challenges is also that it is hard to measure capabilities, as they (a) refer to the possible and not just to the realized and (b) are complex constructs depending on both an individual's internal characteristics or capacities and his/her external environment. A challenge is furthermore how to 'aggregate' over people while not losing sight of the fact that a CA emphasizes that each and every person needs sufficient capabilities to lead a flourishing life. Another topic of discussion has been whether or not the CA, with its emphasis on an individual's

[14] For an analysis of the differences between the CA of Nussbaum and Sen, see for example Robeyns (2005) and part II of Crocker Crocker (2008).

capabilities, is not too individualistic and whether it pays enough attention to groups and social structures (see e.g. Robeyns, 2005). Some authors have argued that groups should be given a more central role (Stewart 2005) or that the framework of the CA should be extended to include collective capabilities (Ibrahim 2006).

Not only has the CA had an influence on scholarly work, but it has also influenced policy and practice. It is, for example, well known that it has provided the intellectual foundations for the human development paradigm of the United Nations Development Program (UNDP).[15] The CA has been applied in different ways (Robeyns 2006), such as the assessment of small scale development projects (this could also include projects involving technology), theoretical and empirical analyses of policies (this could also involve technology policy or perhaps new technologies) and critiques on social norms, practices and discourses (one could think here of design practices and the 'ICT for Development' discourse). Many of the applications so far have been concerned with assessment and evaluation, but of course for advancing justice and development 'prospective' applications should also receive attention (Alkire 2008), meaning that we should investigate how the expansion of human capabilities can successfully be brought about. In general terms:

> "For some of these capabilities the main input will be financial resources and economic production; but for others, it can also be political practices and institutions, [...] political participation, social or cultural practices, social structures, social institutions, public goods, social norms, traditions and habits." (Robeyns, 2005)

Technology and design could, of course, also be important inputs for the expansion of valuable capabilities and it is thus to be applauded that increasing attention is paid to this topic. In the next annex I will discuss what has appeared so far on the more specific topic of the CA and technology, but first below Nussbaum's list of 10 central human capabilities.

Nussbaum's 10 central human capabilities

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[15] For an introductory textbook on the CA and human development, see the edited volume by Deneulin and Shahani (2009).

The complete and detailed list of central human capabilities and their description according to Nussbaum (2002), which I literally quote here:

1. *"Life*. Being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living."
2. "*Bodily Health*. Being able to have good health, including reproductive health; to be adequately nourished; to have adequate shelter."
3. "*Bodily Integrity*. Being able to move freely from place to place; to be secure against violent assault, including sexual assault and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction."
4. "*Senses, Imagination, and Thought*. Being able to use the senses, to imagine, think, and reason—and to do these things in a "truly human" way, a way informed and cultivated by an adequate education, including, but by no means limited to, literacy and basic mathematical and scientific training. Being able to use imagination and thought in connection with experiencing and producing works and events of one's own choice, religious, literary, musical, and so forth. Being able to use one's mind in ways protected by guarantees of freedom of expression with respect to both political and artistic speech, and freedom of religious exercise. Being able to have pleasurable experiences and to avoid non-beneficial pain."
5. "*Emotions*. Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by fear and anxiety."
6. "*Practical Reason*. Being able to form a conception of the good and to engage in critical reflection about the planning of one's life. (This entails protection for the liberty of conscience and religious observance.)"
7. "*Affiliation*.
    a. Being able to live with and toward others, to recognize and show concern for other humans, to engage in various forms of social interaction; to be able to imagine the situation of another. (Protecting this capability means protecting institutions that

constitute and nourish such forms of affiliation, and also protecting the freedom of assembly and political speech.)

b. Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others. This entails provisions of non-discrimination on the basis of race, sex, sexual orientation, ethnicity, caste, religion, national origin and species."

8. "*Other Species*. Being able to live with concern for and in relation to animals, plants, and the world of nature."
9. "*Play*. Being able to laugh, to play, to enjoy recreational activities."
10. *"Control over one's Environment*.
    a. *Political*. Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association.
    b. *Material*. Being able to hold property (both land and movable goods), and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure. In work, being able to work as a human, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers."

Annex II: The CA and technology – a literature review

One of the first authors to apply the CA to technology was - as far as I know - Garnham (1997; 2000), who wrote on the topic of ICT policy. "Thinking of entitlements in terms of functionings and capabilities", he argued convincingly, "allows us to get behind the superficial indices of access and usage that we so often use." For some years to follow only a handful of writings seems to have followed suit. Since roughly 2006, however, there seems to be a steep increase in the number of scholars explicitly and extensively using the CA for deliberations about technology. Just as is the case with the literature on the CA in general, these scholars come from different disciplines, like development studies, economics, science and technology studies, philosophy of technology and computer science. Their publications are scattered over many journals and books and sometimes do not refer to similar publications in this area, as if some authors are inventing the same wheel independently from each other. Hence, it

seemed useful to include an extensive literature review in this introduction[16], which will not only put the papers included in this doctoral dissertation (highlighted in bold letters below) into perspective, but hopefully also help other researchers to find their way in this scattered body of literature.

One thing that is salient when going over the literature that has appeared so far in this area, is that a majority of publications is concerned with ICT. And many of these publications more specifically focus on 'ICT for Development' (ICT4D).[17] So many articles have appeared by now, that I can unfortunately not all discuss them all separately in this annex. They vary from general philosophical reflections (e.g. Hellsten 2007) to applied case studies (e.g. Olatokun 2009). Several of the articles make a strong general case for applying the CA to ICT (e.g. Garnham 2000; Mansell 2001; Alampay 2006; James 2006; Thomas and Parayil 2008). But as a first introduction to the topic the articles of Johnstone (2007) on the CA and computer ethics and of Zheng (2009) on the CA and ICT4D are especially recommendable. Both these articles extensively discuss the advantages and challenges of applying the CA to ICT and present an overview of research questions that deserve further attention. Several other articles explicitly address – with a more empirical focus - the question how the CA can be operationalized in relation to ICT. Only Barja an Gigler (2007), Alampay (2006) and Wresch (2007, 2009) do this at a meso or macro level, many other authors aim to develop a framework for evaluating concrete ICT4D projects (e.g. Gigler 2008; Kleine 2010; Grunfeld, Hak, and Pin 2011; Vaughan 2011). Many articles may furthermore be read with a specific interest in the sort of ICT or application that they discuss, like mobile phones (e.g. Sen 2010), the internet / websites (e.g. Wresch 2007, 2009; Hattaka & Lagsten 2012), telecentres in deprived regions (e.g. Garai and Shadrach 2006; James 2006;

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[16] This section and the next one provide an updated and re-arranged version of the literature review that I included in the introductory chapter to the edited volume *The Capability Approach, Technology & Design,* see Oosterlaken (2012). Considering the rate at which new publications recently have appeared - and continue to appear - at many different places, I do not claim completeness. Without doubt there are publications which have escaped my attention. For example, articles in other languages than English have not been considered. It should furthermore be noted that conference papers have not been included, even though some (e.g. Gigler, 2004) are interesting and relevant. Moreover, I have been selective in leaving out publications that only loosely mention the CA without discussing the approach or its main ideas/concepts in any detail.

[17] For those interested in the CA and ICT4D: a specialized book on this topic will be published in the autumn of 2012 (Kleine, forthcoming).

Ratan and Bailur 2007; Thomas and Parayil 2008; Grunfeld, Hak, and Pin 2011; Vaughan 2011; Thapa et al 2012), e-governance systems (e.g. Madon 2004; Ahmed 2011, 2012), e-commerce (Wresch & Fraser,2012), ICT systems in the health care sector (e.g. Zheng and Walsham 2008), emerging ICTs (Zheng and Stahl 2012), the One Laptop per Child Project (Kullman and Lee, 2012) and podcasting devices **(Oosterlaken, Grimshaw, and Janssen 2012, see chapter 6)**.

One can only speculate why ICTs and more specifically ICT4D is so dominant in the literature on the CA and technology, but at least two factors seem to play a role. Firstly, ICT has become extremely popular as a 'weapon against poverty' in the last 10 to 15 years. The example of farmers in developing countries being able to acquire crop prices by means of a mobile phone and hence being able to raise their income is by now quite well-known. However, the enthusiasm for ICT4D has given rise to a critical 'countermovement' and some of these authors have used the CA for voicing their criticism. For example, it has been claimed that too much emphasis has been put on mere resource distribution or ICT access (e.g. Madon 2004; Alampay 2006; 2006; Hellsten 2007; Zheng and Walsham 2007). From the perspective of the CA this often does not lead to positive development outcomes for everybody, as a great variety in conversion factors exists. It could even be the case (Thomas and Parayil 2008) that ICTs increase inequality, as the socially advantaged classes in a society may be more able to convert access to ICT into something useful in their lives than the already deprived ones. Kleine (2010) claims that the mainstream discourse on ICT4D "remains heavily focused on economic growth, which is too narrow to capture the impacts of ICT." Zheng (2009) furthermore notes that ICT4D often treats people as "passive receivers" of new technologies that are supposedly good for them, while the CA values agency and would hence take their felt needs and aspirations into account. All these authors find a powerful conceptual framework in the CA, which can be used to fruitfully reflect on ICT4D. Their work fits in with some of the sentiments in the wider ICT4D community. For example, one of the conclusions of Walsham and Sahay (2006) in their overview of 'information systems research in developing countries' is that there is a need for "more emphasis in future work on the meaning of development, and how ICTs link to this" (emphasis is mine). Heeks – a prominent scholar in the area of ICT4D - recently (Heeks 2010) stated that "the main practical call [...] is still for more theory-based evidence about ICTs' impact on development; especially for more evidence founded in theories that have currency within development

studies." The CA is such a theoretical view on the meaning of development that has become influential in development studies.

A second factor in explaining the dominance of ICT in the 'technology and CA literature' could be that ICT seems to have – contrary to many other technologies - a quite indeterminate character, in the sense that it can directly and simultaneously contribute to the expansion of human capabilities in very different areas: health, education, recreation, livelihoods, democracy, etc. ICTs might thus be seen as the ultimate embodiment of the ideal of the CA that we ought to promote a variety of capabilities and leave it up to empowered individuals which functionings to realize, depending on their idea about the good life. Whether ICTs can and do fully live up to that promise can, however, be challenged from both practical experiences and philosophical insights. This point has been made most explicitly by Kleine (2011). "Due to the multi-purpose, multi-choice nature of the internet, this area of development studies", she says, "is particularly well-suited to be a test-case for the choice paradigm in development evaluation, execution and planning." Unfortunately, so she notices, funders and donors prefer to assign their resources to development organizations that promise them to deliver certain pre-determined development outcomes. They are not persuaded "by a promise that people will be empowered to make much less predictable choices of development outcomes." An interesting case with respect to this issue, namely so-called rural telecentres where villagers can get access to all sorts of ICT, is analyzed by Ratan and Bailur (2007). The implementing development organizations intend these centres to contribute to pre-defined well-being goals in areas like education, livelihoods or health care, whereas villagers – just like people in the West – often tend to use the telecenters for entertainment, personal desktop publishing and so on. This obviously raises a dilemma for the development organization. The CA, so these authors note, is able to theorize this. One of the problems may be an overestimation on the part of development organizations of what villagers can do and be with ICTs and the information to which they give access:

> "We do not claim that people are not interested in their own welfare, but that this value is hard to see and turn into tangible welfare gains in ICTD projects, given the numerous factors that influence the translation of welfare information into welfare outcomes in developing country contexts today." (Ratan & Bailur, 2007)

Furthermore, Ratan and Bailur argue that what a rational usage of ICTs is, may be quite different from the perspective of people living in great poverty and uncertainty.[18]

Not only the use but also the design of ICT should be a subject of scrutiny from the perspective of the CA. Here as well agency and well-being are values that should be considered, but could contradict. Kleine (2011) introduces the concept of a 'determinism continuum' on which ICTs could be placed "based on the degree to which the spectrum of user choices is already pre-determined by the technology." She thus recognizes that the design features of ICTs matter and that not all technologies are equally good from the perspective of the CA; some of them may restrict agency more than others. The pre-determination of user choices could, for example, be based on ideas of designers about what fosters well-being. When development organizations make a choice between different technologies for usage in ICT4D projects, it is thus recommendable to explicitly consider the values of agency and well-being in relation to the design features of different options. An example can be found in a podcasting case that I discuss in a recent book chapter **(Oosterlaken, Grimshaw, and Janssen 2012, see chapter 6)**. This chapter also reveals that issues of power may also be very important in this process of technology choice. Power issues are more extensively discussed in a recent article by Zheng and Stahl (2011), which adds a critical note to the idea that ICTs are by definition a powerful tool to expand people's agency. Critical theory, they claim, helps to reveal and address that technology is implied in the distribution of power and sometimes in oppression and therefore possesses ''ideological qualities.'' If one wants to expand human capabilities and agency with the help of ICT, these authors make clear, one should look into the design and regulation of technology. For that purpose the CA could learn, Zheng and Stahl say, from 'critical theory.' It shares the value that the CA attaches to empowerment and apparently has a rich history of engaging with technology and ICT. Yet Zheng and Stahl feel that critical theorists sometimes get stuck in their attempt to ''debunk positive myths'' about technology. The CA, however, ''by seeing ICT as means to development and asking questions about what

[18] Another contribution of the article, according to the authors, is to "show how the agency-welfare debate gets even more complicated when it involves more than one individual. If establishing and using a telecentre is a collective choice between providers and users, then how is one social choice (for the 'common good') reached, rather than another?" (Ratan & Bailur, 2007).

conversion factors need to be in place to facilitate the achievement of potential freedom that technology provides", forms a counterpoise to that tendency.

Although ICTs are dominant in the literature on the CA and technology, the CA has also been used to reflect on issues raised by new **bio-technologies and health care technologies**. Cooke (2003) argues that the CA "can be used as a framework to ensure freedom and equality in the use of germ-line engineering technology." In her article she compares Sen's CA with Norman Daniels "normal functionings model." Clague (2006) discusses the CA in relation to the commercialization of bio-technologies and "patent injustice." With respect to bioethics, Nussbaum (2008) has argued amongst others that it is important that capabilities and not actual functioning is the political goal of bio-technologies. She furthermore notes that referring to the "natural" in such debates is unhelpful, as sports like skiing also depend on the usage of all sorts of artifacts for an "unnatural" enhancement of our capabilities. It ties in with the before mentioned article of Coeckelbergh (2011), who likewise believes that human enhancement[19] is not fundamentally different from capability expansion with more traditional technologies. Finally, some authors have used the CA to reflect on the usage of robots in health care. Coeckelbergh (2009) argues that Nussbaum's capability list provides specific, positive criteria to evaluate this technology in relation to the quality of care. Referring to his work, Borenstein and Pearson (2010) address the issue of human needs and human-robot interaction in different health care contexts and the demands that this makes on the careful design of these artifacts. **Energy technologies** have only very recently been discussed from the perspective of the CA, with Mathai (2012) looking at them from a policy perspective and Fernández-Baldor et al (2012) looking at concrete development projects involving the introduction of an energy technology. The latter discuss that technological development projects may not only increase individual agency, but also collective agency.

Several publications have addressed specific engineering issues, technology and the CA in general or **the relation between technology and human**

[19] Coeckelbergh describes human enhancement as follows: "Human enhancement aims at using technology to create better humans. What this means can best be clarified by saying what it is not: its aim is not therapeutic: it does not restore humans to a 'normal' state but wants to create humans that are 'better than normal', 'better than human'." Human enhancement is closely associated with new and emerging technologies like neurotechnology and nanotechnology.

capabilities. To start with the latter, a general discussion of the place of technology in the CA and some problems and prospects can be found in a book chapter by Johnstone (2012). She draws – amongst others – attention to the fact that the relation between technology and human capabilities is not as simple and straightforward as one might think. For example "one and the same technology may have both capability enhancing and capability diminishing effects even for the same person" and "technology is also deeply entangled in the broader social and material context", which may indirectly affect well-being and agency. For Foster and Handy (2008) ICTs make the fundamental question on what different types of capabilities exist more salient. They argue that ICTs can "dramatically amplify" people's 'external capabilities', which they define as the capabilities that one has because one is directly connected to other people with certain capabilities. An example would be a farmer who can increase his income because his neighbor has an internet connection and hence access to relevant agricultural information. Sen (2010) himself has brought up for discussion the idea that different artifacts may have – by their nature - different impacts on human capabilities. He points out that all of them can, of course, in principle be used for good or for bad – like a gun for protecting innocent lives and a mobile phone for planning a terrorist attack. Yet he argues that the phone, contrary to the gun, "is generally freedom-enhancing."[20] Coeckelbergh (2011) has criticized the view, implicitly present in some writing on the CA, that technologies are mere instruments for the expansion of timeless and universally valid central human capabilities. He makes a plea for "a hermeneutics of techno-human change, involving interpretations of dynamic relations between unstable capabilities, technologies, practices, and values. This requires us to use the CA in a way that highlights its interpretative dimension." His point touches upon the debate about the universality and validity of Nussbaum's list of 10 central human capabilities, which the author addresses towards the end of his article. Van den Hoven (2012) puts his general discussion on human capabilities and technology in the wider perspective of changes in the ethics of technology. He furthermore addresses the topic of technology and the good life in relation to the CA, something which I discuss in much more detail in my most recent paper **(Oosterlaken, under review, see chapter 7)**.

[20] Whether or not there is indeed such a principled difference between phones and guns and how this can be accounted for might be an interesting topic of further reflection by philosophers of technology.

In this category of 'general papers on the CA and technology' also falls a reply that I wrote **(Oosterlaken 2011, see chapter 5)** to an article (Smith and Seward 2009) that extensively discusses individuals and social structures as the constituents of human capabilities. I explain that in such an ontology technical artifacts should be explicitly acknowledged as an important third component. Referring to actor-network theory (e.g. Latour 2005)[21], I furthermore argue that technology only expands human capabilities when appropriately embedded in wider socio-technical structures. Whereas I start from the nature of human capabilities and then discuss the role of technical artifacts and socio-technical structures in creating them, Johnstone (2007) makes the opposite move. She starts with discussing the nature of technology and then brings in the CA as a way to ethically reflect on them. She makes an argument that ICTs are increasingly part of complex systems, while ethical theory is traditionally mostly action / agent oriented. This system character of ICTs makes ethical analyses in terms of solely individual actions, agents, intentions, reasons and obligations difficult. Thus, she concludes, a value-based approach is necessary. The CA, with the central importance it gives to agency and valuable human capabilities, can be used for this purpose. It can, Johnstone claims, incorporate the system level effects of ICTs through their influence on the social and material environments that influence the conversion of resources into capabilities.

Central in the development of new technological artifacts and to the job of many engineers is **the design of buildings and technical artifacts**. Architects and other urban designers may also be interested in some earlier work of Frediani (2007) in the area of housing and settlement upgrading projects in developing countries, where he states that "urban programmes with the objective of enhancing people's freedoms should", he says, "be engaged in identifying the underlying physical designs of the built environment."[22] The design of ICTs in relation to the CA is addressed in Johri and Pal (2012) and in Kleine et al (2012). However, a CA of design has been most extensively advocated by Dong (2008) and myself **(Oosterlaken 2009, see chapter 2)**. These two articles each take a different angle and nicely complement each other. Dong applies the CA to

[21] A detailed "encounter between Sen and Latour", investigating the similarities and differences between the oeuvres of both thinkers, has recently been staged by Kullman and Lee (2012).

[22] A practical application of the CA to this field is also mentioned by Rubbo (2010) . She says that the approach, with its ideas about agency, has been a source of inspiration for the international design program Global Studio. Unfortunately, she doesn't specify how exactly the CA has made a difference in this program.

design policy and the process of design. He argues that from a justice perspective we should pay attention to citizens' capabilities to design and in this way co-shape their life world. I emphasize that design outcomes or the design features of an artifact are very important for its exact impact on human capabilities. Hence, I introduce the idea of 'capability sensitive design', analogue to the idea of 'value sensitive design' originating from the field of ethics of technology (e.g. van den Hoven 2007). A recent book chapter by Nichols and Dong (2012) elaborates on Dong's ideas, while I also elaborated on mine in a chapter for an edited volume titled *Design for Values* **(Oosterlaken forthcoming, see chapter 3)**. The ideas of Dong and myself are drawn together in a book chapter by Frediani and Boano (2012), who criticizes us for creating an "unhelpful dichotomy between process of design and product of design" and discuss this further in relation to urban design and planning. The relation between inclusive/universal design and the CA, which I briefly touched upon in my 2009 article, is taken up extensively by Toboso (2011), who argues that designers should pay more attention to human diversity, which is a core theme in the general literature on the CA. He discusses the relevance of the universal/inclusive design movement and introduces the concept of "functional diversity" to support the shift in design practice that he proposes. I myself have meanwhile also discussed this topic of the CA and inclusive/universal design more extensively **(Oosterlaken 2012b, see chapter 4)**, drawing on philosophy of technology to argue amongst others that the apparent commonalities between a CA of design and inclusive/universal design run deeper than one might think.

The relevance of design features also implies that deliberation about technology choice is important. For this purpose Kleine (2011) introduces the concept of a 'determinism continuum' on which ICTs could be placed "based on the degree to which the spectrum of user choices is already pre-determined by the technology." She thus recognizes that the design features of ICTs matter and that not all technologies are equally good from the perspective of the CA; some of them may restrict agency more than others. The pre-determination of choices could, for example, be based on ideas of designers about what fosters well-being. A recent article by Zheng and Stahl (2011) also adds a critical note to the idea that ICTs are by definition a powerful tool to expand people's agency. Critical theory, they claim, helps to reveal and address that technology is implied in the distribution of power and sometimes in oppression and therefore possesses ''ideological qualities.'' If one wants to expand human capabilities and agency with the help of ICT, these authors make clear, one should look into the design

and regulation of technology. For that purpose the CA could learn from 'critical theory', which shares the value that the CA attaches to empowerment and which has a rich history of engaging with technology and ICT. Yet Zheng and Stahl feel that critical theorists sometimes get stuck in their attempt to ''debunk positive myths'' about technology. The CA, however, ''by seeing ICT as means to development and asking questions about what conversion factors need to be in place to facilitate the achievement of potential freedom that technology provides", forms a counterpoise to that tendency.

In all engineering domains **technological risk** is a recurring issue that often raises difficult ethical questions, for example with respect to informed consent and a just distribution of such risks (e.g. Asveld and Roeser 2009). Gardoni and Murphy – a civil engineer and a philosopher respectively - have together written a series of articles in which they develop, step-by-step, a CA of risk assessment and management, with a focus on civil engineering. They discuss the shortcomings of existing risk approaches, including cost-benefit analysis (Murphy and Gardoni 2007) and argue that risks should be assessed according to a hazard's impact on individual capabilities (Murphy and Gardoni 2006). Topics addressed by them include minimum thresholds for capabilities and the acceptability or tolerability of risks (Murphy and Gardoni 2008), a Disaster Impact / Recovery Index analogous to the Human Development Index (Gardoni and Murphy 2008), and a plea for a focus on capabilities instead of functionings in risk analysis (Murphy and Gardoni 2010). In a recent chapter they have taken up the topic of risk and the design of civil works from the perspective of the CA (Murphy and Gardoni 2012).

It may also be worth saying something about the CA and **entrepreneurship and innovation** – as technology often plays a central role in these mechanisms of change. Cozzens et al (2007) sketch a broad overview of how (a) science and technology studies, (b) economic growth theory and (c) innovation systems research have approached the topic of development. None of these, they say, "explicitly takes development-as-freedom [i.e. development conform Sen's CA] as its goal nor explores concretely how the approach would contribute to meeting the basic needs of the world's population." Scholars in these fields should however do so, the authors argue, in order to explicate the contribution of their respective field to the development agenda. One exception that I could find was

an article by Musa (2006)[23], who does connect the CA to work from innovation studies. Based on the CA, he adjusts the well-known 'Technology Acceptance Model', in which the main variables are perceived usefulness and ease of use, in order to better suit the situation in developing countries. The revised model, he claims, "recognizes the fact that technology acceptance or adoption is ultimately influenced by the values that individuals place on technology in their daily lives and that these accumulated values will allow a country to realize the full impact of technology for development." More recently, some interesting work on the CA, entrepreneurship and innovation in developing countries has been done by Ziegler and his colleagues (Ziegler 2010; Ziegler, Karanja, and Dietsche forthcoming). Central in the work of Ziegler and his colleagues is the concept of 'capability innovation': a socio-technical innovation that manages to creatively expand a number of different valuable capabilities with one innovation. Furthermore, some authors have linked the CA to the discourse about entrepreneurship and innovation for the so-called 'Base of the Pyramid', the lowest-income groups in developing countries (Crabtree 2007; Tashman and Marano 2009).

Finally, some authors have referred to **ICTs** in their comparison of **human capabilities versus other possible 'spaces of equality' or core ethical notions**. Van den Hoven and Rooksby (2008) have addressed capabilities versus primary goods[24] in relation to distributive justice and the value of information. The latter topic has obviously gained in urgency as a result of the increasing prominence of ICTs in our societies. They argue that access to information is a Rawlsian primary good, but also believe that "any attempt to extend Rawls' theory of justice to information goods should take Sen's concerns into account." After all, they ask, "what value do information liberties have for someone with a substantial mental impairment, or for someone who is physically incapable of using a computer?" Birdsall (2011) focuses on the connection between capabilities and human rights (see e.g. Sen 2004, 2005). He meticulously explores the differences and parallels between the literatures on the CA and on

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[23] Von Tunzelmann and Wang Nick von Tunzelmann and Qing Wang (2007), in an article on the theory of production, also use the work of Sen "to match the heterogeneity of products and their characteristics existing in markets to the heterogeneity of consumers and their demands." Yet they stay within their own discipline and do not put it in the perspective of larger issues of poverty and development, as Cozzens et al seem to have in mind.

[24] I discuss human capabilities versus primary goods in chapter 8, although without very explicitly or extensively touching upon technology.

the ‘right to communicate’. Freedom of speech and other classical negative communication rights, he argues, in our current world insufficiently guarantee people’s capabilities for true communication and participation in societal dialogues.

I. ZOOMING IN: HUMAN CAPABILITIES & THE DESIGN OF TECHNICAL ARTEFACTS

Design for Development: A Capability Approach

Ilse Oosterlaken[1]

Introduction

Experts seem to agree that in the past decades little scholarly attention has been paid in development and design scholarship to ethics and global justice issues. The subject is sometimes discussed under the heading of "design for development,"[2] "appropriate technology,"[3] or "design in a poor context, for the alleviation of poverty;"[4] but hardly ever receives an in-depth treatment and exclusive attention. Margolin and Margolin, discussing socially responsible design in a broader sense (i.e., not only addressing the needs of the global poor, but also those of the aged, the disabled, etc.), note that there are "extremely well-developed" theories about "design for the market." On the contrary, "little thought has been given to the structures, methods, and objectives of social design."[5] Yet the fact, alone, that several articles on this topic appeared in *Design Issues* in recent years is an indicator that this is starting to change.

In order to further advance this neglected area of design, I suggest a "capability approach" towards designing for society, and particularly, the world's poor. Central in this approach are human capabilities; the effective opportunities that people have to "live the lives that they have reason to value."[6] Capabilities offer an alternative for human dignity and human rights as the grounds for, or first principle of, design as has been proposed by Buchanan;[7] an alternative that may be more appealing at first sight for designers. I will first introduce the notion of the capability approach. Then I will explain its relevance for engineering and design before sketching some directions for future research on design for global justice.

The Capability Approach

The capability approach has been pioneered and developed by the economist and philosopher Amartya Sen and the philosopher Martha Nussbaum.[8] According to this approach, the proper evaluative space in questions of justice, equality, and development is not income, not resources, not primary goods, not utility (i.e., happiness or the sum of pains and pleasures) or preference satisfaction. Its proponents argue that the focus should be on human capabilities. Capabilities have been described as "what people are effectively able to do and be,"[9] or the (positive) freedom that people have "to enjoy 'valuable beings and doings.'"[10] These beings and doings are called "function-

1 Department of Philosophy, Faculty of Technology, Policy and Management, Delft University of Technology/3TU. Centre for Ethics and Technology. This paper is a modification of the start document (E.T. Oosterlaken, May 26th of 2008, working paper of the 3TU.Centre for Ethics and Technology) for a research project that will be executed at TU Delft in the period 2009–2013.

2 Victor Margolin, "Design for Development: Towards a History," *Design Studies* 28 (2007): 111–115.

3 Daan Nieusma, "Alternative Design Scholarship: Working towards Appropriate Design," *Design Issues* 20 (2004): 13–24.

4 Angarad Thomas, "Design, Poverty, and Sustainable Development," *Design Issues* 22 (2006): 54–65.

5 Victor Margolin and Sylvia Margolin, "A 'Social Model' of Design: Issues of Practice and Research," *Design Issues* 18 (2002): 24–30.

6 Amartya Sen, *Development as Freedom* (New York: Anchor Books, 1999).

7 Richard Buchanan, "Human Dignity and Human Rights: Thoughts on the Principles of Human-Centered Design," *Design Issues* 17:3 (2001): 35–39.

8 See among others: Martha C. Nussbaum, *Women and Human Development: The Capability Approach* (New York: Cambridge University Press, 2000).

9 Ingrid Robeyns, "The Capability Approach – A Theoretical Survey," *Journal of Human Development* 6:1 (2005): 94–114. Unless stated otherwise, this is the publication of Robeyns that I refer to.

10 Sabina Alkire, "Why the Capability Approach?" *Journal of Human Development* 6:1 (2005): 115–133. Unless stated otherwise, this is the publication of Alkire that I refer to.

2 Design for development: a capability approach

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2.1. Introduction

Experts seem to agree that in the past decades little scholarly attention has been paid in development and design scholarship to ethics and global justice issues. The subject is sometimes discussed under the heading of "design for development" (Margolin, 2007), "appropriate technology" (Nieusma, 2004), or "design in a poor context, for the alleviation of poverty" (Thomas, 2006), but hardly ever receives an in-depth treatment and exclusive attention. Margolin and Margolin (2002), discussing socially responsible design in a broader sense (i.e., not only addressing the needs of the global poor, but also those of the aged, the disabled, etc.), note that there are "extremely well-developed" theories about "design for the market." On the contrary, "little thought has been given to the structures, methods, and objectives of social design" (Margolin & Margolin, 2002). Yet the fact, alone, that several articles on this topic appeared in *Design Issues* in recent years is an indicator that this is starting to change.

In order to further advance this neglected area of design, I suggest a 'capability approach' (CA) towards designing for society, and particularly, the world's poor. Central in this approach are human capabilities; the effective opportunities that people have to "live the lives that they have reason to value." Capabilities offer an alternative for human dignity and human rights as the grounds for, or first principle of, design as has been proposed by Buchanan (2001); an alternative that may be more appealing at first sight for designers. I will first introduce the notion of the CA. Then I will explain its relevance for engineering and design before sketching some directions for future research on design for global justice.

2.2. The capability approach

The CA has been pioneered and developed by the economist and philosopher Amartya Sen (e.g. 1999) and the philosopher Martha Nussbaum (e.g. 2000). According to this approach, the proper evaluative space in questions of justice, equality, and development is not income, not resources, not primary goods, not utility (i.e., happiness or the sum of pains and pleasures) or preference satisfaction. Its proponents argue that the focus should be on human capabilities. Capabilities have been described as "what people are effectively able to do and be" (Robeyns, 2005), or the (positive) freedom that people have "to enjoy 'valuable beings and doings'" (Alkire, 2005). These beings and doings are called "functionings" by Sen. Functionings "together constitute what makes a life valuable" (Robeyns, 2005) and are "constitutive of a person's being" (Alkire, 2005). Examples of functionings are such diverse things as working, resting, being literate, being healthy, being part of a community, being able to travel, and being confident. "The distinction between achieved functionings and capabilities," as Robeyns explains, "is between the realized and the effectively possible; in other words, between achievements on the one hand, and freedoms or valuable options from which one can choose on the other" (Robeyns, 2005). According to Alkire, one reason to focus on capabilities instead of functionings is that we value free choice:

> "A person who is fasting is in a state of undernutrition, which may seem very similar to a person who is starving. But in the one case, the fasting person could eat and chooses not to; whereas the starving person would eat if she could." (Alkire, 2005)

Moreover, the CA recognizes the importance of both "well-being freedom" and "agency freedom." The latter acknowledges that people pursue not only their own well-being, but may also choose to pursue other ends; for example, the well-being of others, living up to religious ideals, or following moral norms.

Why should we focus on these capabilities in our developmental efforts, rather than utility or resources? One example often given in arguing for capabilities rather than resources is that a healthy and a handicapped person would need different amounts of resources to enable them to have the same opportunities in life. Also, for other reasons, the relationship between a certain amount of goods and what a person can do or can be varies according to Sen:

> "... a person may have more income and more nutritional intake than another person, but less freedom to live a well nourished existence because of a higher basal metabolic rate, greater vulnerability to parasitic diseases, larger body size, or pregnancy." (Sen, 1990)

One of the crucial insights of the CA is that the conversion of goods and services into functionings is influenced by personal, social, and environmental conversion factors; and that it should not be taken for granted that resource provision leads to increased capabilities or functionings.[25]

The reason why capability theorists prefer these capabilities over utility or preference satisfaction is the phenomenon which Sen has called "adaptive preferences":

> Our desires and pleasure-taking abilities adjust to circumstances; especially to make life bearable in adverse situations. The utility calculus can be deeply unfair to those who are persistently deprived.... The deprived people tend to come to terms with their deprivation because of the sheer necessity of survival; and they may, as a result, lack the courage to demand any radical change, and may even adjust their desires and expectations to what they unambitiously see as feasible. (Sen, 1990)

The CA is increasingly being applied in different areas. In 2006, Robeyns identified nine different types of applications of the CA: "(1) general assessments of human development of countries, (2) assessing small-scale development projects, (3) identifying the poor in developing countries, (4) poverty and well-being assessment in advanced economies, (5) deprivation of disabled people, (6) assessing gender inequalities, (7) debating policies, (8) critiquing and assessing social norms, practices, and discourses, and (9) functionings and capabilities as concepts in non-normative research" (Robeyns, 2006). It has led to lively debates on several issues.

One very important debate is about which capabilities matter and who (how, when) is to decide this. Different visions exist on this issue. One of several differences that Robeyns mentions between the contributions of Nussbaum and Sen is that, "Whereas in Sen's work the notion of capabilities is primarily that of

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[25] Robeyns explains this very clearly, including a nice schematic representation of how the conversion of goods and services into functionings takes place.

a real or effective opportunity (as in social choice theory); Nussbaum's notion of capability pays more attention to people's skills and personality traits as aspects of capabilities." And while Nussbaum comes up with a concrete and—so she believes—universally applicable list of important capabilities, "Sen has always refused to endorse one specific well-defined list of capabilities," or to set priorities among different capabilities. His reasons are that the proper list of capabilities may depend on purpose and context, and should be a result of public reasoning and democracy; not something a theorist should come up with.

The question of operationalization of this view has, understandably, received quite some attention (e.g. Comim, Qizilbash & Alkire, 2008). How do we expand the capabilities or positive freedoms of people, and how do we measure the results? "For some of these capabilities," says Robeyns, "the main input will be financial resources and economic production; but for others, it can also be political practices and institutions, [...] political participation, social or cultural practices, social structures, social institutions, public goods, social norms, traditions and habits." Alkire argues that "operationalizing is not a one-time thing," but something that is dependent upon such things as country, level of action and the problem at hand. Both Robeyns and Alkire conceive of the CA as interdisciplinary. Alkire especially advocates close collaboration between capability theorists and experts in relevant fields of application; for example, nutritional science or econometrics, to "trace its implications all the way through." She does not mention engineering and design, but she easily could have, as will be explained in the next section.

2.3. Technology as capability expansion

From a common sense point of view, adopting the CA immediately seems to be strongly compatible with recognizing and improving the contribution of technology and engineering products to development. After all, what is technology for, if not increasing the capabilities that we have as human beings? Just as the wheel enhanced our capability to transport heavy loads; more recently, the computer enhanced our capabilities to make complex calculations. Technologies have grown more complex over time, and are in an increasingly complex way intertwined with society, institutions, laws, and procedures. But ideally, we still intend them to add to our capabilities to survive (such as in the case of medical equipment); and to participate in public deliberation (such as in the case of ICT/Internet applications that facilitate political discussion).

As obvious as making this connection between technology and capabilities may seem, philosophers working on the CA so far do not seem to have sufficiently realized the relevance of technology, engineering, and design for capability expansion. For example, it does not figure on the list that Robeyns presents of inputs for capabilities (political practices, social institutions, habits, etc.). It has hardly received any attention in the literature. Some explorative, agenda-setting articles appeared only recently; mainly concerned with ICT (e.g. Van den Hoven & Rooksby, 2008; Zheng, 2007; Johnstone, 2007). Remarkably, a specific piece of technical equipment, namely a bicycle, has been used on several occasions to explain the approach :

> Take a bicycle.... Having a bike gives a person the ability to move about in a certain way that he may not be able to do without the bike. So the transportation characteristic of the bike gives the person the capability of moving in a certain way. That capability may give the person utility or happiness if he seeks such movement or finds it pleasurable. So there is, as it were, a sequence from a commodity (in this case, a bike), to characteristics (in this case, transportation), to capability to function (in this case, the ability to move), to utility (in this case, pleasure from moving). (Sen, 1983)

However, the bicycle is just used as an example in explaining the focus of the CA, and nothing more. Robeyns does say that the characteristics of the bicycle expand the owner's capability to move around. Yet she also states that:

> We are not interested in a bicycle because it is an *object made from certain materials with a specific shape and color,* but because it can take us to places where we want to go, and in a faster way than if we were walking. (emphasis is mine.)

Of course, the point that Robeyns here attempts to make is that what matters in the end is capability expansion, and that the bicycle is only instrumentally important in this respect. However, Robeyns' remark is still naive regarding the sociology and philosophy of technology, as I will explain in the next section.

2.4. The significance of the details of design

Philosophers and sociologists of technology have argued in the past decades that engineering products are far from neutral instruments to be used at will for either good or bad, but rather value-laden or inherently normative (see e.g. Winner, 1980; Latour, 1992). Values such as privacy, autonomy, sustainability, safety, and justice can be realized in our technologies—or these could rather embed and create the opposite: injustice, insecurity, and so on. And many different design options are generally available during the development process of a new technology or product. This means that the details of design are morally significant. If technologies are value-laden and design features are relevant, we should—so it has been suggested—design these technologies in such a way that they incorporate our moral values. This thought has led to the emerging research field of so-called "value sensitive design," which initially was limited to R&D in the area of ICT, but is now also gaining popularity in other engineering areas (see e.g. Van den Hoven, 2007; Cummings, 2006).

Keeping this in mind, let us discuss the bicycle a bit further. Nowadays, we may take it for granted as a piece of equipment that "can take us to places where we want to go, and in a faster way than if we were walking," as Robeyns did. However, the bicycle is not such a simple and straightforward artifact as it may seem. As it happens, it figures in a classical case study in the sociology of technology (Bijker, 1995). In this study, Bijker describes in detail how the development of the modern bike took place, stretching over a period of more than two centuries in which many different design varieties competed with each other. What is especially interesting is that Bijker's analysis has shown that different social groups attached different meanings to this new artifact, and that this influenced developments in its design. Initially, it was mainly viewed as a piece of sports equipment, used for racing contests. This means that the speed that a certain type of bicycle could achieve was very important. In the second half of the 19th century, the dominant model had become the so-called "high wheeled Ordinary bicycle," which had a very large front wheel in comparison to the smaller rear wheel, and pedals connected directly to the front wheel. Because of the way in which bicycles were viewed, it developed in a direction of less rather than more safety:

> The trend of enlarging the front wheel of the velocipede had continued once speed had become so important, and this made it necessary to

> move the saddle forward in order to keep pedals within reach of the feet. This implied a reduction of the rear wheel's diameter— partly because otherwise the machine could not be mounted at all, partly to reduce the bicycle's weight, and partly for aesthetic reasons (it set off the grandeur of the high wheel). But these two developments moved the center of gravity of the bicycle and rider far forward, to a position almost directly above the turning point of the system. Thus, only a very small counter force—for example, from the bumpiness of the road, but also from the sudden applications of the brake—would topple the whole thing. (Bijker, 1995)

Because of the bad condition of the roads in those days, this happened quite frequently. However, this was not considered a problem, nor a sign of bad bicycle design. Cycling was considered to be an activity for young and adventurous men. The difficulty of riding the "Ordinary" and its accident proneness only contributed to the ability of these lads to impress the ladies by participating in cycling contests in the parks. "Falls were such an accepted part of bicycling," Bijker notes, "that producers advertised their bicycles' ability to withstand falls, rather than claiming that they did not fall at all."

Thus, bicycling was rarely undertaken by senior citizens or women, and certainly not considered as a form of transportation. This, says Bijker, only changed "when manufacturers began to regard women and older men as potential bicycle buyers." The realization that there was a business opportunity here led to a whole series of new developments in bicycle design, with safety instead of speed now being a prominent goal. Some design changes were successful; others not. These attempts to reach new target groups led in the end to the dominance of the so-called "safety bicycle," which is chain driven by the rear wheel. The main function of the bicycle had become transportation.

After this bicycle detour, let us return again to the concept of value-sensitive design. A similar perspective may thus be just what is needed if we want to introduce new technologies in developing countries in such a way that it does benefit the poor by expanding their human capabilities. If one is interested in making the introduction of a new technology, such as the bicycle in 19th century Europe, or currently ICT equipment in developing countries, contribute to capability expansion, one should also be interested in its design. As the bicycle example illustrates, the design features of technologies are relevant for their effect on human capabilities. Perhaps we should not care very much about the color of the bicycle—it is hard to imagine how this could be relevant—but shape

and material definitely deserve our attention. (Although, I agree with Robeyns for instrumental reasons.) We should not too easily assume that a certain product or technology will do well in expanding people's capabilities. Sen's CA, I propose, should be directly applied to the design and engineering of these new technologies and products for developing countries. What responsible innovation for the benefit of the global poor requires, one may say, is "capability sensitive design" of technologies for developing countries.

2.5. Capability sensitive design

A central question, of course, is what capability sensitive design entails, and whether or not adopting such a new design philosophy will in the end make a difference in the lives of people. This is something that needs further investigation, and the last section will point out some research directions. But first let me say something about why I expect that taking a CA is valuable for design scholarship and practice. In the introduction, I referred to an essay by Buchanan (2001). He writes—and I will quote him quite extensive because of the importance and eloquence of his message—the following:

> We tend to discuss the principles of form and composition, the principles of aesthetics, the principles of usability, the principles of market economics and business operations, or the mechanical and technological principles that underpin products. In short, we are better able to discuss the principles of the various methods that are employed in design thinking than the *first* principles of design, the principles on which our work is ultimately grounded and justified. The evidence of this is the great difficulty we have in discussing the ethical and political implications of design.... The implications of the idea that design is grounded in human dignity and human rights are enormous, and they deserve careful exploration. (Buchanan, 2001)

The grounding principle of design that Buchanan envisions is related to the one I am proposing. Sen himself has declared that human capabilities and human rights are closely connected concepts. For example, he says that "there are many human rights that can be seen as rights to particular capabilities" (Sen, 2005) — because of the intuitively obvious connection between technology and engineering products on the one hand, and the expansion of human functionings and capabilities on the other—it will be easier for designers to

incorporate and take into account human capabilities than to deal with human rights. As Johnstone phrased it:

> Because the theory is essentially naturalistic and functionalist in orientation, capability analyses are able to integrate descriptive and normative dimensions in a way that is particularly appropriate to technological domains. (Johnstone, 2007)

The effects of applying the CA to the domain of technology, engineering, and design may be huge. As Buchanan (2001) writes about "human-centered design":

> Unfortunately, we often forget the full force and meaning of the phrase—and the first principle which it expresses. This happens, for example, when we reduce our considerations of human-centered design to matters of sheer usability and when we speak merely of "use-centered design." It is true that usability plays an important role in human-centered design, but the principles that guide our work are not exhausted when we have finished our ergonomic, psychological, sociological, and anthropological studies of what fits the human body and mind. (Buchanan, 2001)

The observation is still valid. Let's illustrate this with two examples. Chalmers University of Technology (Sweden) tells prospective industrial design engineering (IDE) students that "the degree to which a product *satisfies* customers and users is [...] regarded as one of the most critical factors in product development." New developments mean that "previous values, such as functionality, reliability, and cost are partly to be complemented by, partly to be replaced by, other values, such as *usability*, *comfort*, aesthetics, *pleasure*, and *excitement*."[26] One could argue that there are more fundamental values at stake in design than the ones mentioned here. Likewise, in a proposal for a new IDE research program,[27] Delft University of Technology (The Netherlands) recently

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[26] Brochure master's programme Industrial Design Engineering, Chalmers University of Technology, Sweden. Accessed at 14 November 2008, to be found at: www.chalmers.se/en/sections/education/masterprogrammes/programmedescriptions/industrial-design.

