

Product innovation for human development

A capability approach to designing for the Bottom of the Pyramid

Working paper of the

3TU.Centre for Ethics and Technology

Ilse Oosterlaken
May 26th, 2008
Delft: Delft University of Technology

Introduction

In his book *“The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits”* Prahalad (2004) proposes to see the about four billion people living on less than \$2 per day not as victims to be assisted, but rather as value sensitive consumers. If businesses adjust their products to this target group, businesses making profit can at the same time eradicate poverty. This message has been received positively not only by companies, but also by organizations in the field of developing cooperation, where it has become increasingly clear that development efforts require a sound economic and financial basis. Industrial design engineers have taken up the challenge posed by Prahalad. In the past few years they have been doing research on how technology-based products can, in a business context, be designed in such a way that they meet the needs of people in developing countries. Examples of design projects executed so far are the design of a malaria diagnostics device (India), a solar lantern (Cambodia), a screening device for early oral cancer detection (India) and Lifestraw, a personal water purifier (Ghana). Some research projects focused not on the design of a specific product, but on facilitating and understanding the design process for the BoP market itself. Examples are the development of an IT toolkit for creating market insight for designers and a tool for contextualizing products.

This project starts from a recognition of the potential of such product innovations to contribute to human development, but also identifies some pitfalls and problems. Firstly, it should not too easily be assumed that the win-win situation of profit plus poverty reduction arises whenever a company successfully introduces an innovative product or technology in a developing country. Issues may arise about who wins and who doesn't, the distribution of benefits or the larger socio-economic consequences. Secondly, technology is – so philosophers of technology have made clear – not a neutral instrument to be used at will for either good or bad, but always rather value-laden. This means that the details of the design are morally significant. Not just any design will do. This has led to the emergence of the research field of ‘value sensitive design’, that investigates how we can incorporate our moral values – such as justice or safety – in the designs that we make for new technologies. Thirdly, there are strong arguments that the proper focus for development efforts is not – as Prahalad suggest - the reduction of income poverty, but rather the enhancement of human capabilities.

As a response to these worries, this project proposes a capability approach to designing products and technologies for the Bottom of the Pyramid. According to the capability approach the morally significant element in questions of justice and development is not income, access to resources or well-being, but human capabilities. On an intuitive level adopting the capability approach immediately seems to be strongly compatible with recognizing and improving the contribution of technology and engineering products to development. After all, from a common sense point of view it seems obvious that technology is supposed to increase the capabilities that we as human beings have. The aim of this project is to advance an approach that we would like to call ‘capability sensitive design’.

The first sub-project will – on a theoretical level – explore the link between technology and the capability approach. The second sub-project will be an applied one, where capability sensitive design is used, evaluated and further developed on basis of actual cases of product development for developing countries.

Table of contents

Introduction	2
Table of contents	3
1. The contribution of technology to human development	4
2. The bottom of the pyramid, poverty and product innovation	6
3. The capability approach.....	8
4. An example: 'Fair & Lovely' in India.....	11
5. Technology as capability expansion.....	13
6. An example: The Village Phone Program in Bangladesh	15
7. The significance of the details of design, with the bicycle as example.....	17
8. The contribution of industrial design engineering.....	20
9. Issues in capability sensitive design.....	23
10. Focus: health care products for developing countries	25
References	26

1. The contribution of technology to human development

As the scientist Freeman Dyson (1999) illustrates, “it is easy to make a list of historical examples showing how technology has sometimes contributed to social justice.” Looking forward to the future, however, he argues that “we need to apply a strong ethical push to add force to the technological pull. Ethics must guide technology in the direction of social justice”. The new direction needed, he says, is “away from toys for the rich and towards necessities for the poor”. This project is about making technology contribute to human development, to improving the lives of people in developing countries. There are roughly three ways of looking at the contribution of technology to achieving this goal (Leach and Scoones 2006). Firstly, development can be seen as industrial modernisation and economic growth, with technology as the driving force behind this process. In this view “poverty will be reduced by the trickle down of economic benefits to the poor”. Leach and Scoones quote the (UN Millenium Project Task Force on Science Technology and Innovation 2005) as taking this perspective. Secondly, there is the view that science and technology can have “a direct and widespread impact on poverty”, with research being directed towards “big-hitting technologies with the potential for global scope and applicability.” Examples include the green revolution in the 1960s/1970s and the health research supported by the Bill and Melinda Gates Foundation¹. The third perspective is the one that Leach and Scoones want to promote and that is also the closest to the approach taken in this project:

“This emphasises pathways to poverty reduction which may involve science and technology, but are specific to local contexts. It recognizes that technological fixes are not enough, and that social, cultural and institutional dimensions are also key. And it sees science and technology as part of a bottom-up, participatory process of development, where citizens themselves take centre stage. [...] citizens are seen as knowledgeable, active and centrally involved in both the ‘upstream’ choice and design of technologies, and their ‘downstream’ delivery and regulation.” (Leach and Scoones 2006)

Strong parallels can be drawn between this work of Leach and Scoones and a recent paper of innovation scholar Soete (2008), in which he describes a shift currently taking place in the area of research and innovation for development purposes. Since the 1950s, he describes, there has been a strong focus on industrial, large-scale, science-based and professionalised R&D in support of economic growth. Inside R&D facilities knowledge creation, engineering and design took place, outside of these labs production and consumption. With respect to developing countries, says Soete, this “old mode of technological progress” quite naturally emphasises the importance of technology transfer and imitation. Similarly, Leach and Scoones note that effective technology transfer is a key concern in the first two views on technology and human development that they identified.

However, so innovation studies scholars have noted, “innovation capability is today seen less in terms of the ability to discover new technological principles, but more in terms of an ability to exploit the effects produced by new combinations [...] and the use of pieces from the existing stock of knowledge.” In this type of innovation a greater diversity of actors is involved, resulting in a much more complex knowledge structure (Soete 2008). Similarly, the rising popularity of the third approach of Leach and Scoones leads to the emergence of “new patterns of partnership” between “public and private research organisations, NGOs, farmers’ associations, processing and marketing businesses.” This, they say, contrasts with “a linear model, in which funds are allocated to scientists, whose results are then handed to others, who are expected to deliver to a target audience” (Leach and Scoones 2006).

What Soete labels the “new mode of technological progress for development” will, according to him, take place much closer to “users contexts” - a parallel can be drawn with Leach and Scoones’ citizen participation. As an illustration of the fact that this innovation shift is indeed taking place Soete mentions the success of Prahalad’s book “The Fortune at the Bottom of the Pyramid” (Prahalad 2004, see next section), which is also mentioned by Leach and Scoones. One last parallel between these authors is that they see their ‘new model of innovation’ as bearing strong resemblance to the ‘appropriate technology’ movement of the

¹ Freeman Dyson seems to take this perspective too when he argues that “poverty can be reduced by a combination of solar energy, genetic engineering, and the internet”. However, he also says that “one of the virtues of solar energy is in fact that it can be collected in many ways. It is adaptable to local conditions” (Dyson 1999), thus recognizing that it is not a matter of ‘one size fits all’.

1970s. Soete, however, launches the term 'appropriate innovation' to indicate that it is a "much more open" approach in comparison with appropriate technology, which was "defined in terms of a rational set of economically determined 'choices of technique'."

Simply transferring a technology from a western context to developing countries will, clearly, not work in this new model of innovation; "Every innovation appears now unique with respect to its application", Soete claims. Appropriate innovation for developing countries will thus not be easy:

"Learning from previous experiences or from other sectors is difficult and sometimes even misleading. Evaluation is difficult because of changing external environments: over time, among sectors, across locations. It will often be impossible to separate out specific context variables from real causes and effects. Technological progress will be much more of the trial and error base yet without as in the life sciences providing 'hard' data, which can be scientifically analysed and interpreted." (Soete 2008)

Nevertheless Soete thinks that to make a success of this new innovation model "might ultimately well involve engineering expertise, design capabilities even research". It requires, as mentioned before, that "innovation activities will be close to Bottom of the Pyramid (BoP) users contexts". Compared to the old model "the innovation process itself is likely to be reversed, starting with the design phase which will be confronted most directly with the attempt to find functional solutions to the BoP users framework conditions". This may lead to new forms of technology transfer: "The feedback from BoP users and from design developers upstream [...] is possibly the most interesting new example of reverse transfer of technology (from the South to the North)" (Soete 2008).