[27] "Towards a New Research Portfolio for IDE/TUD" (Delft: Faculty of Industrial Design Engineering, TU Delft, 2007, work in progress). Accessed 14 November 2008, to be found at:

claimed that industrial design should contribute to the "well-being" of people, which is defined as "an experiential state of people and organizations, which can have many shapes, such as *satisfaction*, *fulfillment*, support and inspiration, protection, acknowledgement, *comfort*, *happiness*, and involvement." The words chosen by both universities (the emphasis is mine) suggest that it is currently preferences or utility rather than something such as human dignity or capabilities that are at the core of the work of many IDE departments (assuming that these examples are representative). Without denying the relevance of these notions, the concept of human capabilities offers a richer understanding of well-being: one that adds to design scholarship and practice. It certainly accommodates the ideas and preferences of design constituencies which include moral considerations concerning autonomy, privacy, sustainability, accountability, responsibility, etc., as well as the ones mentioned in the most common descriptions of the IDE communities.

What capability sensitive design as an alternative approach entails is a matter of further investigation. Yet we can easily deduct some rough pointers from the CA. One of the merits of the CA is that it has drawn attention to the existence of immense human diversity; not only in terms of what we value, but also in terms of personal and social/environmental characteristics that influence the conversion from resources into capabilities and functionings. People who have paralyzed legs, for example, will obviously not be able to ride an ordinary bicycle. In this case, a personal characteristic completely blocks the conversion of a resource into capability or functioning. One beauty of technological artifacts, however, is that they are resources whose properties can be molded. They can—within certain limits—be designed in such a way that they take these conversion factors into account. Whatever else it may entail, capability sensitive design takes human diversity into account.

2.6. A case: tricycles for the disabled in Ghana

If we consider this aspect of capability sensitive design, the design of tricycles for the disabled in developing countries may be a nice illustration of what I have in

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www.io.tudelft.nl/live/pagina.jsp?id=e667fbe8-b697-4d5d-a709-f61221558c4c&lang=nl). It should be recognized that the document also says that the work of designers should not be "at the cost of others" and should be placed in an "ecological, social, cultural, and economic context." This is mentioned, however, as a limiting condition.

mind. The disabled in developing countries have, as Van Boeijen notes, little opportunities "in education, (finding) work and participation in social life," or to shape their own life. She writes:

> The possession of a tricycle can give a large number of them the possibility to travel.... A tricycle is a hand-operated vehicle that is propelled by means of a chain- or crank lever mechanism and is suitable for driving long distances, under bad road conditions, and for the transportation of goods. All over the world small workshops in developing countries produce these tricycles in many different designs. These tricycle designs need improvements: they are often uncomfortable for the user, not suitable for the local situation, and difficult to produce. Imported tricycles from Western countries are often too expensive and not suitable for use under the average conditions in developing countries. Usually, they also lack spare parts which makes repair difficult or impossible. (Van Boeijen, 1996)

At least since the 1990s, if not earlier, industrial design engineers have—in different local contexts—been working on design improvements that address these problems. In this way, they contribute to the expansion of the capability to move for an otherwise socially marginalized group. In a case in Ghana, a local metal workshop had to stop the production of tricycles due to a lack of financial support. A team of industrial design engineering students did extensive research into local circumstances, the metal workshop, the disabled, and other stakeholders in order to find an appropriate design solution. Their tricycle, for example, has been adjusted in such a way as to enable the handicapped to sell ice cream stored in a cooler in front of the tricycle. Disabled persons are thus enabled to act as street vendors. The financial side of the tricycle production and provision also has been taken care of; among others by getting a company involved whose products can be sold by street vendors (Kandachar et al, 2007). By increasing the income, opportunities, and self-respect of the handicapped in this manner, the tricycles now also contribute to capabilities other than mobility.

Capability sensitive design envisioned in this way bears strong resemblance to the familiar concept of "universal design." As Nieusma (2004) explained, this approach is all about "accounting for diversity." It should be noted that, on Nieusma's analysis, my example of the tricycles in Ghana seems rather an example of the more limited accessibility movement, a predecessor of the universal design movement. It is in no way my intention, however, to make

capability sensitive design only responsive to differences in physical abilities or to just one, specific user group at a time. Moreover, future research may reveal that capability sensitive design has many more sides to it than has been discussed so far.

2.7. Participation in design

Another feature of the CA is that it attaches great importance to agency, free choice, and value judgments. As mentioned earlier, Sen deliberately refrains from specifying and prioritizing a complete capability list. Not surprisingly, public deliberation and participation have thus received attention in the capability literature. It is here that research on capability sensitive design can and should make a link with participatory design which, according to Nieusma (2004) "has developed into a well-articulated, well justified methodology for user participation in design processes" and is all about "coping with disagreements." He regrets, however, that "increasingly, participatory design methodologies are used to advance the goals of user-centered design without emphasizing the inclusion of marginalized perspectives in design processes." We are reminded here of Buchanan's reflections on the ultimate ends of design, and the contrast with the actual focus of IDE departments.

Interestingly, Frediani (unknown date) in exploring the connections between the CA and participatory methods more broadly, notices something similar. In practice, participatory methods used in developmental cooperation often do not meet the expectations, being "sometimes used merely as a tool for achieving preset objectives" and not as a process for true empowerment and improvement of people's lives. He argues[28] that "participatory methods need to be complemented by a theory that explores the nature of people's lives and the relations between the many dimensions of well-being." This theory, he says, should be comprehensive, but flexible and able to capture complex linkages between (aspects of) poverty, intervention, participation, and empowerment. He feels that the CA is able to offer exactly that. In my view, the CA may be able to offer the same revival to the ideals of participatory design.

Finally, I will try to identify some issues that definitely deserve our attention and that hopefully will lead to fruitful discussions about the ethics of design and, more specifically, the concept of capability sensitive design.

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[28] He bases his argument on a work by Cleaver (2001).

2.8. Some directions for future research

Applying the CA to the broad domain of technology, engineering, and design will require research in a wide range of different questions and cases. Research should address issues ranging from design methods to the social and ethical dilemmas that the designer will encounter along the way. More theoretical reflection should go hand-in-hand with case studies of design projects. Johnstone (2007) mentions four different focal points for future research into technology and human capabilities: (1) particular groups or individuals, (2) particular capabilities, (3) particular situations or context, or (4) particular interventions (technologies, artifacts). Case studies could primarily address one of these aspects or a combination of them. She discusses this in relation to ICT only. This is a domain in which a lot of design takes place, the outcome of which is relevant for people's capabilities. In a Western context, one could think of reassessing the debate on privacy and ICT applications in terms of how the latter affect capabilities to control personal information flows. In the context of developing countries, it has been pointed out independently both by Selinger and Zheng that the expectations of ICT for development are high, and that critical reflection is rare. ICT in its current form does not necessarily contribute to (for example) the empowerment of women in developing countries (Selinger, 2008) and a CA could be helpful in avoiding the "pitfalls in e-development" (Zheng, 2007).

The sort of products that industrial design engineers are concerned with offer another domain for application. Again, the context could be Europe or the U.S. However, I would especially like to encourage a CA towards design for development, since both the need and the potential impact are high. Such research could, as inspired by the work of business scholar Prahalad, take place it in a business-like context. Prahalad (2005) has unleashed new enthusiasm and resources for development collaboration with his plea to the business world to come up with innovative products for the "Base of the Pyramid" (BoP). His hypothesis is that companies can make a profit while poverty gets alleviated. This perspective could lead to more financial sustainability and thus the long-term effectiveness of development efforts. The design of these innovative products, however, is underexposed in the BoP literature, as Thomas (2006) has noted. Moreover, one should not too easily assume that the interests of the poor and of companies are always compatible. Ethical and social dilemmas are to be

expected in such a context, in which—to use Margolin's terminology—design for the market and social design come together. There is a real challenge here.

How do we proceed with such research? First and foremost, there is a (largely empirical) question of which capabilities can be expanded (or perhaps unintentionally hampered) by new technology and products, and what engineers and designers (can) contribute to this. And how can philosophical reflection on the ultimate objectives of development, as offered by the CA, be translated in concrete design practice, including methods and tools? As mentioned in the previous section, another important question— perhaps even more so in a BoP/business context—is who should determine which capabilities and design solutions are relevant in a specific case, and what should happen in the case of disagreement or conflicts of interests.

Capability sensitive design is not something completely new or entirely different from existing "alternative design scholarships," as Nieusma (2004) calls it. As we have seen, there is a clear link with universal design and participatory design. But rather than making capability sensitive design redundant, I consider this a strength. It indicates that capability sensitive design is able to integrate lessons learned into a more comprehensive approach which offers a clear philosophical foundation of the ultimate ends of design; is connected to an expanding body of literature in philosophy and the social sciences; and—perhaps even more important—which can provide engineers and designers the inspiration that is needed to advance design for development.

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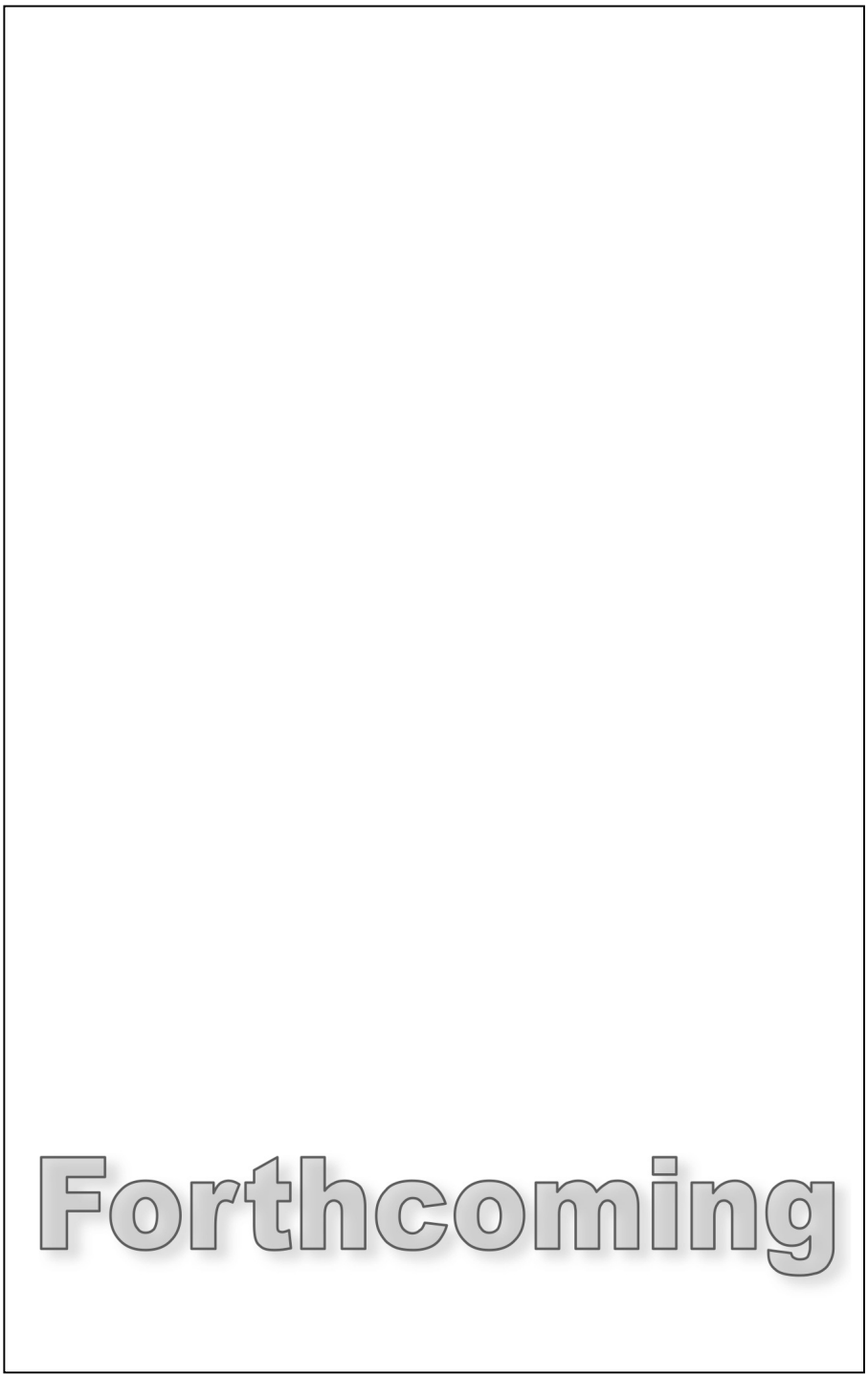
Forthcoming

3 Design and individual human capabilities - a capability approach of design for values

This chapter is forthcoming in Van den Hoven, J., Van de Poel, I. & Vermaas, P.E. (eds.), *Ethics and Values in Technological Design*, Springer, Dordrecht.

3.1. Introduction

As mundane as some technological artifacts may seem to be, there is sometimes a rich story to be told about their meaning for or impact on human lives. Take for example a lamp. It has a rather straightforward function: to give light. Since lamps are ubiquitous in modern, western society, we rarely stop to reflect on it. Yet due to factors such as low income or the absence of an electricity infrastructure, having light is not self-evident for everyone. In 2008 I met an industrial design engineer who had worked on several design projects for poor communities in the South, including the design of lamps. The experiences gained during that work, so he told me, made him realize that lamps are ultimately not about light. The importance of a lamp lies in the fact that it enables you to do things that contribute to the overall quality of life, for example to go to the outdoor toilet at night without being afraid, or to make your homework in the evening after having looked after your family's cattle all day. Technology has, so this simple example illustrates, the potential to contribute to the quality of life by expanding what people can do or be.

That technical artifacts have in essence something to do with enabling human action, with expanding human capabilities, is an intuitively plausible idea that has recently been reflected upon by several philosophers of technology (e.g. Lawson 2010; Van den Hoven 2012; Illies and Meijers forthcoming). The focus of this chapter will, however, be on a more general philosophical framework that attaches central moral importance to human capabilities, namely the so-called 'capability approach' (CA). In this approach - for which Amartya Sen and Martha Nussbaum have done much of the ground work – human

capabilities are often described as the real opportunities for a person to do and be what he/she has reason to value. In a recent introduction to the CA Robeyns (2011) notes that

> "it is generally understood as a conceptual framework for a range of normative exercises, including most prominent the following: (1) the assessment of individual well-being; (2) the evaluation and assessment of social arrangements; and (3) the design of policies and proposals about social change in society." (Robeyns 2011)

This chapter will discuss the CA as a normative framework that also has relevance for the design and evaluation of technical artifacts. As such, it presents a specific elaboration of the general idea of 'design for values' or 'value sensitive design' that is the central topic of this book. We will see, however, that there are commonalities with some of the other chapters in this book, such as that on design for well-being / the good life (chapter 18), design for justice and democracy (chapter 20) and inclusive / universal design (chapter 21).

The structure of this chapter is as follows. I will start with an outline of the central concepts and philosophical ideas present in the CA (section 1). It is meant to give designers a minimal basis for the 'conceptual investigation phase' of the tripartite 'Value Sensitive Design' or VSD approach developed by Friedman and her colleagues (e.g. Friedman, Kahn, and Borning 2001). According to the VSD approach, these conceptual investigations should be closely intertwined with empirical and technical investigations throughout the design process. In that light, it could be considered an attractive feature of the CA that - in addition to the philosophical literature - there also exists a large and interdisciplinary body of literature discussing its 'operationalization' and presenting empirical applications. This social science literature on the CA, although not further discussed in this chapter, may be relevant for designers in two ways. Firstly, the methodologies used to evaluate well-being and social arrangements in terms of human capabilities may also be useful for the evaluation of design alternatives or final design outcomes. Secondly, the results of such empirical studies may be useful, by providing designers with relevant knowledge about (a) stakeholder views on which human capabilities are important and how they should be understood (b) factors contributing to or inhibiting the expansion of human capabilities in concrete contexts of usage.

After having introduced the CA (section 2), it will be briefly discussed how technology and human capabilities are related (section 3). The first two sections thus provide the background against which the remainder of the chapter explores in more detail the different ways in which the CA could be relevant to design – be it engineering design, industrial design or architectural design. It should perhaps be noted at this point that I am rather lenient towards what counts as 'design'. This could be conceptualizing and shaping a completely new artifact, re-designing and improving an existing artifact or merely trying to figure out the best configuration of an artifact based on existing components and technologies. This chapter will drawn a distinction between two usages of the CA in design. In the 'narrow' usage (section 4) the CA is seen as presenting a proper conceptualization of individual well-being, with the aim of design being to contribute to this. This, however, raises some discussion points and a number of problems, most importantly an epistemological and an aggregation problem (section 5). In the 'broad' usage the CA (section 6) is seen as a source of insight and inspiration for taking a broader range of values and concerns into account in design, such as inclusiveness, agency, participation and justice.[29] In the concluding section (section 7) I will sketch some open issues and questions for future work.

3.2. The capability approach

One way to view the CA[30] is as a position in the debate about the best 'informational basis' for judgments about justice, equality, well-being and development. According to the CA, assessment should not primarily take place in terms of income, resources, primary goods, utility (i.e. happiness or the sum of pains and pleasures) or preference satisfaction. The focus should rather be on a range of human capabilities: well-being is multidimensional. This, so

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[29] Note that 'narrow' should not be read as implying a value judgment. See Robeyns (2011) for an explanation of the distinction between a narrow and a broad employment of the capability approach. Note that she contrasts the broad usage in two different ways with the narrow usage: (a) taking into consideration a broader range of values vs. being concerned with well-being alone, (b) focusing on the evaluation of policies and social institutions vs. focusing on the well-being of individuals. I'm using distinction (a), applied to the normative evaluation of design, so comparable to the evaluation of policies and institutions in distinction (b).

[30] In addition to the references mentioned in this chapter, a good source of information is the website of the Human Development & Capability Association (www.hd-ca.org).

Nussbaum (2000, p.81) has argued, "limits the trade-offs that it will be reasonable to make."[31] If someone lacks for example the capability to be well-nourished, we cannot - or at least not fully - compensate this deprivation by expanding his capability to maintain meaningful social relations.[32]

Capabilities are generally described as what people are effectively able to do and be, or the positive freedom that people have to enjoy valuable 'beings and doings'. These beings and doings are called 'functionings' by Sen. Examples of functionings are such diverse things as working, resting, being literate, being healthy, being part of a community, being able to travel, and being confident. Functionings "together constitute what makes a life valuable" (Robeyns 2005) and are "constitutive of a person's being" (Alkire 2005, a). "The distinction between achieved functionings and capabilities," so Robeyns (2005) explains, "is between the realized and the effectively possible; in other words, between achievements on the one hand, and freedoms or valuable options from which one can choose on the other." As Alkire explains, one reason to focus on capabilities instead of functionings is that we value free choice and human agency. "Agency", so Alkire (2005b) explains, "refers to a person's ability to pursue and realize goals that he or she values and has reason to value. An agent is 'someone who acts and brings about change.' The opposite of a person with agency is someone who is forced, oppressed, or passive." Nussbaum (2000) conceptualizes the human being as "a dignified free being who shapes his or her own life", she says: "we see the person as having activity, goals, and projects". The idea is that if people have a range of different capabilities, they may choose to realize those functionings that are in line with their view of the good life. Policies should – according to the CA - aim at expanding people's capabilities and not force people into certain functionings. "The 'good life' is partly a life of genuine choice", says Sen (1985), "and not one in which the person is forced into a particular life – however rich it might be in other respects."

Why should we focus on these capabilities, rather than utility or resources? A main reason is that the relationship between a certain amount of goods and what a person can do or can be varies, as Sen and others have often illustrated:

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[31] In philosophical terms: these capabilities are - at least to some degree - incommensurable.

[32] It may be that increasing someone's capability for social affiliation may turn out to be helpful as a means for expanding this person's capability to be well-nourished – yet they are both also ends in themselves and that is where the problem of trade-offs occurs.

> "... a person may have more income and more nutritional intake than another person, but less freedom to live a well-nourished existence because of a higher basal metabolic rate, greater vulnerability to parasitic diseases, larger body size, or pregnancy." (Sen 1990)

One of the crucial insights of the CA is thus that the conversion of goods and services into functionings is influenced by a range of factors, which may vary greatly from person to person. In the CA a distinction is usually made between personal, social and environmental conversion factors. The quote of Sen above mentions a couple of personal conversion factors – which are internal to the person - in relation to food resources. An example of an environmental conversion factor is climate; Depending on the climate in one's living area, a certain type of house may or may not provide adequate shelter. The society in which one lives gives rise to social conversion factors, for example the availability of nearby schools may be of no use to a girl if gender norms prevent her from taking advantage of this opportunity. In short: the fact of immense human diversity makes that a focus on capabilities is more informative of human well-being than a focus on mere resources. The main reason why capability theorists prefer these capabilities over utility or preference satisfaction is the existence of a phenomenon which Sen has called "adaptive preferences":

> "Our desires and pleasure-taking abilities adjust to circumstances; especially to make life bearable in adverse situations. The utility calculus can be deeply unfair to those who are persistently deprived [...] The deprived people tend to come to terms with their deprivation because of the sheer necessity of survival; and they may, as a result, lack the courage to demand any radical change, and may even adjust their desires and expectations to what they unambitiously see as feasible." (Sen 1999)

Thus, if the deprived are happy with their lot in life we can, according to the CA, not conclude from this that there is no injustice in their situation.

The CA thus chooses to conceptualize well-being in terms of a person's capabilities set and development as a process of expanding these capabilities. In this process of development capabilities can, Sen argues, be both means and ends. For example, a person's capability to be healthy is intrinsically valuable (as an end in itself), but may also be valued instrumentally because it contributes to a person's capability to be part of a community. It should furthermore be noted

here that Sen and Nussbaum use 'human capabilities' as an ethical category; the term refers to those capabilities of an individual that are valuable or salient from an ethical perspective. Some capabilities may be trivial from the perspective of justice and development. Sen (1987), for example, is highly skeptical about a new brand of washing powder expanding valuable human capabilities, as advertisers tend to claim. Other capabilities may be outright undesirable to promote – Nussbaum (2000), for example, gives the example of the capability for cruelty. And a large number of more concrete capabilities will only be morally relevant because they are instrumentally important to or constitutive of the human capabilities that we ultimately or intrinsically value. Not surprisingly one important debate within the CA is about which capabilities matter and who (how, when) is to decide this. This is actually one of the main topics on which Sen and Nussbaum – the former having a background in economics and the latter in philosophy - differ of opinion. Nussbaum has, after extensive discussion with people worldwide, identified a list of 10 central categories of human capabilities that are needed for living a life in conformity with human dignity, in which people can properly exercise their human agency:

(1) Life,
(2) Bodily health,
(3) Bodily integrity,
(4) Senses, imagination and thought,
(5) Emotions,
(6) Practical reason,
(7) Affiliation,
(8) Other species,
(9) Play and
(10) Control over one's environment – both political and material.

She claims that justice requires bringing each and every human being up to at least a certain threshold for each of the capabilities on her list. Although Sen gives plenty of examples of important capabilities in his work, he has always refused to make such a list. His reasons are that the proper list of capabilities may depend on purpose and context, and should be a result of public reasoning and democracy; not something a theorist should come up with. Democracy, public deliberation and participation are – because of this debate about making a list of capabilities or not and because of the value attached to human agency –

also frequent topics of reflection and discussion amongst capability theorists (see e.g. Crocker 2008). It is recognized by both Sen and Nussbaum that from an ethical perspective not only outcomes in terms of expanded capabilities matter, but also the process through which these changes are brought about – and out of respect for people's agency, in principle participatory processes are to be preferred from a moral perspective.

Various other topics and questions also feature in the literature on the CA. One is, not surprisingly, the question of how to operationalize the CA (see e.g. Comim, Qizilbash, and Alkire 2008). This includes questions on how to identify, rank, weigh or trade-off relevant capabilities in policy/project applications, on which no consensus exists. As Alkire (2005a) explains, "operationalizing is not a one-time thing," but something that is dependent upon such things as country, level of action and the problem at hand. One of the many challenges is that it is hard to measure capabilities, as they (a) refer to the possible and not just to the realized and (b) are complex constructs depending on both an individual's internal characteristics / capacities and his/her external environment. A challenge is furthermore how to 'aggregate' over people while not losing sight of the fact that a CA emphasizes that each and every person needs sufficient capabilities to lead a flourishing life. These questions and challenges also appear in a design application of the CA and will be addressed in section four.

The CA has over the past decades been applied in different ways (Robeyns 2006), such as the assessment of small scale development projects (including projects involving the introduction of a technology, see e.g. Fernández-Baldor, Hueso, and Boni 2012; Vaughan 2011), theoretical and empirical analyses of policies (this may also concern technology policy or technology assessment, see e.g. Zheng and Stahl 2012) and critiques on social norms, practices and discourses (e.g. the ICT4D discourse, see Zheng 2009; Kleine 2011). Many of the applications so far have been concerned with assessment and evaluation, but of course for advancing justice, well-being and development 'prospective' applications should also receive attention (Alkire 2008), meaning that we should investigate how the expansion of human capabilities can successfully be brought about. In general terms:

> "For some of these capabilities the main input will be financial resources and economic production; but for others, it can also be political practices and institutions, [...] political participation, social or

> cultural practices, social structures, social institutions, public goods, social norms, traditions and habits." (Robeyns 2005)

Technologies could, of course, also be important inputs or means for the expansion of valuable capabilities and indeed increasing attention is paid to the topic of the CA, technology and design.[33] In that light, this chapter discusses the possible contributions that the CA could make to design for values.

3.3. The complex relation between technology and human capabilities

Before we can start to explore how the CA could be relevant to the design of technical artifacts, it is important to gain some basic understanding of the way in which such artifacts are related to human capabilities. As Zheng (2007) rightly noted, the CA – being a general normative framework - "offers little about understanding details of technology and their relationship with social processes", nor about the relations between human capabilities and technology. For this we will thus have to turn to additional theorizing and empirical studies on technology, but it also requires understanding in even more detail what is meant with 'capabilities' within the CA..

The first thing that is important to realize, is that human capabilities as discussed in the CA are "combined capabilities" (Nussbaum 2000), as their existence depends on a combination of two things. The first concerns internal capacities of a person, which includes both bodily and mental capacities, both innate and realized through training. The second concerns - as Nussbaum expresses it - "suitable external circumstances for their exercise", which includes the individual's access to resources and his/her embedding in institutions and practices. After all, only if we take both into account do we get a picture of what a person is realistically able to do and be in life. Likewise, Smith and Seward (2009) have argued that the ontology of Sen's CA is contextual and relational, as by their nature human capabilities do not fully reside in the person. These authors argue that individuals and social structures should be viewed as the constitutive elements of human capabilities. In response to their article I have elsewhere (Oosterlaken 2011) – extensively using the work of Lawson (2010) –

[33] For example, in September 2009 the thematic group 'Technology & Design' was established under the umbrella of the Human Development and Capability Association (HDCA). For a review of literature that has appeared on the topic until 2011, see the introductory chapter of the edited volume 'The Capability Approach, Technology & Design' (Oosterlaken 2012).

proposed that technical artifacts should be acknowledged by the CA as a third constitutive element of human capabilities. This does not mean, of course, that technical artifacts are always effective in actually expanding valued human capabilities. As Lawson explains, "for the extension in capabilities to be realized the artifacts or devices which are used to extend the capability must be enrolled in both technical and social networks of interdependencies." It is thus the continuous interactions between these elements – the individual, technical artifacts, physical circumstances and social structures[34] – that determine this individual's human capabilities.

A technical artifact that Sen has occasionally referred to, namely a bicycle, may serve as an illustration. All bicycle owners are equal in terms of their possession of this resource, but people with certain disabilities will obviously not gain an increased capability to move about as a result of this bicycle (Sen 1983, 1985). One could also think of other things obstructing or facilitating the expansion of human capabilities by means of bicycles. Arguably, a person in the Netherlands – which has good roads and even many separate bicycle lanes – may gain more capabilities from owning a bicycle than a Bedouin in the desert. And if cultural norms and practices prevent women from using bicycles, as was the case in the early history of bicycle development in Europe (Bijker 1995), having a bicycle will not contribute much to capability expansion for these women either. The CA would acknowledge the relevance of all such contextual factors (bodily abilities, roads, supportive cultural norms) under the label 'conversion factors' (already introduced in the previous section). The bicycle example may also be used to illustrate Sen's distinction between capabilities as means and ends; For some people there may be intrinsic value in the capability to move about, a mountain biker could for example appreciate the sense of 'flow' and freedom and the outdoor experience that the activity of cycling itself may offer. For many others the capability to move about with a bicycle may be merely of instrumental value, as - for example - it may contribute to one's capability to visit friends (which would fall under Nussbaum's category of "affiliation"), or to one's capability to exercise and in that way maintain good health. Even more indirectly, having a bicycle may contribute to one's livelihood opportunities, which could in turn again contribute in diverse ways to some of the 10 intrinsically valuable capabilities on Nussbaum's list. Of course, it is very well possible that one

[34] Social structures, in turn, are increasingly composed of both humans *and technical artifacts*, which is reflected in the phrase 'socio-technical systems'.

person values both the intrinsically valuable and the instrumental capabilities that a bicycle expands.

The example so far concerns a technical artifact that expands the capabilities of its individual users - whether direct or indirect. Yet many technologies influence our capabilities as individuals not because we use them, but because they are embedded in the socio-technical systems, institutions and practices in which we are also embedded as an individual. New medical technologies, for example, often lead to changes in health care institutions and practices and these may in turn have an impact – either positive or negative - on human capabilities. New ICTs change the ways in which governments and politicians go about their daily business, which may in turn have consequences for an individual's capability to have control over his/her political environment. Technology is also related to our culture and values in complex ways, which in turn is a relevant factor influencing people's capabilities (see e.g. Nussbaum 2000, on culture and the capabilities of women in India). To get back to the bicycle example, Bijker (1995) concludes from his historical study of bicycle development in Europe that "the first cycles in fact reinforced the existing 'gender order'", while "it later became an instrument for women's emancipation." Furthermore, as Coeckelbergh (2011) has pointed out, new technologies may influence our interpretation of what certain abstract capabilities, such as those on Nussbaum's list, mean. For example, ICTs such as social networking sites have not merely expanded our capabilities for affiliation, but also challenged and changed our understanding of what it means to be able to engage in meaningful relations with others. Adding to the complexity is that it is conceivable that a technology expands the capability set of one category of individuals while simultaneously diminishing it for another, or influences one capability positively and another negatively, or has positive direct capability effects and negative indirect capability effects, or negative impacts on the short term and positive on the long term.

Either way, the CA - with its normative position that each and every person ought to have certain valuable capabilities – suggests that in the end these technologies should be evaluated in terms of their capability impacts.[35] To fully do so would require extensive empirical research, which may sometimes be – as Alkire (2010) has likewise pointed out for the relation between social arrangements and capabilities – very complex and difficult to do. The general

[35] Although it is acknowledged by capability theorists that other evaluation criteria may also play a role.

picture that arises from the relevant literature is thus that the relation between technology and valuable human capabilities is not simple and straightforward, but dynamic and complex. Some of the implications will be addressed in section four, which discusses amongst others the epistemological challenge that designers will face in a 'well-being usage' of the CA in design.

3.4. The 'narrow' / 'well-being usage' of a CA to design

In this chapter I would like to distinguish between two somewhat different, although not completely separated ways of linking the CA to design.[36] One way is to use the CA as a forceful reminder of the importance of human well-being and moreover a convincing perspective on how well-being should be conceptualized and evaluated within design – namely in terms of human capabilities. This could be called the 'narrow' or 'well-being usage' of the CA for design. We may also call this 'Capability Sensitive Design', it being a specific variety of 'Value Sensitive Design' that uses the CA. In the 'broad' usage the CA (see section 5) is seen as encouraging taking a broader range of values and concerns into account in design, such as inclusiveness, agency, participation and justice.

A proposal for such a narrow or 'well-being' application of the CA can, for example, be found in the joint work of philosopher Colleen Murphy and civil engineer Paolo Gardoni on the CA and technological risks, more specifically risks related to infrastructural works. In one of their recent writings (Murphy and Gardoni 2012) they address engineering design and note that the existing

> "reliability-based design codes only focus on probabilities and ignore the associated consequences [...] there is a need for a risk-based design that accounts in a normative and comprehensive way for the consequences associated to risks." (emphasis is mine)

The CA is, according to them, able to fulfill this need. A "central principled advantage" is that the CA "puts the well-being of individuals as a central focus of the design process." The approach suggests that the negative consequences

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[36] Both are already referred to implicitly in my article in Design Issues (Oosterlaken, 2009b), which talks about design that aims to expand human capabilities and also links the idea of 'capability sensitive design' to participatory design and universal/inclusive design. Yet the explicit distinction made in this chapter was not made in that article

associated with risks should be expressed in terms of a range of morally salient capability deprivations. Furthermore "a capability-based design can provide", Murphy and Gardoni claim, "some guidance to engineers as they make trade-offs between risk and meeting other design constraints, some of which may be also translated in terms of capabilities." Another example of such a 'narrow' or 'well-being usage' of the CA can be found in the work of some authors reflecting on 'care robots', robots meant to contribute to the care for elderly people. Coeckelbergh (2009, 2012), a philosopher of technology, has proposed that such technologies should be evaluated in terms of their impact on the ten capability categories listed by Nussbaum. Following the pro-active attitude of value sensitive design, this implies of course that we should already address these valuable human capabilities during the design phase of robot caregivers. According to Borenstein and Pearson (2010):

> "...a typical motive for introducing robots into an environment has been to maximize profits by replacing human workers. Yet bringing robot caregivers onto the scene could also be motivated by the obligation to meet core human needs. This is a key advantage of the capabilities approach, since it should inform the design and use of robot caregivers in such a way that the 'human' in human-robot interaction is maintained."

More specifically, "by applying the capabilities approach as a guide to both the design and use of robot caregivers", philosophers Borenstein and Pearson say, "we hope that this will maximize opportunities to preserve or expand freedom for care recipients."

Up to present such proposals for a well-being usage of the CA in design have, to my knowledge, not yet been followed by real-world applications. Only quite recently have some actual engineers/designers started to explicitly apply the CA. One of these is Annemarie Mink, who decided to start with re-evaluating a previous project of hers from the perspective of the CA. It concerned a project to re-design a silk reeling machine used in livelihood projects of an Indian development organization. The new design solved problems like energy-loss during reeling, failing materials, yarn quality problems, safety issues and physical problems for the reeling women. Mink's re-design was received well by the organization and taken into production. Looking back on the project years later, after being immersed in the CA, Mink realized that she had quite

uncritically accepted one part of the assignment: the machine should be suitable for usage at women's homes. She made new inquiries and discovered that the reason for this requirement was general unhappiness – mainly of the men in the villages - with the women having to work in silk reeling centers, which goes against a persistent cultural norm that women should stay home as much as possible. The women, however, actually like being able to work in the reeling centers (Mink, Parmar, and Kandachar forthcoming). How certain values and norms existing in India negatively affect the quality of life of these women, depriving them of central human capabilities, has been described impressively by Nussbaum (2000, 2011). A capability of affiliation, including being able to engage in various forms of social interaction, is on her list of 10 central human capabilities. The possibility to connect with other women in silk reeling centers could not only be valuable intrinsically, but also as a means towards their further empowerment. However, in practice the freedom of women to choose to work in these reeling centers is restricted in the name of culture. And the design of the new machine – by being much smaller and less heavy and therefore transportable to home – turned out to facilitate this. An explicit consideration of the well-being of women in terms of a range of capabilities during the design phase might have led to a different project outcome. The CA, especially when illustrated with such cases from design practice, may contribute to increasing designer's sensitivity to such ethical issues. And while the CA provides concepts and ideas that are helpful in deliberating about them, creative value sensitive design may at least in some cases contribute to finding concrete solutions. The potential benefits of applying the CA to design can also be discerned by drawing parallels with the general debate on human capabilities versus resources, functionings and preference satisfaction as an 'evaluative space' (see section 1).

Capabilities and resource possession/access

With respect to capabilities versus resource possession/access as a measure of well-being, one could point out that the CA draws the designer's attention to personal, social and environmental 'conversion factors' that should be in place before a certain artifact (merely a means) can truly contribute to the expansion of valuable human capabilities (its ultimate end). In combination with the pro-active Value Sensitive Design approach this suggests that, in order to make a meaningful contribution to improving human well-being, one should already anticipate these factors during the design process and try to choose design features in response to these factors. As such, the CA could provide an antidote

to any 'product fixation' that engineers/designers – like the economists accused of 'commodity fetishism' by Sen (1985, 1984) - may suffer from on occasion.[37] In all fairness it should, however, be acknowledged that many designers/engineers are already very aware of the importance of taking 'conversion factors' into account, even though they may not be expressing it in the same language as capability theorists. A call for structural attention for some such factors can be found, for example, in the inclusive design and appropriate technology movements.[38] For example, development organization Practical Action – which has roots in the appropriate technology movement - introduced podcasting devices in a rural area in Zimbabwe. Podcasts were recorded on topics in the area of health and cattle management (e.g. how to treat sick cows). The choice for a voice-based technology was already a response to an important personal conversion factor, namely the illiteracy of a significant proportion of the inhabitants of the area. The exact design features were furthermore discussed taking other relevant factors into account. Important choices were that for speakers instead of headphones (in response to a common African cultural practice, e.g. sitting and sharing under a village tree), and between re-charging batteries with the use of solar panels or the electricity grid (in response to local infrastructural problems). There was thus no unquestioned assumption that introducing this or that state-of-the-art ICT could be equaled to 'development'. Yet even if technologists/designers are already aware of the importance of conversion factors, the CA could still contribute by providing criteria to judge the success of such design efforts explicitly from a normative perspective – namely in terms of the expansion of valuable human capabilities (Oosterlaken, Grimshaw, and Janssen 2012).

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[37] An example may be found in Derksen (2008). She concludes that tissue engineers working on hearth valves often have a limited conception of functionality and are very much focused on trying to mimic nature, while according to Derksen they should be more concerned with the impact of the biotechnologies they develop on people's capabilities to play sports, going through pregnancy, etc. – so the sort of 'beings and doings' that people have reason to value. Derksen does, by the way, not refer to the capability approach – even though what she says seems to fit in very well with that approach.

[38] For a discussion of the inclusive design movement in relation to the capability approach, see Oosterlaken (2012) and Toboso (2011). See also section 5 in this chapter. For a discussion of the appropriate technology movement in relation to the capability approach, see Oosterlaken, Grimshaw and Janssen (2012) and Fernández-Baldor, Hueso and Boni (2012).

Capabilities, functionings and preference satisfaction

The idea behind making a distinction between capabilities and functionings is – as explained before – to be respectful of people's agency and their views on the good life by focusing on expanding their capabilities without forcing them to realize the corresponding functionings. Capability scholars acknowledge, however, that there are sometimes reasons why a focus on functionings instead of capabilities may be justified for evaluative purposes (see e.g. Robeyns 2005, p.101). In the case of the design of technical artifacts, one might also wonder if it is sensible to uphold this distinction; Is an artifact that does not lead to an increase in the functioning(s) that the designer aimed at not a failure? This depends. If people lacking the functioning have freely chosen not to realize it, we generally need to accept and respect this. But if the functioning in question is absent on a massive scale, this may warrant further investigation; Has the designer failed to grasp what capabilities are important to people's lives and has therefore nobody chosen to use the artifact to realize the corresponding functionings? Or are there perhaps disruptive conversion factors in play that nobody foresaw and has the design therefore not really enabled people to realize these functionings? These two causes, which can be distinguished when looking through the lens of the CA, obviously ask for different responses. The capability-functioning distinction may also make designers aware of how much choice they are giving users (see e.g. Steen et al. 2011; Kleine et al 2012). Applied to technology this could be taken to imply that designers should take a critical and reflective attitude towards so-called 'behavior steering technology' designed to contribute to well-being by pushing people into certain functionings. This might indicate insufficient respect for people's own agency, although Nussbaum (2000) has argued that "we may feel that some of the capabilities [like that of being healthy] are so important, so crucial to the development or maintenance of all others, that we are sometimes justified in promoting functioning rather than simply capability, within limits set by an appropriate concern for liberty." The concept of 'adaptive preferences' also implies that respect for people's agency should not be taken to mean that designers always need to respect each and every preference that people happen to have. This is an important point, as preference satisfaction – or something akin, like desire satisfaction or happiness – is what design often aims at (Oosterlaken 2009; Van de Poel 2012). The CA offers a richer, less subjective understanding of human well-being, which may challenge designers to develop a critical and deliberative attitude and look beyond what people superficially seem to want. On the other hand: too easily

labeling someone's preferences as 'adaptive' would lead to unjustified paternalism – which especially in the intercultural context of 'design for development' may quickly become an issue.[39] It is hard if not impossible to provide general guidelines on how to balance these different concerns, abstracted from the details of concrete cases. In short, the CA does not offer quick and easy guidelines for designers, but rather a conceptual framework that helps highlighting and discussing important issues.

3.5. The epistemological and aggregation challenge

A 'well-being usage' of the CA in the domain of design – in other words: 'Capability Sensitive Design' - raises challenges. These challenges are partly the same as for two broader categories to which Capability Sensitive Design can be said to belong, namely 'design for well-being' in general and Value Sensitive Design more broadly. With respect to the former Van de Poel (2012, unpublished draft book chapter) has identified and discussed an epistemological and an aggregation challenge, which I will also discuss here. Van de Poel does discuss Nussbaum's capability list as one possible interpretation of design for well-being, yet the more exclusive focus on the CA of this chapter allows me to go more into depth and elaborate on his ideas.

The epistemological challenge

If a designer chooses to concentrate on the capability impacts of a product for its direct users, this raises an epistemological challenge. Van de Poel (unpublished draft book chapter) describes the challenge as follows for 'design for well-being' in general:

> "... design typically concerns products that do not yet exist; in fact design is largely an open-ended process which relates to creating a product. This means that the designers not only need knowledge of [a] what constitutes well-being for users and how that well-being might be affected by new technologies, but they must also [b] be aware that such knowledge needs to be translated into, for example, design requirements, criteria or technical parameters that can guide the design process."

[39] See e.g. the blog of Bruce Nussbaum titled "Is Humanitarian Design the New Imperialism?" (http://www.fastcodesign.com, blog from July 7th 2010).

Let's start with sub-challenge [a]. As was explained before, Sen leaves it rather open which capabilities constitute well-being, while Nussbaum's version of the CA provides more guidance. However, a feature of Nussbaum's list of 10 intrinsically valuable capabilities is its "multiple realizability" (Nussbaum 2000, p.105). It thus still needs to be investigated what these rather abstract capabilities, such as the capability for play or affiliation, could - with preservation of their moral import[40] - mean exactly in the context or culture for which the design is meant. Moreover, the effect of new technologies on human capabilities, so I argued in section two, is dynamic and complex. It may be good for designers to be aware that this is the case. Yet for both practical and epistemic reasons it does not seem realistic to expect them to anticipate and/or influence all capability effects of the artifacts that they help create. Their technical and empirical investigations, as part of a 'Capability Sensitive Design' process, will need to be focused on the capabilities, conversion factors and issues that seem most salient and relevant to the design challenge in question. An obvious and often defensible curtailment will be to concentrate on the well-being of the expected direct users of a technology. One can doubt, says Van de Poel (2012), "whether there is a moral imperative for designers to increase the well-being of other stakeholders besides users." In contrast, the moral imperative not to harm other stakeholders cannot be dismissed that easily, which may sometimes mean that attention needs to be paid to the capability impacts for non-users. Take the example provided by Murphy and Gardoni: infrastructural works may also come with risks for non-users, which may be conceptualized as diminishing the security of their capabilities. There are strong ethical reasons for designers to take this possible harm into account.[41] In any case, an extensive discussion of the moral obligations of designers is beyond the scope of this chapter. The point here is that, as part of Capability Sensitive Design, there is a need for integrated conceptual and empirical investigations addressing the relevance and meaning of certain capabilities and the contribution that a certain technology/design could make to expanding those. Capability Sensitive Design

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[40] What is meant by the latter is that a certain more concrete conceptualization of an abstract capability should do justice to or at least cohere with the reasons we have to consider the abstract capability to be valuable in the first place.

[41] The distinction made here mirrors the distinction made by philosophers between positive duties of benevolence and negative duties not to harm, where the latter is in general considered to be stronger and less controversial than the former. But Van de Poel notices that "increasing or maximizing user well-being is often mentioned or assumed as goal in design."

requires, as Van de Poel (2012) remarks for design for well-being in general, "more than just the identification of user demands by means of surveys or marketing research." One thing that may be beneficial for Capability Sensitive Design is more ethnographic style research for better understanding the relation between technology and human capabilities in light of the local context and good life views.[42]

In another article Van de Poel (forthcoming) has reflected on sub-challenge [b], translating values into design requirements, criteria and so on. This process, so he warns, "may be long-lasting and cumbersome", it "may require specific expertise, sometimes from outside engineering", it "is value laden", "can be done in different ways" and is "context-dependent." That last point may be considered to be especially important from the perspective of the CA, considering its emphasis on human diversity and the great variety of personal, social and environmental conversion factors. Anyway, how to translate values into design requirements? A central idea in this paper is that of a "value hierarchy" going from abstract values, via norms to concrete design requirements – where each of these three main layers may have sub-layers again. An example that he gives is that of animal welfare as a central value in the design of chicken husbandry systems. This value may be translated into norms such as "presence of laying nests", "enough living space" and so on. The latter norm could in turn be translated in a requirement to have at least 1100cm2 usable area per hen.[43] According to Van de Poel:

> "The reconstruction of a values hierarchy makes the translation of values into design requirements not only more systematic, it makes the value judgments involved also explicit, debatable and transparent." (Van de Poel forthcoming)

[42] I take this suggestion from an article by Ratan and Bailur on the capability approach and 'ICT for Development' (2007).

[43] Van de Poel (forthcoming) points out that "the relation between the different layers of a values hierarchy is not deductive. Elements at the lower levels cannot be logically deduced from higher level elements. One reason for this is that the lower levels are more concrete or specific and that formulating them requires taking into account the specific context or design project for which the values hierarchy is constructed."

The reconstruction of value hierarchies can be helpful, even though – as Van de Poel notices – merely describing a value hierarchy does not directly solve possible disagreements about such translations.

This idea of a value hierarchy can, it seems to me, also be put to use in the context of 'Capability Sensitive Design', helping designers to address the epistemological challenge. One of Nussbaum's 10 capabilities – or a context-dependent interpretation of it - could be put at the very top of the value hierarchy of a 'Capability Sensitive Design' project. In the layer below one could put – amongst others - more concrete capabilities, which are important for the sake of the high-level capability. 'For the sake of', Van de Poel explains, can be "seen as the placeholder for a number of more specific relations" A certain capability could, for example, be either a constitutive part of a higher-level capability, or be a means towards that capability. Let me give some examples. One's capability to be free of malaria could be said to be constitutive of one's capability for bodily health – to which designers may for example contribute by creating a new malaria diagnostic device that is suitable for usage in rural areas in developing countries. As we have seen, many conversion factors may stand in the way of such a device leading to the expansion of the capability in question for, say, villagers in India. These factors can be an important source for norms and subsequent concrete design requirements – for example, the fact that local health care workers have little education may lead to a norm that the device should have a simple and intuitively clear user interface.[44] Or take the example of a project to design a walker for elderly people. One's capability to move around could be seen an end in itself, but it can also be considered a means for one's capability for affiliation. In the latter case one can argue that one of the norms should be that one can also comfortably use the walker as a temporary seat when encountering people in the street that one would like to talk to. In both examples – the malaria diagnostic device and the walker - the norms identified still need to be further translated into concrete design requirements, making sure that the interface will be clear enough, respectively the seat comfortable enough.

The aggregation challenge

In addition to the epistemological challenge, Van de Poel (2012) rightly notices that design for well-being will run into an aggregation problem, which

[44] This example is inspired by an actual design project described in Kandachar et al (2007).

> "... arises due to the fact that a design does not affect the well-being of just one person, but rather that of a range of people. This raises the question of how the well-being of these people should be aggregated so that it can be taken into account in the design process. If one believes that well-being constitutes plural and incommensurable prudential values, as some philosophers [...] have suggested, then an aggregation problem arises with respect to how these values can, or cannot, be aggregated into an overall measure of well-being."

As was explained in section one, the CA in general also faces both these problems of aggregation over (a) a range of people while not losing sight of the moral worth of each and every individual and (b) plural, incommensurable capabilities (see e.g. Comim 2008). The incommensurability of values, Van de Poel (unpublished draft book chapter) notes, "limits the applicability of [maximizing] methods such as cost benefit analysis and multi-criteria analysis which are often used in technical design to choose between different conceptual design solutions." Luckily, he says, there exist alternative methods "not unfamiliar to the field of design." He distinguishes between two different situations. The first is where design is supposed to contribute to elementary capabilities in contexts of great poverty. Here the solution that Van de Poel proposes is – in line with Nussbaum's position - to "set thresholds for all the relevant capabilities and to look for a design that reaches all of these thresholds."

The second situation is contexts of more welfare where "one aims to find a design that contributes to the overall well-being of users." Here the focus will be on more intricate and complex capabilities rather than basic capabilities. The solution that van de Poel proposes consists of several elements. A basic step is to "select a user group that shares a comprehensive [life] goal and/or a vision of the good life", a step "which avoids the need to aggregate the well-being of people who have different, incompatible" goals or visions. The idea is then to come up with a mix of specific values (or capabilities, in the context of this chapter) to which a technology may contribute and then to design a product "that enables this mix as much as possible." Van den Poel (2012) hastens to add here that this

> "does not imply a maximising approach to well-being. The focus is on the mix of values [or capabilities] rather than on maximising an overall measure of well-being. The focus is also not on maximising each of the prudential values [or capabilities] in isolation, because it is usually the

> mix of values [or capabilities] that contributes to the overall goal rather than the values [or capabilities] in isolation."

Incommensurability of capabilities thus need not become a problem if creative design solutions enable us to expand all of them rather than to make a trade-off between them.[45]

Van de Poel's idea of focusing on a mix of capabilities rather than on single ones shows some resemblance to the idea of a 'capability innovation' that was introduced by Ziegler (2010). Building on Schumpeterian economics, which views development as a process of economic innovation in the sense of "new combinations in terms of new goods, new methods of production and so on", Ziegler defines social innovation as "the carrying out of new combinations of capabilities." Ziegler views – in line with the CA - capabilities as both ends in itself and means towards other capabilities, emphasizing that the "relations between the capabilities" are "especially important" in his concept of capability innovation. Of course new products and their design details may be an essential element in the success of 'capability innovations', as a case study in a later paper of the same author makes clear (Ziegler, Karanja, and Dietsche, forthcoming). A design case discussed by Oosterlaken (2009) may be taken to illustrate the idea of 'capability innovations'. It concerns a project on tricycles for disabled people in Ghana, executed by industrial design engineering students (Kandachar et al. 2007). Both the local context and entrepreneurial opportunities were carefully taken into consideration. During exploratory field studies it was discovered, for example, that "the major part of the disabled population is willing to work but cannot find employment" and that "the Ghanaian society is annoyed by disabled who are begging on the street." The newly designed tricycle has a cooler in front so that disabled users are able to make a living as street vendors selling ice-cream and other frozen products. To make this a sustainable development success, it was investigated how to embed this artifact in a larger plan and network also involving a local metal workshop being able to produce and repair the tricycles and a supplier of products to be sold.[46] It can be considered a capability innovation in Ziegler's sense, as it involves a clever combination of simultaneously expanding for these disabled the capabilities for mobility,

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[45] Van den Hoven, Lokhorst and Van de Poel (2012) extensively argue along these lines concerning incommensurable values and moral dilemmas more broadly.

[46] A pilot was subsequently executed.

earning a living (and hence basic capabilities related to survival and health), social participation and self-esteem.

3.6. A 'broad' usage of the capability approach in design

Having discussed the narrow or well-being usage of the CA for design in some detail, I would now like to move to a 'broad' usage of the CA in the context of design. In a broader usage the CA is not only seen as highlighting the importance of individual well-being and conceptualizing this in terms of human capabilities, but is also seen as taking aboard a wider range of values, such as agency, participation, justice, inclusiveness or procedural fairness (Robeyns, 2011).[47]

Human agency, to start with, is deemed very important in the CA. This is reflected in the approach's defense of capabilities instead of functionings as a policy goal. However, capability theorists not only connect agency to outcomes in terms of the expansion of human capabilities, but also to the process leading to these outcomes. People are not viewed as passive patients to be helped, but as agents in charge of their own development process. Hence, the literature on the CA pays attention to participation and democratic deliberation (see e.g. Crocker 2008). A connection can be made here with so-called 'participatory design'. According to Nieusma (2004) this "has developed into a well-articulated, well-justified methodology for user participation in design processes" and should be all about "coping with disagreements." He regrets, however, that "increasingly, participatory design methodologies are used to advance the goals of user-centered design without emphasizing the inclusion of marginalized perspectives in design processes." According to Buchanan (2001) as well, designers often "reduce [their] considerations of human-centered design [which often involves users in the design process] to matters of sheer usability." The CA may be helpful in revitalizing the ideals of participatory design (Oosterlaken 2009). A parallel can be drawn here with participatory methods in development cooperation. In practice, says Frediani (unknown date), these methods often do not meet the expectations, being "sometimes used merely as a tool for achieving pre-set objectives" and not as a process for true empowerment and improvement of people's lives. He argues that "participatory methods need to be complemented by a theory that explores the nature of people's lives and the

[47] See footnote 1

relations between the many dimensions of well-being." This theory, he says, should be comprehensive, but flexible and able to capture complex linkages between (aspects of) poverty, intervention, participation, and empowerment. He feels that the CA is able to offer exactly that. Similarly, Frediani and Boano (2012), who focus on urban design, note "a surprising lack of literature investigating the conceptual underpinnings of participatory design and its implications in terms of practice", a gap which – according to them – could be filled with the help of the CA.

Going a step beyond 'mere' participation in a process where professional designers are still in the lead is proposed by Dong (2008), who believes "that the capabilities approach offers one avenue to situate design practice as part of an endeavor of social justice." His focus is on the design of civic works and the built environment. He argues that such design is intimately connected to people's health and identity and therefore Dong proposes to "add 'control over the design and production of civic building' to Nussbaum's list as sitting astride political and material control." However, one could easily extend Dong's argument to the design of technical artifacts more broadly; If we combine the fact that these are nowadays ubiquitous in all domains of human life with insights on the 'politics' (Winner 1980) and 'value-ladenness' (see e.g. Radder 2009) of such artifacts, it seems that Nussbaum's description of what control over one's environment entails (see the appendix) is too narrow and should include control over one's designed surroundings (including buildings and other artifacts). But back to Dong's line of argument:

> "Public policies can effectively remove public engagement in the name of expediency. [...] Thus, what the urban poor in developing countries and citizens in developed countries share is the problem of enacting a policy of design that reflects the values of the people. [...] People have the right to user participation in design only if there are effective policies to make people truly capable of design. So what is needed is not user participation in design as a counterforce to the power of designers [...] but instead a design culture of pluralism with effective means for achieving it."

Dong argues that from a justice perspective we should pay attention to citizens' capabilities to design themselves and in this way enable them to co-shape their life world. For this purpose he fleshes out a set of instrumentally important capabilities that citizens would need to do design, which could become object of

(inter)national design policy. The categories that he distinguishes are information, knowledge, abstraction, evaluation, participation and authority. Dong points out, in line with the CA, that "asymmetries in capability to do design may arise from differences between people and socio-political barriers" and that design policy should thus address both these internal and external factors. As Nichols and Dong (2012) explicate: gaining design capacity or skill – as the 'humanitarian design community' apparently promotes - is not enough for truly gaining the 'capability to design'. The latter may, for example, be inhibited by political factors even though design skills are present.

Not only the CA and participatory design could be fruitfully connected, but also inclusive/universal design and the CA. What the latter two share (Oosterlaken 2012) is an awareness of the pervasiveness and importance of human diversity and the injustice to which neglecting this may lead. The paradigm example here is buildings being inaccessible for wheelchair users – in the language of the CA we could say that personal conversion factors in this case hamper the conversion of resources into valuable capabilities. Both Nussbaum (2006, p.167) and the inclusive/universal design movement have addressed this case, the latter by advocating designs (Connell and Sanford 1999) that are usable by a wide variety of users, including but not limited to people with disabilities. Although wheelchair-friendly buildings may have become the standard by now, in other domains of design and for other user groups the inclusive/universal design movement may still have work to do. Toboso (2011), for example, claims that there is not enough attention for diversity in the design of ICTs. He uses the CA to re-think disability and proposes to enrich it with the concept of "functional diversity" to support the shift in design practice that he proposes. The CA could learn a lot from how the inclusive/universal design has come up with solutions for the challenge of human diversity, thus contributing to the expansion of human capabilities and the practical realization of the normative ideals of the CA. On the other hand, the universal/inclusive design movement might benefit from a better acquaintance with the CA and the conceptual framework it provides (Oosterlaken 2012). It may help designers to get a better understanding of the ultimate aims of design and may make it possible for them to make a quite natural connection between their work and wider normative debates about justice and development. Furthermore, the degree to which a design contributes to the actual realization of human capabilities of different categories of users could be used as a yardstick to determine whether or not universal/inclusive design has achieved its moral objective.

3.7. Looking ahead

Starting with an intuition that technical artifacts have in essence something to do with enabling human action, with expanding what persons are able to do and be, this chapter has explored the relevance of the CA – being a philosophical framework that attaches central moral importance to human capabilities – for the value sensitive design of such artifacts, or in other words: capability sensitive design. A distinction was made between a 'narrow' or 'well-being usage' of the CA and a 'broad usage' in which the CA is also seen as a source of insight and inspiration with respect to a wider range of values, more in particular agency, participation, justice, and inclusiveness. In reality, however, both usages can and should often go hand in hand. Frediani and Boano (2012), for example, have warned against an "unhelpful dichotomy" between a product-oriented (e.g. Oosterlaken, 2009) and a process-oriented (e.g. Dong, 2008) CA of design:

> "...the analysis should not merely engage with the process of design, but also with its outcomes. The reason is that citizens' design freedom is shaped not merely by their choices, abilities and opportunities to engage in the process of design, but also by the degree to which the outcomes being produced are supportive of human flourishing."

Also in the case of risks and the design of infrastructural works a well-being and a justice perspective should, Murphy and Gardoni (2012) make clear, be combined.

What can we expect from such usages of the CA in design? It has already become clear that designers are not oblivious to the considerations that a CA of design would highlight; in fact they regularly already take these into account, without using the CA's vocabulary. Yet using the CA could make these design considerations more explicit and therefore more open to scrutiny and debate. The CA has the potential – to borrow some words of Zheng (2007) – to "surface a set of key concerns [like participation, inclusiveness, justice, well-being and agency] systematically and coherently, on an explicit philosophical foundation."[48]

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[48] Zheng (2007) is speaking about applying the capability approach to the area of 'ICT for Development (ICT4D)' and parallels may be drawn with applying it to design. She notes that "many of the issues unveiled by applying the capability approach are not new to e-development research". Yet, she feels, the capability approach is "able to surface a set of key concerns systematically and coherently, on an explicit philosophical foundation" and "as a conceptual basis, could accommodate other theoretical perspectives in e-development", like discourse

The previous sections have hinted at possible benefits of more explicitly applying the CA to design, but of course the proof of the pudding is in the eating and that is where it is still lacking. Theorizing on the CA and design has only just begun and practical experience with it is still extremely limited. One of the challenges is – so my interactions with some designers have indicated – that the conceptual framework of the CA is not immediately obvious[49] and it takes some effort to learn it. And although some designers may be motivated to plough through the many insightful books and articles of Sen, Nussbaum and other capability theorists, it is not realistic to expect this from all designers.

One possible solution – one that I would personally expect to appeal to practical people like designers – is to develop checklists and tools based on the CA that designers could use in different phases of the design process. So far, these do not exist.[50] For other members of the 'design for values' family, such as design for sustainability, a lot of progress has been made on this path. This comes, however, with a risk of an uncritical usage and an unhelpful simplification of the issues and dilemmas at hand. For example, various software packages exist that help designers to make a qualitative life cycle analysis of their product. In response the chapter on sustainability in a main text book for teaching ethics to engineers (Brumsen 2011) warns engineers that these programs may create an unjustified air of simplicity. They weigh and add different environmental aspects into one final number. Thus, the software's outcomes are based on the normative considerations of the programmers, a specific way of aggregating, which may subsequently not become a topic of discussion amongst designers. Even more qualitatively oriented lifecycle approaches, so the author points out, still have the disadvantage of focusing on environmental impact, while leaving other aspects of sustainability, such as intergenerational justice, unaddressed.

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analysis, institutional theory, social inclusion, the participative approach, local adaptation and information culture.

49 E.g. what is the difference between the function of an artifact and the concept of 'functionings' in the capability approach? What distinguishes a capacity or skill from a capability?

50 Nussbaum's list of 10 central capabilities may serve as a starting point for designers, but it has not been tested yet if and how it helps designers in their deliberations about their design project. Moreover, as discussed in section four, the list is quite abstract and applying it in design would still require quite a lot of additional work, so that 'just' giving this list to designers is probably not enough..

One might say that the idea of sustainability and the CA share the problem of multidimensionality and incommensurability, which provides a challenge for their 'operationalization' for designers. Providing designers with concrete tools in which the thinking has already been done for them does not seem the way to go for an approach that emphasizes the pervasiveness of human diversity, both in people's circumstances and characteristics and their ideas of the good life. Yet there is surely a lot of middle ground between that path and giving designers a pile of philosophical books. One could think of an inspirational portfolio of design cases analyzed with the CA and illustrating dilemmas encountered, in combination with exercises developed to 'sensitize' designers to different ideas highlighted by the CA. Approaches such as Van de Poel's usage of a value hierarchy in translating values into design requirements could be further investigated in relation to the CA, as could other tools and approaches developed within value sensitive design more broadly. And of course there is a lot to be gained from looking at the work already done in design movements which share some ideals and insights with the CA, such as participatory design and inclusive/universal design.

That the capability approach deserves attention in relation to design is evident to me. Especially in the last five years there has been a boom in publications discovering the potential of the capability approach to reflect on technology. Several authors (e.g. Zheng 2009; Kleine 2011) have, for example, started to apply it to the domain of 'ICT for Development (ICT4D)', in response to mainstream ICT4D practices in which there is a recurring assumption that more technology, faster technology transfer and higher adoption rates almost per definition equals development. An advantage of the capability approach, so it has been argued (Gigler 2008), is that it takes the attention in ICT4D away from technology and puts the emphasis again on *people*. I fully agree with that, but - paradoxically - in order to do so we will actually need to pay more rather than less attention to technology. It should, however, be the right kind of attention - one with full awareness of the complex and multiple relations between technology and valuable human capabilities, agency and justice – followed by appropriate attention for the details of design.

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Chapter 13

Inappropriate Artefact, Unjust Design? Human Diversity as a Key Concern in the Capability Approach and Inclusive Design

Ilse Oosterlaken

13.1 Introduction

Sometimes the obvious is easily overlooked in our policies and practices. We all know, for example, that human beings differ from one another in countless ways; Some people live in a cold climate and others in the tropics, some people are highly educated and others are illiterate, some people are tall and others are small, some people are disabled and others are able-bodied, and so on. Yet we do not always act on it; until a few decades ago most public buildings were inaccessible to the disabled. And many websites are nowadays still hard or impossible to use by many groups, such as the blind or people with a slow and unstable internet connection (not uncommon in many developing countries). In these cases design excludes some people from reaping the benefits of the resource in question. And when design is inappropriate for some group of people, we may sometimes be looking at injustice – as the disability movement has successfully argued for buildings being wheelchair-unfriendly.

Awareness of and reflection on the importance of the fact of human diversity can, however, be found in both the literature on the capability approach and on the inclusive/universal design movement. The former is a prominent approach within political philosophy and development ethics, founded by Amartya Sen (e.g. 1999) and Martha Nussbaum (e.g. 2000). It provides a philosophical framework that has been used to think about, assess and evaluate individual well-being, as well as social arrangements and policies (Robeyns 2006). Nussbaum has formulated a list of ten categories of human capabilities to which every person has, she argues, a right. This makes the capability approach thoroughly normative, it demands – at least in Nussbaum's version of it -- (political) action aimed at bringing people to at least a

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4 Inappropriate artifact, unjust design? Human diversity as a key concern in the capability approach and inclusive design

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4.1. Introduction

Sometimes the obvious is easily overlooked in our policies and practices. We all know, for example, that human beings differ from one another in countless ways; Some people live in a cold climate and others in the tropics, some people are highly educated and others are illiterate, some people are tall and others are small, some people are disabled and others are able-bodied, and so on. Yet we do not always act on it; until a few decades ago most public buildings were inaccessible to wheelchair users. And many websites are nowadays still hard or impossible to use by many groups, such as the blind or people with a slow and unstable internet connection (not uncommon in many developing countries). In

[51] The chapters in this dissertation have mostly been included unaltered as compared to the original publication. This chapter is, however, the exception to that. Looking back, I realized that I was not happy with the result of trying to combine two related yet still different undertakings, addressing two very different audiences, in one paper. I was aware of the tension at the time, but not ready to let go of the idea of putting all these ideas into one paper and making it work. In journalism they tend to advice writers to 'kill your darlings' when needed for a better final product, but this can be very hard! Well, at least nobody can accuse me of 'salami science' and this dissertation offered me a chance to re-consider the paper. What I have done is (a) putting sections 7-9 of the original paper in the annex and (b) slightly adjusting section 6 of the original paper (§4.5 in this dissertation) to accommodate this. The annex provides a detailed discussion and analysis of normative judgments on the inappropriateness of technical artifacts, which – at least in that level of detail - will only be of interest to certain theoretical, analytical philosophers of technology. The chapter as it is now can be read by them as providing some practical context and motivation for the theoretical work presented in the annex, but is also meant to be interesting in its own right and accessible to designers and capability scholars.

these cases design excludes some people from reaping the benefits of the resource in question. And when design is inappropriate for some group of people, we may sometimes be looking at injustice – as the disability movement has successfully argued for buildings being wheelchair unfriendly.

Awareness of and reflection on the importance of the fact of human diversity can, however, be found in both the literature on the capability approach (CA) and on the inclusive/universal design movement. The former is a prominent approach within political philosophy and development ethics, founded by Amartya Sen (e.g. 1999) and Martha Nussbaum (e.g. 2000). It provides a philosophical framework that has been used to think about, assess and evaluate individual well-being, as well as social arrangements and policies (Robeyns 2006). Nussbaum has formulated a list of ten categories of human capabilities to which every person has, she argues, a right. This makes the CA thoroughly normative, it demands – at least in Nussbaum's version of it -- (political) action aimed at bringing people to at least a certain threshold of valuable capabilities. Human capabilities and justice are thus intimately related in the CA. And human diversity is one of the main reasons to focus on human capabilities, instead of on the distribution of resources; the CA recognizes that, due to human diversity, access to a resource does not always translate in an expansion of human capabilities. An example that Sen sometimes gives is that a bicycle does not increase the things that a paralyzed person is able to do.

Human diversity is also central to the so-called 'universal design' movement, which can even be said to be all about "accounting for diversity" (Nieusma 2004, p.14). "The discourse on universal design assumes", say Connell and Sanford (1999, p. 49), "that it is possible to design objects and spaces such that they are usable (and will be used) by a broad range of the population, including but not limited to people with disabilities." That such movements came into existence, advocating a change in design practices, indicates that designers have not always been taking human diversity *sufficiently* into account. Yet partly thanks to such social design movements, many engineers are nowadays doing so. They either design artifacts for specific, sometimes previously ignored, users (like a manually operated tricycle for disabled people in developing countries, Van Boeijen 1996), or they try to make designs that are appropriate for a wide diversity of users (such as buildings that are also accessible to wheelchairs).

The CA and the universal/inclusive design movement thus share important commonalities and they could benefit from each other (Oosterlaken 2009). The CA could learn from how the inclusive/universal design has come up with

solutions for the challenge of human diversity, thus contributing to the expansion of human capabilities and the practical realization of the normative ideals of the CA. And the universal/inclusive design movement could benefit from a better acquaintance with the CA and the conceptual framework it provides; It may help designers to get a better understanding of the ultimate aims of design and may make it possible for them to make a quite natural connection between their work and wider normative debates about justice and development.

In this paper I firstly aim, by using work from analytic philosophy of technology, to better explicate the intimate link between design and human capabilities and to show that the apparent commonalities between the CA and universal/inclusive design run deeper than one might think; Using the work of Houkes and Vermaas, two philosophers of technology, I will argue that the concern for human capabilities is something deeply ingrained in the nature of technical artifacts and engineering design. One difference is that engineering is concerned with expanding people's capabilities in general, irrespective of their moral value, whereas the CA focuses on specific individual capabilities which are held to be salient from an ethics/justice perspective. But irrespective of whether a technical artifact is meant to expand instrumentally or intrinsically valuable capabilities: if the design is not universal or inclusive enough, this goal will not be achieved for certain groups of people. A standard bicycle, for example, is not appropriate for many disabled people and will not expand their capabilities to go places they want to go. And if designers did not pay attention to the personal, social and environmental characteristics of the intended user, it would become rare for technical artifacts to expand anyone's capabilities at all.

Although the fact of immense human diversity makes inappropriateness a regularly occurring phenomenon, the exact meaning of judgments like 'this is an inappropriate bicycle for people with this type of disability' has so far not been analyzed in any detail within philosophy of technology; It has at least not received any attention in the work of Franssen, a philosopher of technology who has extensively discussed the normativity of technical artifacts, presenting an account of the meaning of statements like 'this is a good bicycle' and 'this is a malfunctioning bicycle.' One might thus say that the CA and the universal/inclusive design movement also have something to offer to philosophy of technology: a forceful reminder of the ubiquity and pervasiveness of the fact of human diversity, which should not be overlooked in analyses by philosophers of technology. A second aim of this paper is then to extend Franssen's work by

providing an analysis of judgments of the inappropriateness of a technical artifact – the details of which have been included in an annex, as they may not be of interest to all readers of this paper. This analysis of judgments of inappropriateness provides, so I believe, at least some of the grounds for moral judgments that there is sometimes injustice in an artifact's design, by it being inappropriate for certain groups of users. A paradigm case of this is perhaps that of public buildings being inaccessible to people in a wheelchair.[52] Yet not all cases if inappropriateness will amount to cases of injustice. The third and final aim of this paper is then to explore the relation between judgments of the inappropriateness of technical artifacts and judgments of injustice.

The set-up of this paper is as follows. I will first further explore the topic of human diversity, design and the expansion of human capabilities, using Sen's example of the bicycle (section 4.2), and settle some definitional issues (section 4.3). I will then discuss the work of Houkes and Vermaas on the nature of technical artifacts and engineering design and the place that human diversity has in their work (section 4.4). Next, I will discuss Franssen's account of statements like 'this is a good bicycle' and expand it with an analysis of statements like 'this is an inappropriate bicycle for this user' (section 4.5). I will then sketch how these insights from philosophy of technology provide a more in-depth understanding of the bicycle example being discussed in the literature on the CA (section 4.6). As this approach is thoroughly normative, it is also important to be able to make the step from judgments of inappropriateness to judgments of injustice. I will argue that the CA can provide some normative grounding for this step (section 4.7). I will end with some final reflections on further work that needs to be done on the topic of technology/design and human capabilities (section 4.8).

4.2. Human diversity, design and the expansion of human capabilities

As said, human diversity forms a linking pin between the CA and universal/inclusive design. If design does not take facts of human diversity sufficiently into account, an artifact will not expand the capabilities of all user groups. This can be further explained using the example of a bicycle, which is also occasionally mentioned by Sen to illustrate the focus of his approach on capabilities instead of resources or utility as the space of equality:

[52] Although one might challenge understanding a building as a technical artifact.

> Take a bicycle. [...] Having a bike gives a person the ability to move about in a certain way that he may not be able to do without the bike. So the transportation *characteristic* of the bike gives the person the *capability* of moving in a certain way. That capability may give the person utility or happiness if he seeks such movement or finds it pleasurable. So there is, as it were, a *sequence* from a commodity (in this case a bike), to characteristics (in this case, transportation), to capability to function (in this case, the ability to move), to utility (in this case, pleasure from moving). (Sen 1983, p. 160)

In this sequence from resource to capability to utility, it is human capabilities that are – according to Sen – the best 'space of equality'. In his book *Commodities and Capabilities* (1985, p. 9) he criticizes (welfare) economists for their tendency to view resources like bicycles "in terms of their characteristics", where "the characteristics are the various desirable properties of the commodities in question". To Sen's dissatisfaction:

> A bicycle is treated as having the characteristic of 'transportation', and this is the case whether or not the particular person happening to possess the bike is able-bodied or cripple. (Sen 1985, p. 10)

What is important according to the CA is rather "what the person will be able to do with those properties", or to which (human) capabilities the bicycle will contribute – none in the case of a disabled person. As people differ greatly in their personal characteristics and circumstances – Nussbaum and Sen bring it up numerous times in their work – the example is meant to illustrate a widespread phenomenon. So-called 'conversion factors' often hamper the conversion of resources into human capabilities. The specific example of the bicycle, however, has never been analyzed in more detail in the work of Sen. Philosophers of technology may want to dig deeper. They may wonder how exactly we can understand and explicate Sen's uneasiness with the way in which bicycles are being treated. I will get back to this at the end of this paper.

But if bicycles are not helpful for the disabled, how then to expand the capabilities of this group of people? Is it then a matter of providing the *right* resources, say a wheelchair instead of a bicycle? This artifact is not designed for an average person (as most bicycles are), but geared towards a specific group of 'a-typical' people, namely disabled people. This may be a solution in some cases.

But sometimes, to use the vocabulary of the CA, other 'conversion factors' may still be such that an expansion of capabilities does not take place. To have a capability for mobility certain cultural practices and some suitable basic institutions may also be needed, for example constitutional rights that guarantee us freedom of movement. Moreover:

> Someone who is disabled and thus has an impaired capacity for movement may not benefit from a wheelchair (resource provision) unless her surroundings are adapted to allow wheelchair access (environmental change). She may also need to learn to use the wheelchair (capacity building). In this case resource provision can lead to capability expansion only if coupled with appropriate environmental and capacity interventions; the three factors are mutually interdependent. Because we are concerned with a value-based approach [i.e. the CA], the ultimate test of any intervention is the increase in the actual functionings that a person is able to achieve i.e. their degree of substantive freedom; interventions at the instrumental level must be cashed out in substantive terms – that is in enhanced [cap]ability to meet needs for health, knowledge, self-fulfillment, relationship to others and so on. (Johnstone 2007, p. 78)

Johnstone here mentions firstly environmental change and secondly capacity building as actions that need to supplement the provision of technological artifacts such as wheelchairs in order for them to expand capabilities. Those are certainly two important strategies. In this case the required environmental change does, of course, involve re-design, namely of buildings. It is in fact an intervention that Nussbaum (2006, p. 167) forcefully defends as a basic requirement of justice.[53] It is not hard to see, however, that the details of design of the artifact itself, the wheelchair, may also matter. One could think, for example, of a wheelchair that is easier to operate or better able to climb curbs. Such a wheelchair would be appropriate for a wider variety of users respectively circumstances of usage. This seems to be the sort of thing that advocates of the inclusive/universal design movement would focus on in this case.

I have elsewhere introduced the phrase 'capability sensitive design' (Oosterlaken 2009) – analogue to the existing idea of 'value sensitive design'

[53] Van den Hoven and Rooksby (2008) argue along similar lines regarding information technology.

(van den Hoven 2007) – to capture the idea that it is morally desirable that engineers think about how they can contribute to the expansion of valuable human capabilities. Seen from the perspective of the CA, we would like engineers to design artifacts that not only *aim* at this expansion, but also *do* so in real-life situations – as far as within the sphere of influence and responsibility of engineers. The latter means at least properly taking applicable conversion factors into account, including making sure that the artifact is appropriate for the user and circumstances in question. Thus, I have argued that 'capability sensitive design' – whatever else it may be – will share characteristics with or embrace existing design movements like universal or inclusive design. From the perspective of the CA, such inclusive design seems to be – ceteris paribus – better than design that is not inclusive, as it will expand capabilities of more people.[54] Before discussing this in more detail, however, we need to settle some definitional issues that will prevent misunderstandings.

4.3. Distinguishing human capabilities and user capacities

The terms 'capabilities' and 'capacities' are central to this article, but may mean different things to people, depending – amongst others – on their disciplinary background (like political philosophy or philosophy of technology). Hence, it seems wise to define these terms clearly. One useful place to start is Nussbaum (2000, pp. 84–85), who makes a distinction between:

(a) basic capabilities ("the innate equipment of individuals"),
(b) internal capabilities ("developed states of the person herself " – which require training, nurturing, etc.)
(c) combined capabilities ("the internal capabilities *combined with* suitable external conditions for the exercise of the function")

Nussbaum, in her various writings, has defined a list of ten central human capabilities that everybody is entitled to and that are needed to lead a flourishing human life. These capabilities belong to the third category. It is thus the combined capabilities which are the 'human capabilities' that the CA is ultimately concerned with as the end of development and the space of equality.

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[54] The assumption here is that the artifact in question contributes to a valuable capability. See the annex for a discussion on this.

We can use the bicycle example to illustrate this. The *(combined, human) capability* relevant in this case is a person's capability to move about, to go to places where she wants to go. *External conditions* contributing to the realization of this capability may then include access to or possession of certain technologies (such as a car or bicycle). Yet certain *basic and/or internal capabilities* are also necessary for having this capability (such as control over one's legs or developed driving skills).

For matters of clarity, I will from now on consistently use the term '(human) capabilities' for what Nussbaum has called 'combined capabilities' (these are the capabilities that are a central concern within the CA) and '(user) capacities' for Nussbaum's 'basic and internal capabilities' (some of which will be necessary, although not always sufficient, for a technological artifact to result in the expansion of capabilities). This is, I admit, a somewhat arbitrary choice and some people may prefer – with good reasons – to use the terms 'capability' and 'capacity' the other way around. Yet this choice of words creates the conceptual clarity that I need to proceed with the main topic of this article: human diversity and the 'appropriateness' of technical artifacts.

I should also mention at this point that in developing my account of 'appropriateness', I define the term in a very specific way. In our everyday speech people may give a different meaning to the word 'appropriateness', such as cultural appropriateness.[55] Moreover, several other words exist which come also close to expressing what I mean with appropriateness, such as suitability, fitness, applicability and usefulness. Some readers may prefer to use one of these words for the state of affairs which I will label as appropriateness. My account of appropriateness is thus not simply a philosophical explication of a single word in ordinary language. What I aim to do is adding something to our understanding of technical artifacts and rendering the account of Franssen more complete in that in enables us to express normative judgments in response to facts of human diversity.

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[55] The term will remind some people of the 'appropriate technology movement' that was especially prominent during the 1970s/1980s. However, the way 'appropriateness' has been used within this movement clearly goes way beyond the interpretation of appropriateness that I present in this article. For example, this article defines appropriateness in the context of individual, instrumental rationality in one's interaction with specific technical artifacts, not addressing broader (social) practices of deciding about and using technology. The appropriate technology movement, on the other hand, encompasses debates about technology in this much wider sense as well (see chapter 6).

4.4. Human diversity in philosophy of technology

The work of Houkes and Vermaas provides a suitable philosophical basis for developing an account of (in)appropriateness. It presents a philosophical reconstruction[56] of artifact design and usage, which they use to develop a philosophy of artifacts and a theory of technical functions. Their account

> challenges the metaphysical position that functions can be taken as the essences of artifacts [...] our account suggests rather that if artifacts have essences, it is that they are objects embedded in use plans.[57] (Houkes and Vermaas 2010, p. 137)

In their theory an artifact's function depends not just on the materiality of the artifact, but also on the 'use plan' that is associated with it. The concept of a use plan can be explained as follows:

> Characterizing a plan as a goal-directed series of considered actions, a use plan of object x is a series of such actions in which manipulations of x are included as contributions to realizing the given goal. (Vermaas and Houkes 2006, pp. 6–7)

This plan-based approach means that the standards of rationality apply. And:

> In a rational plan, the user believes that the selected objects are available for use – present and in working order – that the physical circumstances afford the use of the object, that auxiliary items are available for use, and that the user herself has the skills necessary for and is physically capable of using the object. (Vermaas and Houkes 2004, p. 59)

User capacities and circumstances are thus part of their action-theoretical reconstruction of the use of objects, which includes the condition "[user] u believes that his or her physical circumstances and set of skills support realizing [use plan] p" (Houkes and Vermaas 2010, p. 23).

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[56] As it is a philosophical reconstruction, they do not aim at psychological accuracy in their description of artifact usage, nor at describing actual design practices in an empirically correct way.

[57] They add to this that this perspective may be "profitably combined" or "supplemented with another common intuition about artifacts, namely that they are man-made objects."

Vermaas and Houkes characterize engineering design as being concerned with the construction of these use plans for artifacts and – when not existing yet – the artifacts required for executing them, instead of with the construction of mere new technical artifacts (e.g. Houkes 2008; Houkes and Vermaas 2006). Given that the standards of rationality apply to use plans, and that design is conceptualized by Houkes and Vermaas as the construction of use plans, relevant circumstances of usage and skills/capacities of the user are or should[58] – by implication – also be taken into account while designing:

> rational design requires [the designer to have] justifiable beliefs about, among other things, the users' skills, circumstances and available artifacts, just as rational use does. (Houkes and Vermaas 2010, p. 44)

And this can be quite challenging in the case of inclusive or universal design:

> the designer has to consider all prospective executings and executors of the use plan that he has constructed. Since these potential users may, for instance, have different skills and resources, aiding one group might actually decrease the chances of aiding the other group, meaning that the designer cannot consistently have skill-compatibility beliefs regarding belief consistency makes good designing a considerable challenge. (Houkes and Vermaas 2010, p. 44)

The fact of human diversity means that most artifacts are not fully universal. If a designer does not rise to the challenge of universal design, the artifact that he designs will be inappropriate for at least one group of people. Judgments of the form 'this is an inappropriate artifact (for person p in circumstances C)' can then be made. As said, I will base my account of such judgments on the work of Franssen (2006, 2009), who in turn relates to the Houkes-Vermaas 'use plan account' of artifacts for developing his account of artifacts and normativity. I will now turn to Franssen's work.

[58] Depending on whether we read their account of engineering design as descriptive or normative or both. It seems that they intend it to be both descriptive and normative, since they also say that their related theory of function ascription is both (Vermaas and Houkes 2006, p. 9).

4.5. Making judgments about the inappropriateness of technical artifacts

Franssen argues that when we say something like 'this is a good bicycle', 'this bicycle is malfunctioning' or even simply 'this is a bicycle', we are making normative judgments of a kind, namely normativity in the context of individual, instrumental rationality in our usage of technical artifacts. He explicates "how such judgments fit into the domain of the normative in general and what the grounds for their normativity are" and spells out what they mean exactly. Note that in discussing his account of such judgments, we are thus not yet speaking about moral judgments – to those we will get back in section 7. In line with the work of Jonathan Dancy (2000), Franssen (2009, pp. 927–928) characterizes "the normative in general as being about the difference that facts about the world make to the question what to do or believe or aim for." Facts about the world, in this view, give rise to second-order normative facts about the relevance of the former facts to our deliberations. The relation between these two types of facts is, says Franssen, of a reason-giving type.

On this account, evaluative statements (such as 'this artifact is good') can thus be interpreted as normative statements (i.e. reason-giving, in this case with respect to the artifact's use).[59] Let's look at a casually formulated example of what it entails to call something a good artifact:

> If we say that x is a good knife, we assume that all people who wish to cut something would agree that the features of this knife make it fi t for cutting, that they would not urge you to start looking for a better knife, and so forth. (Franssen 2006, p. 50)

Facts concerning the use plan of an artifact are, according to Franssen, relevant for normative statements of the kind 'x is a good knife'. His formal analysis of the meaning of the statement 'x is a good K' reads as follows:

> 'x is a good K' expresses the normative fact that x has certain features f that make x a K and that make it the case that (1) p's wish to K and (2)

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[59] Disagreements exist between philosophers on the nature of evaluative and normative statements and the relation between them. In this paper I adopt the position taken by Franssen, who himself builds on the work of Dancy. The reader is referred to the articles of Franssen (2006, 2009) for a more detailed explanation and defense of this characterization of the normative. A fuller treatment of this issue is unfortunately not possible within the scope of this article.

> the accordance with the use plan for x of (i) p's abilities, (ii) p's knowledge, and (iii) the circumstances in which p operates, jointly recommend that p uses x for K-ing. (Franssen 2009, p. 934)[60]

What this comes down to is that if conditions (1) and (2) are satisfied and if p's wish for K-ing is itself reasonable, p has a reason to use x for K-ing.[61] For any question about what to do, however, there may be multiple reasons for and against a certain action. What one should do will depend on the total balance of reasons, on the overall reason that one accordingly has. Thus:

> one cannot go further than saying that p has a reason not to use a poor x, not that p ought not to use x. However poor a K x may be, if no alternative is available p may still have a reason to use x, if only p's need for K-ing is urgent enough. (Franssen 2009, p. 934)

Note also that – in addition to the material features f that make x a K – two different kinds of first-order facts about the world are referred to in Franssen's analysis of 'x is a good K'. The *actual* capacities and circumstances of a specific user are one sort of fact about the world, the user capacities and circumstances *assumed* in the use plan for a certain artifact are another sort of fact about the world. In Franssen's analysis the goodness or poorness of K is relative to the latter only:

> Instrumental goodness may refer to properties of the user, but these are again physical properties; *they do not refer to individuating properties of the particular person who uses the artifact*. The goodness of a knife, for example, lies in the physical properties by which it enables its user to

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[60] Franssen decided on this way of putting after carefully considering several alternatives. One of his considerations was that p's wish to K may be unethical or otherwise unreasonable. As Franssen (2009, p. 932) put it: "it cannot be correct that Mrs. p is granted a reason to put the knife to her husband's throat merely because she wishes to do so and a knife that would do the job is available." On the other hand: "that she ought not to use the knife for cutting her husband's snoring short does not diminish in any way the goodness of the knife." In light of this difficulty, conditions (1) and (2) being met is not followed by the phrase "p has a reason to use x for K-ing", but merely by the phrase that these facts "jointly recommend that p uses x for K-ing". The phrase 'x recommends y for p' is adopted by Franssen from the work of John Broome and means that p has a reason to see to it that (if x is the case then y is the case). For a more detailed discussion of this issue, I refer the reader to Franssen.