It should be noted that positions similar to the ones of Leach, Scoones (British) and Soete (Dutch) can also be found in the South. Take, for example, a pamphlet of Indian activist and author Vandana Shiva. She formulated a critical reaction to the Human Development Report 2001 (UNDP 2001), which, we believe, displays all the characteristics of the first two perspectives on technology and development that were identified by Leach and Scoones. Shiva writes:

"The Human Development Report 2001 focusing on "Making New Technologies work for Human Development" [...] reverses the search for new perspectives and paradigms, especially for assessing technologies. It slips into promoting the most outmoded development paradigms and crude forms of technology myths and technological determinism, sacrificing the rich insights and experiences gained over the past two centuries of technology change in agriculture and health care. [...] There is, however, another perspective which treats technological change as a process that is shaped by and serves the priorities of whoever controls it. In this perspective, a narrow social base of technological choice excludes human concerns and public participation. [...] The debate about technology today is about ecology, ethics, culture, livelihoods and justice. It is about cultural diversity and cross cultural fertilization of innovation. It is no longer about the west as the only source of technology, and North to South as the only direction of technology flows. It is about bringing ecology and culture to the heart of technology." (Shiva 2001).

2. The bottom of the pyramid, poverty and product innovation

With "The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits" the business scholar C. K. Prahalad (Prahalad 2004) has written a book that has been widely acclaimed. His main thesis is that the about four billion people who live on less than \$2 per day (those in the 'bottom' or 'base' of an income distribution graphic in the shape of a pyramid) should no longer be seen as victims to be assisted, but rather as value sensitive consumers. If multinational corporations (MNCs) do that and adjust their products and business model to suit the needs of the poor in developing countries, Prahalad expects a win-win situation to arise; The companies will make profit on these new markets while at the same time poverty gets eradicated. However, he warns his corporate audience, "selling to poor consumers requires innovative research and development". Experience has taught that "successful product development requires a deep understanding of local circumstances, so that critical features and functionality can be incorporated into the product's design" (Hammond and Prahalad 2004).

That Prahalad's message was favorably received by the business community is not surprising; they would be able to satisfy their stockholders while at the same time doing well in the area of corporate social responsibility. In addition, Prahalad's ideas also link up nicely with a tendency in the world of development cooperation to increasingly see the relevance of business and economic development². Governments, multinational organizations and NGOs nowadays often recognize that without a sound financial and economic basis, their development efforts will not be durable. The attention nowadays being paid to micro credit is a clear illustration of this. According to Laundrum (2007), the contribution of Prahalad lies in "first, raising awareness of the BoP, the challenges they face, and global poverty and second, challenging corporations to increase innovation and creativity, with a special emphasis on strategies for entering emerging economies." However, there has also been a lot of criticism on Prahalad's proposal for a BoP strategy. These include – amongst others - critique on his estimations of the size of the BoP market, the ability of MNCs to be successful in this market segment and the insufficient support that his case studies – some featuring non-profit organisations rather than MNCs – would provide for this position (Laundrum 2007). Of all the critique that Prahalad received, two are especially relevant to this research project.

Firstly, there is criticism related to how the poor in developing countries are approached and in which way they are involved in BoP initiatives (Laundrum 2007; Jaiswal 2007; Karnani 2007). Prahalad's call for "a deep understanding of local circumstances" and the needs and wants of the poor may be interpreted as just sound business advice and many companies are likely to follow it only to the point that is needed for ensuring corporate profits. It may very well be the case that nothing like the citizen participation and co-creation envisaged by Leach, Scoones and Shiva takes place³. Laundrum (2007) warns about a too western orientation and ethnocentrism of MNCs. Boguslaw and Boyle (2008) remark that "what is profitable for business may not necessarily be good for the poor." Karnani (2007) and Jaiswal (2007) also worry that intensive marketing may seduce the vulnerable poor to spend their money on products that they don't need and that may even have negative side effects. Especially since adequate consumer protection is often lacking in developing countries (Karnani 2007) one may wonder whether this is not unethical, as Jaiswal (2007) claims.

Secondly, there is discussion about what is the proper focus of attempts to eradicate poverty by means of BoP initiatives. The BoP literature is said to be too much focused on *income* poverty (Crabtree 2007; Boguslaw and Boyle 2008). Although the traditional notion of income poverty is still used nowadays in development cooperation, it is now commonly accepted that the more comprehensive notion of multidimensional poverty (for example the Human Development Index, that uses data on life expectancy, education and standard of living) is more adequate⁴. The even more complex and comprehensive notion of

² See, for example, www.businessindevelopment.nl and the UNEP project 'Human Development through the Market'. (http://www.scp-centre.org/uploads/media/HDtM_InANutshell_01.pdf)

³ As an indication that this may indeed be the case: of 28 abstracts that Green Management International received for a special issue on the BoP strategy, none dealt with the needs and aspirations of the poor people at the bottom of the pyramid. Editors Kandachar and Halme find this surprising and conclude that "the needs of the poor demand attention. They need to be more actively involved in product and service development, and more sophisticated means of need assessment are required to make their voices heard" (Kandachar and Halme 2007).

⁴ To Prahalad's defense one might remark that many of his case studies, as Crabtree also admits, are not focussed on income, but on "other aspects of multidimensional poverty such as health and housing". However, then we just come back to earlier mentioned criticism

development as “expanding the real freedoms that people enjoy” (Sen 1999) or – put differently – enhancing human capabilities (see next section), has also been gaining popularity. Crabtree sees the enhancement of human capabilities as the right evaluative framework for BoP initiatives. Boguslaw and Boyle propose that BoP initiatives should be about increasing the assets of the poor⁵. They refer to a quite extensive body of literature to support their claim that asset development should be at the core of poverty reduction. However, that does not clash with Crabtree’s position, since assets can be seen as “one aspect of long-term capabilities” (Sherraden 2007) and asset development and capability enhancement as complementary approaches (Cabral, Russell, and Singh 2006).

Further (empirical) research is clearly necessary into matters such as the effectiveness of following a BoP strategy towards poverty alleviation, factors leading to success or failure, the needs of the poor and unanticipated side effects (Boguslaw and Boyle 2008; Jaiswal 2007; Laundrum 2007; Kandachar and Halme 2007). Following Crabtree, we propose to do this by further exploring the connection between the capability approach and a BoP strategy towards human development. We do this by applying the capability approach directly to the heart of the matter: innovative, technology-based products and the design processes that bring them about.

that his case studies do not support his overall position. Moreover, the BoP literature nowadays is much broader than just the work of Prahalad.

⁵ Assets are referred to as the “stock of wealth on which human lives and livelihoods ultimately depend”. As a further explanation: “income is what people use to survive – to meet their most basic daily needs – while assets are what people use to move ahead”.

3. The capability approach

The capability approach has been pioneered by the economist and philosopher Amartya Sen (Sen 1999, 2005) and further developed by him and the philosopher Martha Nussbaum (Nussbaum 2000, 2006). According to this approach the proper philosophical foundation of and evaluative space in questions of distributive justice, equality and development is not income, not resources, not primary goods, not utility or preference satisfaction. Rather the focus, it is argued by proponents, should be on human capabilities. One example that is often given in arguing for a focus on 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 be varies:

“... 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)

The reason why capability theorists prefer these capabilities over utility is the phenomenon of what 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)

Johnstone (2007) thinks that issues related to an inability “to make proper determinations of value” are “particularly salient in the case of technology, since users may have a very limited informational basis on which to make value determinations.”

Not everybody agrees with the capability approach - there is still a lot of philosophical debate going on about what would be the best focal point for theories of justice and equality and what the exact differences between theories emphasizing, say, resources or capabilities are (see for example Keleher 2004; Berges 2007; Robeyns and Pierik 2007; Robeyns 2005). The well-known global ethicist Thomas Pogge is one of the people arguing against the capability approach (Pogge 2002). Although this project is positive about the potential of the capability approach and takes it as a starting point, these debates will not be ignored; The project will explore the theoretical and practical value of the capability approach in the specific context that was sketched earlier (product innovation in developing countries) , but with an open eye towards the critiques and alternatives. That being said, let us now take a more detailed look at what the capability approach entails.