[61] See the previous footnote.

> make cuts of a particular smoothness. This cannot be defined independently of the pressure that is exerted on the knife, which must fit *the average human*. A knife that is able to cut smoothly but only when pressed with a force of 100 kgf is not a good knife. (Franssen 2009, p. 937, emphasis is mine)

Note that Franssen here assumes that the use plan for a knife refers to an average human; Only a very non-average person will be able to press a knife with a force of 100 kgf or 100 N. Use plans do not necessarily presuppose average users, but in practice designs are indeed often made with average people in mind. Of course plenty of artifacts – such as wheelchairs – are designed with a specific, a-typical user group in mind. But the use plan for a wheelchair still refers to the average disabled user, while within this group there may in reality be a large variety in capacities, such as strength in their arms. Franssen's analysis of 'x is a good K' applies to such cases as well.[62] We are, after all, able to distinguish good wheelchairs from poor wheelchairs. Having noticed this, we should be careful to correctly interpret Franssen (2006, p. 50) when he says that:

> If someone has a different opinion as to whether a certain [good] knife is good, it is *because* this person's abilities are atypical, she is, for example, left-handed or rheumatic or just plain clumsy, or because she has an atypical form of use in mind. (Franssen 2006, p. 50, emphasis is mine)

As most artifacts are designed with average humans in mind and assuming that most designers do a good job, Franssen's own analysis reveals that this a-typical person, saying 'x is a poor K' is in most cases uttering a normative statement that is false. Good knifes do not turn into poor knifes in the hands of a-typical people. And a high-quality, well-designed bicycle remains just that, even when owned by a disabled person. This disabled person may also be perfectly justified in

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[62] Some artifacts (like advanced artificial limbs or even a simple set of false teeth) are even tailor-made, or designed with one very specific user in mind. In those cases as well, we are able to distinguish good design from poor design and Franssen's analysis of 'x is a good K' would work. It would simply be a matter of a use plan referring to one specific user, with his or her specific characteristics. But even for those artifacts there will be situations that call for a judgment of inappropriateness, a type of judgment that will be introduced and explicated in the next section. In fact, a good, tailor-made set of false teeth will most likely be inappropriate for all people except for the person for whom it was designed.

drawing the conclusion that this bicycle is a good bicycle, even though she cannot use it. Yet it is understandable why a-typical people would sometimes make the mistake of calling a good artifact a poor one. I thus think that we should read Franssen's 'because' as giving an explanation for the occurrence of the mistake in judgment. We cannot take it as an endorsement of the correctness of the statement 'x is a poor K' or 'x is not a good K' in those cases.

One might object that this a-typical person is uttering an incomplete statement and that she may seem to be correct if we take it as short for 'x is a poor-K-for-me'. In everyday speech people may have the tendency to leave out the 'for me' part, especially if they feel that this is clear from the context in which they are speaking. Fair enough, but despite the usage of the same word 'poor', I believe that this person is really making a different normative statement. A disabled person may have a good and possibly even a conclusive reason not to try and use a perfectly good bicycle, a reason that does not apply to the non-disabled person for which the bicycle was meant. If a left-handed person has to decide between using a *good* right-handed pair of scissors and an equally *good* left-handed pair of scissors, he/she has a reason to choose the latter. For a right-handed person it is the other way around. No matter how well or poorly designed, there will often be such differences in the reasons that a typical and an a-typical person have to use a certain artifact. This seems to call for a certain sort of normative judgment that reflects this difference in reason. To avoid confusion it would be better to use another adjective instead of 'poorness for me/user x' in those cases, and my proposal would be to use inappropriateness. Thus, I propose to extend the account of Franssen with another normative judgment, namely that an artifact is appropriate or inappropriate for specific users or circumstances that we find in the world. In the annex the interested reader can find a detailed argument for statements about inappropriateness being a separate type of normative judgments and a detailed analysis of the meaning of this type of statements.

4.6. Sen and his uneasiness with the bicycle as a transportation device

It is now time to get back to Sen's uneasiness with the bicycle being characterized by welfare economists as a transportation device even though the artifact does not benefit the disabled. To ascribe 'transportation' as a characteristic to a bicycle is – in the language of engineers – the same as ascribing the function of transportation to it. After all, Sen is not speaking about

any physical or structural properties of the bicycle, but about what it can do – providing us with transportation. Ascribing a function to an artifact is, on Franssen's analysis, making a normative statement (in the context of instrumental rationality). Sen's dissatisfaction might thus seem to suggest that he believes that this particular function ascription is incorrect. According to the Houkes and Vermaas (2010) theory of function ascription Sen would clearly be wrong on this. These philosophers of technology would agree with welfare economists that 'transportation' is the defining characteristic or function of a bicycle. However, Sen was obviously not intending this as a statement within the context of philosophy of technology.

A better way to understand Sen's complaint is to put it in the context of his reproaching economists for having a "commodity fetishism" (Sen 1984, 1985), in light of the fact that resources do not always lead to expanded human capabilities. It may then be asked if engineers tend to share this fetishism – it would certainly fit the stereotype image of engineers loving nuts and bolts, big machines or intricate gadgets. It would, however, not fit inclusive designers, who seem to put people central in their work. According to the Houkes-Vermaas theory as well, material artifacts are not so central to design as is often assumed. They (2010, p. 26) conceptualize designing in the technical realm as "primarily – sometimes even exclusively – constructing and communicating use plans." If the artifacts needed for the execution of the use plan do not exist yet, these need to be designed as well, but "activities that result in new material objects are a subtype of designing, called *product designing*" (Houkes and Vermaas 2010, p. 26). And as became clear in section 5, their theory "emphasizes the 'instrumental' or 'goal-oriented' aspect of designing over its 'productive' or 'object-oriented' aspect" (Houkes 2008, p. 40). Put differently, according to this account "designers primarily aim at aiding prospective users to realize their goals" (Vermaas and Houkes 2006, p. 7). Obviously, people can only realize their goals when they have the capabilities to do so. This is what technical artifacts are supposed to do: expanding human capabilities. In other words, in the Houkes-Vermaas artifact theory the concern for *human capabilities* becomes thus something internal or inherent to the practice of engineering design itself.

If an artifact is inappropriate for some group of people, the introduction of this artifact will obviously not lead to the intended expansion of human capabilities for this group. This is what, so I believe, underlies Sen's dissatisfaction about how economist treat resources and what has been explicated in more detail in this paper. We should, however, also put Sen's

complaint in the context of his ethical concern for justice and equality. What we should explore is how judgments of the inappropriateness of technical artifacts in the context of instrumental rationality link to *moral* judgments concerning the injustice of designed artifacts. I will discuss this in the next section.

4.7. Inappropriateness and moral judgments about technology

Judgments about inappropriateness may sometimes be at the basis of judgments about injustice. The clearest example of this is perhaps that of building entrances that are *inappropriate* for people in a wheelchair and hence exclude them from a part of public life. Inappropriateness and injustice are intimately related here. On the other hand: it seems odd, to take an extreme example, to call an atom bomb that is inappropriate for some group of users an exemplification of injustice. These examples show that the account of appropriateness, as discussed in section 4.5 and presented in full detail in the annex, cannot suffice for a *full* account of the injustice of artifacts, although I think it certainly contributes to such an account by providing part of the grounding for it. The interesting question is, then, how to further distinguish between those cases were inappropriateness is morally problematic from those in which it is not. It would be beyond the scope of this article to develop a complete and robust answer to the question which cases of inappropriateness are cases of injustice. All I can do here is make some loose suggestions.

For a case of inappropriateness to be a case of injustice the function that the artifact is supposed to fulfill should be morally salient. The CA could be used to bridge the gap between 'is' and 'ought' – to get from 'this artifact is inappropriate for this user group' to 'this artifact design is a case of injustice'. The key is to realize that if an artifact is sufficiently inappropriate for some user, it will not expand the human capabilities of this user. And the CA argues that some human capabilities have moral value and that it is a requirement of justice – at least in Nussbaum's version of the approach -- to bring each and every person up to at least a threshold level of these capabilities. We should note, however, that the CA would not value *each and every* capability that is expanded by a technological artifact. Nussbaum, for example, has created a list of ten capabilities that governments – according to her – ought to guarantee and promote. It is based on an ethical evaluation. Hence, she says (Nussbaum 2000, p. 83), the "capacity for cruelty, for example, does not figure on the list." This should be kept in mind when discussing, for example, the capabilities that are or

are not being expanded by chemical weapons and other morally questionable technologies. Also in the case of morally far less controversial or even uncontroversial technologies, like cars and bicycles, inappropriateness for some user group or some circumstances of usage may not necessarily be a case of injustice. I think that most people would, for example, share my intuition that there is no injustice in cars not being appropriate for 8-year old children. In distinguishing morally problematic from morally unproblematic cases of inappropriateness, one of the factors that could play a role is the availability of alternatives – e.g. disabled people will find that alternatives exist for bicycles, but not for inaccessible government buildings.

Thus although all technologies are – on the account presented in this article – designed to expand *some* capabilities of people, their inappropriateness for some group of users is not always a case of injustice. In those cases where it is, one may also wonder if this also implies that one can say that the artifact *itself* is inherently morally bad. The question whether technical artifacts are morally neutral or value laden has been much debated (e.g. Verbeek 2008; Radder 2009). Within the scope of this paper, I cannot do justice to this whole debate and fully defend my own position within it. So again, I can only give some loose suggestions; My account may seem to suggest that the injustice in those cases is indeed 'inscribed' in the artifact, as the designer has made material choices that automatically lead to the inclusion or exclusion of certain users or circumstances of usage. Technical artifacts hence do not seem to be fully value-neutral. However, we should note that inappropriateness on my account is also always a *relational* quality, as it only arises in relation to certain circumstances or certain users. This suggests that moral badness resulting from inappropriateness for some group of users does not *fully* reside in the artifact itself, but in the contingent combination of artifact (including use plan) and actual users/circumstances. This is, not coincidentally, in line with human capabilities – according to the literature on the CA – being relation in nature (Smith and Seward 2009; Oosterlaken 2011). Both human capabilities and inappropriateness only come into existence in an interplay between the person, the artifact/resource and the environment.

Although speaking about inherent moral badness of artifacts – for example, saying that a dangerous electric saw is morally bad – may be problematic, Franssen (2009, p.948) thinks that it is "less controversial to establish the moral value of artifacts in a comparative sense only". He gives the example of two instrumentally equivalent electric saws, of which one is more dangerous than

the other. According to him "we have good reason to call the more dangerous saw morally worse than the safer one." He might have a point there. To paraphrase his argument: If we have two instrumentally equivalent artifacts, one of which is appropriate for a larger group of users than the other, we may want to argue that the one which accommodates a larger group of users is the morally better one. We should note, however, that Franssen's argument only seems to work because the moral value of safety is quite uncontroversial. Hence, our variation on it would only work in cases where the (in)appropriateness is linked to a human capability that is deemed valuable, so that the exclusion becomes morally relevant. For example, when we compare a wheelchair friendly building with another building that is the same, except that it is inaccessible by handicapped users. It seems odd again, however, to call an atom bomb that is appropriate for a larger group of users a morally better one than an atom bomb for which only some people have the required capacities to handle it. This illustrates once more that inappropriateness as discussed in this paper may provide *some* grounding for moral judgments about artifacts, although it is not sufficient on its own. We need to discuss – as capability theorists also propose – which human capabilities we have reason to value. These discussions are of great importance for engineers too.

4.8. A final reflection

In this paper I have used analytic philosophy of technology to show that the apparent commonalities between the CA and universal/inclusive design run deeper than one might think; Not only do both highlight human diversity, but moreover the concern for human capabilities is something deeply ingrained in the nature of technical artifacts and engineering design. In turn, the CA and the universal/inclusive design movement also have something to offer to philosophy of technology: a forceful reminder of the ubiquity and pervasiveness of the fact of human diversity, which means that statements concerning inappropriateness should be included in an account of normative statements about technical artifacts. When connecting three formerly separate fields of research – the CA, design and philosophy of technology – one runs the risk of remaining somewhat brief and sketchy at points. Certainly there is more that can and needs to be said about human capabilities, design and normativity. For example Franssen – and hence this article as well – focuses on normativity in the context of individual,

instrumental rationality in our artifact usage. This, he acknowledges (2006, p. 926),

> does not exhaust by far the normative dimension of the practice of designing and making such artifacts — that is, the practice of engineering — nor the normative dimension of the practice of using them or deciding about them — in short, the practice of technology as a whole.

The same holds for this article. It seeks to explicate when and how individual usage of a technical artifact may or may not expand the capabilities of the user – something that will not happen if the artifact is inappropriate for the user in question. However, technology affects the capabilities of people also indirectly, through its indirect effects and its formative influence on social institutions and practices. Thus, a full analysis of the connections between technology and human capabilities would also require looking at practices of technology as a whole. This is beyond the scope of this article, but needs to be addressed in future work.

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Annex: normative judgments of the inappropriateness of technical artifacts

A first exploration of the (in)appropriateness of artifacts

What exactly makes 'inappropriateness' a different normative judgment than 'poorness'? Well, whether an artifact can be judged to be poor or good is, in Franssen's definition, relative to *the assumptions* about users and circumstances in the use plan. Such judgments are thus grounded in two categories of underlying first-order facts about the world, namely (a) the properties f of artifact x, in relation to (b) the abilities, knowledge and circumstances that were *assumed in the use plan of K*. A third category of first-order facts about the world does not come into play in such judgments, namely the (c) actual abilities, knowledge and

circumstances of some particular person that uses or tries to use x. Remember that a disabled person could be perfectly justified in his judgment 'this is a good bicycle', even though the use plan of a bicycle assumes capacities that (s)he does not have. This judgment of instrumental goodness is thus not affected by the inability of this person to use his legs (a fact belonging to category c), whereas a judgment of inappropriateness for him/her would be grounded in this fact. Saying that 'x is an inappropriate K' – as people may casually do in everyday speech – should thus always be read as 'x is an inappropriate K for person p in circumstances C'. As judgments of (in)appropriateness and goodness/poorness are thus at least partly grounded in different first-order facts, they also correspond to different normative or second-order facts.

An example may clarify the grounds for a statement like 'this is an inappropriate car for p'. We will take the case of a good car which was – as is usually the case – designed for an average human adult (and not for Martians, children, giants or little people). Let's assume – for the sake of argument – that it has the following features (we are thus abstracting from the many other relevant features that a car has): (1) green, (2) sporty shape, (3) reliable engine, (4) high-quality brakes, (5) a distance y between the driver's seat and the brake. Which of these facts would ground a judgment that this car is a good car? Not features 1 and 2; they may be important for aesthetic reasons, but they are not relevant for instrumental goodness.[63] The judgment that a car is a good car would obviously be based on features 3 and 4, but also on 5. This last feature is relevant because the assumed user in the use plan – a normal adult – is of a certain height. Feature 5 means that a driver needs a minimum leg length to be able to push the brake while still being seated safely and with an ability to keep an eye on the road. If the distance from the seat to the break would be so big that only a giant could reach the breaks, it would not be a good car. We would not consider it to be a good car either if the distance was too small. A good car is appropriate for the intended user.

Which features would ground the judgment that the car is inappropriate for an 8-year-old child? Well, obviously feature 5 in combination with the fact that a child of this age is much smaller than the average user for which the car was designed. The child will thus have a lot of trouble hitting the brake. Whether the engine is reliable or not makes no difference for this judgment – feature 5

[63] Although one might be able to come up with an exceptional, non-standard use for a car in which they would become relevant.

already gives the child a reason not to use the car.[64] However, as the child is not the user assumed by the use plan, this gives no ground for a judgment that the car is poor. Of course, which of the many features of an artifact ground a judgment of inappropriateness depends on the specific judgment that is made[65]; For which user, for which circumstance is the artifact said to be inappropriate? For example, before mentioned car may also be inappropriate for racing a certain rally track, but this is another judgment that would be grounded in another subset of the car's features (features not mentioned in this simplified example). The car example contains two quite straightforward and unproblematic cases of judgments of (in) appropriateness:

1. x is meant for (people like) p and p has no problem to use x for K-ing: x is appropriate for p (as before mentioned good car is for a normal adult user)
2. x is not meant for (people like) p and p has indeed problems using x for K-ing: x is inappropriate for p (as before mentioned good car is for a child or a little person)

Based on this example, one might propose that a judgment of inappropriateness for p in C can be made based merely on a comparison of (b) assumptions made in the use plan about users/circumstances and (c) the characteristics of some actual users/circumstances. If they match, we judge that the artifact is appropriate. And if not, we judge that the artifact is inappropriate. As inappropriateness then does not refer to (a) x and its properties f, this proposal may on second thought seem unsatisfactory. After all, the examples at the beginning of this section showed that judgments of (in)appropriateness have a reason-giving force. Where would this come from, if not from the object being a K with certain properties f? It is these properties that give an artifact its instrumental value. One might object to this that x 's properties f feature indirectly in such a comparison, as the assumptions made in the use plan about

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[64] This analysis clarifies why Franssen (2006, p. 47) is correct in his casual remark, referring to a good car, that a 12 year old girl "definitely has a reason not to use the car to drive to school"; this good car is inappropriate for her.

[65] In many cases only a subset of all properties f relevant for the goodness/poorness of x will ground a specific judgment of inappropriateness for p. But an artifact can be inappropriate for p in more than one way. The more features f ground the judgment of inappropriateness, the more inappropriate x (ceteris paribus) is for p in C.

users and their circumstances somehow get 'translated' into the properties of x. If all design was good design, it could indeed be as simple as that.

A more detailed analysis of the (in)appropriateness of artifacts

The problem is that designers sometimes fail to make a proper 'translation' between the characteristics of their intended users and features f of x. Or, alternatively, they achieve more than was intended. This raises two additional cases (3 and 4) which are more controversial. Whether these are cases of inappropriateness, depends on the position that one takes (a or b) (table 4.1). If one takes position (a), one could indeed rely on merely a comparison of a real p with the assumptions made in the use plan in order to determine if x is appropriate or inappropriate. Choosing (b) means that for making judgments of (in)appropriateness one also has to take into account the properties f of x. As our interest is in judgments of (in)appropriateness as *normative, reason-giving* judgments, it makes more sense to choose for (b). This can be illustrated by an example of case (3), namely Franssen's case of a knife that "is able to cut smoothly but only when pressed with a force of 100 kgf", a pressure that an ordinary/average user could not exert. Yet – Franssen plausibly postulates – the designers of this knife had an ordinary/average user in mind when designing the knife. The heavy knife is thus a case of a design failure. Opting for (a) implies saying that the knife is appropriate for an average person. It seems obvious, however, that this average person also has a reason not to use the knife. This reason has something to do with the weight of the knife, but that fact could then only ground the judgment that the knife is a case poor design, as we have already made the choice – based on design intentions – that the knife is appropriate for an average user. However, it seems more simple and elegant to say – following (b) – that due to one of the design features f of the knife (namely its weight), the artifact is inappropriate for her (giving her a reason not to cut with it) *and because she is the intended user* this inappropriateness implies that we can also make a grounded judgment that it is a poor knife.

	(a) Design intention takes precedence ('meant for')	(b) Design result takes precedence ('de facto suitable for')
(3) *x* is meant for (people like) *p*, but *p* does not succeed to use *x* for K-ing	*x* is appropriate for *p*	*x* is inappropriate for *p*
(4) *x* is not meant for (people like) *p*, but nevertheless *p* has no problem to use *x* for K-ing	*x* is inappropriate for *p*	*x* is appropriate for *p*

Table 4.1 Judgments of (in)appropriateness based on design intention versus design result

The analysis of 'x is an appropriate K for p in C' should thus include a reference to the artifact being a K with certain features f, in order to capture appropriateness in the intended *normative sense*. Furthermore, it matters not only that an artifact is a K, but also that it is an *operational K*; If x is malfunctioning, it would be odd to say that the appropriateness of x gives p a reason to use it for K -ing. My proposal would be:

> 'x is an appropriate K for person p in circumstances C ' expresses the normative fact that (1) x has certain features f that make it a K and (2) the relevant features f" of x are compatible with the characteristics of p and C that jointly make it the case that if (i) x is operational and (ii) p has a (reasonable[66]) wish to K, then p has a reason to use x for K-ing.

We could say that the explication of 'x is a good K' focuses on the properties of x, while the explication of 'x is an appropriate K for p in C' concentrates on the characteristics and/or circumstances of a specific p.

When reflecting on both Franssen's account of goodness and my account of 'appropriateness for p in C' together, it becomes clear that appropriateness for the intended users is a necessary, although not sufficient condition for good design. 'X is a good K' if and only if 'x is an appropriate K for the intended user.' Whatever else may make a bicycle a good bicycle and a pair of scissors a good pair of scissors, it cannot be good unless it is at least appropriate *for the exact users and circumstances assumed in the artifact's use plan*. Franssen never gives a specification in engineering terms or otherwise what makes that an x is a good K. Such criteria will, he says, differ from artifact type to artifact type; In the case

66 See footnote 6 on why, according to Franssen, this addition is necessary.

of bicycles, for example, the chain should not come of easily and in the case of scissors the blades should be sharp. But this one general criterion of good design – that the artifact should be appropriate for the specific users and circumstances assumed in the use plan – is valid for every artifact.

Goodness/poorness, (in)appropriateness and the balance of reasons

What the proposed interpretation of 'x is an appropriate K for p in circumstances C' allows for, is that this x may still be a poor x in other respects. In our simplified car example: the distance between the driver's seat and the brake may be compatible with p's length (so in that respect the car is appropriate for p), but the car has an unreliable engine and lousy brakes (so the car is poor). Abstracting from this example, there are four basic possibilities:

1. x is a good K and appropriate for p in C
2. x is a good K, but inappropriate for p in C
3. x is a poor K, but appropriate for p in C
4. x is a poor K and inappropriate for p in C

If p has a reasonable wish to K, in case 1 and 4 all the features f of x would be pressing on respectively the 'pro' and the 'contra' side of p's balance of reasons.[67] In case 2 and 3 there would be features pressing on each of the sides. Obviously p has on balance most reason to use artifact 1 and least reason to use artifact 4. Nothing can be said a-priory about the ranking of artifacts 2 and 3. Only if we know specific details concerning x and p/C, will we be able to make a choice. Take a pair of scissors, with three features: (a) the sharpness of its blades, (b) the tightness of the connection between both blades and (c) the shapes of its handles. It is feature (c) that makes the pair of scissors left-handed or right-handed, so either inappropriate or appropriate for a right-handed person. However, all three features are relevant to determine if a pair of scissors (whether left-handed or right-handed) is a good or a poor one. Now assume that left-handed p must choose between a good right-handed pair of scissors (case 2)

[67] Note that this is a simplified situation. Even artifacts that we call overall good may have some feature which we judge to be poor and the other way around. Thus, in reality even for artifacts that are good and appropriate for p in C (case 1) some feature f may be on the 'contra' side of p 's balance of reasons. There exist also artifacts that are neither good nor poor., but something exactly in between. For these artifacts, about half of the features will press on the 'pro' and half on the 'contra' side of the balance of reasons.

and a poor left-handed pair of scissors (case 3). In that case, it seems to me, p has on balance reason to choose the former (case 2). However, this is a judgment based on personal experiences as a left-handed person with scissors, so on empirical facts. I have learned that right-handed scissors are only slightly inappropriate for me as a left-handed person and that features (a) and (b) are much more important for reaching my goal of cutting a piece of paper than (c).

In many other cases, however, it will be hard to tell if two or three should be preferred. Take a child that has not yet fully mastered the art of bicycle riding. But he wants to go for a bicycle ride anyway. Let's assume that bicycles differ in only two respects, so that there are four possible combinations coinciding with four bicycles available for the child:

1. A bicycle with a decent chain and training wheels
2. A bicycle with a decent chain without training wheels
3. A bicycle with a chain that comes of easily and with training wheels
4. A bicycle with a chain that comes of easily and without training wheels

Again, it is obvious that the child has the strongest reasons for taking bicycle 1 for a ride and the weakest reason – if any at all – for using bicycle 4. Of the two alternatives that rank in the middle, it is hard to tell which one should be preferred without learning specific details. It all depends. How easily does the chain of bicycle 3 come of? How poor are the cycling skills of the child really?

As mentioned at the end of section 4, one could say that in a sense 'appropriate for' is really the same as 'good for'. So why propose a different term instead of 'good for'? The reason is that by calling it 'appropriate for', it becomes more transparent that it is possible for some x to be an appropriate K for person p in circumstances C, while it is actually not a good K (as several examples have illustrated). If we would choose to say instead that 'x is a good K for person p in circumstances C', it would become more difficult to put aside – as we should – the (wrong) intuition that this implies 'x is a good K – period!'

Extreme inappropriateness

Table 4.2 visualizes the "hierarchy of normative facts" that Franssen (2009, p. 938) put together and indicates (last column) how I propose to expand it. In this section I will discuss the branch 'useless for K-ing' and at the same time deal with one of the possible objections to my account of (in)appropriateness for p in

C. This objection against my analysis of 'x is an (in)appropriate K for p in C ' is that we may frown upon the thought that a disabled person missing both legs has a reason to use a good bicycle, no matter how insignificant in the balance of reasons compared with the strong reason not to use it because of its inappropriateness for him. Surely he has *no reason at all* to use it? He simply cannot do so. We can draw an analogy here with Franssen's analysis of 'x is a malfunctioning K'. About malfunctioning artifacts he says that it would seem that:

> [...] whereas one may still have a reason to use a poor K for K-ing [...] one cannot have a reason to use a malfunctioning K for K-ing, since a malfunctioning K will not enable you to K in the slightest. So we would have to say that, in the case of a malfunctioning K, p has a compelling or conclusive reason not to use x for K-ing, in other words, that p ought not to use x for K-ing. (Franssen 2009, p. 935)

Just as you can have very good artifacts and very poor artifacts and everything in between, you can have very appropriate artifacts for p in C and very inappropriate artifacts for p in C and everything in between (for example, a left-handed pair of scissors is only slightly inappropriate for a right-handed person). Just as in some cases one may have an overall reason to use a poor K for K-ing, one may in some cases have an overall reason to use an inappropriate K for K-ing (for example if the artifact will help you to safe somebody's life and a better or more appropriate artifact is not available[68]). And just as in the case of a malfunctioning K one has a conclusive reason not to use this K, we may argue that a paralyzed person has a conclusive reason not to use a bicycle for transportation, as the artifact is extremely inappropriate for him. He ought not to use it.

[68] The features of the artifact that make it poor or inappropriate for you will still result in a reason against using it on the balance of reasons, but they will not put that much weight in the scales in this situation.

Artifact *x*	Useful for K-ing	Working *K*	Poor *K*	Appropriate *K* for *p* in *C*
				Inappropriate *K* for *p* in C
			Good *K*	Appropriate K for *p* in *C*
				Inappropriate K for *p* in *C*
		Natural object that can do K-ing	Makes a good *K*	Appropriate K for *p* in *C*
				Inappropriate K for *p* in *C*
			Makes a poor *K*	Appropriate K for *p* in *C*
				Inappropriate K for *p* in *C*
	Useless for K-ing	Not a *K*		
		Malfunctioning *K*		
		Unfit *K* for *p* in *C* (because extremely inappropriate)		

Table 4.2 An extended version of Franssen's "hierarchy of normative facts"

However, in the latter case a commonly used term analogous to 'malfunctioning' does not exist. One might call it 'extremely inappropriate for p in C'. To distinguish those cases in which an artifact is so extremely inappropriate for a user that conclusive reasons arise from it from those cases where an artifact is 'merely' very inappropriate for a user, we might want to introduce a new term. One candidate would be 'unusable' or 'useless'. In his 2006 article Franssen applied exactly the latter term to the sort of cases I am talking about now, cases where the circumstances of usage or the user's capacities make that a person has a compelling or conclusive reason not to use a certain artifact – which actually supports my claim that 'this is an inappropriate artifact for p in C' is a different kind of normative judgment than 'this is a poor artifact':

> there are many cases where someone has a reason not to use a particular artifact that do not involve a judgment of poor functioning or malfunctioning, although they involve normative facts of some sort: [...] an electric drill is *useless* for drilling holes if there is no electric power at hand, [...] (Franssen 2006, p. 48)

Yet whereas 'malfunctioning' is a term with a quite unique meaning, the term 'useless' can have a lot of different meanings. Indeed, in both articles Franssen also applies the term in another way, namely as an overarching category for objects that are either not a K or a malfunctioning K (see Table 4.2 with the 'hierarchy of normative facts' sketched earlier). In order to avoid confusion, it would thus be best to come up with a different term to apply in those cases where the circumstances of usage or the user's capacities make that a person ought not to use the artifact in question. I propose to refer to those cases as, say,

cases where 'x is unfit for p in c'. This should thus be added as a third option – instead of 'extremely inappropriate for p in c' – to the category 'useless for K-ing'.[69]

[69] Just like Franssen poses the question whether the transition from an extremely poor x to a malfunctioning x is discontinuous or continuous, one may wonder if the transition from extremely inappropriate to unfit is continuous or discontinuous. Proper treatment of this topic would go way beyond the scope of this article.

II. ZOOMING OUT: HUMAN CAPABILITIES & THE EMBEDDING OF TECHNICAL ARTEFACTS

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Notes and Comments

Inserting Technology in the Relational Ontology of Sen's Capability Approach

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Abstract In the July 2009 issue of this journal, Smith and Seward presented a critical realist ontology of human capabilities. Using insights from philosophy of technology/science and technology studies, it is argued that their ontology can and should be extended; not only individuals and social structures, but also technological artifacts should be recognized as important constituents of human capabilities.

Key words: Capability approach, Human capabilities, Ontology, Technology, Technical artifacts, Actor network theory, Critical realism

Introduction

In the July 2009 issue of this journal, Smith and Seward (S&S) pose some very fundamental questions regarding the nature of human capabilities:

> Are elements of the context to be treated as external variables that somehow enhance capabilities? Or are they actually a constitutive part of capabilities themselves? How do we understand the interaction between the individual and the social spheres that shape and determine capabilities? (S&S, 2009, p. 214)

They set out to articulate an answer in the form of a critical realist ontology of human capabilities, which, they argue, is already implicitly present in Sen's work on the capability approach (CA). Technological artifacts play no role in their account. This may not be surprising, as these are often ignored within critical realism (Elder-Vass, 2008).

However, the ontology of S&S could quite easily be extended to accommodate technological artifacts as an important constituent of human capabilities. I believe it is important to do so for two related reasons. Firstly, technology is an important factor in expanding valuable human capabilities. Examples can easily be found for many of the capabilities that figure on Nussbaum's well-known list. Prefab homes facilitate that people quickly get

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5 Inserting technology in the relational ontology of Sen's capability approach

This chapter appeared in 2011 the *Journal of Human Development and Capabilities* 12(3):425-432.[70]

5.1. Introduction

In the July 2009 issue of the *Journal of Human Development & Capabilities* Smith and Seward (S&S) pose some very fundamental questions regarding the nature of human capabilities:

> Are elements of the context to be treated as external variables that somehow enhance capabilities? Or are they actually a constitutive part of capabilities themselves? How do we understand the interaction between the individual and the social spheres that shape and determine capabilities? (S&S, 2009, p. 214)

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However, the ontology of S&S could quite easily be extended to accommodate technological artifacts as an important constituent of human capabilities. I believe it is important to do so for two related reasons. Firstly, technology is an important factor in expanding valuable human capabilities. Examples can easily be found for many of the capabilities that figure on Nussbaum's well-known list. Prefab homes facilitate that people quickly get 'adequate shelter' in a disaster area (no. 2—bodily health). Cars and bicycles expand people's abilities 'to move freely from place to place' (no. 3—bodily integrity). Telephones contribute to expanding people's capabilities 'to engage in various forms of social interaction'

[70] With the exception of the annexes, which were written for this dissertation.

(no. 7—affiliation). Secondly, several scholars have started to explore the overall value of the CA for discussing technology in the last couple of years (for example, Johnstone, 2007; Oosterlaken, 2009; Zheng, 2009). Others have reported on more specific applications of the CA to technology; for example, to evaluate ICT4D projects (e.g., Gigler, 2004; Madon, 2004), or to assess healthcare technologies or biotechnologies (e.g., Clague, 2006; Coeckelbergh, 2009).

Yet an ontological basis for better understanding the interaction between technology and human capabilities has so far not been explicated. In this commentary note I aim to contribute to such a basis. The view of technology adopted here is—broadly speaking—that it is a set of material artifacts or systems of such artifacts.[71] I will argue that technical artifacts can and should be inserted in the relational ontology of the CA that S&S propose. In doing so, I will make use of insights from philosophy of technology/science and technology studies concerning the nature of technical artifacts and their relation with humans and society at large.

5.2. Social structures and capabilities

The starting points of S&S are two articles by Martins (2006, 2007), who argues that Sen, in using concepts such as 'well-being,' 'advantage' and 'capability,' is operating on the level of *scientific* ontology. Martins is rather concerned with the more abstract level of *philosophical* ontology. He sees capability as a type of causal powers, which is one of the ontological categories within critical realism. Other key elements in this philosophical ontology are the following:

> *Structures* are the underlying conditions of possibility that enable or facilitate the occurrence of a given phenomenon. [. . .] *Mechanisms* refer to the mode of operation of structures and exist as the power that a structure possesses of acting in a given way. (Martins, 2006, p. 6)

Structures can refer to both natural and social 'objects.' Examples of the latter are gangs, churches and governments. S&S (2009, p. 217) emphasize that the

[71] Many definitions exist of what technology is; see for example, Mitcham and Schatzberg (2009). Within the scope of this commentary note, I do not have the space to discuss this in any detail.

causal mechanisms 'do not act deterministically,' considering the multitude of interacting mechanisms in our highly complex world. They are 'better understood as *tendencies* of a structure to behave in a particular way.' The idea is that the Humean notion of causality ('if *a*, then *b*') is replaced with a 'contextual causality' ('*x* causes *y* (in circumstances *c*)'; S&S, 2009, p. 218). The causal powers of these structures 'emerge' from the internal relations of their constituent parts, the structures are 'more than the aggregate sum' of these parts. 'Social structures and their mechanisms,' S&S (2009, p. 224; emphasis added) state, 'emerge from relations between people and between people and *nature*.' However, they do not further discuss the latter in the remainder of their article. Nor do they discuss the relations between people and *technical artifacts*, which are such an important part of our material world. This is a pity, as this type of relation is very important for social structures. Take, for example, social structures such as national healthcare systems or energy suppliers. It is not difficult to see that not only people, but also technological artifacts form a very important constituent part of such structures, as is indeed expressed in the term 'socio-technical systems' (e.g., Bauer and Herder, 2009; Krohs, 2008).

Now let us move on to individual human capabilities. These are—in the account of S&S (2009, p. 218)—also 'structures with particular internal relations from which their causal powers (mechanisms, i.e. the potential to perform a functioning) emerge.' And 'functionings are the realization (outcomes) of the activations of these causal mechanisms.' In this ontology, capabilities are contextual and relational in nature, as—say S&S (2009, p. 214)—'a particular capability is the outcome of the interaction of an individual's capacities and the individual's position relative to others in society' (i.e. within the existing social structures). However, technological artifacts are not only constituent parts of social structures, but of human capabilities as well. In the words of Lawson (2010, p. 211; emphasis added): 'the very capabilities that people have depend upon the relations in which people stand both to other people and to *things*.' For example, artifacts like cars and bicycles have—as mentioned—the potential to expand an individual's capability to move around.

5.3. Technical artifacts and the expansion of human capabilities

For explication of how exactly technology fits in with S&S's relational ontology of the CA, a recent article by Lawson (2010) is exceptionally helpful. In this article, entitled 'Technology and the Extension of Human Capabilities,' Lawson does not

refer to the CA. Yet on the level of philosophical ontology his account seems very compatible with that of S&S, as both are based on a critical realist ontology. The main argument of Lawson's article is that it is a defining characteristic of technical artifacts— setting them apart from toys, works of art and the like—that they extend human capabilities in a certain way.[72] He argues, however, that artifacts will only do so if they are incorporated in both 'technical and social networks of interdependencies.' He calls upon actor network theory (ANT) to articulate this idea. 'Perhaps the central proposition of ANT,' he explains, 'is that technical objects cannot be understood in isolation. Rather technical objects take on their properties, characteristics, powers or whatever only in relation to the networks of relations in which they stand.' The networks in which artifacts are enrolled have both social and material components.

The example of the car can illustrate this. Basically a car remains just a specific configuration of wires, metal, nuts and bolts, and so on, until it is embedded in a network with roads, gas stations, traffic rules, driving schools, and the like. Only in such a network could the artifact be understood as a car, with all the powers that cars have. And, Lawson would arguably say, only then will it be expanding people's capabilities to move about. Something similar could be argued for the bicycle, an example that is actually mentioned by Sen (1983, 1985) himself. Sen focuses on the characteristics of the individual (i.e. being disabled) that may prevent the expansion of capabilities from taking place. But for the bicycle as well, the expansion of human capabilities is dependent upon the larger network in which the bicycle and its owner are positioned; for example, it makes a difference if the bicycle owner is a Bedouin in the desert, or an inhabitant of a city with bicycle lanes. A telephone can also illustrate the importance of the network in which an artifact is enrolled:

[72] Philosophers of technology are likely to associate the phrase 'expanding human capabilities' (used in the CA literature) with 'extension theory' within their field, which Lawson (2010, p. 208) describes as 'any theory in which technical objects are conceived of as some kind of extension of the human organism by way of replicating, amplifying, or supplementing bodily or mental faculties or capabilities.' This idea of extending human capabilities is clearly different from the idea of expanding human capabilities put forward in the literature on the CA. Yet Lawson explicitly distinguishes this type of extension theory from his own idea of the sense in which technology extends human capabilities. And his own proposal comes rather close to the concept as it is being used within the CA.

> A new phone must be inserted within technical networks where it has access to the right kind of telephone signal or the correct voltage of electricity, etc., but to be usable it must also be inserted within particular [social] relations, which might mean being left outside the house for Amish communities or it might assume the status of a best friend for a chatty teenager. (Lawson, 2010, p. 213)

Lawson (2010, p. 214) argues that 'some aspects of the technical object can be treated in exactly the same way as social structure [. . .] for the simple reason that the social relations, in which artifacts stand, are constitutive of the artifact' (as illustrated by the previously discussed examples). However, technical artifacts in one respect differ from social structures, so Lawson argues. And this is that they have a dual nature, both a social and a material one. This becomes clear when we start looking into the interaction between individuals, social structures and artifacts through time. Individuals and social structures, in the critical realist ontology, recursively depend on each other. 'People experience social structures as an objective reality,' so S&S (2009, p. 223) explain, 'and, through human activities, transform or reproduce social structures' over time. But unlike social structures, technology is, says Lawson, 'not *simply* transformed or reproduced' through human activity:

> If human society disappears overnight hammers, in an important sense not shared by the highway-code, language, etc., do not. To be clear, what persists is the physical presence of the hammer, not it's *being* a hammer, which of course is a construction that would indeed disappear along with human societies. (Lawson, 2010, p. 214)

Lawson (2010, p. 216; emphasis added) suggests that 'technical objects [like cars and hammers] are those objects whose *primary* causal powers are intrinsic to them, as opposed to [social] objects [like passports or bank notes] whose causal powers are relational.' This difference between technical artifacts and social structures thus provides a reason to distinguish them as a separate constitutive element of human capabilities.

In the critical realist ontology, the link between social structures and individual agency is to be found in so-called 'positioned practices': individuals engage in social practices, in which they occupy certain positions. 'In this way,' S&S (2009, p. 223) explain, 'a person's relative position in society subjects them to the causal mechanisms that constrain and enable behavior.' Lawson (2010, p.

215) suggests that 'technical objects can be understood as "slotting" into positions in much the way that individuals do.' But they do have material properties (like being hard or heavy and subject to gravity) that humans by necessity have to 'work around and respect.' We 'position ourselves with respect to the operation of such mechanisms,' says Lawson. Put differently: 'the positions into which technical objects 'slot,' are reproduced and transformed as human agents attempt to *harness* the causal powers of such objects' (Lawson, 2010, p. 217). Technical activity (ranging from design to use), so Lawson (2010, p. 217) proposes, is 'that activity that harnesses the intrinsic causal powers of material artifacts *in order to extend human capabilities*.'[73]

5.4. Ontology, capabilities and ethics

Although the works of Lawson and S&S thus seem to be very compatible on the level of philosophical ontology, and more in particular their ontological understanding of capabilities, it is worth noting that there is a subtle difference in the way in which capabilities tend to be discussed in their respective fields, philosophy of technology and the CA. The example of so-called 'sleeping policemen,' which are sometimes mentioned in the literature on ANT, can be used to illustrate this difference. These artifacts force people to drive slowly and thus constrain what drivers are able to do. Philosophers of technology, so Lawson notes, tend to discuss such cases in terms of technical artifacts 'disciplining' drivers into certain behavior, thus 'imposing' a certain morality or ethics on them. Lawson instead chooses to highlight that such cases involve a *direct* expansion of human capabilities; the traffic authorities gain causal powers by introducing the sleeping policemen into the existing material and social network. This expands the capabilities of their officers at the expense of those of the drivers, whose capability to speed gets diminished.

Scholars working within the CA would, I suspect, rather tend to highlight that the sleeping policemen contribute to traffic safety, which means that—in a more indirect way—the capabilities of citizens in Nussbaum's categories of bodily integrity and life get expanded by these artifacts. The reason is that much of the literature on the CA focuses on valuable capabilities, capabilities that

[73] As for design: elsewhere (Oosterlaken, 2009) I have argued, using the example of a bicycle, that the design features of an artifact are indeed a determining factor of the human capabilities to which the artifact contributes.

enable one to live the life one has reason to value. For example, Nussbaum (2006, p. 182) says that her list of 10 central human capabilities is based on an ethical evaluation. Hence she did not include the capability of being cruel on her list. The very specific capability of traffic officers to control drivers' behavior, although not morally bad as a capability for cruelty seems to be, would not be crucial enough to survive such an ethical evaluation. For philosophers of technology, like Lawson, this capability may still be worth analyzing though.

Yet this difference in focus between both fields does not—it seems to me—invalidate the argument that I make in this commentary note. Whether one chooses to talk about a capability to speed, a capability to control some aspect of other people's behavior, a capability to remain uninjured in traffic or a capability of being cruel, they are comparable on the level of philosophical ontology. Although they may invoke very different ethical evaluations, these capabilities are, as has been explained, all constituted by individuals, technical artifacts and social structures.[74]

5.5. Some implications

Having laid out how a critical realist account of human capabilities could incorporate technologies as an important constituent, there are a couple of adjacent points to which I would like to draw attention. Firstly, processes of technical advance—so Lawson (2010, p. 219) suggests—are 'driven' by 'our need to extend our capabilities.' But then 'we might ask what kinds of things we wish to be capable of and, of course, are we happy with others being capable of.' This is, the previous section already mentioned, exactly one of the questions that theorists within the CA have been reflecting on. Insights gained in that body of literature may thus be helpful for the normative and social assessment of new technologies — indeed, several authors have already started to apply it in this way (for example, Coeckelbergh, 2009).

Secondly, in discussing the desirability of certain technologies aiming to expand certain human capabilities, we should be aware that an individual is

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[74] I cannot further discuss this within the scope of a commentary note. The interested reader is advised to take a look at Martin's (2007) discussion of the ontological versus ethical contributions of the CA, and the S&S (2009, pp. 228–230) discussion of the different concept levels that can be distinguished within scientific ontology—this is where philosophy of technology and the CA seem to make different choices.

always, as S&S (2009, p. 218; emphasis added) mention, part of a 'context of particular enabling (or *disabling*) mechanisms.' Likewise, as the case of 'sleeping policemen' already hinted at:

> The introduction of a particular technology involves the extension of the capabilities of some, empowering them while making others disempowered or even redundant. Thus a central task will be to question whose capabilities [. . .] are being extended, and what the implications of this might be. (Lawson, 2010, p. 220)

It is important to be aware of this, as the CA in the end cares about the capabilities of each and every individual to lead the lives they have reason to value. Because of this, a certain *methodological* individualism (which is not excluded by critical realism's rejection of *ontological* individualism) may thus—so S&S argue—be recommendable. The idea is (S&S, 2009, p. 228) that our 'analysis must focus on the relative positioning of the individuals within the social structure to understand for whom different structures are differentially causal' and thus for whom—for example—certain essential capabilities may sink under some acceptable threshold level. Also in the case of technology, one should sometimes resort to such methodological individualism in order to assess technologies on their merits for different categories of individuals.

Thirdly, so Lawson points out (2010, p. 220), 'extending our capabilities [with the help of technical artifacts] commits us to, or encourages us to invest in, particular networks of interdependencies.' This is in line with the remark of S&S (2009, p.219) that 'an intervention will only generate a particular outcome (such as increased capabilities) where the relevant contextual mechanisms exist.' They are thus wary of best practices, as (S&S, 2009, p. 231) 'it is hard to imagine that one set of practices will work in all contexts.' It seems to me that many of the past cases of failed technology transfer to developing countries are a perfect illustration of the fact that technologies do not expand human capabilities without the required interdependencies with people, social structures and other artifacts being present in the recipient country. 'Best technologies' thus also is something we should be wary of, as the 'appropriate technology movement' (for example, Willoughby, 1990) advocated decades ago.

5.6. Conclusion

Technology plays a very important role in expanding human capabilities. In this commentary note I have argued that we can understand this role by seeing technical artifacts in their networks of interdependencies with people, other artifacts and social structures. The relational ontology of the CA should ascribe causal efficacy not only to individuals and social structures, but also to technical artifacts. All three form a constitutive element of human capabilities. With this comment, I hope to have made a small contribution to giving technology a firmer place within the CA. With my usage of the work of Lawson I hope to have demonstrated that work done within philosophy of technology and within science and technology studies may enrich the CA (and possibly also vice versa).

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Annex I: compatibility of the CA, critical realism and actor-network theory

This paper is a comment on an article by Smith & Seward (2009) in the *Journal of Human Development & Capabilities* that explicated the relational ontology of human capabilities that – the authors claim – is implicit in the work of Amartya Sen. My comment was submitted to and subsequently published in the 'notes & comments' section of the journal, a disadvantage of which is that it had to be very short. In this annex I would like to briefly elaborate on the compatibility of three key approaches that get connected in it, namely (a) the CA and critical realism, (b) critical realism and actor-network theory or ANT, and (c) ANT and the CA.

The CA and critical realism

One thing worth noting is that my reply accepts, without questioning, the claim of Smith & Seward that the ontology implicit in Sen's work is best captured by critical realism. This implies that social structures are seen to have causal powers that are irreducible to individuals. These social structures are thus a distinct type of entity in a critical realist social ontology. Alternatively, so Lanzi (2011, p.1091) explains, one may consider social structures as the outcome of strategic human interaction, without these structures having independent causal power, which means that one adopts instead an interactionist social ontology. "Unfortunately", so Lanzi claims, "Sen's works are sociologically vague" and "both perspectives are, in principle, consistent with the capability approach." Lanzi thus proposes to merge both perspectives, by defining "an inertial social ontology in which social structures are built strategically by players of social games, and, once created, persist in time." He elaborates that "the inertial social ontology presumes an

interactionist explanation of the matter in which social structures and institutions are forged in the short run, and a realistic assessment of their long term effects after these inertial factors have become sufficiently strong." Such an inertial ontology, he says, "enables us to find room in the analysis for mechanisms and tactics used by individuals, or social groups, to alter the rules of social convivience as well as to criticize the long term, perverse effects of binding social structures."

To me it seems that Smith & Seward say something similar, even though they present this as being part and parcel of their critical realist ontology. They say (p. 224) that "social structures and their mechanisms emerge from relations between people" (i.e. the interactionist explanation), but obviously also accept an at least partial realist assessment (p. 223):

> "people experience social structures as an objective reality and, through human activities, transform or reproduce these social structures that form the people's new social environment. However, social entities can also exist prior to any one individual human activity that reproduces those social structures, logically implying that they are at least partially independent from those activities."

Since I am not an expert in social ontology, I am not able to judge whether Lanzi interprets critical realism too narrowly, or whether Smith & Seward stretch it too much. The important thing is perhaps that both Smith & Seward and Lanzi seem to agree that existing, well-established social structures or institutions have at least some realist effects or independent causal powers, or emergent properties that are irreducible to those of the individuals living in that moment and place. Following Smith & Seward, I will continue to refer to this position as a critical realist one.

Critical realism and ANT

The previous discussion about the nature of social structures has, however, some importance for another aspect that has remained implicit in my reply to Smith & Seward. In inserting technology in the critical realist ontology explicated by them, I refer to actor-network theory or ANT (Latour[75] 2005). ANT is a clear example of what Lanzi calls an interactionist social ontology, with the noteworthy

[75] Just like Sen is considered the founding father of the CA, so Latour has this role in ANT.

feature that not only humans but also technical artifacts are considered to be 'actors' operating within a larger actor network. ANT reduces reality to the interaction between human actors and technical actors. So one might question the compatibility of ANT with critical realism, because of the latter's assumption that social structures do have causal powers that are irreducible to individuals. In other words (Elder-Vass 2008): critical realism considers both individuals and social structures to be causal efficacious, while ANT generally denies the causal efficacy of social structures. Thus, Elder-Vass (2008) notes, "superficially, [they] are radically opposed research traditions." In the course of his article he argues, however, that "there is more common ground than might at first appear" and both have much to learn from one another. One of the points on which ANT, according to Elder-Vass, could learn from critical realism is exactly the causal efficacy of social structures. One of the points on which critical realism could learn from ANT is acknowledging the role of technical artifacts.

In the spirit of the analysis of Elder-Vass I – in line with ANT – acknowledge that the power of technical artifacts to expand human powers or capabilities to a certain degree depends on the larger network in which they are embedded and yet – in contrast to ANT, but in line with critical realism – choose to ascribe causal efficacy to three different entities: social structures, humans and technological artifacts. All three, I would like to add, are mutually constitutive and co-evolving over time. Hence the dividing line within each of the three possible combinations (social structures – humans, humans – artifacts and artifacts – social structures) can be blurry at times, even though they can be distinguished analytically. Critical realism says that this is the case for social structures and humans (Smith and Seward 2009, p.224). ANT arguably takes a similar position with respect to humans and technical artifacts, as indicated by Latour's famous example of the 'gunman'- a hybrid term. And the same arguably holds for technical artifacts and social structures, as indicated by the hybrid term 'socio-technical systems' (Bauer and Herder 2009; Krohs 2008).

ANT and the CA

Although I borrow a specific insight from ANT in my paper without necessarily committing to the whole stock of ideas of ANT, this may be a good place to briefly say something more anyway on the compatibility of ANT and the CA. This has actually been explicitly addressed in a recent book chapter of Kullman and Lee (2012), in which they stage a detailed "encounter between Sen and

Latour", investigating the similarities and differences between the oeuvre of both thinkers. They each have, so Kullman and Lee explain, a different disciplinary background and audience, and aim at different things with their work. Kullman and Lee emphasize that there are however major resemblances in their work, despite the apparent differences that one may also notice at first. One thing that they mention is that "there is a clear structural resemblance between Sen's moment of 'conversion' of commodity into capability and Latour's moment of 'translation' of human and non-human materials into situated forms of agency and association." The main correspondence that they discuss is that both Latour and Sen, each in their own way, promote a "liberation within" rather than a "liberation from." This means, Kullman and Lee explain, that both these thinkers see achieving freedom as not being a matter of gaining independence from one's social and material environment, but as arising from making alterations within this environment and one's relation to it.

One related concept that to me seems to deserve some attention in such a comparison, is the notion of 'agency' present in the work of both Sen and Latour. The concept of agency is very central to Sen's version of the CA. One of the things that he discusses in several of his publications is that people are not just creatures that work to optimize their own well-being, as economists tend to suppose. People may for example decide to fulfill some obligation or commit themselves to some greater good, even when this is at the expense of their personal well-being. "A person's agency aspect", says Sen (1985), cannot be understood without taking note of his or her aims, objectives, allegiances, obligations, and – in a broad sense – the person's conception of the good." An agent is thus somebody with an inner life, a privileged perspective on the world.

Sen's view of agency seems radically opposed to how humans are depicted in ANT. Characteristic for the work of Latour is that he treats both human beings and technical artifacts alike as 'actors.' These actors are not assumed to have agency in the sense that was just described. According to Waelbers (2011) agency has four characteristics within ANT: (1)"An entity is an agent if it acts, meaning that it has to make some difference to a state of affairs within the socio-technical network"; (2) "an agent should have some kind of figuration: a form or shape"; (3) "agents [...] in pursuing their program of action, will come across other agents with affirming, conflicting or transforming programs of action" – she uses the metaphor of pinball to explain this, with an actor being merely one ball, or e.g. a flipper, in this game; (4) "the metaphysics of the observer determines how the acts of both humans and technologies are perceived." Although both humans

and technologies are considered as actors or agents in ANT, Waelbers asserts, "within ANT, agency is understood as the result of many human-technology interactions, and not as the result of autonomous human intentions."

So does this pose any challenge for my paper? I would say not, since – as I already said – I have not committed myself to the full stock of ideas of ANT. However, this does make clear that one should be careful to combine different approaches like the CA and ANT, because the underlying metaphysics or other assumptions may be incompatible. This means that to combine them extensively, adjustments in one or both may be necessary. As for agency: Sen would clearly not like Latour's understanding of it and Waelbers (2011) is also not fully happy with this – in her case she is concerned about the possibility to ascribe responsibility to agents. She notes though that Latour's conception of agency results from a specific anthropological 'project' for which only the outcomes of social interaction matter, and not the human intentions behind actions. For ethics the latter of course matters greatly. She sets out to adjust the framework that ANT provides, so that reasoning, desires, emotions and intentions get a place in it. Such work is very useful if one would like to further integrate the CA and ANT.

Annex II: critical realism and technological versus social determinism

In the introduction to this dissertation I explained that the basic view that emerged during the research project is that understanding the relation between technical artifacts and human capabilities requires us to regularly move back and forth between 'zooming in' and 'zooming out'. The former allows us to see the details of the design of technical artifacts, the latter allows us to see how exactly technical artifacts are embedded in broader socio-technical networks or systems – including cultural norms, social practices and so on. Both the socio-technical embedding of technical artifacts and the details of design, so I claim, are relevant factors in the expansion of human capabilities. If one were to adopt the view of technological determinism[76], one would be inclined to adopt mainly or exclusively the zooming-in-perspective. If one were to adopt the view of social determinism, one would be inclined to adopt mainly or exclusively the zooming-

[76] With technological determinism I do not mean the view that technology develops autonomously, without human influences, but the view that "the physical materiality of technology plays a causal role in social change" and its social impact (Smith, 2006).

out-perspective, be it that one would speak of *social* instead of *socio-technical* networks, structures and practices. This dissertation thus steers a middle course, one could say, between the extremes of technological determinism and social determinism with respect to the creation of human capabilities.

As I discovered only recently (Oosterlaken, 2012), critical realism – which in this chapter has been presented as the philosophical ontology underlying the CA – has also been said to be able to dissolve the duality or tension between technological versus social determinism. This argument is actually made by one of the authors of the paper to which I reply in this chapter, namely Matthew Smith (2006).[77] Social determinism, so he explains, emphasizes the interpretive flexibility of technical artifacts. "From this perspective", he says, it makes no sense to theorize the impacts of information technology apart from the context of implementation." Noticing that there are no general causal regularities between the introduction of technology and social changes, researchers who adopt this perspective will instead fully focus on social groups and their beliefs and interactions in their study of ICT innovations, neglecting the influence of the technology itself. "The result", according to Smith, is "a 'nominal' view of technology where it is invoked 'in name only' and remains an omitted variable."

Yet information systems as a specialized research field, Smith says, makes no sense if we do not assume that technology is able "to causally interact with the world", to have a real and discernible influence. The challenge according to Smith is "to understand [based on empirical research] what *kind* of influence, and to have a theoretical vocabulary that is appropriate to describe that influence." He presents critical realism as providing this theoretical vocabulary at the most abstract theoretical level, making it possible to transcend the opposition between technological and social determinism. As I have briefly explained in this chapter, critical realism claims that we should not look for law-like regularities in the world, but for the different interacting causal mechanisms that underlie the outcomes that we see. These causal mechanisms could be both social and technical in nature. Both should be included in our investigations.

One thing that I noticed in my review of the literature that has appeared in the past couple of years on the CA and technology, and especially on ICT4D and

[77] It thus seems that he would have been perfectly able to insert technology into the relational ontology of Sen's CA himself, although he has clearly chosen not to do so in the article to which I reply – perhaps for practical reasons like a lack of space, perhaps also because technology had until quite recently not received much attention in the research community on the CA or in the *Journal of Human Development and Capabilities*.

the CA, is that there is actually not that much attention for technology itself. One of the things that I argue for in this dissertation is that the technology itself should be considered in more detail. Critical realism as the philosophical ontology underlying the CA is able to facilitate that, so both this chapter and the paper of Smith (2006) show.

Chapter 7
Marrying the Capability Approach, Appropriate Technology and STS: The Case of Podcasting Devices in Zimbabwe

Ilse Oosterlaken, David J. Grimshaw, and Pim Janssen

7.1 Introduction

The expansion of valuable, individual human capabilities is, according to the capability approach, a central aim of development interventions. Capabilities are the real opportunities or positive freedoms to achieve valuable 'functionings' or 'being and doings', examples of which are being healthy, participating in community life or travelling. One of the rationales behind this focus on expanding someone's human capabilities, is that this means empowering this person to be an agent, to be someone who is able to make choices and undertake actions in line with one's own ideals and ideas about a good human life. This may be either actions or choices that increase the persons's own well-being, or that contribute to other goals that the person finds important. Both well-being and agency are held to be centrally important in the capability approach. Because the capability approach is, says Johnstone (2007),

> essentially naturalistic and functionalist in orientation, capability analyses are able to integrate descriptive and normative dimensions in a way that is particularly appropriate to technological domains.

The capability approach provides a development perspective that allows one to quite naturally make a connection between on the one hand technology choice and the

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6 Marrying the capability approach, appropriate technology and STS: the case of podcasting devices in Zimbabwe

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6.1. Introduction

The expansion of valuable, individual human capabilities is, according to the capability approach (CA), a central aim of development interventions. Capabilities are the real opportunities or positive freedoms to achieve valuable 'functionings' or 'being and doings', examples of which are being healthy, participating in community life or travelling. One of the rationales behind this focus on expanding someone's human capabilities, is that this means empowering this person to be an agent, to be someone who is able to make choices and undertake actions in line with one's own ideals and ideas about a good human life. This may be either actions or choices that increase the person's own well-being, or that contribute to other goals that the person finds important. Both well-being and agency are held to be centrally important in the CA. Because the CA is, says Johnstone (2007),

> essentially naturalistic and functionalist in orientation, capability analyses are able to integrate descriptive and normative dimensions in a way that is particularly appropriate to technological domains.

The CA provides a development perspective that allows one to quite naturally make a connection between on the one hand technology choice and the details of engineering design – which may have a direct impact on what capabilities a technical artifact contributes to – and on the other hand the ultimate aims of development. The sparse body of literature that has so far made a link between

the CA and technology is focused on ICT.[78] One explanation for this might be found in the "multi-purpose, multi-choice nature" (Kleine 2011) of ICTs, which can – at least in principle – simultaneously contribute to expanding many different capabilities and leave it up to the empowered user which 'functionings'[79] to realize. This, says Kleine (2011), makes 'ICT for Development' (ICT4D) "particularly well-suited to be a test-case for the choice paradigm in development evaluation, execution and planning." In reality, of course, tensions sometimes arise between the goals that development organizations or NGOs attempt to achieve and the choices that people make. An example is when so-called 'ICT telecenters' are being used for entertainment purposes – which could be seen as an exercise of these users' agency – while the NGOs intended the centers to be used for achieving pre-determined well-being goals, such as better health or improved livelihoods (Ratan and Bailur 2007). This raises a dilemma for the NGO to either respect people's choices and not meet their organizational goals, or to become paternalistic in its interventions. When reviewing the literature (Oosterlaken 2009), it becomes clear that challenges in or criticism of the mainstream practice of ICT4D – such as a tension between well-being and agency goals, too much emphasis on resource distribution and the dominance of an economic perspective – are amongst the reasons for authors to turn to the CA, in search of critical and fundamental reflection. We believe that the CA does indeed have added value for ICT4D. However, in order to realize this potential it is very important to investigate the connections that may fruitfully be made with other approaches, theories and insights. As Zheng (2007) has noted, "many issues unveiled by applying the CA are not new to e-development." According to her a lot of existing perspectives and approaches within ICT4D, such as 'social inclusion', 'information culture' and 'information infrastructure', can "be used compatibly with the CA perspective of e-development." It is even desirable that such connections are made, as the CA

> is not a theory that can *explain* poverty, inequality or well-being [...] Applying the capability approach to issues of policy and social change

[78] A literature review in 2009 – for example – identified 18 publications in this area, of which 13 focused on ICT and 10 more in particular on ICT4D (Oosterlaken 2009).

[79] An important distinction in the capability approach is that between functionings and capabilities, or between "the realized [functionings] and the effectively possible [capabilities]; in other words, between achievements on the one hand [functionings], and freedoms or valuable options from which one can choose on the other [capabilities]" (Robeyns 2005).

> will therefore often require the addition of explanatory theories. (Robeyns 2005)

What the CA can do is provide "a tool and a framework within which to *conceptualize* and *evaluate* these phenomena" (Robeyns 2005), it is "able to surface a set of key concerns, systematically and coherently, on an explicit philosophical foundation" (Zheng 2007). But "the capability approach offers little about understanding details of technology and their relationship with social processes" (Zheng 2007).

In this chapter we aim to illustrate both (a) what the added value of the CA for reflecting on technological development projects could be and (b) how the CA so applied could benefit from insights of existing theories and approaches with respect to technology. For this purpose we will use the case of the *Local Content, Local Voice* project, during which podcasting devices were introduced in Zimbabwe by the non-governmental organization Practical Action.[80] In section 2 we will discuss what taking a CA towards the case would entail – to which aspects of the project would it draw attention? In section 3 we will discuss how the CA relates to the ideas behind and experiences of the Appropriate Technology (AT) movement. To fully understand the complex and dynamic interaction between technology and human capabilities, so we will argue in section 4, the CA should also pay attention to theories and insights from Science and Technology Studies (STS). Aspects of the case feature throughout these two sections as an illustration. In section 5 we will discuss the topic of technology choice for our project case and we will argue that the CA allows us to conceptualize considerations of agency and well-being that play a role in such a choice. Let us first briefly introduce the case.

6.2. A machine with knowledge of cattle management

According to some the idea of appropriate technology "has not yet gained much ground in the area of ICT" (Van Reijswoud 2009). But our case, the *Local*

[80] The main sources of information for the case study are documentation of Practical Action about the project, its predecessors and the ideas behind the project (Mika 2009; Gudza 2009; Talyarkhan et al. 2005), fieldwork for his master thesis by one of the co-authors in the period April-August 2010 (Janssen 2010) and experiences of another co-author with the case and its predecessors while working for Practical Action (reflected upon in Grimshaw and Gudza 2010; Grimshaw and Ara 2007).

Content, Local Voice project, is an example of an ICT project resulting from the appropriate technology movement. Practical Action only adopted its current name a few years ago and was formerly known as ITDG, the Intermediate Technology and Development Group. Established in 1966 by economists E.F. Schumacher (e.g. 1973) and others, this NGO has played a crucial role in the 'intermediate' or 'appropriate' technology movement that reached its peak in the 1970s and early 1980s. Since the last decade or so Practical Action is also explicitly paying attention to new and emerging technologies, such as nanotechnology and ICT. Our case is but one of Practical Action's activities in this area.

In 2007 Practical Action and its local partner organization LGDA have introduced mp3 players and podcasts in the Mbire district in the Lower Guruve area in Zimbabwe. 'Kamuchina kemombe' is the name that local people have given to these mp3 players. The literal translation of this is 'a machine with knowledge of cattle management' (Grimshaw and Gudza 2010). The lessons on cattle management made available in this way have, according to project evaluation reports from Practical Action (Mika 2009; Gudza 2009), led to an increase in agricultural productivity and hence improved livelihoods for the local people. The introduction of this technical artifact took place as part of the pilot project *Local Content, Local Voice*, which builds on earlier work within Practical Action on the question of how to 'connect the first mile' – how to deal with the challenge of

> sharing information with people who have little experience of ICTs, low levels of literacy, little time or money, and highly contextualized knowledge and language requirements. (Talyarkhan et al. 2005)

Such challenges also apply to the Lower Guruve area. Literacy, for example, is 75%. In many other respects, the development challenges are big in this semi-arid area: livelihoods are mainly dependent on small-scale subsistence farming (livestock production and drought resistant crop cultivation); and the district's infrastructure services in the district are poor (no electricity, running water, telephone landline, mobile phone network or FM radio network). Traditional agricultural extension services[81] had ceased to be reliable because of poor

[81] According to Wikipedia "Agricultural extension was once known as the application of scientific research and new knowledge to agricultural practices through farmer education. The field of extension now encompasses a wider range of communication and learning activities organized

transport and other economic reasons. One of the bottlenecks was, for example, that governmental livestock officers did not have enough time to properly train the animators interacting with the villagers. After consultation with local stakeholders the mp3 players were viewed as an additional channel for knowledge sharing rather than a replacement. Hence the process of sharing knowledge came to be regarded as "digital extension".

The *Local Content, Local Voice* project was part of a larger EC Block Grant project with the objective to improve livestock health and product value of resource poor households in the Mbire District. In the preparation phase, local people made a prioritization of possible interventions within the scope of this project. Also at later stages opportunities for participation were present. Participation was also built into the process of the sub-project *Local Content, Local Voice*. People were, for example, consulted on the proposed technical solution. This led to changes, such as the addition of loudspeakers to the device in order to enable collective listening while sitting under a tree in the village. Thus, a way of information sharing was made possible that is very much in line with local cultural practices. One of the key drivers of this approach was to minimize the impact of the technology on the power balance in the communities, in order to increase its chances of success (Grimshaw and Gudza 2010). Explicit attention was also paid to the podcasts themselves, making sure that their contents would be understandable and relevant to local people. It was furthermore investigated what would be the best way to deal with the infrastructural challenges, for example using solar cells or batteries that would regularly need to be re-charged elsewhere.

6.3. A capability approach of the case

So what would it mean to take a CA towards this case? Well, first and foremost it would mean recognizing that a successful development project is not a matter of merely giving access to resources like mp3 players. These are just means, and the CA would ask if they contribute to the expansion of valuable human capabilities. What are people now able to do and be, which they could not do and

for rural people by professionals from different disciplines, including agriculture, agricultural marketing, health, and business studies." But, says Wikipedia, "there is no widely accepted definition of agricultural extension" – the page lists 10 definitions from different sources to illustrate this. Source: http://en.wikipedia.org/wiki/Agricultural_extension, retrieved on February 11th 2011.

be before this project was implemented? The CA furthermore holds that poverty and well-being are multidimensional, an evaluation in line with the CA could thus take a wide range of things into account as relevant. The current project evaluation reports, however, limit themselves largely to outcomes in terms of the number of podcasts recorded and distributed, "a decrease in animal mortality", "increased milk yields from the animals" and "increased crop productivity" (Mika 2009). Of course strengthening people's livelihoods means strengthening their ability to support themselves. If successful, it would imply increasing people's basic capabilities, their "freedom to do some basic things that are necessary for survival and to escape poverty" (Robeyns 2005). As capabilities can be both an end in themselves as well as a means for the expansion of other capabilities, this may – in a positive spiral – also contribute to the expansion of further capabilities. As one farmer said: "because of my increased number of cattle and increased crop yields, I am now able to pay school fees for my children." Receiving more education may be valuable in its own right, yet it may also contribute to the expansion of more capabilities. Yet there may be other, less tangible project impacts. For example, according to another local farmer the mp3 players fostered "group work and group harmony which did not exist before. When groups ask for lessons we share experiences and ideas." So the technology seems to have improved farmers' relations with each other and with the development agents. The project also seems to have given farmers more self-esteem, as expressed by yet another farmer when asked about the project's benefits: "before the technology, if an animal was dying then I could not take action [lack of agency!], but now I can. I am happy since I am a full farmer now!" (Janssen 2010, pp. 70–71). If one attaches importance to both well-being and agency, as the CA does, such impacts are certainly worth taking into consideration. In short, the CA could provide a conceptual framework for a more comprehensive evaluation of the project.

What one would further want to look at, from the perspective of the CA, is the *process* that led to these development impacts. The CA resists viewing people living in poverty as passive patients to be helped, but rather pictures them as human agents able to shape their own lives. Hence, the literature on the CA pays a lot of attention to participative processes and democratic deliberation (e.g. Crocker 2008). Of course participatory methods have been part of development discourse and practice for quite some time now, and interesting parallels between this body of literature and the CA can be drawn (Frediani unknown date). The appropriate technology movement, in turn, has emphasized the

importance of enabling people to choose a technology that will suit their needs. Practitioners like Practical Action advocate the empowerment of people to participate in the development process, so that they can choose an appropriate technology.[82] In the case of podcasting in Zimbabwe the participation of a wide range of stakeholders – including agricultural and veterinary agencies, local government, local development associations, community workers, and local village chiefs – has, according to Practical Action, been an important factor in bringing about ownership, empowerment and a high degree of uptake of the technology. Indeed it could be observed that the technology has been woven into the fabric of village life. We should note, however, that in the view of the CA participation is not just of instrumental importance for reaching pre-set goals such as technology adoption or even increased well-being (Frediani unknown date). Participation in collective deliberation and decision-making is first and foremost seen as being important for normative reasons; it is respectful of human agency to put people in the driver's seat of policies and projects that concern them. To determine to which degree this was realized in a case like ours, one could – for example – make usage of Crocker's classification of modes of participations (Crocker 2008, chapter 10), which this author himself applies to a case study of a small-scale development project as described by Alkire (2002). Such a detailed analysis of the degree of participation might, when applied to our case study, reveal that there is room for improvement.

Finally, the CA would draw attention to the differences that might exist between categories of individuals, in so far as these could influence the impact of a policy or project on the expansion of human capabilities. The valuable capabilities it proposes to promote "are sought for each and every person, not, in the first instance, for groups or families or states or other corporate bodies" (Nussbaum 2000, p.74). However, the so-called 'conversion factors' could be such that a technology does not lead to a capability expansion for each and every individual. In our case it was acknowledged, for example, that the impact of ICT may be different for literate and illiterate people and by choosing for a voice-based rather than a text-based technology it was ensured that both groups would benefit. Another difference that may be relevant is that between males and

[82] Academics like Chambers (1997) conceptualize this as a process of participative learning and action. His approach is grounded in many years of practical experience from which he notes, "local people have capabilities of which outsiders have been largely, or totally, unaware" (Chambers 1997, p. 131).

females. This also applies to our case. For example, during group meetings men were seated close to the (mostly male) animator and the mp3 player. They were also more actively involved in the discussion after the broadcast. Sometimes their speaking volume was impossible to hear for the women who were sitting approximately 10m away. Furthermore, women sometimes needed to ask their husbands permission to individually go on a visit to the animator in order to listen to a podcast (Janssen 2010, p. 72). Such factors may, however subtle, influence the conversion of a technology into valuable human capabilities. From a capability perspective this may thus be worth investigating in more detail. More contextual conversion factors have received plenty of attention from the appropriate technology movement. Thus, this movement has a wealth of knowledge and experience to offer that is relevant from the perspective of the CA. It is to this topic that we now turn.

6.4. Appropriate technology: taking conversion factors seriously

It is hard to accurately capture the ideas behind the heterogeneous appropriate technology movement in a few words. Nieusma (2004) summarizes it as follows:

> In part as a response to failures of technology transfer approaches, 'appropriate technologists' argued that context suitability should be central to identifying technologies relevant to poor people of the Third World and other marginalized social groups. [...] Attention to contextual particularities became one of the guiding approaches to appropriate technology and, hence, unlike technology transfer scholars, appropriate technology thinking took *design* as the point of intervention. (Nieusma 2004)

This focus on design does not mean that appropriate technology always needs to concern a tailor-made design solution. It may also mean that the design features of existing technological artifacts play a central role in technology choice for a specific context of application. In our case in Zimbabwe, for example, research was done into developing an innovative technological solution using Bluetooth technology and solar energy panels. The latter were considered because of the lack of an electricity network in the region. The Bluetooth technology would enable podcasts being exchanged between people passing each other. However, this technology gave rise to several difficulties and in the end this solution was

not chosen for several reasons (which will be discussed in section 5). The podcasting devices introduced instead by Practical Action were quite ordinary, existing devices. The important thing is, however, that this decision was only taken after different technical alternatives had been investigated in light of the context of application. There was no unreflected assumption that transferring some state-of-the art technology from the West would be the solution to the local development challenges.

Nieusma's view on appropriate technology is an example of what Willoughby (1990, 2005) calls the "general principles approach" to appropriate technology. This conceptualization of appropriate technology leads to a rather formal definition of what appropriate technology is. It merely "emphasizes the universal importance of examining the appropriateness of technology in each set of circumstances" (Willoughby 2005). It thus stays close to the daily meaning of the adjective 'appropriate'; something – a technological artifact in this case – is always appropriate for something else. Such appropriateness may have many different dimensions, thus we should always ask 'appropriate *for what*?' A technology may be culturally appropriate, as when loud-speakers are added to enable collective listening in line with African practices. It may be appropriate for specific user groups, as when a choice is made for a voice-based technology in an area with a lot of illiteracy. It may be appropriate for an area lacking certain infrastructure, as when solar-powered devices are chosen for an area without an electricity network. And technology may be appropriate in an economic, political, ecological or other sense. The important thing to note is that the general principles approach makes no choice yet for one or the other type of appropriateness, it just claims that appropriateness is a very important consideration in all our dealings with technology.

Willoughby (2005) distinguishes this "general principles approach" from the "specific characteristics approach", which tends "to predominate within the Appropriate Technology movement itself." In this second approach appropriate technology is given a fixed and specific interpretation, for example ecologically sound, easy to use, low-cost, low-maintenance, labor-intensive, energy efficient, etc. Some of such interpretations resulted in the appropriate technology movement as a whole getting an image of being concerned only with simple, low-cost, low-tech solutions for poor countries, such as a smoke hood or gravity ropeway. In investigating if and how modern, 'high-tech' ICTs can be appropriate solutions for certain development challenges, Practical Action is clearly not sticking to this approach of appropriateness. A similar concept,

namely "intermediate technology", was introduced by Schumacher and defined as "vastly superior to the primitive technology of bygone ages but at the same time much simpler, cheaper, and freer than the super technology of the rich" (Schumacher 1999, p. 128). Schumacher (1973) put forward six criteria for determining if a technology was "intermediate". In the case of the podcasting in Zimbabwe we can say that the technology makes use of modern knowledge, was conducive to decentralization, compatible with the laws of ecology, gentle in the use of resources, and served the human person. That is, five out of six of Schumacher's criteria are met. The exception being production by the masses.[83] According to Willoughby the specific-characteristics definition of appropriateness:

> is more than a concept about the nature of technology and the way it relates to ends. It is simultaneously a normative statement (because it assumes priority for certain ends rather than others) and an empirical statement (because the practical criteria of appropriateness must be based upon some assessment of which technical means generally best serve the ends in question). Whereas the general-principles approach tends to leave the evaluation of ends and means relatively open, the specific-characteristics approach embodies the results of previous efforts to evaluate both of these factors. (Willoughby 2005)

Of course, the CA would ascribe one important normative goal to technology, namely the expansion of valuable human capabilities. But it would certainly not claim that this should be the only goal. And especially if one keeps it an open question which capabilities should be promoted – as Sen does – the CA seems perfectly compatible with the general-principles approach to appropriate technology. It can even be argued that they share an important insight. According to the latter, one should evaluate technologies and their specific design features according to their appropriateness for the set of relevant circumstances. This is very important, as the context may vary a lot from country to country or even from region to region. The CA likewise emphasizes human diversity. The fact of immense human diversity is indeed one of the main reasons why the CA focuses on the expansion of human capabilities instead of

[83] Grimshaw (2004) attempted to relate these criteria to the case of open source software. The main reason for this was to refute the often quoted view that "new technologies" could never be "intermediate technologies".

resources as the end of development. After all, due to facts of human diversity the 'conversion factors' may be such that a certain resource or technological artifact does not lead to an expansion of the human capabilities needed to live the life one has reason to value. The appropriate technology movement, one could say, has always taken conversion factors seriously, even though its view was not expressed with the same concepts as the CA.

In the case of ICTs, it may even be more important than in other domains to pay attention to appropriateness. The reason is that actually two different resources are involved here: the technological artifact and the information distributed. Both of them are resources that could be inappropriate for the context of application or the envisaged users. Thus, one often faces what Oosterlaken (2009) has called a "double conversion challenge." Yet according to Talyarkhan, Grimshaw and Lowe:

> Projects connecting the first mile often assume that improved access to ICTs leads to improved access to information, which leads to improved knowledge and decision making and therefore development outcomes. Evidence from projects suggests that in many cases the information is difficult to appropriate because it is exogenous, in an inaccessible format, or not from a source people trust (Talyarkhan et al. 2005, p. 18)

In the *Local Content, Local Voice* project in Zimbabwe explicit attention was paid to this challenge (Grimshaw and Gudza 2010). The information needs of the local population were thoroughly investigated in the beginning of the project. The process by which people acquired knowledge, via agricultural extension, were mapped and key stakeholders included in all the dialogues. The podcasts were created in the local language and geared towards the least educated farmers in the community, so that the information would be understandable for everybody. When it became clear during the project that villagers sometimes still had difficulties putting the information of the podcasts to use, additional demonstration meetings were organized, showing – for example – how to treat sick cattle in the way explained by the podcasts.

According to Willoughby (1990) within the appropriate technology movement "there is a great deal of confusion about the meaning of Appropriate Technology". He sees this as one of the reasons that (p. 12)

> "while becoming a significant international movement Appropriate Technology has remained a minority theme within technology policy

> and practices." Another significant reason for the limits in the influence of the movement would appear to lie with the lack of a clearly articulated formal theory, the salient features of which are both universally recognized by the movement and identifiable by those outside the movement. (Willoughby 1990, p. 13)

It is to such a theoretical framework that the CA may be able to contribute something. It provides a general, normative view on development that is nowadays widely accepted – for example, it has been adopted by the UNDP. Moreover the CA, as we have argued, shares a key insight with the appropriate technology movement interpreted in Willoughby's 'general principle' sense: the importance and pervasiveness of human diversity.

6.5. Understanding capability expansion: STS

Not only work in the area of appropriate technology is useful if one is interested in the expansion of human capabilities by means of technology. The field of science and technology studies (known as STS) also has much to offer, namely an in-depth investigation of how technology and society *mutually* shape each other. This enables a richer understanding of the complex ways in which technologies and human capabilities are related. The understanding enabled by STS is richer in the sense that goes beyond the linear idea of a technological artifact (like a bicycle) being instrumentally important for expanding human capabilities (like the capability to move about), if only some relevant conversion factors (like being able-bodied) are met (an example mentioned by a.o. Robeyns 2005; Sen 1983). Figure 6.1 originally depicted, "a stylized non-dynamic representation" (Robeyns 2005) of how human capabilities relate to resources. But in reality technical artifacts do not only simply and straightforwardly expand the capabilities of an individual, who is free to use or not use the artifact to realize a certain functioning. It is more complex than that. A less stylized and more realistic picture of our dynamic reality would thus include many additional arrows, such as the dashed arrows added by the authors to Robeyns' scheme. One of these arrows indicates that the relevant conversion factors for certain categories of individuals could, if designers acknowledge them, influence the design of the artifact. And technologies also shape social practices and the social context at large, which in turn again can influence human capabilities and agency.

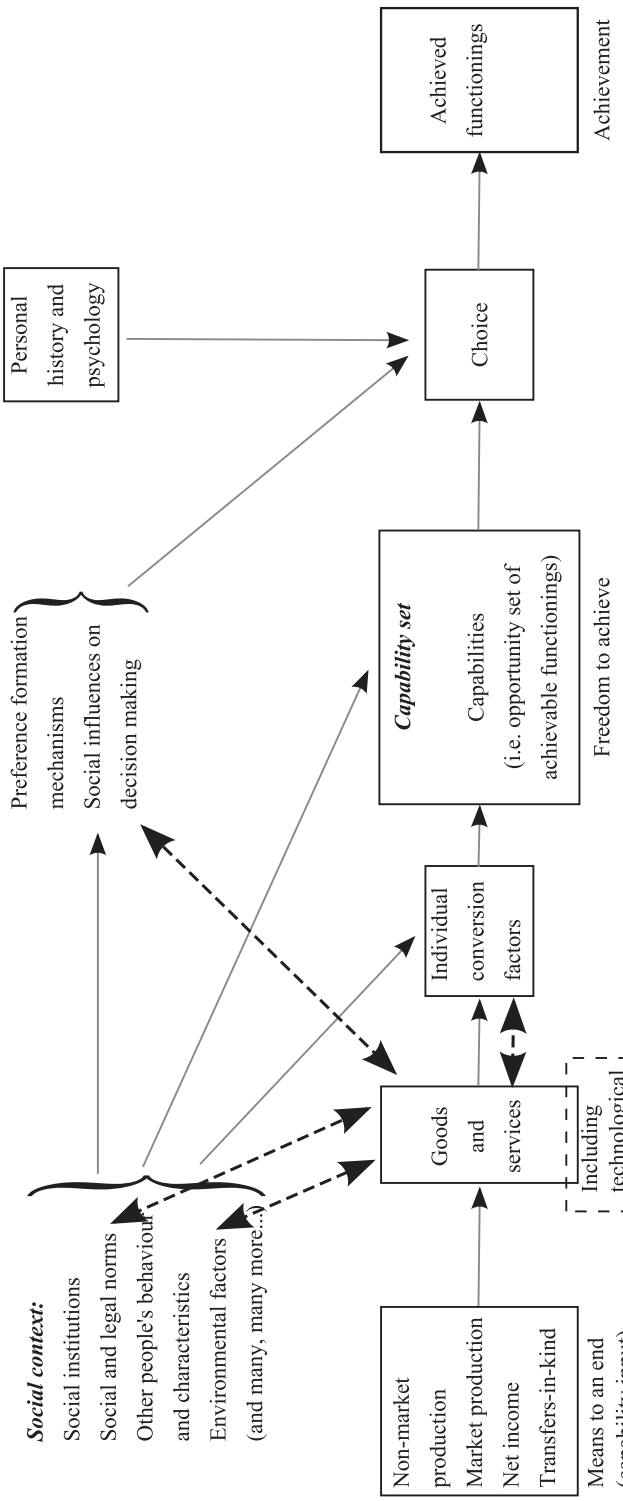

Fig. 6.1 A stylized representation of the relation between technical artifacts and human capabilities (source: Robeyns, 2005 with dashed arrows added by the authors)

For example, power is an issue that is obviously important for anyone interested in expanding human capabilities and agency, in other words empowering people. And power is one of the issues at stake in the dynamics between technology and society. In the case of ICTs it is not only the technology per se, but also the knowledge that is communicated using the technology, which can change power relations. Danowitz et al. (1995) referred to ICT as being "loaded with an embedded virtual value system." Knowledge contains meaning which is dependent on context for its interpretation and understanding (Grimshaw et al. 1997). Implicit assumptions are made when that knowledge is codified and these are typically dependent on the dominant paradigm of the culture of the society where the knowledge originates. Thompson (2004) draws attention to a further dimension of the power balance with respect to ICTs; the way in which less developed countries become "locked-in" to the global networks of capital, production, trade and communications. Both media type and content source should be acknowledged as determinants of changes in the global power balance. In cases where the Internet predominates in the delivery of text based media the balance of power is away from local people. However, for technologies such as hand-held voice devices which can record local content the power balance is tipped towards local people. The issue of the CA, power and ICT is extensively addressed by Zheng and Stahl (2011). They conclude that Critical Theory (CT), one of the streams existing within both STS and information systems research, is very useful in this respect, as it "explicitly and directly addresses the issue of technology and the distribution of power, which is exactly what is lacking in the capability approach."

Furthermore, it is important to realize that human capabilities do not only reside in human beings. This becomes clear when reading the work of Nussbaum (2000, pp. 84–85), who makes a distinction between the innate/internal capacities of a person and so-called 'combined capabilities'. The latter come about when innate/internal capacities are combined with suitable external conditions for the exercise of the functioning in question. As the CA is concerned with what people are *realistically* able to do and be, it takes such combined capabilities as the ends of development interventions. Similarly, Smith and Seward (2009) argue that the ontology of Sen's CA is "relational", as an individual's capabilities "emerge from the combination and interaction of individual-level capacities and the individual's relative position vis-à-vis social structures." However, not only individuals and social structures, but also technical artifacts are important constituents of human capabilities. The field of

STS, which encompasses Actor-Network Theory (ANT), can help to gain insight in these complex and dynamic relationships between individuals, technology and social structures.[84] ANT considers *both* humans and technical artifacts to be 'actors' in a complex network that is continuously changing over time as these actors exert their influence on each other. The identities, characteristics and powers of these actors – or, what we are interested in, the capabilities of the humans in the network – depend on the precise network of relations in which they stand.[85] In our case as well, it is not merely the podcasting device that expands human capabilities. Rather, as Janssen (2010) has described, an extensive actor network had to be created around these devices. The old network in which information dissemination took place was quite simple, the elements being notebooks, pencils, livestock officers, animators, community members and group representatives. That the podcasting devices were able to expand human capabilities as compared to the old situation was due to a new and more extensive network (see fig. 6.2). This network includes – amongst others – the podcasting devices, the loudspeakers, the laptop with the database with podcast, the batteries, the charger at the head office of LGDA, the car to transport the batteries, the electricity grid available there (which is lacking, as mentioned, in the pilot area), the different government departments involved in providing the contents of the podcasts, employees of LGDA and Practical Action and the person with the right local dialect who is able to record clear podcasts. And the exact composition of and relations within the network turned out to matter for the expansion of human capabilities.[86] For example, the new and expensive

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[84] The example of a car can illustrate this. Basically a car remains just a specific configuration of wires, metal, nuts and bolts and so on, until it is embedded in a network with roads, gas stations, traffic rules, driving schools and the like. Only in such a network could the artifact be understood as a car, with all the powers that cars have. And only then will it be expanding people's capabilities to move about (Oosterlaken 2011).

[85] Note though that, as Elder-Vass (2008) points out, ANT generally denies the causal efficacy of social structures. Yet one could borrow some insights from ANT while still ascribing causal efficacy to three different entities: social structures, humans and technological artifacts.