Capabilities can be 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 that these authors give 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”, explains Robeyns, “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”. According to Alkire (2005a) one reason to focus on capabilities instead of functionings is because 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.” This brings us to another important aspect of the capability approach: the distinction it makes between well-being and agency and the importance it attaches to both (Robeyns 2005; Alkire 2005).

The capability approach has led to lively debates on several issues. One very important debate is about which capabilities matter and who (how, when) is to decide about this (Robeyns 2005). It should be noted that there is in reality not just one capability approach, many different versions exist. Even between Sen and Nussbaum, the pioneers in this field, large differences exist (Robeyns 2005; Alkire 2002). The first

difference that Robeyns mentions is that “whereas in Sen’s work the notion of capabilities is primarily that of 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 Nussbaum comes up with a concrete and universally applicable list of important capabilities, organized in ten categories. Some examples (Nussbaum 2006) are: “being able to have good health” (under the category ‘bodily health’), “being able to move freely from place to place” (under ‘bodily integrity’), “being able to participate effectively in political choices that govern one’s life” (under ‘control over one’s environment’) and “being able to use the senses, to imagine, think, and reason” (under ‘senses, imagination and thought’). On the other hand “Sen has always refused to endorse one specific well-defined list of 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. More differences could be mentioned, but this research proposal is not the place to discuss these differences, or to compare the problems and advantages of the approaches of Nussbaum and Sen in detail.

The question of operationalisation has, understandably, also been asked quite a lot (Alkire 2005, 2002). How do we expand the capabilities or positive freedoms of people and how do we measure the results? There seems to be no clear-cut, simple answer to that; “For some of these capabilities”, says Robeyns (2005), “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.” To make it even more complex, the conversion from goods into functionings, so Robeyns explains, is influenced by personal, social and environmental conversion factors (see figure 1).

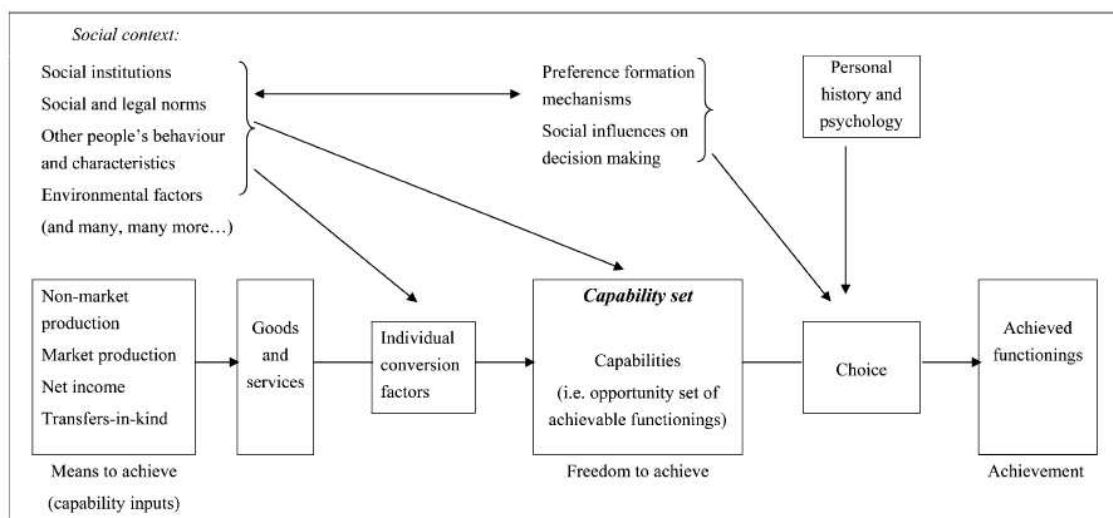


Figure 1 - “A stylised non-dynamic representation of a person’s capability set and her social and personal context” (Robeyns, 2005)

Alkire (2002, 2005) appoints information and principle pluralism as important features of the capability approach. Robeyns (2005) sees this broadness of the approach not as a problem, but rather as an advantage, since it can thus take human diversity into account. It does so “in two ways: by its focus on the plurality of functionings and capabilities as the evaluative space, and by the explicit focus on personal and socio-economic conversion factors of commodities into functions, and on the whole social and institutional context that affects the conversion factors and also the capability set directly.”

Robeyns (2006) counted nine different types of applications of the capability approach: (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) assessing gender inequalities and (9) functionings and capabilities as concepts in non-normative research.

Considering the information and principle pluralism in the capability approach and the diversity of its applications, it is not surprising that Alkire (2005) argues about the capability approach 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. Robeyns (2005) sees the capability approach as “highly interdisciplinary” in nature and Alkire (2005) similarly argues:

“You could think of the application fields of the capability approach, then, as a set of boxes, each consisting of the related technical disciplinary tools, whether of gender analysis or nutritional science or econometrics or decision theory or policy-making” [...] The ‘things’ inside the boxes are relatively well worked out. [...] One problem is that the tools inside the boxes are not connected to the capability approach — the information flow between the emphases of the capability approach and the various literatures does not exist; the implications are not driven through. The other problem is that the tools inside the boxes are not easy for those outside to use. They require skills and techniques that take years and years to learn. Experts in their field know them yet other researchers may not have mastered them. [...] How do we address this? Part of the further research must be to carefully study the best existing work in different areas and try to trace through how the capability approach could be applied. This will require rather a great deal of creativity. [...] Another part of the research is either to master new techniques (the very worst thing researchers could do is second-class technical work) or to develop collaborative relationships with colleagues who are experts in a particular tool or field that is of interest. [...] So what will operationalizing the capability approach look like? It may be a collaborative enterprise, with many researchers working on different aspects at the same time. Researchers and practitioners will have to keep communicating with one another in order to build up a consistent set of simplifications and also create more momentum.” (Alkire 2005)

Alkire gives the examples of nutritional science and econometrics as disciplines relevant for the application of the capability approach. She does not mention engineering, but she easily could have, as will be explained in section 1.5. But first, let us take a look at an example illustrating which difference a focus on capabilities in a BoP context could make.

4. An example: 'Fair & Lovely' in India

There is a skin cream called 'Fair & Lovely', that promises to whiten your skin color. It is marketed by Unilever in countries like India. Karnani (2007) takes it as an example in his article about the Bottom of the Pyramid strategy and is quite critical of the product. One of the TV ads aired for Fair and Lovely in India illustrates perfectly why, it:

"showed a young, dark-skinned girl's father lamenting he had no son to provide for him, as his daughter's salary was not high enough – the suggestion being that she could not get a better job or get married because of her dark skin. The girl then uses the cream, becomes fairer, and gets a better-paid job as an air hostess – and makes her father happy." (BBC News 2003)

Not surprisingly, such advertisements raised quite a lot of protest, amongst others from the All India Democratic Women's Association, since they are "racist, discriminatory, and an affront to women's dignity". In the end, two advertisements were banned by the Indian government. Prahalad, however, says of a poor sweeping woman using Fair & Lovely that she "has a choice and feels empowered because of an affordable consumer product formulated for her needs" (Hammond and Prahalad 2004) – needs that only exist because of racist and sexist prejudices in Indian society. Moreover, the product can apparently have negative side-effects for your health. Nevertheless, it is popular with consumers. "This is no empowerment!", Karnani fulminates. "The way to truly empower a woman is to make her less poor, financially independent, and better educated; we need social and cultural changes that eliminate the prejudices that are the cause of her deprivations."

This example is given in support of Karnani's worries that the BoP strategy "could result in the poor spending money on products such as televisions and shampoo that would have been better spent on higher priority needs such as nutrition and education and health." Prahalad dismisses such arguments as patronizing and arrogant; "the poor themselves", so Karnani puts Prahalad's position into words, "are the best judge of how to maximize their utility". This Karnani doubts, because "the poor are vulnerable by virtue of lack of education (often they are illiterate), lack of information, and economic, cultural and social deprivations" and he supports his position by referring to Sen's argument of adaptive preferences. Because the preferences of a person are shaped by her/his background and experiences, says Karnani, we have to look beyond them and – here he quotes Sen – focus on "people's capabilities to choose the lives they have reason to value." We should, he believes, impose constraints on the right of companies to make profits by selling and advertising products such as Fair & Lovely. Unfortunately such consumer protection, present in rich capitalist countries, is "inadequate" in developing countries.

Interestingly, later on in his article it seems that Karnani does not succeed in consistently sticking to this position. He claims that "to have a significant impact on the purchasing behavior of the poor, the BoP proposition calls for price reductions of over 90%" and claims that this is only doable by an enormous reduction of the quality of products. In his writings and speeches Prahalad always emphasises that the BoP strategy should lead to high-quality products and services. Yet the poor, says Karnani, "do like inexpensive, low-quality products!" The poor, not being able to "afford the same quality products as the rich", have a "different price-quality trade-off". He gives the example of Nirma, a low-price locally developed detergent that is apparently very successful in India. "They are even willing", Karnani emphasises, "to put up with a detergent that sometimes causes blisters!" And he concludes with:

"Selling inexpensive, low-quality products does not hurt the poor (as long as they understand any trade-offs related to safety). Insisting on not lowering the quality actually hurts the poor by depriving them of a product they could afford and would like to buy. The BoP proposition argues that selling low quality products to the poor is disrespectful. Quite the contrary, imposing our price-quality trade-off on the poor is disrespectful of their preferences." (Karnani 2007)

But are we certain that these vulnerable poor, lacking education, do understand the trade-offs? How come that we should now all of a sudden respect their preferences, instead of focusing on what they have really reason to value? It may be that it is justifiable in this case because a few blisters now and then is not as harmful as being reinforced in your idea that a dark skin color is undesirable. Where to draw the line?

This example was about a beauty product; not what most people would label as a technology. Also, it was not so much about the design of products, but rather about the marketing of products. Ethical

questions concerning the marketing approach of multinationals towards the 'bottom of the pyramid' have already been raised by several authors (Laundrum 2007). They will not be at the core of this project. Nevertheless it seemed relevant to discuss this example, because it did bring out clearly the philosophically interesting dilemma of focusing on satisfying people's actual preferences or on enhancing people's capabilities, a dilemma that is also very relevant for the design stage of new products and technologies. Let us now take a look at the relationship between technology and human capabilities.

5. Technology as capability expansion

On an intuitive level adopting the capability approach immediately seems to be strongly compatible with recognizing and improving the contribution of technology and engineering products to development. After all, from a common sense point of view it seems that technology is supposed to increase the capabilities that we as human beings have. 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. However, ideally we still intend them to add to our capabilities to survive (such as in the case of medical equipment), to participate in public deliberation (such as in the case of ICT/internet applications that facilitate political discussion), etc. Nevertheless, this idea of making an explicit (theoretical) connection between the capability approach and technology and engineering has hardly received any attention in the literature.

Two explorative, agenda-setting articles appeared only recently (Johnstone 2007; Zheng 2007), both concerned with ICT. In connecting the capability approach with technology, Johnstone draws support from philosophers in the domain of cognitive science, where “technology is identified with tools and techniques by which we use the world to extend our powers”, or more specifically “our thinking capabilities” in the case of ICT. The relevant functionings in the latter case are “calculation, thought, communication, expression and interaction”. In addition to the direct technology-capability relationship, Johnstone points out that “the theoretical framework allows for technology to have an indirect effect [i.e. on capabilities] through its influence on the wider social and material environment.” Zheng also sees multiple connections between technology and the capability approach. “The exploitation of commodities, such as technology”, she writes, referring to the illustration of Robeyns in the previous paragraph, “certainly contributes to not only social conditions but also personal characteristics which would feedback to the conversion factors and decision making mechanisms.”

The advantage that Johnstone sees of applying the capability approach in computer ethics is that “we can thus bring in the picture the kind of system-level effects that can be problematic in conventional ethical theory” – she characterizes the latter as agent/action centered. Zheng feels that the capability approach can offer a philosophical and conceptual foundation that can help to avoid some “existing or potential pitfalls in e-development”, which she identifies as (1) “a simplistic correlation between ICT acquisition and diffusion and the improvement of people’s well-being”, (2) “an implicit assumption that ICT is intrinsically good and beneficial for human development, namely, it embodies a set of ultimately desirable functionings that are achievable in developing countries”, (3) “the unquestioning pursuit of ICT diffusion across contexts, and a tendency to apply universal criteria on using ICT as developmental instruments” and (4) “a danger in e-development initiatives to perceive potential users as passive receivers of innovations, due to the fact that many technologies are transferred to the third world from contexts of more advanced economies” (Zheng 2007).

As obvious as making this connection between technology and capabilities may seem, philosophers working on the capability approach so far do not seem to have sufficiently realized the relevance of engineering and technology for capability expansion. For example, technology is not mentioned as a factor of relevance in figure 1, which is otherwise quite detailed. Neither does it figure on the list that Robeyns (2005) presents of inputs for capabilities (political practices, social institutions, habits, etc). True, a specific piece of technical equipment, namely a bicycle, is used by some authors to explain the approach (Sen 1983; Alkire 2005; Robeyns 2005):

“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 capability approach and nothing more. Robeyns (2005) 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 colour*, but because it can take us to places where we want to go, and in a faster way than if we were walking.”
(Robeyns, 2005, emphasis is ours)

Of course, the point that she would like to make is that what matters in the end is capability expansion and that the bicycle is only instrumentally important. On this, we tend to wholeheartedly agree with the capability approach. However, Robeyn’s remark will still seem a little naive to philosophers of technology and explaining why – the purpose of section 1.7 - will take some time. But again, we discuss an example first.

6. An example: The Village Phone Program in Bangladesh

The American philosopher Evan Selinger (Selinger 2008, forthcoming) analyses an interesting case, namely the Village Phone (VP) Program of the Grameen Bank in Bangladesh (established by Nobel prize winner Muhammad Yunus). The situation is as follows. People in the villages in Bangladesh are often illiterate and cannot afford to obtain any telecommunication devices. With the help of microcredit, women in these villages come into the possession of a mobile phone, with which they can entrepreneur and earn money by renting out calling time to other villagers. Selinger reports that the program was so successful that it has been copied in several other developing countries. The phones can be and are being used for goals such as gaining access to the price of commodities without the exploitation of middlemen or obtaining medical advice without the expensive and inefficient trip to the city. "Mobile phones", he says, "have become elevated to symbols of effective digital development; they are routinely characterized as 'weapons against poverty'." ⁶ In the standard development literature, he concludes, "the guiding assumption appears to be that 'in poor countries, mobile phones have no obvious downside'." ⁷ Selinger fears that Yunus' view on VP is "based on an instrumental conception of technology – one that portrays technology as a value-neutral tool".

The combination of microcredit and technology transfer in the VP program has been applauded for empowering the women (called 'phone ladies') "who have been disfranchised by religious fundamentalism." Several reasons for this claim of empowerment are given in the literature; The VP provides very poor women with employment opportunities that traditional (Islamic) customs inhibit. These economic opportunities give women more authority and "respect", while the income that they earn allows them to be more active in giving their children a better future. And due to the way in which the Grameen Bank runs such programs (with resolutions that participants have to take and by organizing the women in groups) the women learn to embrace modern values and the virtue of solidarity. Finally, "by promoting 'entrepreneurialism', VP is said to do something that charity cannot; it instills pride and confidence", which are the foundation for enhancing civic participation. Of course, telecommunication companies have without doubt also greatly benefitted from VP-like programs (Selinger 2007). As it happens, Prahalad himself mentioned these phone ladies as a good example of the BoP strategy in a speech that he gave in 2006 at Tilburg University:

"The key is to innovate appropriate economic models - wide, unorthodox and low cost distribution *such as phone ladies*, pricing based on pay/use, prepaid cards, and new features such as cell phones with a torch light for rural folks, and new features such as SMS based financial transactions, - that makes it accessible, affordable and available and useful to this segment." (Prahalad 2006)(emphasis is mine)

Selinger, however, criticizes the claim of 'empowerment' of these phone ladies. He is not the first to do so⁸, but what is interesting is that he concentrates on the actual practice of using the mobile phones and the technological scripts⁹ involved. "What opportunities", Selinger asks, "for engaging with customers, technology and technical professionals does VP facilitate as well as inhibit?" In line with the traditional role of women in Bangladesh society, he notes, the phone ladies "need to be silent and unobtrusive" in order to "present their customers with optimal conditions for conversation." Also, talking to the customers afterwards about the (private) calls that they have overheard will not be appreciated by most customers. The phone ladies also have only one very simple service to offer, for which they have to follow a simple protocol. Selinger contrasts this with an employee in a mobile phone shop in a western country, who will have a wide range of knowledge and skills available to help the customer and advise her/him on the best course of action. "Thus, the *very practice of renting mobile phone time is so restrictive that if phone ladies deserve to be*

⁶ The phone project of Grameen is also mentioned by Leach and Scoones (2006) as a positive example of what "technology entrepreneurs" can do when it comes to demand-driven technology contributing to human development.