[86] The case can also illustrate ANT's insight that technical artifacts can be seen as 'actors' in the sense that their mere presence or absence makes a difference to the course of events. For example, during the field work a health animator explained the following: "Today I gave a lesson on cholera because it was recorded in the machine" (Janssen 2010, p. 85). Thus, the mere availability of the podcast devices may 'seduce' the health animators to be guided by these, while in the absence of the artifacts they would perhaps have come to a decision to distribute a different lesson by word of mouth.

cattle treatments recommended by the podcasts, such as vaccinations, were not always available or affordable for all the farmers and this was a limiting factor for the impact of the podcasts on human capabilities. Partly as a result of this, local people requested that indigenous knowledge be captured in podcasts as well. This was done (without verifying this knowledge in any scientific way). Furthermore, certain practices had to be developed within the network after the introduction of the devices. For example, the lessons were better understood once demonstrations accompanying the mp3 player were introduced.

As somebody's human capabilities arise in a complex interaction of this person, technical artifacts and social structures, the CA does not seem to support *ontological* individualism – the claim "that only individuals and their properties exist, and that all social entities and properties can be identified by reducing them to individuals and their properties" (Robeyns 2005).[87] Yet as mentioned, the CA *in the end* cares about the capabilities of each and every individual to lead the lives they have reason to value, not the capabilities of groups or societies at large. It thus embraces *ethical* individualism, as it makes individuals the central unit of moral concern. Because of this, a certain form of *methodological* individualism may sometimes – so Smith and Seward (2009) argue – be recommendable. The idea is that our "analysis must focus on the relative positioning of the individuals within the social structure to understand for whom different structures are differentially causal" and thus for whom – for example – certain essential capabilities may sink under some acceptable threshold level. Also in the case of technology, one should sometimes resort to such methodological individualism in order to assess technologies on their merits for different categories of individuals. The case study can again illustrate (Janssen 2010) that it is – as ANT also acknowledges – important how a specific individual is positioned vis-à-vis the network as a whole. Obviously, people depending on livestock and crops for their livelihoods gained the most capabilities as a result of the introduction of the mp3 players. On the other hand, the basic capabilities of some traditional healers seemed to diminish due to the podcasting devices, as they more or less lost clientele to the device, people that would previously have gone to these healers with their health issues or sick cattle. The livestock animators benefited the most, since they closely related to

[87] See Robeyns (2005, pp. 107–109) for an extensive discussion of different forms of individualism within the capability approach. Note though that Smith and Seward use the term 'methodological individualism' in a different way than Robeyns.

the mp3 players and had access to its knowledge all the time. People who lived close to the animator went more often to him to demand individual lessons. Some female farmers had to ask permission of their relatives to attend group meetings or to ask the animator for individual re-playing. It is in such an analytic exercise of 'isolating' or 'highlighting' certain categories of individuals from the network, so we propose, that the specific conversion factors at work for different individuals can become clear.

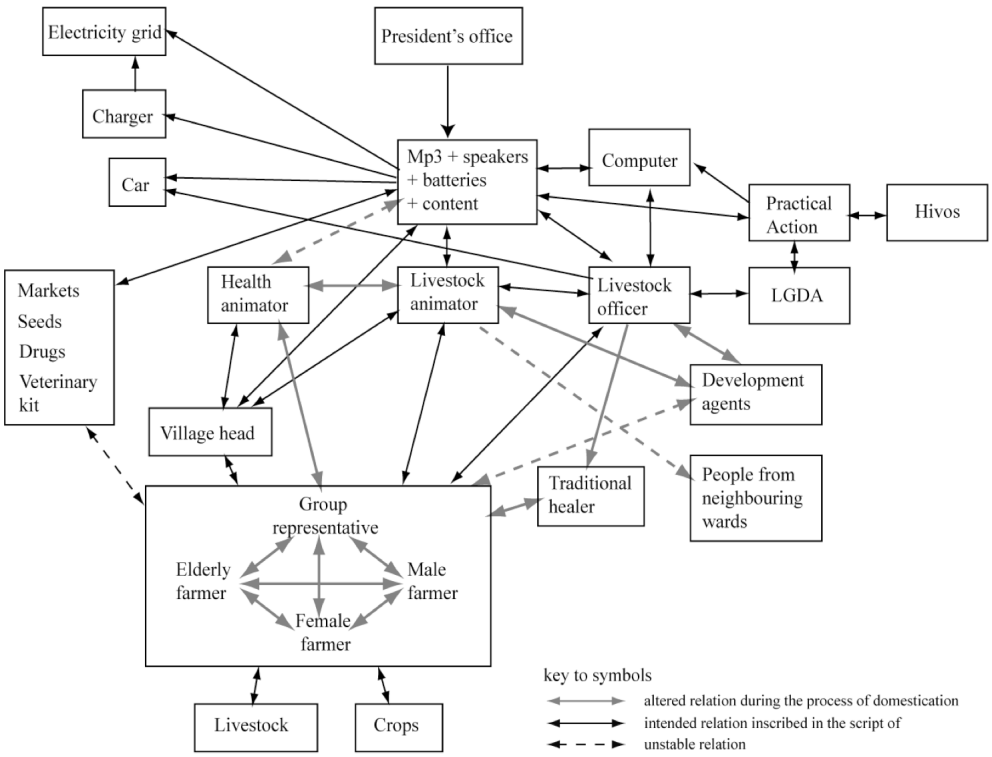

Fig. 6.2 Network surrounding the mp3 player in period April-July 2010

Finally, STS is also useful to look at the processes of change leading to the introduction of a specific technology or a certain technological design, with certain implications for the expansion (or decrease) of human capabilities. Under the motto 'follow the actor', ANT is interested in how different actors influence the coming about of a piece of technology or scientific insight, irrespective of conventional levels of analysis ranging from global to local, from macro to micro. Also the technology and the mostly local network in our case

study has been shaped partly by at least one important actor at the macro-level, namely by the President's office of Zimbabwe. This institution supported the implementation of the ICT, but also made clear that it would hold Practical Action responsible for all disseminated content – by the way illustrating the claim made earlier that power issues matter. The original idea was to introduce a device that would allow people to record their own podcasts and disseminate them widely amongst people using Bluetooth technology. Obviously, this would make it impossible to control the dissemination of content. In the end, simple mp3 players without Bluetooth were implemented. It seems that the position of the President's office had an influence on that course of events,[88] even though technical and financial problems with respect to the original technical solution also played a role. Further research would be necessary to disentangle the factors leading up to the technology choice made.[89] What is certain is that the recording function that allowed the livestock officers to create new lessons was disabled before giving the mp3 players to the animators. The interest of the President's office has, as ANT would put it, been inscribed in the technology. This brings us to the last topic of this chapter: agency, well-being and technology choice.

6.6. Agency, well-being and technology choice

The case study of the podcasting devices introduced in Zimbabwe seems to call for some further reflection on technology choice in relation to agency and well-being. As we have mentioned, podcasts are produced and distributed on a limited number of topics only, mainly in the domains of health and cattle management. Villagers do have influence on the contents, as participatory methods were used early in the project to determine their development priorities and information needs and now that the project is running, they can make requests for new podcasting topics to the animators. Yet on the face of it, this arrangement may seem to limit the agency and capabilities of individuals in comparison with other ICT alternatives that one can imagine, of which we would like to mention two. The first was already mentioned, namely the alternative that

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[88] See amongst others the project evaluation by Mika (2009), which recognizes the legal and regulatory environment with respect to communication technology as a factor that may work against a positive project outcome.

[89] How actors perceive a technical or financial problem, for example with either determination to tackle it or a readiness to admit defeat, may in this case have been influenced by the attitude of the powerful President's office.

was investigated and tested early in the project, where people would be able to directly record their own knowledge and questions, which could then – with the help of Bluetooth technology – be disseminated throughout the network of device owners. The original idea was that not only the animators, but also many of the villagers would come in the possession of a podcasting device. The second is a completely different, mainstream ICT4D alternative, namely that of the so-called 'telecenters' already mentioned in the introduction. A telecenter is basically an office with ICT equipment where people can get access to the wide variety of information offered on the internet.

We could place these three alternative technologies on a 'determinism continuum' (fig. 6.3) as proposed by Kleine (2011), which indicates "how tightly prescribed their usage is." She rightfully notices that

> Broadly speaking, the further down on the determinism continuum a specific technology is, the more danger there is that the technology circumscribes the choices of a user-citizen more than that it widens them.

or – put differently – the higher the odds are that a technology might entail choices that do not coincide with those the individual or group of individuals would have made for themselves. This would not be judged positively from the perspective of the CA. Telecenters would go a long way towards the 'open-ended' extreme of the continuum and of the three alternatives mentioned, the restrained podcasting devices introduced by the project – with the disabled recording function – would be the most towards the 'closed' side of the continuum.

Kleine proposes the idea of a determinism continuum to draw attention to the importance of deconstructing the ideologies that get embedded in a technology in its context of origination. Yet if one were to use this simple and seemingly intuitive picture unwisely – with insufficient regard for the context in which the technology is to be applied – one would risk repeating exactly the mistake that the CA attempts to avoid, namely an excessive focus on the resources or technologies themselves, overlooking what people can actually do or be because of them. Although one could argue that *in general* more open-ended technologies are to be preferred from the perspective of the CA, as this in principle contributes most to expanding human agency, this may not always be

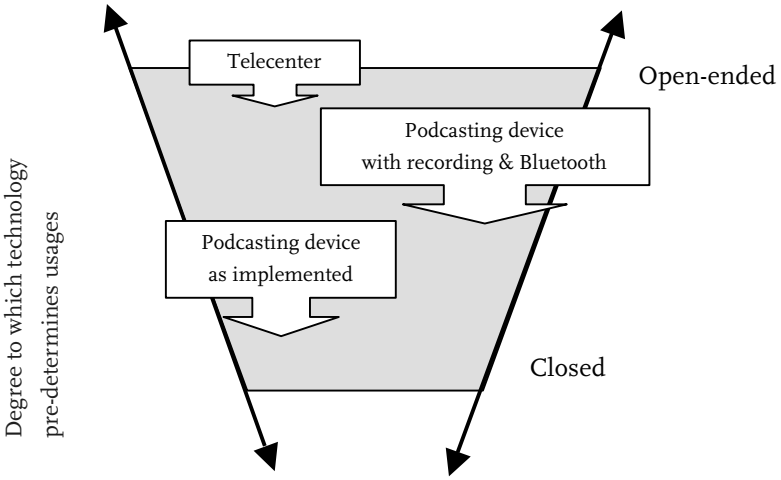

Fig. 6.3 Determinism continuum (Kleine, 2011) with the discussed technological alternatives

the case in a concrete context of application.[90] Recall that the question whether or not human capabilities and agency are being expanded, is within the CA very much a matter of 'all things considered'. In the context of the Lower Guruve area in Zimbabwe, telecenters – despite their being open-ended in principle – would in reality not contribute anything to the expansion of human capabilities of the people living there, considering conversion factors like the absence of electricity in the villages. And even when there had been electricity, it should not be overlooked that a substantial percentage of the people in this area is illiterate. Even in places where the existing 'conversion factors' are not so clearly prohibitive, there are often more subtle factors in play that still make that the telecenters do not live up to the expectations (Ratan and Bailur 2007). A nice example can be found in Rhodes (2009), who quotes the manager of an African telecenter which was supposed to be helpful to local entrepreneurs:

[90] In her article Kleine (2011) presents not only the determinism continuum, but also her wider approach to operationalizing the work of Sen. To that end, she has developed the Choice Framework, which carefully considers aspects of the context in which technologies are applied. Kleine would thus be the first to agree that her determinism continuum needs to be used without excessive focus on the technology in isolation from the context of application.

> We tried, and everywhere we went, at meetings and conferences people told us how good the Internet is, how we can find customers, we felt very stupid because we know people are using the Internet to help them with business, but we could not do it. We know we can do market research with the Internet, but how can we do this, we cannot understand how. (Rhodes 2009)

Here it is not so much the technical artifact, but the information itself that seems to invoke conversion problems (recall the 'double conversion challenge' mentioned in section 4). In the *Local Content, Local Voice* project, however, great care has been taken to ensure that the podcasts are understandable to the local people and directly applicable in their everyday life. The first evaluation results seem to indicate that it has led to people reaping a higher income from their livestock and improved health, which could contribute in turn to expanding people's capabilities to lead the lives they have reason to value.

Something similar might be argued for podcasting devices with a recording function and Bluetooth technology; this technology is more open-ended in principle and can thus be placed more towards the desirable end of Kleine's determinism continuum. As compared to the technological alternative actually introduced in the Mbire area, it has the potential to contribute more to the agency of local people, as this alternative would allow them to record and disseminate their own knowledge and messages, without having to depend on the willingness of some employee of an NGO to grant a request to address a certain topic in a new podcast. However, *in reality* these potential agency benefits may never have been fully realized, considering the pending pressure of the President's office to intervene with the work of the NGO and the distribution of the devices in case of unwelcome recordings of a political nature. Strategically speaking, the devices that have actually been introduced by Practical Action may not be optimal from the agency perspective, but they are arguably better from the well-being perspective, as they seem to contribute in a durable way to the enhancement of local livelihoods and thus to the expansion of a range of capabilities and so-called 'functionings'. However, Kleine rightfully notices, for more closed applications the litmus test should be whether the choices embedded in the technology align with the choices of the end users. To achieve this, Kleine argues that especially for more closed-ended technologies, there should be user participation in the decision-making process: "the more users' choices will later be locked in by the technology, the more the users' choices

must already be integrated in the design process" (Kleine 2011). Participation is thus central if we want to respect people's agency, also in the process of engineering design and technological choice. Note though that this may make the 'scaling up' of a solution developed and tested in a project more problematic, as the new context of application may differ substantially from the context of origination.

Of course, the question which of the technical alternatives discussed would overall have been the best technology – taking into account practical, strategic and normative considerations – remains a question open for further debate. Around the world, ICTs have also proved their value in changing unjust and corrupt regimes, being a force of change that these regimes have found hard to control. The most important point of this short discussion on technology choice is not that a certain technology choice is definitely the best in this case. Rather, the point is that the CA offers a useful framework for conceptualizing and discussing such dilemmas of agency and well-being. Ratan and Bailur (2007) uncovered that such dilemmas may arise after implementation, in the usage of technology – recall their case of telecenters that are being used for entertainment purposes instead of for increasing certain forms of well-being, as the development organization intended. We have likewise revealed that such dilemmas also exist in the phase of engineering design or technology choice.

6.7. Conclusions and recommendations

In the case studied we saw there was a certain degree of local participation in and ownership of the development process and the project went beyond making available mere resources (podcasting devices in this case). The main 'conversion factors' which could influence the development outcomes were anticipated in this project. The project has thus resulted in improved livelihoods and hence an expansion of basic capabilities of local people. Although *Local Content, Local Voice* was never explicitly conceptualized, implemented or evaluated by Practical Action in terms of the CA, the project thus seems – on the face of it – to be doing quite all right from this perspective. This should not surprise us, considering Zheng's observation that "many issues unveiled by applying the CA are not new to e-development." A full evaluation in line with the CA – so we have argued (section 3) – would take into account the multidimensionality of poverty and well-being, the degree of local participation in and control over the development process and the possible differences in development impacts

between categories of individuals. Furthermore, the CA's concepts of agency and well-being – so we have attempted to show (section 6) – are useful to bring out some of the issues at stake in technology choice. We also saw (section 4) that the CA and the appropriate technology movement share an important insight: the importance of human diversity. What the appropriate technology movement has to offer to the CA is a wealth of knowledge and experience on how conversion factors can be taken into account in such a way that a technology does have the intended development impact. What the CA has, in turn, to offer to the appropriate technology movement is a powerful perspective on what good development is, one that has already had a widespread influence on both the theory and practice of development. In making a connection with the CA, the appropriate technology movement may be able to find a 'fresh' and rich conceptual framework in which to convincingly bring across its message. The CA can not only be enriched by the practical experiences of the appropriate technology movement, but also by the theoretical insights from science and technology studies (section 5). Theories and approaches from this field would allow a richer understanding of how individuals, social structures and technological artifacts interact over time and co-shape human capabilities.

With the help of our case we thus hope to have illustrated both (a) what the added value of a CA could be and (b) how the CA could benefit from insights of existing theories and approaches with respect to technology. On a more practical level, the case study discussed in this chapter contains a number of lessons:

- A wide range of conversion factors may influence whether or not the introduction of a technology leads to the expansion of human capabilities. Some of these factors may be obvious, such as the absence of electricity. Other factors may be less obvious, such as women having difficulties to hear the podcasts because they are seated 'second row' during village meetings. It is best to address these factors as much as possible in the phase of engineering design or technology choice, for example by making the devices solar-powered or including a strong loudspeaker.
- It should especially be noted that ICTs often give rise to a 'double conversion challenge', as both the technology and the information to which it gives access are resources that may not always and for everybody result in an expansion of human capabilities. Attention should thus be paid not only to technology choice and engineering design, but also to the information itself. In our case, for example, the information was made available in the local

language and adjusted to make it directly relevant for and applicable to the daily lives of people.

- A technological artifact or information alone does not necessarily lead to an expansion of valuable human capabilities. To achieve this, it should be embedded in an appropriate network of other artifacts and human actors. For example, podcasts on the treatment of sick cattle will not be very effective unless the recommended treatments are also made available and affordable. Also, certain (collective) practices concerning the usage of technology should develop. This may be more likely to succeed if the technology is appropriate for the local culture. In our case, relying on verbal instead of written information fitted in very well with local knowledge sharing practices.
- Open-ended ICTs in theory contribute most to expanding human agency, yet increasing well-being is also important and closed-ended technology may sometimes be very effective for this purpose. Well-being and agency should thus be explicit factors in deliberations during the phase of technology choice and design. Such evaluations should always be sensitive to the context of application and not focus too much on the technology itself. If a more closed technology is chosen, participatory processes become even more important, in order to ensure that the choices made reflect user choices closely.

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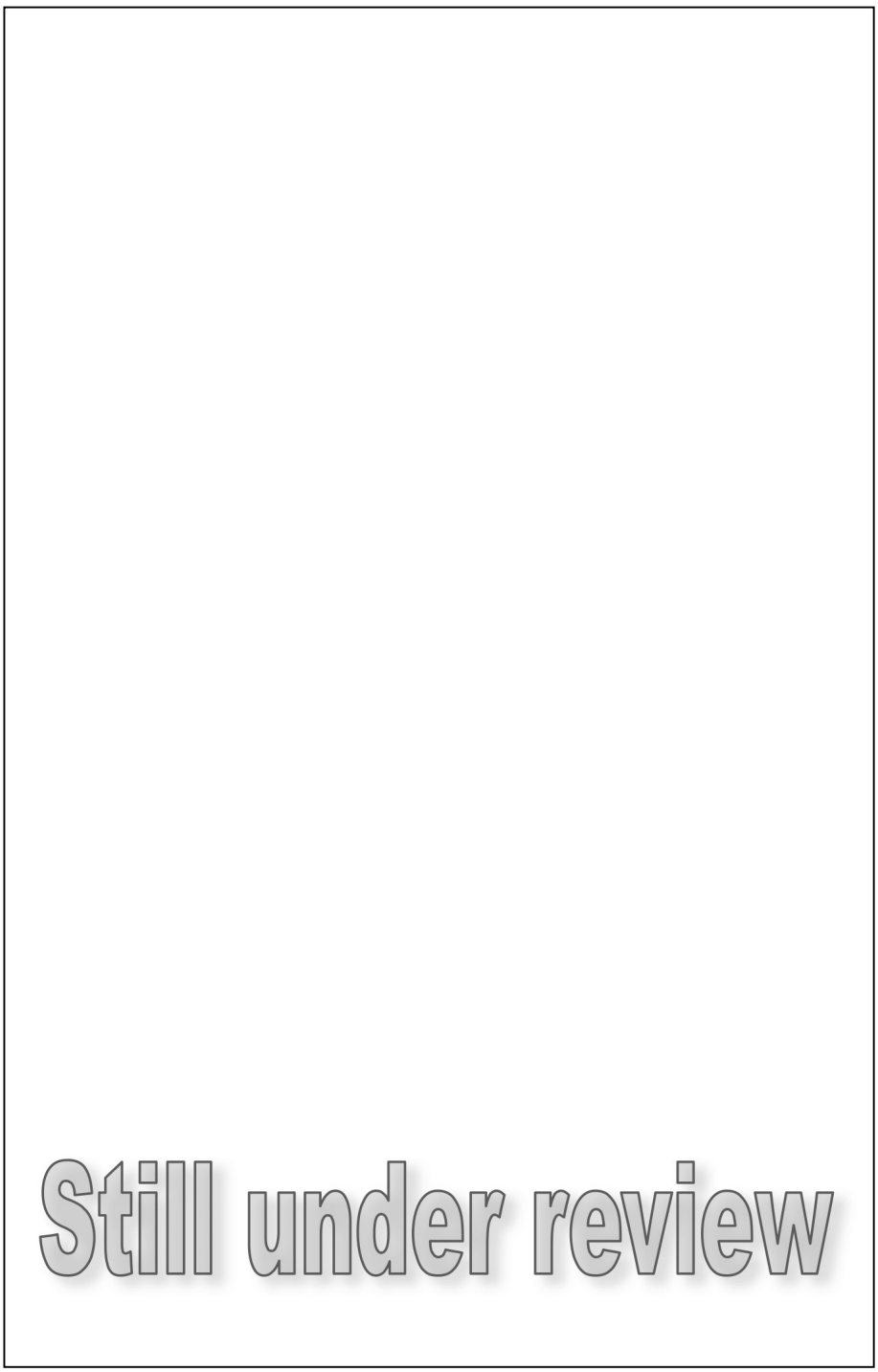
Still under review

7 Technology, individual freedom and the good life – a capability approach

This chapter has been submitted to *Philosophy & Technology* in October 2012 and is currently under review.[91]

7.1. Introduction

In western, liberal societies the introduction and usage of technology is, so some philosophers of technology have claimed, often seen as something that should be left to individual choice, as long as no unacceptable harm or risk is brought about. Policy making concerning technology is in many cases limited to issues of risk and harm, while deliberation about technology and 'how to live' is supposed to remain confined to the private realm. Underlying this phenomenon is, these philosophers of technology assert, liberalism's emphasis on individual freedom (Van den Hoven, 20120a), which resonates well with the dominant pre-theoretical view that people tend to have of technology, namely technological instrumentalism: that technology concerns value-neutral instruments that merely enable people to realize their own view of the good life (Valkenburg 2009; Briggle 2009). However, within philosophy of technology it is nowadays commonly held that technology tends to be value-laden (see e.g. Winner 1980; Radder 2009), although this idea can be cashed out in a host of different ways (Franssen, Lokhorst, and Van de Poel 2009). And while ethics of technology is still mainly an 'ethics of the right' and not an 'ethics of the good' (Van den Hoven, 2012b), several philosophers and ethicists of technology have in the past decade made a plea that public deliberation about technology and the good life should take place more often (see e.g. Brey, Briggle, and Spence 2012), and should even be extended to the design stages of technological development (Swierstra and Waelbers 2012). Certain 'technology theories' – providing an answer to the question 'what is it about technology that creates this need for public deliberation about the good life?' – are generally outlined in order to support such pleas. For example, Valkenburg (2009), Briggle (2009) and Van

[91] The annex has been added in this dissertation only and does not belong with the original article.

den Hoven (2012a) all highlight technology's network or system level effects in their call for more public debate about technology and the good life.

Although an appropriate and credible 'technology theory' may be necessary to justify the need for more debates on technology and the good life[92], this does not seem to be sufficient for actually getting such debates going. Swierstra (2002) contended already a decade ago that a more comprehensive and successful public debate will not take place unless we also have available a "moral vocabulary" or language that makes this possible. A vocabulary or conceptual framework, he explains, guides us in how to understand the world around us and how to evaluate situations and enables us to co-ordinate our actions. The "vocabulary of self-determination" (p.228), which is a dominant vocabulary in liberal societies, sees the no-harm principle as providing the only truly legitimate limitation on an individual's freedom and privatizes deliberations about the good life. This had obvious merits in the period of religious wars in which it originated, yet Swierstra finds it defective in the domain of technological development in modern society. One of its shortcomings is that 'harm' has to be clear and manifest before any restrictions on individual freedom are justified; the uncertain, long-term effects of technology on our society, especially the cultural, anthropological and ethical changes to which it may lead, do not count as harm. This vocabulary, Swierstra argues, thus does poorly when it comes to facilitating debate about non-harmful technological alternatives, as it does not allow one to distinguish, evaluate and compare them. Let us call this problem I: opaqueness of technological alternatives). Furthermore, it takes people's wants and preferences as given and not up for discussion. Let us call this problem II: sanctity of preferences. Swierstra ends his paper with a call for "rethinking our current vocabularies" (p.239), but does not provide an alternative. I think though that we may make some progress by noting that this vocabulary of self-determination hinges on a specific conception of negative freedom: not being

[92] There seem to be several ways of disagreeing with before mentioned philosophers of technology. One is to dispute the technology theories that they put forward, in that way attacking their conclusion that more public debate about technology and the good life is urgently needed (sections two and four will discuss competing technology theories). Another possibility is agreeing that such debates are necessary, but arguing that they are already taking place more than enough. Whether that is the case or not is partly an empirical issue that I cannot address satisfactorily within the scope of this paper. But even if it is true that such debates already take place quite a lot, it is still worthwhile – so I believe – to explore some philosophical and theoretical issues with respect to framing these debates in terms of the CA.

coerced by anyone, not having others unduly interfere with one's choices. The tradition of liberalism contains, however, also a conception of positive freedom, which on one interpretation is "freedom as effective power to act or to pursue one's ends" (Gaus and Courtland 2010, §1.3).

In the past decades this idea of positive freedom has been elaborated upon in a specific way within the so-called 'capability approach' (CA), for which Amartya Sen and Martha Nussbaum have done much of the ground work. The CA conceptualizes positive freedom more concretely as the set of different 'human capabilities' needed to lead the life one has reason to value. According to Robeyns (2011, §1) it is "generally understood as a conceptual framework for a range of normative exercises, including most prominent the following: (1) the assessment of individual well-being; (2) the evaluation and assessment of social arrangements; and (3) the design of policies and proposals about social change in society." Its success and popularity in a range of domains (Robeyns 2006), including increasingly also technology and design (Oosterlaken and Van den Hoven 2011, 2012), justifies a focused, in-depth exploration of how the CA could be brought to bear specifically on debates about technology and the good life. In this paper I will show that the rich conceptual framework of the CA allows us to identify, voice and discuss the issues at stake in a comprehensive and balanced way, and I will contrast the CA with Swierstra's "vocabulary of self-determination" in order to bring out the differences with the CA and the advantages of the latter. The CA should, however, arguably be seen as a substantive modification and extension rather than a full replacement of such more limited vocabularies of negative freedom. Nussbaum (2003, 2006), for example, has repeatedly emphasized that negative freedoms in the form of the major classical political liberties are part and parcel of her list of 10 centrally important human capabilities. Her work shows that careful deliberation, taking into account a range of moral considerations, is necessary when applying the CA to a certain issue or case. Furthermore, it should be noted that the CA is not the only alternative moral vocabulary available. Within the scope of this paper I will, however, not be able to discuss further alternatives like the human rights framework.[93]

Concerning the CA there are two things that I would like to emphasize up-front. Firstly, it is not a full-blown theory, but merely a general philosophical

[93] The reader interested in the relation between human rights and the CA is referred to e.g. Sen (2005) and Nussbaum (2011).

framework that allows us to conceptualize and evaluate issues in the area of justice and well-being. This means that it often cannot be put to any practical work, so Robeyns (2005, p.94) explains, without additional "explanatory theories" – for the purpose of this paper, theories on the connections between technology, people and society.[94] I will thus pay substantial attention to the incorporation of such 'technology theories' in the CA, so as to pave the way for applying it to debates about technology and the good life more specifically. Secondly, it may not be inconsequential which explanatory theories one adds to the CA. What one sees through the lens of the CA will be partly determined by which filters one adds to this lens. For example, Robeyns (2008) has shown that one may arrive at a different normative capability analysis of certain gender cases, depending on whether one supplements the CA with a conservative or feminist gender theory. Something similar holds when applying the CA to technology cases.[95] In this paper I will thus discuss more than one 'technology theory' that could be combined with the CA, in order to give the reader a richer understanding of the CA and a realistic picture of the work that it can and cannot do.

The set-up of this paper is then as follows. I will first - selectively - introduce the CA for those readers unfamiliar with it (section 1). This section is meant to put more flesh on the bones of the idea of 'human capabilities' as a specific interpretation of the alternative conception of positive freedom. It will also make clear how the CA proposes to deal with the existence of a plurality of views of the good life. I will then (section 2) start discussing how technology could be

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[94] Unfortunately the core literature on the CA hardly addresses or theorizes technology in any substantial way. If we would like to incorporate technology in the CA, we will thus have to drawn on the fields of philosophy of technology (PoT) and science and technology studies (STS), plus a recent small but growing specialized body of literature on technology and the capability approach (see e.g. Oosterlaken and Van den Hoven 2011, 2012).

[95] Take for example technological instrumentalism, the view that technical artifacts are merely neutral means towards the ends that users choose. We may criticize these ends, but technology itself is generally assessed to be unproblematic in this view. When instrumentalism is combined with the CA, any technology that could contribute to valuable capabilities would seem to be desirable to promote or bring into existence. Deliberation about technologies would – with this combination of the capability approach plus technology theory – be seen as something to be fully left to individuals, who should decide on whether or not usage of the technology fits with their ends and good life view. Sections 2 and 4 will discuss alternatives to technological instrumentalism, which is nowadays generally discarded by philosophers of technology.

incorporated in the CA, by sketching an intimate, triangular relation between technical artifacts, human capabilities and views of the good life. Discussing this triangle will show that there is a natural, but not yet widely perceived link between the CA and debates about technology and the 'good life'. The triangle is compatible, so I will also explain, with what Briggle (2009) has called 'pluralist theories of technology.' These two sections will prepare the ground for a first exploration (section 3) of how the CA may be helpful in addressing the two problems that Swierstra identified with the dominant vocabulary of negative freedom: (I) the sanctity of preferences and (II) the opaqueness of technological alternatives. It also identifies an additional advantage of the CA, namely that it points towards the importance of making sure that individuals have a capability to deliberate about technology. Realizing the importance of one's selection of 'explanatory technology theories', I will not only discuss the incorporation of pluralist theories of technology in the CA, but also of the alternative view (section 4) that technology has strong system/network effects (Valkenburg 2009; Briggle 2009; Van den Hoven 2012a). This view can be seen to both increase the need for public deliberation about technology and the good life and complicate the basic triangle. Again I will explore (section 5) what the added value of the CA could be. However, the network/system character of technology can also be used to illustrate and perhaps even aggravate a challenge for the CA that has been raised in the general philosophical debate about it: that the CA is not sufficiently neutral towards the good life and therefore not a suitable framework for liberal societies. I will argue that capability scholars should acknowledge that policies based on the CA cannot always be fully neutral, probably even more so in our technological age, but that this fact does not necessarily disqualify the CA. The concluding section will summarize the argument made.

7.2. Human capabilities and the good life in the capability approach

The CA has given rise to an enormous and highly interdisciplinary body of literature on issues of justice, well-being, development and equality. It has also been very influential in public policy. In this section I will introduce the CA in a selective way, focusing on explaining what is meant with 'human capabilities' and how the CA proposes to deal with the existence of a plurality of views of the good life. In the next section I will then start to examine how the CA can be fruitfully applied in discussions about technology and the good life.

For judging how well a person's life goes we should, according to the CA, attach central moral importance to her set of different individual human capabilities: the real opportunities or effective freedoms that she has to lead the life she has reason to value. The interest that many capability scholars take in policies and social arrangements should be seen in light of their impact on or perhaps rather constitutive role in the expansion of individual human capabilities. Persons and the lives they are able to live are of ultimate moral concern according to the CA, which thus emphasizes the individual worth and moral separateness of people. Thus, as Robeyns (2005) has pointed out, the CA is committed to ethical individualism, but not at all to methodological individualism or ontological individualism. In other words, the CA finds it important that each and every person has certain valuable human capabilities, but has no problem acknowledging that these individual capabilities often depend on the existence of certain social structures. To put it in more philosophical terms: the ontology of human capabilities implicit in Sen's work is relational, as an individual's capabilities "emerge from the combination and interaction of individual-level capacities and the individual's relative position vis-à-vis social structures" (Smith and Seward 2009, p.213). Nussbaum (2000) prefers to speak about 'combined capabilities', as human capabilities only come about when innate and/or internal capacities are "combined with suitable external conditions" (p.85). Take, for example, a bicycle. Before somebody truly has the capability or positive freedom to go where she wants to go, a combination may be needed of (a) a basic capacity to move one's legs and cycling skills, (b) access to a bicycle, (c) appropriate cultural norms - for example, a society may consider cycling to be highly indecent for women - and (d) the presence of paved roads. Such elements are not always all present, and therefore resources may, as the CA emphasizes, not always and for everyone 'convert' into valuable human capabilities. If we focus on the relation between technical artefacts and individual human capabilities, the CA takes the role of institutions, cultural practices and the wider environment into account in terms of so-called 'conversion factors.' What is thus typical for the CA, according to Robeyns (2011), is an analytical distinction between ends and mere means and an acknowledgement of the existence of immense human diversity – leading to a large variety in conversion factors.

In focusing on capabilities, the CA proposes an evaluative space that is in the literature often contrasted with subjective well-being indicators, such as happiness, utility or preference satisfaction. The reason for the CA to focus on

capabilities instead is the existence of a phenomenon which Sen (1999) has called 'adaptive preferences': the phenomenon that people's desires and expectations of life may become distorted by their continuous exposure to situations of extreme deprivation or injustice – such as the oppression of women in some cultures. Also in situations other than dire poverty the CA is not committed to uncritically accepting whatever preferences people have or whatever choices they happen to make. The CA "takes into account the influence of societal structures and constraints on those choices" (Robeyns, 2005, p.108). At the same time human agency is held in high esteem by capability scholars. According to Sen (1985, p.70) "the 'good life' is partly a life of genuine choice, and not one in which the person is forced into a particular life – however rich it might be in other respects." Nussbaum (2000, p.72) conceptualizes the human being as "a dignified free being who shapes his or her own life", and elaborates that "we see the person as having activity, goals, and projects" (p.73). The idea is that if people have a wide range of capabilities available, they are effectively able to exercise their agency and realize the 'being and doings' that they see fit. Respect for agency is moreover reflected in a principled choice for making a distinction between capabilities and their corresponding 'functionings', which refers to 'beings and doings' as diverse as working, resting, being literate, being healthy, being part of a community, being able to travel, and being confident. The functioning-capability distinction, so Robeyns (2005, p.95) explains, is "between the realized and the effectively possible; in other words, between achievements on the one hand, and freedoms [...] on the other." This distinction is often (e.g. in Alkire 2005) illustrated as follows: A person who has been fasting may be in a state of malnutrition, just like a person who is starving. But in the former case the person could eat and chooses not to; whereas the latter person would eat if she could. Their functionings are the same, but not their capabilities. In liberal societies policies should, Robeyns (2005) claims, in principle aim to expand people's capabilities and not force people into specific functionings, in that way avoiding paternalism. The implication is that (p.101) "in real life two people with identical capability sets are likely to end up with different types and levels of achieved functionings, as they make different choices following their different ideas of the good life."

In light of the problem of adaptive preferences, key authors on the CA consistently speak of capabilities needed to live the life one has reason to value, instead of the life that one just unreflectively happens to value. A genuine ethical evaluation of capabilities is thus considered necessary. Capabilities as an

ontological category may have either intrinsic or instrumental value, or both. Furthermore, some capabilities may be trivial to human lives, others may be outright undesirable to promote (such as a capability for cruelty). Which capabilities matter most for human lives? Which capabilities should a government guarantee to its citizens to achieve justice, or should development interventions aim at in order to increase people's well-being? Nussbaum has proposed a list of 10 categories of intrinsically valuable capabilities that she considers to have universal validity. This is her list: (1) life, (2) bodily health, (3) bodily integrity, (4) senses, imagination and thought, (5) emotions, (6) practical reason, (7) affiliation, (8) other species, (9) play and (10) control over one's political and material environment. Under each category she lists some more concrete capabilities. This capability list has often been criticized in the literature for reflecting a specific view of the good life. Nussbaum (2003, p.48) does acknowledge that "some supporters of a capabilities approach might be reluctant to endorse a list because of concerns about pluralism," but she believes that we cannot achieve a just society without defining some concrete minimum requirements. Her version of the CA, she claims in various writings (e.g. Nussbaum 2000, 2006), still respects pluralism and is able to remain neutral with respect to very diverse conceptions of the good life that people may hold. The principled capability-functioning distinction is her main argument. Another argument that she gives is that her list is quite abstract and allows for "multiple realizability: each of the capabilities may be concretely realized in a variety of different ways, in accordance with individual tastes, local circumstances, and traditions" (Nussbaum 2000, p.105). Thus, to give an example, the exact meaning and implementation of having a capability for affiliation – "being able to live with and toward others" – will be very different in Southern Africa and in Western Europe. Sen, contrary to Nussbaum, holds that the proper list of capabilities may depend on purpose and context, and should be a result of public reasoning and democracy, not something a theorist should come up with (Robeyns 2005). However, one could see Nussbaum's list as her contribution as a philosopher to the democratic process (Claassen 2011). Democracy, public deliberation and participation are frequent topics of reflection and discussion amongst capability theorists, both because of the need to select and define the capabilities that policies should aim at and the value attached to human agency (see e.g. Crocker 2008).

7.3. The basic triangle 'views of the good life-technical artifacts–human capabilities'

The CA, as I posed in the introduction, may be able to provide an attractive alternative 'moral vocabulary' for public deliberation about technology and the good life. However, technology still needs to be incorporated in the framework that has been sketched so far. That is what I would like to address in this section, by visualizing and explaining a triangular relation between technical artefacts, human capabilities and views of the good life (figure 1). The previous section already discussed one side of the triangle: the 'human capabilities - good life' connection. In this section I will address the two other sides of the triangle. The connection 'good life – technical artifacts' is discussed, for example, by historian of technology Basalla (1989), who, in his book *The Evolution of Technology*, notes that an enormous diversity in technical artifacts has come into existence throughout history and worldwide. He finds this diversity "every bit as astonishing as that of living things" (p.2). He shows that it can be neither explained by bare human needs for which technology provides a solution, nor by varieties in climate and natural resources. Artefactual diversity has to be explained, Basalla concludes (p.217), "as the material manifestation of the various ways men and women throughout history have chosen to define and pursue existence." According to Van den Hoven (2012a,b) Basalla was heavily influenced by the philosophical anthropology of Ortega Y Gasset (1961; 1972), who discusses the human condition and likewise argues that technology and the good life are intimately related. He quotes (2012b, p.32) Ortega y Gasset (1961) as saying that "man's desire to live [...] is inseparable from his desire to live well," which creates a need for technology, the development of which is given direction by ideas of the good life. Both religious conceptions of the good life and mundane life programs, Van den Hoven (2012a, p.331) asserts, "come with technological assumptions, requirements and implications." One example of such implications is the following: "The Bodhisattva, the Buddhist ideal of man [...] protects all living creatures and it is very unlikely that the invention of [...] intensive farming, weapons of mass destruction could have arisen in a community where the bodhisattva is the established ideal mode of being." Another example that Van den Hoven gives is that "the gentleman needs leisure, sports, lots of running water, a water closet, clean shaves, etc." – which can be taken to illustrate the fact that certain conceptions of the good life can only arise once certain technological requirements are met, or alternatively co-develop

along with the required technologies. This means that ideas about the good life get at least to a certain extent expressed or embedded in technical artifacts.[96] The CA's concept of capabilities may be seen to provide (figure 1) the implicit or 'missing link' between more comprehensive ideas of the good life and concrete technical artifacts.

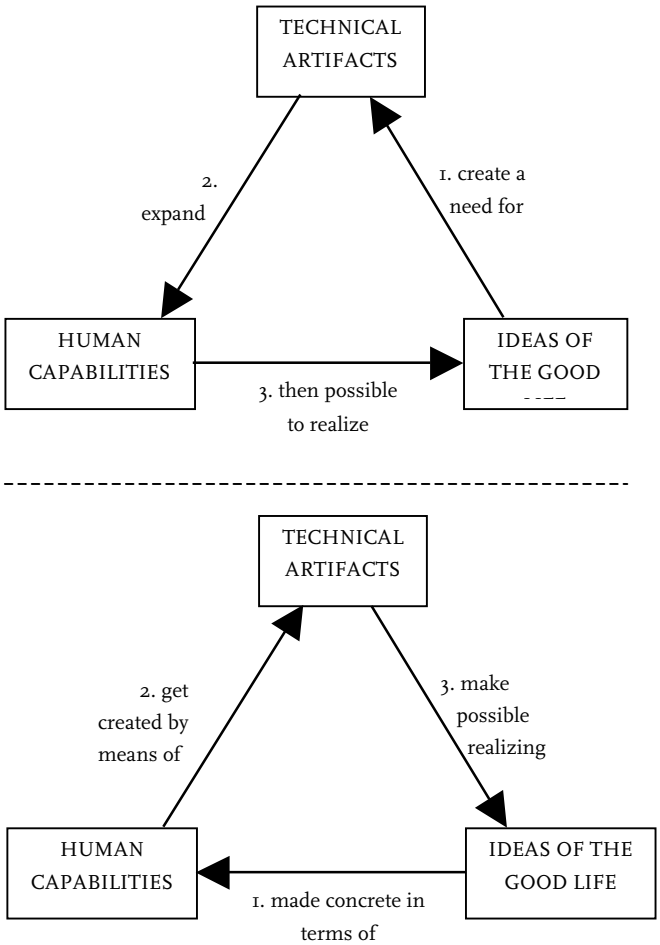

Fig. 7.1 – The close connection between technical artifacts, human capabilities and the good life

[96] Of course, one may still disagree about how to best understand this, e.g. as a process of the social construction of technology (see e.g. Pinch and Bijker 2002) or as a more targeted or explicit process of value-sensitive design (see e.g. Flanagan, Howe, and Nissenbaum 2008).

What about the connection 'technical artifacts – human capabilities'? As Johnstone (2012, p.85) notes, "the place of technology in CA at first sight appears relatively straightforward and entirely instrumental." That there exists an intimate connection between human capabilities and technical artifacts could be established both by empirical research[97] and by engaging in philosophy of technology.[98] Within the latter discipline several authors have argued that all technology is in some way meant to expand human capabilities, although these may be merely instrumentally valuable capabilities (e.g. a hammer and nails expanding someone's capability to join timber). A chain of means-ends reasoning may then be needed to make the link with the ultimately valuable human capabilities that are of concern to the CA (in case of the hammer e.g. the capability to "have adequate shelter", which Nussbaum lists as a component of the capability to have "bodily health"). Another reason that the relation 'technical artifacts – human capabilities' is less straightforward than one might initially think is, as Johnstone (2012) discusses, that many of the effects of technical artifacts on people's ultimately valuable capabilities are not at all a consequence of them being able to use a technology; rather is, for example, because microscopes expand lab a assistants' capabilities to examine viruses, and because certain health care practices have developed around this, that in the end my capability to have good health gets expanded. Furthermore, in the CA the term 'functionings' refers to both the 'doings' and 'beings' of people. The latter may depend not only on the technical function that artifacts are able to fulfill, but also and perhaps more on their cultural and symbolic value. As Van den Hoven (2012b, p.33) puts it: "Technology is not only important to achieve certain functionings, it may also be necessary to be a particular type of person who is the subject of those functionings. [...] one cannot be a young urban professional without a mobile phone and laptop computer."

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97 For example, we may discover that more people tend to have the capability to be healthy in countries where good sanitation technology is widely available. Or, more specifically, that a computer with internet access can be a very good means for some groups – like the chronically ill or the elderly - for expanding the intrinsically valuable capability to "engage in various forms of social interaction", part of Nussbaum's capability category of 'affiliation'.