⁷ Here Selinger quotes Bishop (2006).

⁸ For example, Selinger discusses the critique of Aminur Rahman on microcredit programs and empowerment in Bangladesh. According to this anthropologist the success of the Grameen Bank depends in reality, on the utilization of patriarchal structures. For example, since the Grameen Bank is targeting women, some of the 'excluded' husbands force their wives to get a loan and hand over the funds or profit to them. Selinger quotes Rahman as insisting that the Grameen Bank is guilty of establishing "new forms of domination over women in society".

⁹ 'Script' is a term used in the philosophy of technology, "to indicate that artifacts can prescribe certain specific actions, just like the script of a film or play which prescribes who does what and when" (Verbeek 2008)

considered ‘entrepreneurs’, it is only in a qualified sense.” Furthermore, the mobile phones provided by Grameen Telecom are, according to Selinger, designed to fulfill just one single function. This leaves very little opportunities for users to start using the artifact in new and creative ways, unintended by the designer. “The techno-economic script simply restricts the phone lady’s degrees of freedom to such an extent that they cannot take creative liberties with the artifact they spend considerable time with each day.” Finally, since the phone ladies are often illiterate and certainly have not had any advanced formal education, they will not understand much of the science and engineering behind the phones. They don’t have the resources to learn more about this and thus they “need to *rely upon and fully defer to the skilled technicians* who are charged with keeping the phone systems operative and fixing malfunctioning equipment” (and these technicians are probably predominantly male...). The technological script of VP, Selinger concludes, does not provide the right environment for the women to feel that there is “a personal achievement worthy of pride”.

Selinger has more concerns. Apparently Yunus gives great priority to the realization of the first millennium development goal (that of eradicating extreme poverty and hunger), to which the economic empowerment of the phone ladies should contribute. “The principal idea is”, so Selinger interprets Yunus’ position after reading his biography “that once economically empowered, agents will, as a consequence, experience empowerment spreading to other arenas as well.” However, Borgmann and others have, Selinger explains, pointed out that making this sort of easy, accessible oral-based telecommunication equipment available might have the unintended effect of diminishing the (economic) stimulus that people have to learn how to read and write. Realizing the first millennium goal in this way could thus hamper the realization of the second millennium goal (which is about education and reducing illiteracy). Whether or not this is the case, so Selinger admits, is something that needs further empirical investigation. But Selinger expects that “when Yunus boasts that in the future phone ladies will have a chance to become ‘internet ladies’, what he has in mind is the idea that, in *top-down fashion, his staff* will find a way to provide impoverished women living in rural areas with working computers that have voice-operated functions that illiterate populations can find user-friendly.”

What this example and the one discussed in section 1.4 both obviously have in common is the criticism from a perspective on what it means if you say that women are empowered¹⁰. Without specifying what it consists of exactly, it no doubt has something to do with enhancing women’s capabilities to live the lives they have reason to value, as Sen would put it. Karnani did refer to Sen, Selinger didn’t (but he easily could have). In fact, both Sen and Nussbaum pay a lot of attention to how the capability approach can help improving the position of women (Nussbaum 2000; Sen 1999). The case discussed by Selinger was about the transfer of a telecom product, so relatively high-tech, to a developing country and hence more directly relevant for engineers trying to design technical products from a BoP perspective. Selinger’s analysis of the case has a lot of merits and raised a lot of interesting points. What he did, unfortunately, not do enough is going into the details of the design of both the technology itself and the institutional arrangements in its operating environment that are necessary to make it work. This is really a pity, because, as we will see in the next section, the details of design do matter. It may be that with a different technological and institutional design – but this unfortunately remains a matter of speculation here - the VP program would have contributed more to enhancing the capabilities of Bangladeshi women.

¹⁰ ‘Empowerment’ of women has become a very central notion within the development debate and for NGOs and multinational organizations working in the field of development cooperation.

7. The significance of the details of design, with the bicycle as example

We left off in section 1.5 with the remark that capability theorists seem to be a bit naïve about technology; Philosophers of technology have made it increasingly clear 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 (Radder forthcoming; Winner 1980; Verbeek 2008, 2005; Latour 1992). Values such as privacy, autonomy, sustainability, safety and justice can be materialized and 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. The (choice of) the *details of design are morally significant*. If technologies are value laden and design features are relevant, so it has been suggested, we better 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 was initially limited to R&D in the area of ICT, but is now also gaining popularity in other engineering areas (van den Hoven 2007; Cummings 2006; Friedman, Kahn, and Borning 2001).

Now let us return to the bicycle. We may nowadays 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 (2005) 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). 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 with the small 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 of 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)

In combination with the bad condition of the roads in these days, this means that cyclists would frequently go head over heels and hurt themselves¹¹. However, this was not considered to be a problem at all, nor a sign of bad bicycle design; Cycling was considered to be an activity for young, adventurous and well-to-do men (the latter being the case because bicycles were so expensive). The difficulty of riding the ‘Ordinary’ and its accident proneness only contributed to the ability of these young men to impress the ladies by participating in cycling contests in the parks. “Falls were such an accepted part of bicycling”, so 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. Another perceived problem of the high-wheeled bicycles in those days was that it led to a “masculine and, on the high-wheeler, revealing posture”. “Some bicycle producers”, Bijker remarks, “tried to find a solution for what was euphemistically called “the dress problem”. An example is an 1870 patent for “having

¹¹ Bijker’s research revealed that this led to the introduction of a new expression: “bicyclist’s face”, because of the anxiety that riding a bike often caused.

two pedals on one side of the velocipede, thus enabling it to be “side-riden.” Others sought the solution for the dress problem in the introduction of tricycles. These tricycles were associated with the upper classes and thus “tricycling made it possible for young ladies of good breeding to get out of their stuffy Victorian homes” and “showed the way to a loosening of customs”. 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 on the rear wheel. The main function of the bicycle had become transportation, contributing to women’s emancipation during the process.

Now, Bijker’s analysis of the history of bicycle design ends here. But of course that is not the end of it, as the introduction of new types in the 20th century, such as the folding bicycle and recumbent bicycles, has shown. In the context of this research proposal, it is also interesting to note the usage of tricycles by handicapped people in developing countries:

“As a consequence of disease, accident or war many of these, mostly poor, people have partly or completely lost their freedom of movement. This seriously hampers their opportunities in education, (finding) work and participation in social life. They are house bound and are completely dependent on other people. 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)

Since the 1990s industrial design engineers from Delft have been working on improvements in different local contexts that address these problems. In this way, they contribute to the expansion of the capability to move for an otherwise socially marginalized group. The tricycles have – for example- been adjusted in such a way as to enable the handicapped to sell ice creams stored in a cooler in front of the tricycle and to make local production and repairs of the tricycle possible (Kandachar et al. 2007). Thus, by increasing the income and self-respect of the handicapped the tricycles also contribute to other capabilities.

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 indeed not only benefit companies, but also and convincingly 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 its 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 for capability expansion – but shape and material definitely deserve our attention (although, we agree with Robeyns, for instrumental reasons). We should not too easily assume that a certain product or technology will do well in enhancing people’s capabilities, as illustrated by the three examples so far. The capability approach of Nussbaum and Sen should, so this project poses as a starting point, be applied deliberately and directly to the design and engineering of these new technologies and products for developing countries. What responsible innovation in developing countries and elsewhere requires, one may say, is ‘capability sensitive design’ of technologies for the BoP market.

Quick recap

In section 1 we started with a discussion of the contribution of technology to development, with Soete (2008) arguing that the design phase of technology based products is the central focal point in the 'new mode of innovation', in which the user context is considered to be very important. Inspired by people like business scholar Prahalad (2004) there is also attention of the poorest people in developing countries – the so-called 'bottom of the pyramid' (BoP) - as potential customers or users of innovative products (section 2). However, the same section also voiced criticism on the BoP strategy (see Laundrum, 2007 for an overview) for not taking the interests of the poor sufficiently into consideration and not choosing the right focus for poverty reduction. With respect to the latter, Crabtree (2007) proposed that BoP initiatives should not aim for reduction of income poverty, but rather for the expansion of human capabilities. We used section 3 for explaining what the capability approach – pioneered by philosophers Nussbaum (2006) and Sen (1999) – is about. The example of skin cream Fair and Lovely (Karnani, 2007) has been used to illustrate in section 4 how such a shift in perspective may make a difference in how one judges a product for users in developing countries. We then went on (section 5) to explain that intuitively there seems to be a very natural link between new technologies and expanding human capabilities, although only some very recent articles have recognised this (for example, Johnstone, 2007). The case of mobile phone technology in poverty reduction initiatives in Bangladesh, as discussed by Selinger (2007), was used in section 6 to illustrate that, as empowering as new technologies may potentially be, there is also reason to be critical. In section 7 we made our concerns more concrete in explaining how the details of design are morally significant, using the work of Bijker (1995) to elaborate on a favourite example of capability theorists themselves for explaining their approach: the bicycle. It was proposed that what we need – analogous to the field of value sensitive design (Friedman, Kahn & Borning, 2001) - a new approach: 'capability sensitive design'. And this brings us – equipped with better understanding – back to what we started with: designing innovative engineering products for BoP users. There is obviously an important role to be played here by industrial design engineers.

8. The contribution of industrial design engineering

How have industrial design engineers – or designers more broadly – responded to the challenge so far? “Design for development is not a new concept”, says Margolin (2007): “Since the 1960s it has been introduced sporadically to the development process, although it is yet to earn itself a permanent place in that process.” The appropriate technology movement of the 1970s, so Nieuwsma (2004) explains, “took *design* as the point of intervention. [...] Nevertheless, despite its early successes and widespread recognition, the appropriate technology movement never cemented its place within Western design scholarship.” “Design in a poor context, or for the alleviation of poverty”, says Thomas (2006), “has received little or no attention”. Margolin & Margolin (2002), discussing socially responsible design in a broader sense (i.e. design addressing the needs of the poor in developing countries, of the aged, of the disabled, etc.), have the following to say:

“Compared to the “market model”, there has been little theorizing about a model of product design for social need. Theory about design for the market is extremely well developed. It cuts across many fields from design methods to management studies and the semiotics of marketing. The rich and vast literature of market design has contributed to its continued success and its ability to adapt to new technologies, political and social circumstances, and organizational structures and processes. Conversely, little thought has been given to the structures, methods, and objectives of social design. Concerning design for development, some ideas have been borrowed from the intermediate or alternative technology movement, which has promoted low-cost technological solutions for problems in developing countries, but regarding the broader understanding of how design for social need might be commissioned, supported, and implemented, little has been accomplished. Nor has attention been given to changes in the education of product designers that might prepare them to design for populations in need rather than for the market alone.” (Margolin and Margolin 2002)

Thomas (2006) notes that the work of business scholar Prahalad has recently raised awareness that the poor in developing countries offer business opportunities. But:

“Although design is a component of many of the case studies presented by Prahalad, such as the development of the Jaipur Foot, a prosthetic lower limb that is provided and serviced free to those who need it, design inputs are not identified or included in the analysis, although design must have taken place during its development. There is a need for design to be recognized and identified in these situations, so that it can be credited for what it enables people to do, and applied again in other contexts” (Thomas 2006).

The same omission or disinterest is also noted by Kandachar and Halme (2007). As editors they received 28 abstracts for a special theme issue on the BoP strategy for Green Management International (with technology and innovation as one of three topics in the call for papers). “While engineers and designers are used to working as integrators of various market, technological, social and sustainability aspects leading to the development of products and services”, they remark, “very few submissions highlight the role and possible contributions of these professions in addressing the needs of the poor at the BoP”. The academic discipline of development theory also pays little attention to the topic: “design is barely considered in the development theories on which governments and outside funding agencies base their policies” (Margolin 2007).

Design scholars, development theorists or business scholars are not the only ones paying insufficient attention to the contribution of (industrial) design to development and poverty alleviation. According to Margolin (2007) “national development agencies [...] also make little use of design as an integral part of their aid programmes. Similarly the thousand of non-governmental organisations lack an understanding of what designers do, and neither can they envision what design can contribute to their programmes and concerns.” In short: “design is insufficiently understood among the myriad organisations involved in the development process.” According to Amir (2004), however, governments of third world countries have increasingly become aware of the potential of design – as shown by their growing support for design schools and the establishment of new design centers and institutes. But “the endeavors to bolster design activities in Third World countries are motivated by the idea that design is a strategic tool for business and commerce”. He regrets this¹²:

¹² Not everybody seems to agree with Amir. Margolin describes how the sporadic (!) attention for ‘design for development’ over the past decennia has mainly been inspired by the classic works of Victor Papanek (*Design for the Real World*, 1972) and E.F. Schumacher (*Small is Beautiful*, 1973), who very much focused on poverty alleviation, human needs and local communities. At the same time there has, however, also been another strand of thinking about design and

“While design policy appears to be serving industry’s needs to increase its competitiveness in the international market, it overlooks local people in terms of alleviating poverty and fulfilling their basic needs. Design policy [...] neglects questions such as: What is the strategy to empower laypersons through design so that they can build their economic life more independently? How does design play its social and cultural role in a situation in which Third World societies are marginalized?” (Amir 2004)

Amir argues for a “human-centered design policy” instead. His focus is on design policy and not on design practice itself, because he feels that more attention to politics is necessary “to implement the idea of design as a solution for Third World societies.” However, the idea and practice of design for development itself is not self-evident either, and the same holds for other, similar ‘alternative’ design views like human-centered design. Buchanan (2001), after attending a design conference in South Africa, reflects:

“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.” [...]

[...] the central place of human beings in our work. In the language of our field, we call this “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)

Let’s take the Faculty of Industrial Design Engineering (IDE) at TU Delft to illustrate Buchanan’s observation. In its proposal for a new research program for the period 2008-2012 (Towards a New Research Portfolio for Ide/Tud. 2007) it is 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 focus on *experiential* states and the choice of words elucidating this (such as satisfaction, comfort and happiness) suggest that it is currently preferences or utility rather than something like human dignity (Buchanan) or capabilities expansion (this proposal) that are at the core of this research program. It is mainly through surveys and other techniques from the social sciences that industrial designers learn more about the users of their products (see IDE-professor Kandachar’s illustrations of industrial design and the BoP-strategy, figure 2).

Selinger, in his writings on the Grameen Village Phone Program, makes an observation that is relevant here: “when phone ladies are characterized as empowered, such depictions are primarily based upon survey data that measures how well individual “preferences” are “satisfied”. Such surveys are constructed from a “bird’s eye” perspective that does not adequately register several aspects of lived experience.” Such quantified analysis, he believes, can “only foreground selective consequences of participating in VP.” An anthropological and philosophical approach, so Selinger believes, is needed to gain a deeper insight into the contribution of a technology to the empowerment of women (Selinger 2008). If Selinger is right that these techniques give only a limited insight, the capability approach – if properly made operational as capability sensitive design – may form a valuable addition to their ‘tool-kit’. Although in many

development, of which the 1979 Ahmedabad Declaration on Industrial Design and Development and the work of Gui Bonsiepe are the prime examples. In this less influential school of design thinking emphasis is more on the contribution of design to a country’s economic development and industry and the ties between design, science and technology (Margolin 2007). It reminds us of the debate about technology and development more broadly, as sketched in section 1.1. Note, however, that although Margolin wants more attention for the latter school, he does not reject the former. “Design for development”, he says towards the end of his article, “needs to *broaden* its brief from an emphasis on poverty alleviation to include the strategic creation of products for export” (emphasis is ours). His call is to “address the *full* range of complex factors that determine the possibilities of design for development within the global economy” (again, emphasis is ours).

cases there will probably not be a contradiction between focusing on preferences and focusing on capabilities, it does not necessarily lead to the same result. For example, an in-depth World Bank survey of 60.000 of the world's poor on the issue of poverty revealed that "while literacy is viewed as important, schooling receives mixed reviews, occasionally highly valued but often notably irrelevant in the lives of the poor" (Narayan 2000). Education is, however, of invaluable importance for raising many of the human capabilities put forward by Nussbaum and Sen – so should a designer in this case merely follow people's preferences, or should he go beyond them?