98 For example, Van den Hoven (2012) conceptualizes technical artifacts as "agentive amplifiers" and uses a simple counterfactual conditional analysis to reveal "the structural similarities between human capabilities and technology." Theories about the nature of engineering design and artifact functions can also be used to argue that technical artifacts are by definition meant to expand some human capability (Oosterlaken 2012).

The triangle as sketched so far seems compatible with what Briggle (2009) has called 'pluralist theories of technology.' Pluralists admit, Briggle (p.7) explains, that "technologies shape identities and practices and are thus not neutral with respect to the good life", but they picture artifacts (p.5) as still "enabling a variety of uses" and emphasize "user freedom [while engaging with technical artifacts] and specific practices." Thus pluralists see technology as still "supporting a diversity of ways of being and conceptions of the good life while nonetheless shaping those ways of being and conceptions." Capability scholars may actually tend to be very sympathetic towards this pluralist view on technology for two reasons. One is that it aligns very well with Nussbaum's claim of the 'multiple realizability' of the capabilities on her list, which pluralist theories of technology show to be also highly plausible in the context of technology. Respect for pluralism or people's different views of the good life then means stimulating the availability of a wide range of technologies, without it being necessary to make any hard choices on the best technology or way of living. Secondly, the existence of user freedom and choice seems to suggest that the CA's theoretical capability-functioning distinction can be to a large extent maintained in practice also where it concerns technology, which would again help to soften possible tensions between people holding different views of the good life; The technology in question may not be neutral towards the good life, but as long as it does not force anyone into certain functionings there does not seem to be a big problem. Still, both pluralist theories of technology and my elaboration on the triangle 'technical artifacts - human capabilities – view of the good life' (figure 7.1) imply the desirability of a considerable degree of interpersonal deliberation about technology and the good life. For example, it suggests to people with a shared view of the good life to deliberate – possibly together with engineers – how technical artifacts may be developed that contribute to capabilities that they have reason to value. And it suggests that they jointly deliberate about which collective practices involving technical artifacts best fit their shared view of the good life. So let's now consider how the CA may be of help in such deliberations.

7.4. Deliberating technology and the good life: the added value of the CA

The previous sections have explained how the CA conceptualizes freedom, and how it proposes to deal with the existence of pluralism in views of the good life (section 2) and how technology could be given a place in this approach (section

3). This suffices as a basis for a first exploration of the added value of the CA for facilitating debates about technology and the good life. As I summarized in the introduction, Swierstra (2002) identifies two problems with the dominant "vocabulary of self-determination", revolving around negative freedom. Let's consider how the CA performs with respect to these two problems. Problem II, the 'opaqueness of technological alternatives', is that the "vocabulary of self-determination" does poorly when it comes to facilitating debates about technological alternatives. The reason is, according to Swierstra (p.239), that "it sees technological innovation as morally indifferent as long as concrete, identifiable interests are not threatened by it" (and thus no direct harm is done to anyone). This vocabulary does not give us any clues on how to go about making in-depth comparisons between different non-harmful technological alternatives. The CA can indeed be helpful here as it is able to acknowledge more readily that the moral import of technology is not limited to harm defined in this limited way; technology can be a relevant positive factor in the creation of a wide range of capabilities needed for leading a good life, a life we have reason to value. Moreover, the conception of positive freedoms as human capabilities does enable us to compare and assess different technological options, whether it concerns different design alternatives for a concrete technical artefact (Oosterlaken 2009) or a more broad and general technology assessment (Zheng and Stahl 2012). Acknowledging that a range of different valuable capabilities exist which are incommensurable, the basic idea is to map the impact of different design/technological alternatives on these different capabilities that people need to be able to lead the lives they have reason to value. Technologies will differ in their performance on expanding these capabilities, depending on how well relevant 'conversion factors' have been taken into account. Of course, questions about which capabilities matter, how to interpret and operationalize them and how to make trade-offs immediately emerge – hence this cannot be a merely technocratic exercise, but should involve genuine, explicit deliberation about the good life.

The second problem identified by Swierstra is that the vocabulary of self-determination takes people's wants and preferences as a given, as something that cannot or should not be criticized or discussed, which is what I call problem II: the sanctity of preferences. Swierstra responds to that by pointing out that – as the CA also acknowledges – our preferences and wants are thoroughly shaped by society, which includes the process in which "new technologies create new wants" (p.239). There is thus, Swierstra believes, "no reason to approach them

with over-reverence." The point of public deliberation about them is not to strive necessarily for consensus, Swierstra claims. Even without achieving this, "a sustained reflection of the character of our preferences" may still be useful. The CA is well aware of the social shaping of people's preferences and choices, which is most clearly expressed in the acknowledgement of the aforementioned 'problem of adaptive preferences'. According to Johnstone (2007, p.84) not only "severe deprivation or oppression may undermine people's ability to make proper determinations of value", but "such issues are [also] particularly salient in the case of technology, since users may have a very limited informational basis on which to make value determinations." However, it is important to note that the CA does not contain a specific theory of choice or way of distinguishing those preferences that are problematic from a normative perspective from those that are not (Robeyns 2000). This is thus another example of the fact that the CA needs supplementary theories, the selection of which may influence one's subsequent analysis from the perspective of the CA. The selection of additional theories with respect to choice and preferences is especially important because of the value of agency and the respect for pluralism and human diversity that the CA is committed to; In light of that, one would not want to label an unusual or 'strange' preference as problematic too easily. In short: the CA does not give us a specific way to handle preferences, but certainly does not suffer from the problem of the sanctity of preferences.

In addition to problematizing too much reliance on people's (unreflected) preferences with respect to technology, the CA is also able to make a more constructive contribution by emphasizing the importance of people gaining, to a sufficient degree, a capability for practical reasoning - which plays a key role on Nussbaum's list of ten central capabilities. This should include a capability for practical reasoning about technology. When turned into a functioning, this capability may possibly lead to an adjustment of their preferences concerning technology. Interestingly, it may be the case that this capability may not only be a condition for, but also a consequence of more (fruitful) public deliberation about technology and the good life. An article by Boenink and Van der Burg (2010) on ethical issues with respect to predictive DNA tests for Huntington's disease and hereditary breast cancer can be taken to illustrate the latter idea. Providers of such tests, they argue, usually communicate that it is up to individuals to decide whether or not to take a predictive DNA test. The emphasis on autonomy in decision-making results in a tendency to privatize deliberations about the desirability of predictive DNA testing. The public discourse is phrased in terms

of risk and prevention, it (p.132) "tends to focus on a few values (health and life) and leaves too many valuable aspects of life that can be affected out of scope" - such as having an open future, family relationships, solidarity, and bodily integrity. The CA, with its multidimensional view on well-being, would likewise tend to broaden the discussion. The result of the current limited public discourse may, however, be that people lack the ability to make a well-rounded and fully informed decision about DNA testing, especially since people may be confronted with the technology of DNA testing only once in their lives. Sharing and discussing the experiences and perspectives of others is then helpful in getting a full grasp of what is at stake, and developing one's capacity of practical reasoning. According to Boenink and Van der Burg (p.132) "while the plurality of values on the basis of which people choose may be a good reason not to interfere with their decision making and to leave them free to decide for themselves (negative freedom), they are not given the necessary prerequisites to be enabled to think or do something (positive freedom)." Boenink and Van der Burg do not refer to the CA, but clearly their argument is made in the spirit of it.

7.5. Complicating the triangle – the system/network effects of technology

The CA thus has – compared to the vocabulary of self-determination - some advantages when it comes to stimulating and facilitating public deliberation about the good life and technology. However, one's evaluation of technology from the perspective of the CA will partly depend on which technology views supplement the CA. Such views, originating from the fields of science and technology studies (STS) and philosophy of technology (PoT), can be used to elaborate and complicate the smooth triangle sketched in section 2. This triangle is highly compatible with the so-called 'pluralist view of technology.' What I would like to focus on in this section is the alternative view that technology has a strong system or network character (Valkenburg 2009; Briggle 2009; Van den Hoven 2012a). Van den Hoven (2012a, p.335) describes this as follows:

> "All significant technology is public in a relevant sense. One cannot keep technology all to oneself. Technology's typical service value can only be enjoyed in networks of users, producers, and those who maintain, govern and disseminate it, and hence give it its real value."

This implies that technology – in order to function - at least partly shapes our life-world in a way that is beyond the individual that chooses to engage in certain technological practices. Thus, contrary to the assumptions made by 'pluralist theorists of technology, Briggle (2009, p.5) holds that "the impacts of technology cannot be so easily privatized and controlled." Therefore, liberalism's solution for the existence of conflicting religious views, namely relegating them to a private or semi-private sphere, does according to these philosophers not work for technology. While some collective deliberation about technology and the good life was already desirable or even necessary from the pluralist view of technology, the necessity and urgency becomes stronger if one adopts the system/network view of technology instead.

None of these three authors – Valkenburg, Briggle or Van den Hoven - refers to the CA, but it is not difficult to make the connection. Instead of talking quite abstractly about the 'service value' of technology, as Van den Hoven does, we should rather start discussing the value of technologies rather in terms of the human capabilities that they expand and/or diminish. As Lawson (2010, p.6) has argued, technology's system/network effects are equally crucial from this second perspective. He notes that "technical objects cannot be understood in isolation. Rather, technical objects take on their properties, characteristics, powers or whatever only in relation to the networks of relations in which they stand." The networks in which artifacts are enrolled have both material and social components. This insight can be used (Oosterlaken 2011) to smoothly insert technology into the relational ontology (see section 1) of the capability approach. The upshot is that technical artifacts will generally only expand valuable human capabilities when embedded in an appropriate network with other technologies, individuals, social practices and institutions. The example of the car can illustrate this.[99] A car is in a sense just a specific configuration of wires, metal, nuts and bolts, and so on, until it is embedded in a network with roads, gas stations, traffic rules, driving schools, and the like. Only in such a network could this material artifact be understood as a proper technical artifact, namely a car, with all the powers that cars have, which is to provide transportation etc. And only then will it substantially and in a durable way expand people's capabilities to move about. The car may thus superficially seem to be a single artifact that – just as the bicycle – straightforwardly adds to the capabilities of its users in the area

[99] For a more detailed example embedded in a case study, see Oosterlaken, Grimshaw & Janssen (2012).

of mobility and transportation. Yet this would not be telling the whole story of the connection between this technical artifact and the expansion of human capabilities.

Briggle (2009) also uses the car as an example, and he takes the idea of the network/system-level implications or effects of technical artifacts even further. He asserts (p.5) that cars "do not just transport people in an otherwise unchanged world; they shape infrastructures, create markets, alter residential patterns and communities, and influence, through their use of oil and other materials, international relations and the global environment. Furthermore, in shaping the character of the human life world, they play a role in both generating and foreclosing lifestyle choices." Of course, Briggle admits (p.8), "a system of roads does not force someone to travel in any particular direction." But, he continues "it does foreclose the opportunity of a solitary hike in those places and it does create a new networked existence for those brought within the sphere of influence of the roads." What he could also have mentioned is that the way in which US urban areas have been shaped, following the introduction of the car, also makes it more difficult to do commuting and shopping by bicycle, even though some may consider this as a healthier and more stress-free way of living. Since all sorts of different capabilities are created or hampered in interrelated, complex, messy systems or networks, some conflicts seem to be unavoidable. For example, given the network effects of cars, we may have to decide collectively whether the capability for solitary hikes is more important for a good human life than the capability to quickly and easily drive anywhere, or whether we are somehow able to guarantee both capabilities up to some threshold level.

The car is obviously not unique in bringing about such network or system level effects and especially in the area of ICT similar examples could be given. Take mobile phones. At the smallest level of analysis, an individual may be able to make choices about whether to make a certain call with his cell phone, call this or that person, make the call later or not at all, or use texting instead. At a micro-level of analysis, which pluralist theories of technology prefer, the person may be seen to be free to use his phone for maintaining friendships in this way or another, to use the phone as part of certain business practices or not, or even to discard her cell phone completely. Yet if we zoom out even further and look at the person with a bird's eye view, it may be very hard - at least in the West, but increasingly also elsewhere - to decide to lead a life that does not include mobile telecommunication and being reachable by others most of the time. Patterns that

develop at a larger scale may mean that you may be forced into certain functionings, like being reachable for your boss even during the holidays. It may also mean that you lose valuable human capabilities when you get rid of your phone, like being able to find and hold all sorts of jobs. Or take Facebook. You may disagree with its implicit view of what it means to "live well with and towards others" – as Nussbaum describes her capability for affiliation. It may not match your view of the good life. Yet if all your friends and acquaintances are on it, your individual freedom to choose an alternative way of engaging with others is at the very least constrained.

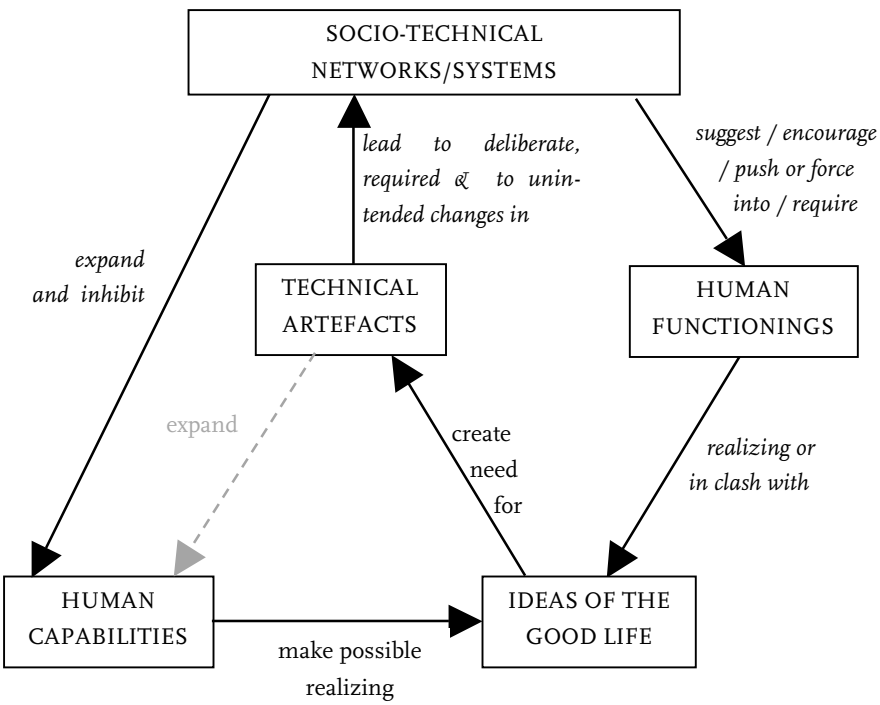

Fig. 7.2 – System/network view of technology complicating the basic triangle 'the good life / technology / human capabilities'

To summarize: on the one hand, certain changes on the system or network level are required before a technology can expand certain intended capabilities (like that of going places). On the other hand, such changes may also – unforeseen and/or unintended – affect other capabilities (like that of solitary hiking or more local, stress-free living). And sometimes system/network effects may mean that

the capability-functioning distinction becomes blurred. Do mobile phones and Facebook merely expand our capabilities, or is it more accurate to say that they push us into certain functionings and ways of living? Acknowledging the system/network effects of technology means complicating the basic triangle that was sketched before (see figure 7.2). Pluralist theories of technology acknowledge – see section 7.3 – that technology is not fully neutral towards people's different ideas of the good life, but they emphasize the choice that people have between different technologies or technological practices. Proponents of the system/network view emphasize that the impact of technology is not only non-neutral, but also at least partly beyond individual choice. Briggle's analysis (p.7) is that "the pluralists [of technology] are able to draw different conclusions due to their commitment to analyse technologies as discreet artefacts and practices without positing any emergent patterns on a larger scale." The CA in isolation is not able to detect and identify these patterns; Additional 'explanatory theories' from fields like PoT and STS are needed for this, as well as empirical studies of technology based on them. Yet once these patterns are seen and the need for public deliberation about technology and the good life is acknowledged, the CA may be helpful in the subsequent process of ethical deliberation about them. This I will discuss in more detail in the next section.

7.6. Using the CA to evaluate technology's system/network effects

The advantages of the CA as sketched in section 3 still hold if one adopts the system/network view of technology. The CA has, though, some additional advantages for a PoT/STS-scholar who would like to build an argument about the moral import of system/network effects, or provide an ethical evaluation of them. Johnstone (2007, p.80) already argued that the fact that technologies like ICTs have strong and complex system-level effects gives us a reason to adopt the CA, as it provides "a framework for a rigorous and structured analysis" of this phenomenon. The CA, she explains (p.79), "allows for technology to have an indirect effect [on human capabilities] through its influence on the wider social and material environment". This environment may be seen to contain constitutive elements for human capabilities, or 'conversion factors' if one zooms in on the relation between a specific technical artefact and human capabilities for certain categories of individuals. I think, though, that we can make a somewhat stronger claim that the CA not only allows taking the

system/network effects of technology into account, but would even encourage this. The CA explicitly and persistently puts central people and the lives they are able to live – not technology. And adopting a CA means asking what these people are, all things considered, able to do and be in their lives. This means, according to Robeyns (2011, §2.2), that we must take "a comprehensive and holistic approach." On the input side, this means that we should evaluate institutions, social practices and other capability inputs in combination. Similarly, a piecemeal analysis of a technology's capability impact is to be avoided. On the output side, it requires looking at sets of simultaneously achievable capabilities, since sometimes a person may be able to realize one functioning or another in her life, but not both at the same time – while from the perspective of justice or the good life, enabling both could be desirable, and we would want to try and avoid the person having to make a choice between both functionings. If people and their comprehensive capability sets are consistently one's focal point, one may be less likely to ignore emergent patterns of technology on a larger scale, or at least be less likely to be able to defend ignoring these. Yet, as the CA encourages us to ethically evaluate different capabilities, in the process also distinguishing between capabilities that are merely instrumentally important and those that are intrinsically valuable, it is not committed to considering every socio-technical pattern of change or every capability impact equally important.

The main question, though, that this paper asked is not just whether the CA is helpful for PoT/STS scholars, but whether this conceptual framework can be expected to perform better than what Swierstra labeled the "vocabulary of self-determination." Within the vocabulary of self-determination there is only an undeniable justification for limiting the freedom of an actor – either the developer or user of a technology – if we can clearly ascribe to him the responsibility for causing somebody else harm with this technology. But the system/network effects of technology include vague, contestable, indirect, complex, non-linear, long-term effects – cultural, social, institutional and so on - for which responsibility is very dispersed. The vocabulary of self-determination, with its core concepts of negative freedom and no-harm, is thus not enabling us to deal with that. On the contrary, the CA, with its specific conceptualization of positive freedom, is able to take the wider effects of technology into account as relevant, as was already explained. Even if nobody is directly causing harm to others, the indirect system/network effects of technology matter if we care about people's capability set or their overall ability to lead the lives they have reason to

value. Johnstone (2007) actually makes basically the same point about the CA's superior ability to deal with the system/network effects of ICT, although she discusses the CA as a type of value-based approaches and contrasts it with more traditional agent- or action-centred approaches in computer ethics – which arguably have a family resemblance to or shared historical roots with the vocabulary of self-determination. Within both, the system/network effects become elusive. And as Johnstone (p.74) puts it: "the danger is that because they fail to fit existing ethical categories and tools we may fail to address them." With the CA as a central moral vocabulary this is less likely to happen.

Having discussed a range of advantages and strengths of the CA throughout this paper, I would like to end by briefly addressing a challenge that has been raised for the CA by some scholars and that has relevance for the present discussion about technology. What is being challenged (Deneulin 2002; Barclay 2003) is the claim of prominent capability scholars (Robeyns 2005; but especially Nussbaum 2003; 2006) that the CA is a form of liberalism, as it respects pluralism and is able to remain sufficiently neutral with respect to very diverse conceptions of the good life that people may hold. The most important of Nussbaum's arguments[100] is, in my assessment, that she emphasizes the principled distinction that the CA makes between capabilities and functionings – with policies aiming at the expansion of capabilities, without forcing anyone into the corresponding functionings (see §7.2). Deneulin (2002), however, has forcefully argued that the capability-functioning distinction is – for several reasons - impossible to consistently maintain in policy practice. It cannot always be avoided that policies based on the CA target functionings instead of capabilities and therefore, she claims, they are sometimes unavoidably paternalistic. One reason for this is that there are a lot of interdependencies between all sorts of functionings and capabilities, both at the individual and the collective level. At the level of the individual, for example, we may note that someone who has the capability to be healthy but makes life choices that seriously damage his health, also jeopardizes losing many other capabilities. Nussbaum (2000, p.91) herself admits that "we may feel that some of the

[100] It should be noted that the CA comes in more flavors than just Nussbaum's version of it. Sen, for example, has not made a capability list like Nussbaum, which makes her vulnerable to criticism about adopting a certain view of the good life. Yet Deneulin (2002) has argued that Sen would also not be able to completely avoid paternalism when implementing his vision, therefore, she argues, at least Nussbaum's version of the CA is, in a sense, more honest than Sen's.

capabilities are so important, so crucial to the development or maintenance of all others, that we are sometimes justified in promoting functioning rather than simply capability, within limits set by an appropriate concern for liberty." At a collective level, Deneulin illustrates these interdependencies with Nussbaum's claim that a person with opportunities for play and leisure should be left free to choose a workaholic life. Since employers have a preference for people that work more rather than less, Deneulin, however, fears that in the long term everyone will be less and less free to take leisure time if government did not enforce some compulsory legal holidays, which comes down to forcing them into not choosing the functioning 'work' during these days. Technology - with its network/system level effects - can be taken to both exemplify and aggravate such interdependencies, which make it even harder to always maintain the capability-functioning distinction in practice, elegant as it may be in theory.

How detrimental the practical fuzziness of the capability-functioning distinction is for the claim that the capability approach is a form of liberalism depends, of course, on how one fleshes out the further details of the capability approach, as well as one's understanding of liberalism itself. Among political philosophers, there exist many interpretations of and little agreement on what liberalism is exactly, and therefore I will not be able to do justice to this debate between Nussbaum and her critics within the scope of this paper. To me it seems, however, plausible that the CA is not a paradigm case of liberalism, but rather an approach that carves out a third way between liberalism on the one hand and paternalism or perfectionism[101] on the other. It does attach central importance to freedom, which is, according to many political philosophers, the cornerstone of liberalism (Gaus and Courtland 2010). It argues that we capture what is valuable about freedom best in terms of human capabilities, which have a thoroughly relational ontology. We therefore should, according to the CA, make sure that people have centrally valuable capabilities at least up to some threshold level. However, considering what the world is like – with increasing interdependencies between capability inputs like technologies, social practices, and institutions – the theoretical capability-functioning distinction will become

[101] Perfectionism (Kupperman 2005) is "…the view that promotion of human excellence is one of the factors that should be weighed in judging the political and social worth of a society. […] Any case for perfectionism must contain two elements. One is an argument that some forms of human activity or experience [or ways of living] have special value. The other is that a policy of furthering this special value should play a part in some aspects of our conduct towards others, including some social and political decisions."

fuzzy in practice, which makes it impossible to always stay fully neutral. And neutrality is, according to other political philosophers, another cornerstone of liberalism (Kymlicka 1989). Capability scholars and critics alike should continue investigating this apparent tension between the CA and some strands of liberalist thought. Since the network/system view of technology dovetails nicely with the arguments made by Deneulin and others, philosophers of technology can offer interesting case studies that may advance this debate.

What is important though for the purposes of this paper is that acknowledging the mixed character of the CA would not necessarily disqualify it for the purposes discussed in this paper. On the contrary, this may be exactly what we need if classical political liberalism - and the moral vocabulary that is its legacy - do not allow us to publicly voice, express and discuss issues that urgently need to be debated in public. As Van den Hoven (2012a) has recently argued, compatible with Swierstra's argument: we may just have to let go of any ideal or concept of complete public neutrality towards the good life that turns out to be unfeasible and unworkable in our technological age, especially if we do not want to forego the many benefits that technology brings in terms of well-being and the good life. We will then have to evaluate and assess technologies in those terms, for which the CA can provide a conceptual framework. However, the discussion between Nussbaum and her critics shows that using the CA as the common vocabulary for public debates about technology and the good life is not uncontroversial, despite its advantages.

7.7. Conclusion

Technical artefacts can be seen to expand what people are able to do and be, their capabilities to achieve certain valuable 'functionings.' In that sense, they give people additional freedom to lead the lives they have reason to value, to realize their preferred version of 'the good life.' One could see human capabilities as providing the link between more abstract ideas about the good life and more concrete technical artefacts. The CA – as it has been shown in this paper – provides us with a conceptual framework that allows us in principle to articulate and discuss issues of technology and the good life in a balanced and comprehensive way. It is a more fruitful moral vocabulary than the "vocabulary of self-determination" that Swierstra (2002) criticized, amongst other because the CA does not suffer from the problems of (I) the opaqueness of technological alternatives and (II) the sanctity of preferences, amongst other things.

However, it has also become clear that the CA has its limitations and that our expectations of it should be realistic in acknowledging these. Firstly, what one sees through the normative lens of the CA depends partly on what further filters one adds to it. In this paper I have discussed two different 'technology theories' which can be sensibly combined with or plugged into the CA, but which would give different results: the pluralist view of technology and the system/network view. Secondly, the compatibility of the CA with liberalism and the ideal of neutrality is a topic of debate among capability scholars and therefore adopting the CA is not uncontroversial. The irony is that public debates about technology and the good life are most urgently needed if one adheres to the system/network view of technology, while adopting this view will also aggravate the problems for the most important argument that the CA has for it being a form of liberalism: the principled capability – functioning distinction. Perhaps not surprisingly, the CA thus cannot help adherents of the system/network view of technology to have their cake and eat it: to facilitate deliberation about 'the good life' as part of public debates on technology, while also remaining fully neutral and acceptable to all.

Acknowledging these limitations, I still believe that the CA can be of value in thinking about technology and the good life. Of course proof of the pudding will be in the eating, or in practice. Some authors have recently started to explore how applying the CA could advance the debate about issues of the good life raised by concrete technologies (see e.g. Coeckelbergh 2012; Kleine, Light, and Montero 2012). Future work should start exploring more of such concrete cases, to verify in detail if the CA would indeed open up new considerations, enrich the discussion and widen perceived possibilities of action.

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Annex: More technology theories complicating the basic triangle

This paper illustrates, as I explained in the introduction to this dissertation, that what one sees through the lens CA will also depend on which of the filters that one adds to this lens, in our case: which explanatory technology theories. The paper contrasts 'pluralist technology theories' with the 'system/network view of technology'. It was shown (fig. 7.1) that the latter complicates the basic triangle 'technical artifacts - human capabilities - good life views' (fig. 7.2). However, there exist more technology theories that are useful, yet complicate the basic triangle. They were left out so that the paper would not become too complicated, but they are useful to further illustrate the general point made in the introduction to this dissertation about the importance of one's choice of

explanatory theories. So here is a further example: not only do good life views influence technology, it may also be the other way around; Modern ICT applications like social networking sites do, for example, not merely expand our capabilities for - as Nussbaum calls it - 'affiliation', but they also change our understanding of what "being able to live with and towards other" (Nussbaum's main description of the capability 'affiliation') actually means. Thus, so Coeckelbergh (2011) argues, "the end/means scheme as applied to the relation between capabilities and technology must be abandoned and replaced by a hermeneutics of techno-human change." Or consider the idea of behavior steering technology, which is receiving increasing attention from both engineers and ethicists of technology. Such technology can be inspired by certain good life views, for example when it is designed to encourage healthy behavior (see e.g. Grimes and Grinter 2007), in other words certain human functionings. This phenomenon could – like the system/network view of technology, see §7.5 – be seen to challenge the effectiveness of the CA's functioning-capability distinction, implying a greater need for public deliberation about the good life views embedded in the technology in question. These and other views can thus also be used to elaborate and complicate (see fig. 7.3 on the next page) the smooth triangle sketched before.

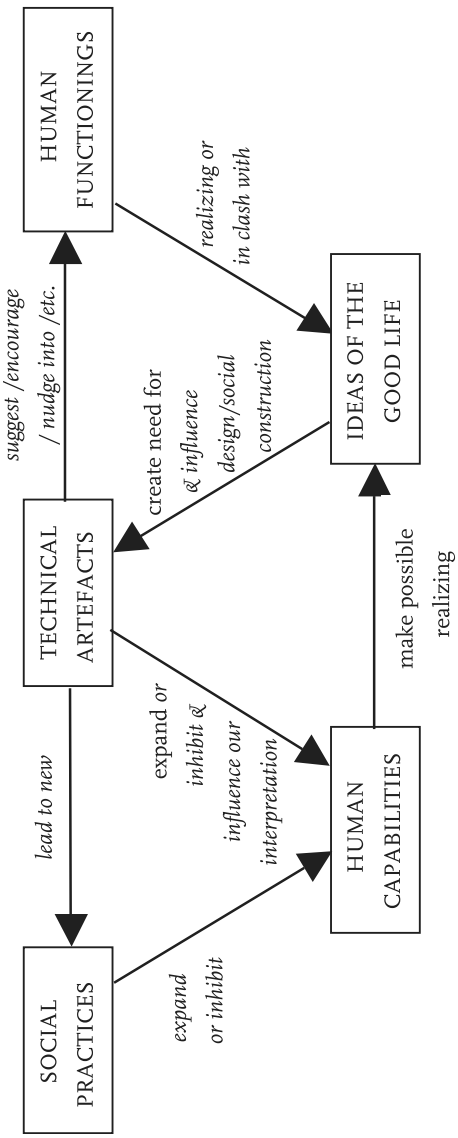

Fig. 7.3 – *Some of the ways in which PoT & STS can further enrich our understanding of the nexus 'the good life / technology / human capabilities'*

III. ADDENDUM: HUMAN CAPABILITIES & THE QUESTION OF THE METRIC OF JUSTICE

Ethic Theory Moral Prac
DOI 10.1007/s10677-012-9344-9

Is Pogge a Capability Theorist in Disguise?

A Critical Examination of Thomas Pogge's Defence of Rawlsian Resourcism

Ilse Oosterlaken

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Abstract Thomas Pogge answers the question if the capability approach can be justified with a firm 'no'. Amongst others, he ridicules capability theorists for demanding compensation for each and every possible natural difference between people, including hair types. Not only does Pogge, so this paper argues, misconstrue the difference between the capability approach and Rawlsian resourcism. Even worse: he is actually implicitly relying on the idea of capabilities in his defence of the latter. According to him the resourcist holds that the institutional order should not be biased towards the average person or the needs of some. Yet, as his own case of blind people and traffic lights can illustrate, whether or not this is the case is impossible to assess without resorting to some concept like people's capabilities. Secondly, it is argued that the real issue at stake is not at all the best metric of justice—primary goods or capabilities—but rather the scope of theories of justice. On the surface the difference of opinion seems to be how to deal with so-called "personal heterogeneities", yet the discussed case of interpersonal differences in metabolism and communal land-use choices hints at something else; Whereas Pogge insists that questions of justice only concern the institutional structure of society, many capability theorists support the inclusion of culture and social practices as possible sources of injustice. Unfortunately Pogge does not properly acknowledge this, as right from the start of his paper he frames the debate between both approaches in terms of institutions only.

Keywords Thomas Pogge · Primary goods · Human capabilities · Capability approach · Rawlsian resourcism

1 Introduction

In 1979 Amartya Sen gave the *Tanner Lecture on Human Values*, for which he chose the title "Equality of what?" (Sen 1979). This question, concerning the best metric or evaluative space in matters of justice and equality, is nowadays still a topic of philosophical debate. Answers that have been discussed in the literature include utility, preference satisfaction,

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8 Is Pogge a capability theorist in disguise? A critical examination of Thomas Pogge's defence of Rawlsian resourcism

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8.1. Introduction

In 1979 Amartya Sen gave the *Tanner Lecture on Human Values*, for which he chose the title "Equality of what?" (Sen 1979). This question, concerning the best metric or evaluative space in matters of justice and equality, is nowadays still a topic of philosophical debate. Answers that have been discussed in the literature include utility, preference satisfaction, access to advantage, resources, Rawlsian primary goods, and—which Sen himself defends— human capabilities. This paper is concerned with the latter two. As the basic primary goods Rawls lists (a) certain rights, liberties, and opportunities; (b) income and wealth and (c) the social bases of self-respect. He claims that these primary goods are means or "things that every rational man is presumed to want [...] whatever a person's rational plan of life" (Rawls 1999, p.54). From the perspective of the CA, however, we should take account

> "not only of the primary goods the persons respectively hold, but also of the relevant personal characteristics that govern the conversion of primary good into the person's ability to promote her ends. What matters to people is that they are able to achieve actual functionings, that is the actual living that people manage to achieve" (Sen 1999, p.74).

'Functionings' refers to anything a person could do or be, like travelling or being part of a community. Capabilities are then the corresponding positive or substantive freedoms to achieve these functionings. A recent addition to this debate is a book edited by Brighouse and Robeyns (2010), titled *Measuring*

Justice—Primary Goods and Capabilities. This volume also contains an abridged version of an article that Thomas Pogge already published in 2002(a) under the title *Can the Capability Approach be Justified?* In that article—and in the reprinted book contribution—Pogge answers the question that he poses with a distinct 'no' and defends Rawlsian resourcism instead. Amongst others he ridicules capability theorists for demanding compensation for each and every possible natural difference between people, including hair types. The question that I will discuss in this paper is whether Pogge's rejection of the capability approach (CA) is coherent and justified.

The second section will summarize how exactly Pogge understands Rawlsian resourcism, the CA and the differences between them. What I will argue in this essay is firstly that Pogge misconstrues the difference between the resourcist approach and the CA and is even implicitly relying on the idea of capabilities in his defence of resourcism. This is being discussed in section three, which will focus on primary goods versus human capabilities as the metric of justice, using the case of blind people and traffic lights. Secondly I will argue that, when reading Pogge's article carefully, it seems that his apparent rejection of capabilities as the evaluative space for justice is masking something else. What Pogge, on a more fundamental level, seems to disapprove of is the widening by many capability theorists of the scope of justice beyond institutional design, to include things like cultural practices as well. This will be discussed in section four, where I will discuss the scope of justice, using the case of interpersonal differences in metabolism. Sections three and four thus address two different topics of disagreement between Pogge and capability scholars - of which only the second will turn out to be a real topic of disagreement. The last section will summarize the conclusions.

8.2. Pogge's analysis of the contrast between both approaches

The existence of immense human diversity is a key concern in the literature on the CA. Because of facts of human diversity, the degree to which resources can be converted into capabilities differs from person to person. A disabled person, for example, may need more or different resources to be able to do and be the same things as an able-bodied person. Hence, capability theorists consider

capabilities to be a better 'space of equality' than resources. Pogge (p.32)[102] also concludes that the "key theoretical difference" between a capability approach and a resourcist approach is their answer to the question "how institutional schemes are to respond to natural *human diversity*" (emphasis is mine). The "key question" in the debate between both approaches, Pogge said earlier in the same book chapter (p.18), is the following:

> "Should alternative feasible institutional schemes be assessed in terms of their participants' access to valuable resources or in terms of their participants' capabilities, that is, access to *valuable functionings*?"

Note the centrality of the term 'institutional schemes' in both quotes—I will get back to this in section four.

So what is Pogge's take on resourcism versus the CA in relation to human diversity? He claims that a sophisticated resourcist approach—like the Rawlsian one—can take into account many of the facts of human diversity often mentioned by Sen, such as differences in relational perspectives, variations in social climate and environmental diversities. Variations in social climate, for example, concern amongst others "the prevalence or absence of crime and violence [...] epidemiology and pollutions [...] the nature of community relationships" (Sen 1999, p.70). Pogge (p.22) says that

> "our paradigm resourcist Rawls sees such factors as rendering insecure some of the basic liberties of citizens such as their physical and psychological integrity and their freedom of movement."

The "core of the debate between the two approaches" lies, according to Pogge (p.23), rather in the way both approaches treat *pure* personal heterogeneities, by which he means *natural* individual variations in physical/mental characteristics due to "ordinary genetic variations, self-caused factors, and differential luck". Pogge (p.29) thus concludes that if one makes the resourcist approach as strong as possible, then the class of cases on which both approaches differ fundamentally is actually quite limited. For argument's sake I will accept Pogge's claim that a sophisticated resourcist can take into account many different facts of

[102] Unless stated otherwise, I will refer to the 2010 abridged reprint of Pogge's article (Pogge 2010).

human diversity. Like Pogge, I will thus also focus on cases of pure personal heterogeneities.

It should be noted, however, that Pogge argues that many personal heterogeneities are not natural at all, but caused by either past or present inequality in resource access under some institutional order. Such resource deprivation, he says, is the cause of many physical/mental special needs or disabilities coming into existence. Resourcists, Pogge claims (p.28), have a more compelling response to such cases than capability theorists:

> "Where the latter criticize institutional schemes for their failure to compensate for special physical and mental frailties, resourcists more powerfully criticize the same institutional schemes for their failure to compensate for frailties they *themselves produce*."

Thus, he says, "on a resourcist view, the causal origins of special needs and disabilities are morally significant."

What is implicitly illustrated in this brief summary of Pogge's position is that there are at least two different questions at stake in discussions about distributive justice. One question is what the right metric or evaluative space of justice is (e.g. resources, Rawlsian primary goods, preference satisfaction, human capabilities or something else). The other question is what rules govern a just distribution of whatever is chosen in answer to the first question. Anderson (2010), who herself defends capabilities as the right metric of justice, gives a detailed overview of possible answers to this last question. She makes a distinction between unconstrained procedural rules, constrained procedural rules and distributive pattern rules. Common answers in the last category, for example, are that there should be complete equality amongst people (egalitarianism), that everybody should have the good in question up to at least a certain threshold (sufficientarianism), or that the holdings of the worst off should be maximized (prioritarianism). As both questions present different options that can be combined, a large number of different theories of justice can thus be constructed. Rawlsian resourcism, for example, combines a focus on primary good as the metric of justice with principles of justice that are prioritarian, since Rawls' difference principle says that "social and economic inequalities [...] are to be to the greatest benefit of the *least advantaged* members of society" (Rawls 1993, p.6, emphasis is mine). Nussbaum (2006), like Sen considered to be one of the founders of the CA, combines a focus on capabilities

as the metric of justice with sufficientarianism, as she claims that justice requires everybody to be brought up to at least a threshold level for all the capabilities on her list. Sen is not defending a particular set of rules concerning the distribution of capabilities.

In discussing what a just distribution is, one may also—as Pogge does—ask what the *cause* of an inequality is and distinguish between different causes. One might label this as the question about the scope of distributive justice. As we already saw, this question is important for Pogge. This is not surprising, considering that his other work in the area of global justice is known to emphasize the importance of causal chains (e.g. Pogge 2002b). His argument is that the global institutional schemes that Western people have created and uphold—such as the patent system and certain property rules—cause poverty elsewhere. We are—according to Pogge—harming the global poor in this way. Thus, our obligation to change their situation of deprivation is not stemming from positive duties of beneficence, but rather from us violating our negative duties not to harm them. For the purposes of this paper the important thing to realize is that according to Pogge "on a resourcist view, the causal origins of special needs and disabilities are morally significant." He thus construes the resourcist view not exclusively as a choice for resources or primary goods as the right metric of justice.

What I will argue in the next section, is that in defending resources as the best metric of justice, Pogge misconstrues the difference between the resourcist approach and the CA and is moreover implicitly making use of the idea of capabilities in his defence of resourcism. The example used here is that of blind people and traffic lights, which was introduced by Pogge himself in the paper under discussion here. In section four I will get back to causal chains and Pogge's focus on institutions, using the case of interpersonal difference in metabolism.

8.3. The metric of justice: the case of the blind and traffic lights

Capability theorists, says Pogge, "value the goods persons have access to by reference to the *specific* needs and endowments of each particular person", while resourcists are "guided by some conception of the *standard* needs and endowments of human beings" (p.23–24). This is also the distinction between both approaches according to Anderson (2010, p.87). Yet, Pogge also asserts, the

resourcist "must avoid the complaint that this account is modeled mainly on the needs of some and much less appropriate to the needs of others." The resourcist metric "must take account of the *full range of diverse* human needs and endowments" (p.31, emphasis is mine). However, as Anderson (2010, p.92) notes, it is hard to see how one can depart from both standard human needs and the full range of diverse human needs at the same time; as soon as one opts for the latter, one comes close to taking a CA, with its characteristic emphasis on human diversity. One cannot help but wonder: How is the resourcist able, without resorting to some concept like capabilities, to determine that some institution providing primary goods is unbiased towards specific human needs or characteristics?

One of the cases that Pogge himself discusses is that of blind people and traffic lights with only visible signals. He considers these artefacts to be a part of the institutional order. According to Pogge (p.31) capability theorists may:

> "say to the disabled person: 'I understand that you have a lesser capacity to convert resources into valuable functionings. For this reason, we will ensure that you get more resources than others as compensation for your disability. In doing so, our objective is that, by converting your larger bundle of resources, you will be able to reach roughly the same level of capability as the rest of us [...]. The resourcist might say instead: 'I understand that the present organization of our society is less appropriate to your mental and physical constitution than to those of most of your fellow citizens. In this sense, our shared institutional order is not affording you genuinely equal treatment. To make up for the ways in which we are treating you worse than most others, we propose to treat you better than them in other respects. For example, to make up for the fact that traffic instructions are communicated through visible but inaudible signals, we will provide free guide dogs to the blind'.

In this quote Pogge sketches a distorted picture of the likely response of a capability theorist and a false contrast between the two approaches. Three points stand out. Firstly, it is strange that in this case Pogge ascribes a vague and general solution like *compensation by providing more resources* to capability theorists. This is surprising, as proponents of the CA are particularly aware of the limitations of merely providing resources. Without referring to this specific case, Keleher (2004) makes the same point:

> "Pogge wrongly commits himself to the problematic position that the only way the capability theorist can hope to enhance capabilities—regardless of a particular individual's situation, is through the distribution of (various quantities and qualities of) resources. Thus, according to Pogge, the capability theorist, like the resourcist, is concerned only with institutional distribution of resources. This is a grave error."

Being concerned about guaranteeing actual *capabilities* in practice and not in principle, in the case of the traffic lights capability theorists would opt for a concrete solution that efficiently and effectively tackles the capability deprivation in question, be it by providing resources like guide dogs or by institutional re-design in the form of adding audible signals to the traffic lights.

Secondly, Pogge suggests that capability theorists propose to provide compensation *for inferior physical properties or a lack of internal capacities*. However—as Anderson (2010, p.97) remarks—a capability theorist would not demand compensation for "the bare fact of lacking certain innate endowments", as on its own this does not constitute a capability deprivation. The CA is interested in what Nussbaum (2000, p. 84/85) calls "combined capabilities, which may be defined as internal capabilities combined with suitable external conditions for the exercise of the functioning." In other words (Smith and Seward 2009): the ontology of capabilities is relational, as an individual's capabilities come about or cease to exist in a constellation of specific characteristics of these individuals and of those social/physical structures in which they are embedded. One might try to argue that in the case of disabilities like blindness or not being able to use one's legs, the capability of which the person is deprived is not relational, as these handicaps are purely physical characteristics of a person (an internal 'incapacity'). Yet this position is exactly what has been forcefully and quite successfully been challenged by activists in the area of disability (Terzi 2010)—the degree to which not being able to use one's leg becomes a severe handicap or capability deprivation depends on external states of the world, like the wheelchair accessibility of our buildings. Pogge (p.30) actually acknowledges this at one point in his resourcist reply to the case of disability.