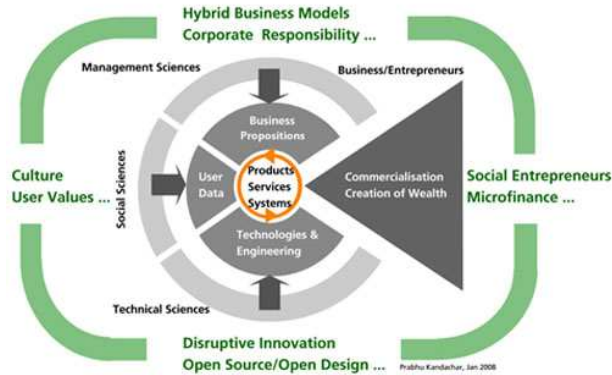


Figure 2 - A model for design processes for the Base of the Pyramid (Kandachar et al. 2007)

9. Issues in capability sensitive design

Section 8 already raised one of the issues that an industrial design engineer doing capability sensitive design must face – What does he do when preferences and capabilities clash? When does paternalism stop and participation begin? Here are some other issues that the project should address:

Designing what – broadness of the task of industrial design engineers

Should industrial design engineers then ‘just’ designing a product, or should they conceive of their design task in a broader sense, for example also including the institutional arrangements surrounding the technology? This question is not new, of course; The philosophy and sociology of technology have since long made clear that the effects of technology also depend on the context of implementation. This will be no different when the expansion of human capabilities is the effect that we are aiming for. We saw earlier how Soete (2008) emphasised the importance of taking into account user contexts in the ‘new mode of innovation’ and in BoP projects. In the practise of development cooperation the long list of failed technology transfer project has also made clear the importance of a ‘fit’ between technology and context. From a capability perspective similar observations can be made. For example, having reviewed the literature on the capability approach, Johnstone (2007) notes:

“[...] the personal characteristics (skills, abilities, conditions and traits) of individuals, the resources available to them, and the wider social and material environment. These three sets of factors, and the mutual interactions among them, together determine the ways in which a person is able to function and the possibilities open to them – that is, their capabilities or freedoms. [...] Because the three components are so closely connected [...] interventions will need to take careful account of the interactions among the three components rather than to consider each in isolation. 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).” (Johnstone 2007)

So should an industrial design engineer developing a new wheelchair for the Bottom of the Pyramid do this with an existing environment and existing local capacities as point of departure? Or should he image his product to function in a changed, improved context and interpret his design assignment accordingly, so in a much broader sense? To what extent do designers need to take this into account? Any account of capability sensitive design for the Bottom of the Pyramid should address these issues. This project will do so from the perspective of one actor in particular: the (forward looking) responsibilities of industrial design engineers.

Moral responsibility of industrial design engineer in BoP context

According to Johnstone (2007):

“the first and perhaps most important criticism [on the capability approach] is the relatively limited attention given to social and particularly power relations. [...] As a result, capability literature can appear to assume goodwill inproblematically on the part of the powerful, and seems to have little to say about their obligations.”

BoP projects, at least as envisaged by Prahalad, start with companies developing and designing an innovative product, in view of a certain profit potential that has been identified. Products and technologies that are responsive to the preferences of customers in developing countries - or any related preferences that can be ‘created’ by applying marketing techniques – will probably a lot easier to sell and thus have a larger profit potential. To what extent do these companies have an obligation to make their products expand capabilities when it is possibly at the expense of profit? And what is the obligation of the industrial design engineer when he finds himself in the middle of such a conflict of interests? Or could the win-win situation envisaged by Prahalad be realized after all, with the help of sophisticated capability sensitive design?

Differences and commonalities with other design philosophies

“Borrowing from the inspiration of the early appropriate technology movement”, says Nieusa (2005), “I use the term *appropriate design* to encompass the best of alternative design scholarship.” His rough sketch of what appropriate design would be is based on an analysis and sythesis in his article of the following

alternative design views: universal design (“accounting for diversity”), participatory design (“coping with disagreement”), ecological design (“coping with uncertainty”), feminist design (“understanding governing mentalities”) and socially responsible design (“thinking through agency”). While giving content to the concept of capability sensitive design, this project should likewise take note of previous existing design philosophies; What are the differences and commonalities with other design philosophies? What could capability sensitive design learn from them and what does it have to add?

10. Focus: health care products for developing countries

One may think that, compared to the examples discussed in this research proposal, the development of innovative health care products for developing countries is rather uncomplicated and straightforward. After all, medical technologies that reduce infant mortality per definition contribute to raising the basic, but essential capability to survive. What can be unethical or problematic about that? Especially when we consider how dire the situation still is in some developing countries, with more than one fifth of the children still dying before the age of five in countries like Angola, Liberia and Mali (World Health Organization 2005). And yet we should keep in mind – as argued earlier – that the details of design, the details of both the products and the institutional arrangements surrounding them, matter. Also in the case of the development and introduction of such health care technologies, there are many (design) options available to us along the way, some of which will be more successful in terms of raising human capabilities than others. Soete (2008) claims that when it comes to research and design for Bottom of the Pyramid users, “the main focus within the developed world at the moment is on BoP innovations in the health area”. He finds this not surprising and even justified, because it is a sector:

“...where applied medical research is increasingly dominated by access to new technologically sophisticated equipment (e.g. combined PET – positron emission tomography ct-scanners) and much less by more down to earth research questions about, and the list is non-exhaustive: anti-biotic resistance, infectious diseases or resistant tuberculosis. Not surprisingly, health is the sector most in need for what could be called a bottom of the pyramid research re-prioritization.” (Soete 2008)

Dyson (1999) believes that it is especially in medical technology that “there is a clash between the economic forces driving the technology and the needs for the poor.”

References

- Alkire, Sabina. 2002. *Valuing Freedoms; Sen's Capability Approach and Poverty Reduction*. Oxford: Oxford University Press.
- . 2005. Capability and Functionings: Definition and Justification (last updated 1 september 2005). In *Briefing Notes: Human Development and Capability Association*.
- . 2005. Why the Capability Approach? *Journal of Human Development* 6 (1):115-133.
- Amir, Sulfikar. 2004. Rethinking Design Policy in the Third World. *Design Issues* 20 (4):68-75.
- Anand, P., G. Hunter, and R. Smith. 2005. Capabilities and Wellbeing: Evidence Based on the Sen-Nussbaum Approach to Welfare. *Social Indicators Research* (79):9-55.
- BBC News. 2003. India debates 'racist' skin cream ads. *BBC News*, 24 July, 2003.
- Berges, Sandrine. 2007. Why the Capability Approach is Justified. *Journal of Applied Philosophy* 24 (1).
- Bijker, Wiebe E. 1995. *Of Bicycles, Bakelites, and Bulbs; Toward a Theory of Sociotechnical Change*. Cambridge, Massachusetts: The MIT Press.
- Boguslaw, Janet, and Mary Ellen Boyle. 2008. Investment at the Base of the Pyramid: Reducing Poverty through Sustainable Asset Development. In *Sustainability Challenges and Solutions at the Base-of-the-Pyramid: Business, Technology and the Poor*, edited by P. Kandachar and M. Halme. Sheffield: Greenleaf Publishing.
- Buchanan, Richard. 2001. Human Dignity and Human Rights: Thoughts on the Principles of Human-Centered Design. *Design Issues* 17 (3):35-39.
- Cabraal, Anuja, Roslyn Russell, and Supriya Singh. 2006. Microfinance: Development as Freedom. In *Financial Literacy, Banking and Identity Conference*. Storey Hall, RMIT University, Melbourne.
- Crabtree, Andrew 2007. Evaluating "The Bottom of the Pyramid" from a Fundamental Capabilities Perspective. In *CBDS Working Paper Series: Copenhagen Business School*.
- Cummings, Mary L. 2006. Integrating Ethics in Design through the Value-Sensitive Design Approach. *Science and Engineering Ethics* 12 (4):701-715.
- Dyson, Freeman J. 1999. *The Sun, the Genome and the Internet; Tools of Scientific Revolutions*. New York: Oxford University Press.
- Elster, John. 1986. Laundering Preferences. In *Foundations of Social Choice Theories*, edited by J. Elster and A. Hylland. Cambridge, UK: Cambridge University Press.
- Friedman, Batya, Peter H. Kahn, and Alan Borning. 2001. Value Sensitive Design: Theory and Methods. In *UW CSE Technical Report*
- Garnham, N. 2000. Amartya Sen's "Capabilities" Approach to the Evaluation of Welfare and its Applications to Communications. In *Beyond Competition: Broadening the Scope of Telecommunications Policy*, edited by B. Cammaerts and J. C. Burgelmans: VUB University Press.
- Hammond, Allen A. , and C.K. Prahalad. 2004. Selling to the Poor. *Foreign Policy* (May/June 2004).
- Jaiswal, Anand Kumar. 2007. Fortune at the Bottom of the Pyramid: An Alternate Perspective. Ahmedabad: Indian Institute of Management.
- Johnstone, Justine. 2007. Technology as Empowerment: A Capability Approach to Computer Ethics. *Ethics and Information Technology* 2007 (9):73-87.
- Kandachar, Prabh, and Minna Halme. 2007. Introduction (theme issue: An Exploratory Journey towards the Research and Practice of the 'Base of the Pyramid'). *Greener Management International* (51):3-17.
- Kandachar, Prabh, Jan Carel Diehl, Gabrielle van Leeuwen, and Jaap Daalhuizen, eds. 2007. *Design of Products and Services for the Base of the Pyramid; IDE Graduation Projects 2*. Delft: Delft University of Technology, Faculty of Industrial Design Engineering.
- Karnani, Aneel 2007. Fortune at the Bottom of the Pyramid: A Mirage – How the Private Sector can Help Alleviate Poverty. *The California Management Review* Summer 2007.
- Keleher, Lori. 2004. Can Pogge's Evaluation of the Capability Approach be Justified? In *4th International Conference on the Capability Approach: Enhancing Human Security*. University of Pavia, Italy.
- Kuklys, Wiebke 2005. *Amartya Sen's Capability Approach; Theoretical Insights and Empirical Applications., Studies in Choice and Welfare*. Berlin: Springer.

- Latour, Bruno. 1992. Where are the Missing Masses? The Sociology of a Few Mundane Artifacts. In *Shaping Technology / Building Society*, edited by W. E. Bijker and J. Law. Cambridge: MIT Press.
- Laundrum, Nancy E. 2007. Advancing the "Base of the Pyramid" Debate. *Strategic Management Review* 1 (1).
- Leach, Melissa, and Ian Scoones. 2006. *The Slow Race; Making Technology Work for the Poor*. London: Demos.
- Madon, Shirin. 2004. Evaluating the Developmental Impact of E-governance Initiatives: An Exploratory Framework. *Electronic Journal of Information Systems in Developing Countries* 20 (5):1-13.
- Margolin, Victor. 2007. Design for Development: Towards a History. *Design Studies* (28):111-115.
- Margolin, Victor, and Sylvia Margolin. 2002. A "Social Model" of Design: Issues of Practice and Research. *Design Issues* 18 (4):24-30.
- Narayan, Deepa 2000. *Voices of the Poor: Can Anyone Hear Us?* New York: Published for the World Bank, Oxford University Press.
- Nussbaum, Martha C. 2000. *Women and Human Development; The Capability Approach*. New York: Cambridge University Press.
- . 2006. *Frontiers of Justice; Disability, Nationality, Species Membership*. Cambridge: The Belknap Press of Harvard University Press.
- Pogge, Thomas. 2002. Can the Capability Approach be Justified? *Philosophical Topics* 30 (2):167-228.
- Prahalad, C.K. 2004. *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*: Warthon School Publishing.
- . 2006. Democratizing Commerce: The Challenge for the 21st Century. Tilburg, November 16, 2006.
- Radder, Hans. forthcoming. Why Technologies are Inherently Normative. In *Part V: Normativity and Values in Technology*, edited by I. van de Poel: Elsevier.
- Rivers, Theodore John. 2008. Technology's Role in the Confusion of Needs and Wants. *Technology in Society* 2008 (30):104-109.
- Robeyns, Ingrid. 2005. Assessing Global Poverty and Inequality: Income, Resources, and Capabilities. *Metaphilosophy* 36 (1/2):30-49.
- . 2005. The Capability Approach - A Theoretical Survey. *Journal of Human Development* 6 (1):94-114.
- Robeyns, Ingrid, and Roland Pierik. 2007. Resources versus Capabilities: Social Endowments in Egalitarian Theory. *Political Studies* 55 (1):133-152.
- Selinger, Evan. 2007. Technology Transfer: What Can Philosophers Contribute? *Philosophy & Public Policy Quarterly* 27 (1/2):12-17.
- . 2008. Does Microcredit "Empower"? Reflections on the Grameen Bank Debate. *Human Studies* (31):27-41.
- . forthcoming. Towards a Reflexive Framework for Development: Technology Transfer After the Empirical Turn. *Synthese*
- Sen, Amartya. 1983. Poor, Relatively Speaking. *Oxford Economic Papers (New Series)* 35 (2):153-169.
- . 1990. Justice: Means versus Freedoms. *Philosophy and Public Affairs* 19 (2):111-121.
- . 1999. *Development as Freedom*. New York: Anchor Books.
- . 2005. Human Rights and Capabilities. *Journal of Human Development* 6 (2):151-166.
- Sherraden, Michael. 2007. IDA and Asset-Building Strategies: Lessons and Directions. In *Conference on Access, Assets, and Poverty*. University of Michigan and Brookings Institution.
- Shiva, Vandana. 2001. The Seed and The Spinning Wheel - The UNDP as Biotech Salesman; Reflections on the Human Development Report - 2001. <http://www.co2.newmobility.org/NewMobility/today-save/today.htm>.
- Soete, Luc. 2008. International Research Partnerships on the Move. In *Knowledge on the Move: Research for Development in A Globalizing World*. The Hague, the Netherlands.
- Swann, Cal. 2002. Action Research and the Practice of Design. *Design Issues* 18 (2):49-61.
- Thomas, Angharad. 2006. Design, Poverty, and Sustainable Development. *Design Issues* 22 (4):54-65.
- Towards a New Research Portfolio for IDE/TUD. 2007. Delft: Faculty of Industrial Design Engineering (TU Delft).

- UN Millenium Project Task Force on Science Technology and Innovation. 2005. *Innovation: Applying Knowledge in Development*. London: Earthscan
- UNDP. 2001. *Human Development Report 2001; Making New Technologies Work for Human Development*. Oxford: Oxford University Press.
- van Boeijen, Annemiek G.C. 1996. Development of Tricycle Production (DTP) in Developing Countries. In *RESNA '96 Annual Conference; Exploring New Horizons... Pioneering the 21st Century*. Salt Lake City, Utah.
- van den Hoven, Jeroen 2007. ICT and Value Sensitive Design. In *The Information Society: Innovations, Legitimacy, Ethics and Democracy*, edited by P. Goujon, S. Lavelle, P. Duquenoy, K. Kimppa and V. Laurent. Boston: Springer.
- Verbeek, Peter-Paul Camiel Christiaan. 2005. *What Things Do; Philosophical Reflections on Technology, Agency and Design*. Translated by R. P. Crease. University Park, PA: Penn State University Press.
- . 2008. Design Ethics and the Morality of Technological Artifacts. In *Philosophy and Design; From Engineering to Architecture*, edited by P. E. Vermaas, P. Kroes, A. Light and S. A. Moore. Heidelberg: Springer.
- Winner, Langdon. 1980. Do Artifacts have Politics? *Daedalus* 109 (1):121-136.
- World Health Organization. 2005. *The World Health Report 2005; Make Every Mother and Child Count*.
- Zheng, Yingqin. 2007. Exploring the Value of the Capability Approach for E-development. In *9th International Conference on Social Implications of Computers in Developing Countries*. Sao Paulo, Brazil.