Thirdly and most importantly, the resourcist in the quote from Pogge's paper implicitly relies on some capability concept. To see that, first let me ask the question what resource is at stake here. If it is the traffic light itself, as a merely

material artefact, one could say to a blind person: "of course this traffic light has been installed for your convenience as well, you are as free to take advantage of it as any other person and nobody is keeping you from doing so." And that would be the end of the story. Underlying this response is a view of traffic lights as basically a constellation of wires, nuts and bolts, light bulbs and so on—how could that discriminate against the disabled or be a case of injustice? There is nothing discriminatory about green lights per se, just as there is nothing inclusive about audio-signals per se. If instead we want to argue that something is wrong with this response, that this specific institutional arrangement unfairly assumes—*as Pogge's resourcist says it does in the quote from p.31*—some average person, it seems that a different conceptualization of the resource in question is needed. One possibility would be to conceptualize the resource distributed not as 'traffic lights' but as 'safety in traffic.'[103] In fact, this move seems not so radical in light of the fact that Pogge himself defends not a simplistic resourcism, but what he claims to be the most sophisticated form of it: Rawlsian resourcism. As was mentioned at the start of this article, the first items on Rawls' list of primary goods are certain rights, liberties, and opportunities. For blind people freedom of movement would be restricted in a very practical way if there were only traffic lights with visible signals— their physical safety would be threatened every time they would try to cross a busy street. Rawls claims that primary goods are "things that every rational man is presumed to want [...] whatever a person's rational plan of life" (Rawls 1999, p.54)—arguably this also applies to basic traffic safety. It can be said to be one of the constitutive elements of true freedom of movement.

However, it should be noted, this choice for 'safety in traffic' instead of 'traffic lights' as the good in question is not trivial; Safety in traffic is not 'out there' in the world in the same way that traffic lights are, independent from who the person participating in traffic is. This safety arises or fails to arise in an

[103] There is a different way to argue along the same lines as is being done here, but it would require a detour in philosophy of technology. This alternative argument proposes a move not from traffic lights to safety in traffic as the good to be distributed, but from seeing traffic lights as mere *material* artefacts—e.g. a collection of 'nuts and bolts' and so on—to proper *technical* artefacts. Using the account of Houkes and Vermaas (2010) about the nature of technical artefacts and engineering design, it can be argued that technical artefacts are (1) per definition designed with the aim of expanding some human capabilities and (2) may indeed discriminate against non-average users like the disabled—in which case the artefacts will not expand the capabilities of these users. For more details the reader is referred to Oosterlaken (2012).

interaction between a specific person—whether blind or not—and her specific environment. We have thus already come close to the relevant concept of capability, which is—as noted before—relational in exactly this way; Whether or not someone has the capability to be safe in traffic depends on the internal capacities of the person (seeing or blind) *in combination with* the details of design of the external environment, including traffic lights (with or without audible signals). Now let's recapitulate:

(1) Pogge considers traffic lights to be part of the basic institutional order, so that (2) a condition of fairness or treating everybody as equals applies, meaning that
(2) in their design we "must take account of the full range of diverse human needs and endowments,"
(3) a condition that—considering the fact that some people are born blind-
(4) is, according to Pogge, violated in case of traffic lights with visible signals only, a claim that
(5) can only be substantiated if we resort to a capability-like concept as the metric of justice

The upshot is thus the following: Pogge identifies a certain type of traffic lights as a case of injustice, but how would he be able to determine that this traffic light or any other institutional design is unjustly biased towards the needs of some, while excluding others, without resorting to a concept like capability? He cannot. There is nothing about traffic lights as mere material artifacts *in isolation* that points in that direction. The problem cannot be identified without at least implicitly using some concept of a lack of capability or 'access to functioning' for the blind person, resulting from the interplay between specific personal characteristics and design features of the institutional arrangement in question. Perhaps it *seems* possible to leave capabilities out of the story, but this is only because it is a very simple and intuitively obvious example—surely we don't need any fancy philosophical concepts or insights to grasp that a certain type of traffic light by design is not appropriate for blind people? However, when we have to judge more complex institutional designs or when a larger range of less salient individual characteristics becomes important, it may no longer be feasible to make a judgment on the justice or inclusiveness of a design without explicitly

investigating what the implications of different design alternatives are for the capabilities of different categories of individuals.[104]

8.4. The scope of justice: the case of metabolism

The previous section made a contribution to a specific existing debate amongst political philosophers on the best 'metric of justice.' Pogge and capability scholars, so I argued, actually do not deeply disagree on the question of the best metric of justice—access to resources or access to functionings (that is, capabilities). Using Pogge's own example of traffic lights, I showed that Pogge has to resort—even if only implicitly—to something like capabilities in order to identify the injustice inherent to some institutional designs. However, on carefully reading Pogge's paper a second topic of apparent disagreement between Pogge and some or possibly many capability theorists emerges—namely on the importance of causal chains and on the scope of theories of justice. This difference of opinion seems to be more fundamental to me than the one on the best metric of justice.

To clearly bring out this second disagreement, let's take another look at pure or natural personal heterogeneities, according to Pogge at the "core of the debate between the two approaches." Pogge (§2.2) is under the impression that the capability theorist—unlike the resourcist—prescribes compensation *for each and every* possible natural difference between people, ranging from differences in metabolism to differences in hair type, for which the different options all need to be fully ranked from the most to the least desirable in order to make decisions about compensation. This is, as Keleher (2004) and Anderson (2010) note, not true. In reality, most capability theorists tend—like resourcists—to care about only some but not all differences. Both approaches diverge, however, in how they determine when a personal heterogeneity is a concern of justice. The case of differences in metabolism between people can illustrate this. Unlike blindness, Pogge (p.48–49) seems to consider a high metabolism as irrelevant in matters of justice, while Sen (e.g. 1984, p.320) has repeatedly mentioned interpersonal metabolism differences as one example that can illustrate why human capabilities would be a better metric of justice than resources. Now assume that

[104] In her chapter on primary goods versus capabilities in the case of disability Terzi (2010) makes the same point as I do—using a related, but somewhat different and non-technical case—and the interested reader is referred to her more extensive treatment of the issue.

the metabolism of one person is such that 8 h of work a day would feed him and of another person is such that 4 h of work would feed him. This, says Pogge,[105] does not mean that there is any demand of justice that both people work 6 h per day and split the production such that both people will be fed adequately (and thus maintain the capabilities for which being adequately nourished is a precondition). In other words, we do not—according to the resourcist—need to compensate the person with a higher metabolism for his natural disadvantage. But now take the following example: a community has to decide between two crops that they can grow on their communal land. Crop A is highly nutritious, but does not taste that good, while crop B has low nutritious value, but is very delicious. If crop A were chosen by the community, the person with the high metabolism would also be adequately fed by his equal share of the harvest. If crop B is chosen, he will be undernourished if he works as hard in the field as everybody else. In response to this example, Pogge admits that in that case metabolism would indeed become relevant, just like blindness in the case of traffic lights, because the design of the institutional order would be such that it "is modelled mainly on the needs of some and much less appropriate to the needs of others."[106]

So for Pogge it is not the specific heterogeneity as such that is decisive, but if and how it is somehow implied in a causal chain including institutions. For different reasons the capability theorist is also not per definition committed to any interpersonal difference being salient from the perspective of justice. From the perspective of the CA innate endowments only matter insofar as they are one of the constitutive components of a *valuable* human capability—the other components arising, as explained in the previous section, from the person's environment. We should thus also ask, as Anderson (2010, p.94/95) notes, which specific capabilities are valuable, are subject of demands of justice, and what rules of distributive justice apply. Both Nussbaum and Anderson, the latter explains, propose a sufficientarian standard of justice; For Anderson, everybody should have those capabilities that are needed to have an equal standing as a citizen to a sufficient level, for Nussbaum we all have a right to a sufficient level of those capabilities on her famous list of ten capabilities, which—she claims—are necessary for a dignified and truly human life. Arguably, undernourishment

[105] Personal communication with Thomas Pogge on May 18th 2010.

[106] Personal communication with Thomas Pogge on May 18th 2010.

would lead to capabilities falling below those thresholds, but once that level is reached the sufficientarian capability theorist may find differences in metabolism irrelevant.

To summarize, the case of metabolism is illustrative of the following. When we ask if certain personal heterogeneities are somehow relevant for distributive justice, Pogge and capability theorists like Nussbaum and Anderson go about differently in answering the question. Pogge will first and foremost want to know whether the potential injustice involves some institution(s) being biased towards the average person, which would mean an unequal treatment of persons deviating from that average. As I have argued in section three, such a bias cannot be determined without resorting to some notion like human capabilities. Thus a necessary condition for something being a case of injustice is—according to Pogge—that it involves some biased institutional arrangement, but—so I argued—a capability-like concept is needed to determine that this bias indeed exists. When asked if certain personal heterogeneities are relevant for distributive justice, capability scholars like Nussbaum and Anderson will primarily want to know if there is any human capability at stake that is relevant for respectively human dignity or democratic standing and if so, to what degree person(s) with the relevant personal characteristics fall short of having the capability. What capability scholars like Nussbaum are less concerned with, is whether or not the capability deprivation in question is a consequence of the institutional order not properly responding to personal heterogeneities, or rather of cultural practices.

It is thus a pity that Pogge—as I noted in section two—immediately frames the debate between capability theorists and resourcists in terms of the assessment of institutional schemes. This is hardly surprising, as he is a Rawlsian resourcist. And it is not without meaning that Rawls (1971) begins his *Theory of Justice* with the memorable sentence "Justice is the first virtue of *social institutions*, as truth is of systems of thought" (emphasis is mine). It is exactly this point that has recently been challenged forcefully by Sen (2009), who argues that our philosophical debates are too much preoccupied with 'just institutions', while we should rather be discussing 'just societies'. He defends a non-ideal or non-transcendental idea of justice, to which a comparative approach of possible states of the world—using amongst others the capability metric —is central. And these capabilities are brought about not only by the right institutions, but also—says Sen—by means of culture, social practices and

individual people's behavior. As Sen puts it in the preface of *The Idea of Justice* (2009, p.x):

> "The presence of remedial injustice may well be connected with behavioral transgressions rather than institutional shortcomings. [..] Justice is ultimately connected with the way people's lives go, and not merely with the nature of institutions surrounding them."

Attention for culture and social practices is also prevalent in other literature on the CA (e.g. Nussbaum 2000). It seems that many capability theorists—in line with Sen—hold it to be one of the advantages of the CA over a resourcist approach that it is able to reveal some of the consequences of culture and social practices as being cases of *injustice*. For example, in her chapter on gender in the book *Measuring Justice—Primary Goods versus Capabilities* Robeyns (2010, p.227) writes:

> "[Rawls'] Justice as fairness postulates that the subject of justice is the basic structure of society, that is the totality of social institutions. For the capability approach, justice is everywhere. For example, the quality of life of individuals in terms of their capability sets is profoundly affected by the behavior of other family members and indeed behavior of people outside the family. Capability theorists argue that the injustices that such behavior can generate need to be part of a theory of justice, and not relegated to moral theory"

Pogge and these prominent capability scholars thus give different answers to the question of the scope of justice. But as mentioned before, there is no logical necessity to combine a choice for capabilities as the metric of justice with a widening of the scope of justice beyond institutions. Different combinations of answers to the questions of the metric, scope and distributive rule of justice are possible. And each of these questions deserves attention in its own right. For example, Broome (2010) has argued that Sen is stretching the scope of justice too much: "Sen is looking for particular ways to make the world better. Not all those ways necessarily make it more just." Unfortunately, this question cannot be properly discussed, let alone settled, within the limitations of this paper. The main point being made here is that this topic of disagreement between Pogge

and capability scholars is not always properly recognized and deserves more attention.

8.5. Conclusion

Whether justice is the virtue of institutions only, or whether for example cultural practices may also give rise to instances of injustice is a question which deserves further attention from both Pogge and capability scholars. Pogge, however, does not even seem to recognize the question of the scope of justice as a point of contention between him and some main proponents of the CA. The initial framing in his paper about capabilities versus resources as the metric of justice simply *assumes* that all discussants are concerned with just institutions only. However, as was explained, the questions about the metric and the distributive principles/ scope of justice should not be confused. This, of course, also means that endorsing capabilities as the best metric of justice does not automatically commit one to also acknowledging capability deprivations caused by cultural practices as cases of injustice; We can easily conceive of a variety of the CA that merely defends a choice for capabilities instead of primary goods as the best metric to compare possible institutions only.

So let's assume—for the sake of argument—that justice indeed only concerns the institutional structure of society. In this way we enter the discussion on Pogge's terms, in order to get to the heart of a major flaw in Pogge's argument. Pogge holds that—according to resourcism— the design of institutions should be "guided by some conception of the *standard* needs and endowments of human beings", but without being biased against some people. What was argued in section three is that without looking at capability levels it is hard if not impossible to tell whether or not institutions are indeed unbiased. Thus Pogge implicitly has to rely on the concept of human capabilities and seems to be a capability theorist in disguise.

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Summary

Technology has the potential to contribute to the quality of life by expanding what people can do or be, their capabilities – yet it is not self-evident that technology indeed does so. A bicycle may expand a person's capability to move about and go places where she wants to go, but not if that person is unable to use her legs because of a disability, and not if she lives in a desert without paved roads, or in a country where cultural norms dictate that it is highly indecent for a woman to cycle. If a technology leads to the expansion of human capabilities thus depends on a range of 'conversion factors'. Likewise, getting access to a telephone or computer with internet access does not always, everywhere and for everyone lead to an expansion of capabilities. Therefore, resource-based development indicators like the number of mobile phones per person in a country are only a very rough proxy of people's quality of life.

This doctoral dissertation reflects on the relation between technology and human capabilities, working from a general philosophical, evaluative framework that attaches central moral importance to certain human capabilities, namely the so-called 'capability approach' (CA). In this approach - for which Amartya Sen and Martha Nussbaum have done much of the ground work – human capabilities are often described as the real opportunities or positive freedoms for a person to do and be what he/she has reason to value. Often mentioned examples of valuable capabilities are the capability to be healthy or to be part of a community. The CA acknowledges that a multitude of such incommensurable capabilities matter for well-being or the quality of life. According to a recent introduction to the CA, it

> "is generally understood as a conceptual framework for a range of normative exercises, including most prominent the following: (1) the assessment of individual well-being; (2) the evaluation and assessment of social arrangements; and (3) the design of policies and proposals about social change in society." (Robeyns 2011)

In the past the CA has already been successfully applied to a range of areas and issues, including health, education, disability and gender. Yet until fairly recently the CA had hardly been applied as a theoretical and normative lens to look at

technology. The articles in this dissertation – which have previously been published elsewhere or are currently under review - together explore, from a philosophical and theoretical perspective, how the CA can be brought to bear on (2) the evaluation and assessment of technology and (3) the design of technical artifacts as one way to bring about a positive change in people's life.

Although the first specialized publication on the CA and ICT appeared already at the end of the 1990s, up to 2007 less than a dozen publications focusing on the CA and technology had appeared, spread over different disciplines and journals. This has, however, quickly changed since roughly 2007, and a small research community has grown around the topic. There are at least three other ways in which this dissertation could be characterized and compared to the work of others on this new and emerging research topic. Firstly, an overwhelming majority of the work done focusses on ICT, and more specifically on ICT for development (ICT4D), while I also address technology more broadly. Secondly, many scholars working on this topic come from the empirical sciences, while I have a philosophical/ethical outlook. Taking this perspective is important because the topic raises important normative and conceptual issues that cannot be addressed by purely empirical research. Thirdly, most of the work done focuses on technology assessment or the evaluation of projects implementing a certain technology, while I also specifically address the design of technical artifacts, inspired by the notion of 'value sensitive design' coming from ethics of technology. The combination of these three things might be considered to give this dissertation a quite distinct character.

The newness of this specialized research topic of 'the CA and technology' at least partly explains its exploratory nature. The main research question has been: *How can the CA be brought to bear on technology and its design, and what is the potential added value?* There are different ways to answer this question: the CA is argued to be applicable to and to have added value for the design of technical artifacts (chapter 2, 3), for the evaluation of technological development projects (chapter 6), and for the assessment of technology from the perspective of the good life (chapter 7). One might initially think that the main research question concerns merely a matter of 'operationalizing' the CA in yet another domain. However, often one cannot simply and straightforwardly apply the CA to a new issue or domain. As Robeyns (2005) has pointed out:

> "The CA is not a theory that can explain poverty, inequality or well-being; instead, it rather provides a tool and a framework within which to conceptualize and

> evaluate these phenomena. Applying the CA to issues of policy and social change will therefore often require the addition of explanatory theories."

Without additional explanatory technology theories one can still use the CA to assess – for example - how well an ICT4D project contributes to human development. The CA would recommend making the expansion of valuable capabilities of different categories of individuals a central element in the project evaluation. However, without additional 'technology theories' from fields like philosophy of technology (PoT) and Science and Technology Studies (STS) the technology in question can and will then only be discussed in a generalizing or superficial way, it remains a black box. This means that there would be an important limitation on one's ability to explain the project's outcome. One would then not be able to investigate if the choice of the technology, or the way in which it was designed, or its embedding in socio-technical networks, plays an explanatory role in achieving the project outcomes. One might not even think of asking these things, as without any technology theories one might not even be able to fully see their relevance.

The main research question thus implies the following question: *Which technology theories and design approaches could fruitfully supplement the CA?* Which technology theories or design approaches one chooses will of course in part depend on one's purpose, but also on things like the general merits of these theories and approaches. In this dissertation the following technology theories and design approaches are discussed:

- participatory design (ch. 2, and also 3);
- value sensitive design (ch. 2, and especially 3);
- the use plan account of technical artifacts (ch. 4);
- inclusive/universal design (ch2/3, and especially 4);
- actor-network theory (ch. 5/6);
- appropriate technology (ch. 6);
- pluralist theories of technology (ch. 7);
- the system/network view of technology (ch. 7).

Making a connection between the CA and a specific technology theory or design approach may sometimes not only be needed to 'operationalize' the CA, but may actually also be beneficial for the technology theory or design approach in question. For example, the CA has arguably something of value to offer to the movements promoting participatory design (chapter 2), inclusive/universal design (chapter 3) and appropriate technology (chapter 6). In all these cases,

generally speaking the added value of the CA lies – not surprisingly - in its ability to facilitate a coherent and systematic normative reflection on the values at stake in the approach in question. Values like agency, justice and well-being become more tangible for engineers and designers by relating them, as the CA does, to concrete capabilities and the conversion factors relevant for certain technologies.

With respect to the choice of technology theories and design approaches supplementing the CA, two general issues are worth highlighting. The first is that it may not be inconsequential which 'supplements' one chooses. Although making such a choice will generally speaking be unavoidable to 'operationalize' the CA, it may sometimes also be a choice that becomes a topic of disagreement and debate. For example, Robeyns (2008) has shown that one may arrive at different capability analyses or normative evaluations of certain gender cases, depending on whether one supplements the CA with a conservative or feminist gender theory. It is thus not only the CA that does all the work in such analyses. Something similar holds when applying the CA to technology cases. An example of this can be found in chapter 7, in which 'pluralist technology theories' are contrasted with a 'system/network view of technology'. This chapter illustrates that when reflecting on technology and the good life, what one sees through the lens CA will also depend on which of these filters one adds to this lens. The second issue is that one should of course be aware that different theories and approaches may, in more or less subtle ways, not be compatible – for example, because underlying assumptions or the understandings of certain notions are clashing. An illustration of this can be found in chapter 5, which explicitly deals with one of the most fundamental questions that arose during this research: *What is the nature of the relation between technology and human capabilities?* The chapter draws on Actor-Network Theory (ANT) in order to answer this question. In annex I to this chapter I explore the compatibility of the CA and ANT in some more detail, in this case with the conclusion that one should explicitly drop or selectively accept certain parts of either approach to ensure coherence.

So what is then the nature of the relation between technology and human capabilities? Answering that question requires, of course, that one gains a good understanding of both the nature of technology and the nature of human capabilities within the context of the CA. There is, however, no agreement or single dominant view concerning what is the nature of technology. Throughout history and in different disciplines 'technology' has been defined and understood in a range of ways, for example as a product, a process or a form of knowledge. The basic view of technology adopted in this dissertation is that it

concerns a set of material artifacts, or systems of such artifacts, designed to perform a certain function. Concerning the nature of human capabilities one could of course also have different views, but within the CA concept has been understood in a quite specific way, which is most explicitly addressed in chapters 4 and 5. These chapters make clear that within the CA 'human capabilities' have a relational and contextual nature, meaning that they depend not only on the characteristics of a person (like one's ability to use one's legs), but also on the relation in which she stands to social institutions, the physical environment and so on (like social norms concerning cycling, or the presence of roads. Furthermore, the term is used as an ethical category: not all capabilities are valuable from a moral perspective.

Based on this understanding of technology respectively human capabilities, the basic view that I gained during this doctoral research project, is the following: understanding the relation between technical artifacts and human capabilities requires us to regularly move back and forth between 'zooming in' and 'zooming out'. This has subsequently become the basic structure of this dissertation::

- 'Zooming in' (part I of this dissertation, chapters 2-4) allows us to see the specific features or design details of technical artifacts;
- 'Zooming out' (part II of this dissertation, chapters 5-7) allows us to see how exactly technical artifacts are embedded in broader socio-technical networks.

The chapters to this dissertation taken together show that both the details of design and the socio-technical embedding of technical artifacts are relevant factors in the expansion of human capabilities. The latter perspective also takes on board cultural norms, collective usage practices and other 'soft', non-material factors. It suggests two basic, complementary strategies if e.g. a development organization aims to effectively expand the human capabilities of marginalized groups with the help of technology. On the one hand one may make the design of a technical artifact appropriate – to the degree possible - for the relevant users and socio-technical network or usage environment as it exists (see chapter 4). In other words, designers should take 'conversion factors' pro-actively into account. On the other hand one may make sure – to the degree possible - that the introduction of a technical artifact is accompanied by appropriate changes in the surrounding socio-technical networks (see chapter 5). Preferably both strategies

should be combined – as illustrated by the analysis of a quite successful ICT4D project in chapter 6.

The mainstream discourse on the digital divive and ICT4D has been criticized by some authors for putting too much emphasis on technology and too little on the people who live in poverty. It reminds me of Amartya Sen (1985, 1984) accusing economists of suffering, all too often, from a "commodity fetishism." Likewise policy makers and engineers sometimes seem to suffer from a technology fetishism, based on a one-sided, over-simplified view on what technology is and what it can do. One of the advantages of adopting a CA is, so it has been claimed, that it puts *humans* at the center of our critical evaluations, not technology. Yet at the same time, so this dissertation shows, we should also watch for the other extreme of leaving fully underexposed the significance of technology itself when applying the CA. What we can learn from contemporary Science and Technology Studies and Philosophy of Technology is that for the expansion of human capabilities it strongly matters what technology exactly we are talking about and what the details of its design are (as e.g. the examples discussed in chapters 2 and 6 illustrate). It cannot be emphasized enough though, as it is somewhat paradoxical that in order to put humans and their lives central, we need to pay more rather than less attention to technology. It should, however, be the right kind of attention - based on a thorough understanding of the empirical details of specific technologies and how they interact with people's lives and with society. Technology should receive appropriate attention in our analyses, without ever letting out of sight that what we are ultimately interested in is not creating ever more advanced gadgets, but making sure that people are empowered to - as Sen would put it - live the lives they have reason to value.

Samenvatting

Technologie heeft de potentie om bij te dragen aan de kwaliteit van leven door het verruimen van wat mensen in staat zijn om te doen of zijn, hun 'capabilities' of reële mogelijkheden – het is echter niet vanzelfsprekend dat technologie dit ook daadwerkelijk doet. Een fiets zou voor een persoon haar 'capability' kunnen vergroten om te bewegen en plekken te bezoeken waar ze naar toe wil, maar dit is niet het geval als deze person verlamd is, of als ze woont in een woestijn zonder verharde wegen, of in een land waar men het hoogst onfatsoenlijk vindt voor vrouwen om te fietsen. Of een technologie leid tot de verruiming van reële menselijke mogelijkheden hangt dus af van tal van 'conversie factoren'. Net zo goed leidt het krijgen van toegang tot een telefoon of computer met internet access niet altijd, overal en voor iedereen tot een vergroting van 'capabilities'. Daarom zijn op goederen gebaseerde ontwikkelingsindicatoren, zoals het aantal mobiele telefoons per persoon in een land, maar een heel grove benadering van de kwaliteit van leven van concrete mense.

Dit proefschrift reflecteert op de relatie tussen technologie en menselijke 'capabilities' op basis van een algemeen filosofisch kader dat grote morele waarde hecht aan bepaalde 'capabilities, namelijk de zogenaamde 'capability approach' (CA). In deze benadering[107] - waarvoor de funderingen gelegd zijn door Amartya Sen en Martha Nussbaum – worden menselijke 'capabilities' vaak beschreven als de *reële* individuele mogelijkheden[108] of positieve vrijheden voor een person om te doen en zijn wat zij/hij redden heeft om te waarderen. Vaak genoemde voorbeelden van waardevolle 'capabilities' zijn die om gezond te zijn, of onderdeel van een gemeenschap. De CA onderkent dat een veelheid van zulke onderling niet uitwisselbare 'capabilities' van belang zijn voor welzijn of de kwaliteit van leven. Volgens een recentie inleiding wordt de CA;

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[107] In deze samenvatting neem ik aan dat de lezer al bekend is met de kernconcepten en -ideeën van de CA (maar indien dat niet zo is: annex I bij de introductie geeft een inleiding op de CA).

[108] De term 'capabilities' is enigszins moeilijk te vertalen in het Nederlands. 'Capaciteiten' verwijst toch vooral naar interne factoren, zoals de vaardigheden en aangeboren eigenschappen van een persoon, terwijl 'mogelijkheden' toch vooral naar externe factoren verwijst, zoals de beschikbaarheid van banen, of onderwijsinstellingen. De term 'capabilities', zo laat het voorbeeld van de fiets zien, neemt zowel deze interne als externe factoren mee – wellicht dat 'reële individuele mogelijkheden' daarom nog wel de beste vertaling is.

> "in het algemeen gezien als een conceptueel kader voor een keur aan normatieve oefeningen, inclusief met name de volgende: (1) de assessment van individueel welzijn; (2) de evaluatie en assessment van sociale praktijken en instituties, en (3) het ontwerp van beleidsvoorstellen en plannen voor sociale veranderingen in de maatschappij." (Robeyns 2011, mijn vertaling)

In het verleden is de CA al succesvol toegepast op een scala van terreinen en onderwerpen, inclusief gezondheidszorg, onderwijs, invaliditeit en gender. Tot vrij kort geleden was de CA echter nog nauwelijks toegepast als een theoretische en normatieve lens om te kijken naar technologie. De artikelen in dit proefschrift – die eerder al elders gepubliceerd zijn, of op het moment ter beoordeling bij tijdschriften en redacteuren liggen – verkennen gezamenlijk, vanuit een filosofisch en theoretisch perspectief, hoe de CA relevant en toepasbaar gemaakt kan worden voor (2) de evaluatie en assessment van technologie, en (3) het ontwerpen van technische artefacten als een manier om een positieve verandering in de maatschappij tot stand te brengen.

Hoewel de eerste publicatie specifiek over de CA en ICT al aan het eind van de jaren '90 van de vorige eeuw verscheen, zijn er tot 2007 minder dan een dozijn artikelen over de CA en technologie verschenen, verspreid over verschillende vakgebieden en tijdschriften. Dit is echter snel veranderd sinds ongeveer 2007, en er heeft zich inmidels een kleine onderzoeksgemeenschap gevormd rondom het onderwerp. Er zijn tenminste drie manieren waarop dit proefschrift gekarakteriseerd kan worden en vergeleken met het werk van anderen over dit nieuwe, zich snel ontwikkelende onderwerp. Ten eerste concentreert een overgrote meerderheid van de onderzoekers zich op ICT, en meer specifiek op 'ICT voor Ontwikkelinglanden', terwijl ik me op technologie in het algemeen richt. Tn tweede zijn veel onderzoekers die aan dit onderwerp werken afkomstig uit de empirische wetenschappen, terwijl ik een filosofische/ethische invalshoek heb. Deze invalshoek is van belang, omdat het onderwerp substantiele normatieve en conceptuele vraagstukken oproept die niet door puur empirisch onderzoek geandresseerd kunnen worden. Ten derde concentreert het grootste deel van de onderzoekers zich op de assessment van technologie of de evaluatie van projecten die een bepaalde technologie implementeren, terwijl ik me ook heb beziggehouden met het ontwerp(en) van nieuwe technologie, geinspireerd door de notie van 'waardebewust onwerpen'

afkomstig uit het gebied van de ethiek van technologie. De combinatie van deze drie dingen geeft dit proefschrift een specifiek en herkenbaar karakter.

De 'nieuwheid' van dit specifieke onderzoeksonderwerp 'de CA en technology' verklaart ten minste ten dele het exploratieve karakter van dit proefschrift. De overkoepelende onderzoeksvraag was simpelweg: *Hoe kan de CA relevant worden gemaakt voor technologie, en wat is de potentiele toegevoegde waarde?* Er zijn verschillende manieren om deze vraag te beantwoorden: de CA, zo wordt betoogd in dit proefschrift, is toepasbaar op en heeft toegevoegde waarde voor het ontwerpen van technische artefacten (hfst. 2,3), voor de evaluatie van technologische ontwikkelingssamenwerkingsprojecten (hfst. 6), en voor de assessment van technologie vanuit het perspectief van het goede leven (hfst. 7). Nu zou men kunnen denken dat de overkoepelende vraag slechts een kwestie is van het 'operationalizeren' van de CA op het zoveelste terrein. Men kan de CA echter vaak niet simpelweg rechtstreeks toepassen op een nieuw onderwerp of gebied. Zoals Robeyns (2005, mijn vertaling) hierover gezegd heeft:

> "De CA is geen theorie die armoede, ongelijkheid of welzijn kan verklaren; In plaats daarvan biedt het een gereedschap en een kader waarbinnen deze fenomenen geconceptualiseerd en geevalueerd kunnen worden. Het toepassen van de CA op onderwerpen van beleid of sociale verandering zal dus vaak de toevoeging van verklarende theorieën behoeven."

Zonder dergelijke aanvullende verklarende theorieen zou men de CA nog steeds kunnen gebruiken om bijvoorbeeld te evalueren hoe goed een bepaald 'ICT4D' project bijdraagt aan ontwikkeling en armoedebestrijding; De CA zou voorstellen om in de projectevaluatie central aandacht te besteden aan de verruiming van de waardevolle 'capabilities' van verschillende categorieen van individuen als gevolg van het project. Maar zonder additionele 'technologietheorieën' afkomstig uit vakgebieden zoals techniekfilosofie (TF) en wetenschaps- en technologiestudies (WTS) kan en zal de technologie in kwestie slechts op een algemene en oppervlakkige manier besproken kunnen worden, het blijft als het ware een zwarte doos. Dit betekent dat er een substantiele beperking zou zijn op ons vermogen om de uitkomst van het project te verklaren. Men zou dan niet kunnen onderzoeken of de technologiekeuze, of de manier waarop de technologie was ontworpen, of ingebed werd in bredere sociaal-technische netwerken, een verklarende rol speelt in het realizeren van de projectuitkomsten (voor een voorbeeld van al deze dingen, zie de casus in hfst. 6). Men zou misschien niet eens op het idee komen om te vragen naar deze

aspecten, aangezien men zonder enige 'technologie theorie' wellicht niet eens op het idee zou komen dat deze zaken mogelijk relevant zijn.

De overkoepelende onderzoeksvraag impliceert dus de volgende vraag: *Welke technologietheorieën en ontwerpbenadering zouden een vruchtbaar supplement kunnen zijn voor de CA?* Welke technologietheorieën of ontwerpbenaderingen men kiest, zal natuurlijk mede afhankelijk zijn van welk doel men heeft, maar ook van dingen als de algemene sterkes en zwaktes van de theorie of benadering in kwestie. In dit proefschrift worden de volgende technologietheorieën en ontwerp-benaderingen besproken:

- participatief ontwerpen (hfst. 2, en ook wel 3),
- waardebewust ontwerpen (hfst. 2, en vooral 3),
- de gebruiksplanvisie op technische artefacten (hfst. 4),
- inclusief/universeel ontwerpen (hfst. 2/3, en vooral 4),
- actor-netwerk theorie (hfst. 5/6),
- aangepaste technologie (hfst. 6),
- pluralistische technologietheorieën (hfst. 7) en
- de systeem/netwerk visie op technologie (chapter 7).

Het leggen van een connectie tussen de CA en een bepaalde technologietheorie of ontwerpbenadering is soms niet alleen nodig om de CA te 'operationaliseren', maar kan ook nuttig zijn voor de technologietheorie of ontwerpbenadering in kwestie. De CA heeft bijvoorbeeld, zou men kunnen zeggen, iets waardevols te bieden aan de bewegingen die participatief ontwerpen, inclusief/universeel ontwerpen of aangepaste technologie bevorderen. In al deze gevallen ligt de toegevoegde waarde van de CA, algemeen gesproken en niet geheel verassend, in haar vermogen tot het faciliteren van een coherente en systematische ethische reflectie op de waardes die in de betreffende theorie/benadering centraal staan.. Waarden zoals actorschap, rechtvaardigheid en welzijn kunnen meer concrete en grijpbaar worden gemaakt voor ingenieurs en ontwerpers door ze, zoals de CA doet, te relateren aan concrete 'capabilities' en de conversiefactoren die relevant zijn voor een bepaalde technologie of technologisch ontwerp.

Wat betreft de keuze voor technologietheorieën en ontwerpbenadering ter aanvulling van de CA springen twee algemene aandachtspunten in het oog. De eerte is dat het niet trivial hoeft te zijn welke aanvullende theorie of benadering gekozen wordt. Hoewel het maken van zo'n keuze in het algemeen onvermijdbaar is bij het 'operationalizeren' van de CA, kan het ook het geval zijn dat die specifieke keuze onderwerp van debat en meningsverschil wordt. Robeyns (2008) heeft bijvoorbeeld aangetoond dat men tot verschillende

'capability' analyses of normatieve evaluaties van bepaalde gender casussen kan komen, afhankelijk van of men de CA aanvult met een conservatieve of feministische gender theorie. Het is dus niet uitsluitend en alleen de CA die het werk doet in dergelijke analyses. Iets soortgelijks is het geval als je de CA toepast op technologie casussen. Een voorbeeld hiervan is te vinden in hoofdstuk 7, waarin pluralistische technologietheorieën gecontrasteerd worden met de systeem/netwerk visie op technologie. Dit hoofdstuk illustreert dat wat men ziet door de lens van de CA bij het reflecteren op technologie en het goede leven, mede afhangt van welke filters men toevoegt aan deze lens. Het tweede aandachtspunt is dat je je er natuurlijk van bewust moet zijn dat verschillende theorieën en benaderingen, op meer of minder subtiele manieren, wel eens incompatibel zouden kunnen zijn – bijvoorbeeld omdat de onderliggende aannamen of de definieren van bepaalde begrippen met elkaar botsen. Een illustratie hiervan kan gevonden worden in hoofdstuk 5, dat expliciet ingaat op een van de meest fundamentele vragen die zich voordeed tijdens dit onderzoek: *Wat is de aard van de relatie tussen technologie en 'human capabilities' ofwel reële menselijke mogelijkheden?* Het hoofdstuk maakt gebruik van Actor-Netwerk Theorie (ANT) om deze vraag te beantwoorden. In annex I bij dit hoofddstuk verken ik de verenigbaarheid van de CA en ANT meer in detail, in dit geval met de conclusie dat je bepaalde delen van de beide benaderingen zou moeten laten vallen, of selectief zou moeten accepteren, om coherentie te garanderen.

Maar wat is dan de aard van de relatie tussen technologie en 'human capabilities' ofwel reële menselijke mogelijkheden? Het beantwoorden van die vraag vereist natuurlijk een goed begrip van zowel de aard van 'human capabilities' binnen de context van de CA, als van de aard van technologie. Een aantal van de eerder genoemde verklarende technologietheorieën zijn gebruikt om deze vraag te beantwoorden. Er is echter geen overeenstemming of algemeen geaccepteerde visie op wat de aard van technologie is. In de loop van de geschiedenis en binnen verschillende disciplines is 'technologie' op verschillende manieren gedefinieerd en begrepen, bijvoorbeeld als product, proces of een vorm van kennis. Deze samenvatting is niet de plek om dat in detail te bespreken, maar grofweg is de visie op technologie die in dit proefschrift aangehouden wordt dat het een set van materiele artefacten of systemen van dergelijke artefacten betreft, ontworpen om een bepaalde functie te vervullen. Op de aard van menselijke 'capabilities' kan men ook verschillende visies hebben, maar binnen de CA wordt dit concept op een specifieke manier gedefinieerd, hetgeen het meest expliciet geadresseerd wordt in de hoofdstukken

4 en 5. Deze hoofdstukken maken duidelijk dat 'capabilities' binnen de CA relationeel en contextueel van aard zijn, wat betekent dat ze niet alleen van de eigenschappen van een persoon afhangen (zoals het vermogen om al dan niet zijn benen te gebruiken), maar ook van de relatie waarin de persoon staat tot socale instituties, de fysieke omgeving en zo voort (zoals sociale normen met betrekking tot fietsen, of de aanwezigheid van wegen). Verder wordt de term binnen de CA gebruikt als een ethische sub-categorie.

Gebaseerd op dit begrip van technologie respectievelijk 'human capabilities', heb ik de volgende basisvisie ontwikkeld tijdens dit doctorale onderzsoeksproject: het begrijpen van de relatie tussen technische artefacten en menselijke 'capabilities vereist dat we afwisselend zowel 'inzoemen' als 'uitzoemen'. Dit is vervolgens ook de structuur geworden van dit proefschrift:

- 'Inzoemen' (deel I van dit proefschrift, hfst. 2-4) maakt het mogelijk om de specifieke eigenschappen of ontwerpdetails van technische artefacten te zien;
- 'Uitzoemen' (deel II van dit proefschrift, hfst. 5-7) maakt het mogelijk om te zoen hoe technische artefacten ingebed zijn in bredere socio-technische netwerken en praktijken.

Zowel de ontwerpdetails als de socio-technische imbedding van technische artefacten, zo maken de hoofdstukken in dit proefschrift duidelijk, zijn relevante factoren in het verruimen van menselijke 'capabilities.' Dat laatste perspectief – uitzoemen – omarmt ook culturele normen, collectieve gebruikspraktijken en andere 'softe', niet-materiele factoren. Het gemaakte onderscheid suggereert twee complementaire basisstrategieën als bijvoorbeeld een ontwikkelingsorganisatie zich tot doel stelt om effectief bij te dragen aan de verruiming van waardevolle menselijke 'capabilities' met behulp van technologie. Aan de ene kant kan het ontwerp van een technisch artefacts geschikt worden gemaakt – voor zover mogelijk – voor de relevante socio-technische omgeving zoals die op dat moment bestaat (zie hoofdstuk 4). Aan de andere kant kan men er voor zorgen – voor zover mogelijk – dat de introductie van een technisch artifact gepaard gaat met gepaste veranderingen in de socio-technische omgeving (zie hoofdstuk 5). Beide strategieën zouden bij voorkeur gecomineerd moeten zorden – zoals de analyse van een redelijk succesvol ICT4D project in hoofdstuk 6 laat zien.

Het mainstream debat over de digitale kloof tussen arm en rijk en over 'ICT voor ontwikkelingslanden' is door sommige auteurs bekritiseerd omdat het te veel nadruk zou leggen op technologie en te weinig op de mensen die in armoede leven. Dit doet me denken aan de beschuldiging die Amartya Sen wel eens geuit heeft op economen, die volgens hem maar al te vaak aan een 'goederen fetishime' lijden. Enigszins vergelijkbaar lijken beleidsmakers en ingenieurs soms te lijden aan een technologie fetishisme, gebaseerd op een eenzijdige, overgesimplificeerde visie op wat technologie is en wat het kan doen. Een van de voordelen van het toepassen van de CA, zo is wel gezegd, is dat het *mensen* centraal stelt in onze kritische analyzes, en niet technologie. Tegelijkertijd, zo laat dit proefschrift zien, moeten we ook uitkijken voor het andere uiterste van het volledig onderbelicht laten van technologie bij het toepassen van de CA. Wat we kunnen leren van de hedendaagse Techniekfilosofie en van Wetenschaps- en Technologiestudies, is dat het voor het verruimen van reële menselijke mogelijkheden van groot belang is over wat voor technologie we het precies hebben en wat de ontwerpdetails zijn (zoals de voorbeelden besproken in hfst. 2 en 6 laten zien). Dit kan niet te veel benadrukt worden, omdat het enigszins paradoxaal is dat om mensen en hun daadwerkelijke levens centraal te stellen, we meer in plaats van minder aandacht aan de technologie moeten besteden. Het moet echter de juiste soort aandacht zijn – gebaseerd op een diepgaand begrip van de empirische details van specifieke technologieën en hoe deze in wisselwerking staan met het leven van mensen en met de maatschappij. Technologie moet dus gepaste aandacht krijgen in onze analyses, zonder ooit uit het oog te verliezen dat we uiteindelijk niet geinteresseerd zijn in het creëren van steeds maar meer geavanceerde artefacten, maar in ervoor zorgen dat mensen in hun kracht worden gesteld om – in de woorden van Amartya Sen – het leven te kunnen leiden dat zij met recht waarderen.

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[111] ICT4D Collective, Royal Holloway, University of London.

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About the author

Ilse Oosterlaken (1976) obtained her combined bachelor/master degree in 2001 from Eindhoven University of Technology, in the multidisciplinary program Technology & Society. She took her engineering courses at the Faculty of Architecture, Building and Planning. Within the 'society side' of the program she specialized in International Technology & Development Studies. As part of her studies she spent 2.5 months in Tanzania, 4 months in South Africa and 8 months in Thailand. From 2003 to 2007 she was enrolled as a part-time student in Philosophy at the University of Utrecht. In 2011 she finally found time to write the thesis that gave her a bachelor degree in Philosophy. This mixed academic background has served her well in writing this doctoral dissertation, which is part of the NWO-funded project 'Technology and Human Development – A Capability Approach'. The project is a close collaboration between ethicists of technology and industrial designers. Ilse was one of the co-applicants for this grant application, written while she was – since December 2006 – the communication/policy officer of the 3TU.Centre for Ethics and Technology. Starting September 2009, she has been a full-time PhD candidate at the philosophy section of TU Delft. One of the highlights during this period was organizing the annual conference of the Human Development & Capability Association (HDCA) in September 2011, with innovation as its theme. She also spent 6 weeks as a visiting scholar at the Uehiro Centre for Applied Ethics, University of Oxford, 2 weeks at the ICT4D Collective, Royal Holloway, University of London and 6 weeks at the University of Sussex, STEPS Centre (which is linking environmental sustainability and technology with poverty reduction and social justice).

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Simon Stevin (1548-1620)

'Wonder en is gheen Wonder'

This series in the philosophy and ethics of technology is named after the Dutch / Flemish natural philosopher, scientist and engineer Simon Stevin. He was an extraordinary versatile person. He published, among other things, on arithmetic, accounting, geometry, mechanics, hydrostatics, astronomy, theory of measurement, civil engineering, the theory of music, and civil citizenship. He wrote the very first treatise on logic in Dutch, which he considered to be a superior language for scientific purposes. The relation between theory and practice is a main topic in his work. In addition to his theoretical publications, he held a large number of patents, and was actively involved as an engineer in the building of windmills, harbours, and fortifications for the Dutch prince Maurits. He is famous for having constructed large sailing carriages.

Little is known about his personal life. He was probably born in 1548 in Bruges (Flanders) and went to Leiden in 1581, where he took up his studies at the university two years later. His work was published between 1581 and 1617. He was an early defender of the Copernican worldview, which did not make him popular in religious circles. He died in 1620, but the exact date and the place of his burial are unknown. Philosophically he was a pragmatic rationalist for whom every phenomenon, however mysterious, ultimately had a scientific explanation. Hence his dictum 'Wonder is no Wonder', which he used on the cover of several of his own books.