Part I
Theoretical foundations

This part, comprising Chapters 2, 3, and 4, forms the theoretical foundation of the thesis. The chapters each address one of the initial questions posed in the introduction, in order to explore and specify the main research question. Chapter 2 analyses sustainable design literature to identify possible limitations of existing approaches. Chapter 3 draws on social practice theory literature to compose an interpretation of theories of practice specifically tailored for design research. Chapter 4, eventually, analyses a range of publications in design research that have worked with theories of practice before. It works towards an overview of the current state of affairs in this area of research and in particular strengths and limitations of earlier attempts to develop practice-oriented design approaches. The section closes with a specification of the research question.

Implications of Social practice Theory for Sustainable Design

2 Sustainable design

2.1   Introduction

As explained in Chapter 1, this thesis aims to contribute to the knowledge base in sustainable design. It does so by proposing an approach that is argued to highlight new avenues for reaching the challenging targets facing the discipline. To make such an argument, this chapter offers a detailed account of existing approaches, their strengths and limitations.

Section 2.2 starts with a short overview of the history of sustainable design as a specific area of design research. The aim is to explain where in sustainable design attention to the role of products in direct household resource consumption – the focus of this thesis – originated. Within this focal area, two main approaches can be distinguished: one with a technology focus and one with an interaction focus. Both are briefly explained in section 2.3. Because the interaction focus can be viewed as an approach encompassing the technology focus – since it deals with user-technology interactions – it will be taken as the basis for elaborating on the limitations of sustainable design approaches. In Section 2.3, four interaction focused illustrative examples are offered, which are in Section 2.4 used to illustrate the points of concern raised by different authors critiquing interaction-oriented approaches.

2.2   A short history of sustainable design

Although industrial design has traditionally been tied to industry and commercial product development, connections with non-commercial objectives have been made from the start of defining the design (research) discipline. Archer characterizes design as an important cog in the wheel of addressing 'the problems modern society is faced with such as the ecological problem, the environmental problem, the quality-of-urban-life problem and so on' (Archer 1979: 18).

Moreover, concerns with issues of sustainability in a broader sense have existed as long as the design disciplines (notably William Morris and his battle against mass production in the 19th century). Working towards a more coherent area of research, some important publications were made in the 1970s in response to the emergence of environmental concerns with books like 'Silent Spring' (Carson 1962) and the Club of Rome's 'Limits to Growth' (Meadows et al. 1972). Examples in the design arena are 'Operating Manual for Spaceship Earth' (Buckminster Fuller 1969) and 'Design for the Real World' (Papanek 1971). However, Thorpe (2010) locates the emergence of sustainable design as a recognizable field of research in the 1990s. Preceded by a focus on material recycling, i.e., re-using discarded products in the early 1990s, the first manifestation of a more formal design approach in sustainable design was 'eco-design', which emerged in the late nineties.

Initially, research efforts into eco-design focused on analysing developments in industry (e.g. Potter and Dewberry 1993, Roy 1994). There, a shift was identified from 'end-of-pipe' approaches, to taking into account the entire product lifecycle. Such 'systematic' eco-design attempted to 'take into account all environmental impacts throughout the product life cycle from initial manufacture to final disposal' (Roy 1994: 364). Later, publications become more prescriptive, such as the Ecodesign Checklist by Brezet and Van Hemel (1997), which is described in an UNEP press release as 'the first manual to provide companies with a step-by-step approach to ecodesign' (UNEP 1997).

In eco-design, the life-cycle of a product involves the phases of extraction of raw materials, manufacturing, transport, use, re-use, maintenance, recycling and final disposal (Azapagic 1999). Especially in the case of appliances that consume energy and materials during use, the life-cycle focus highlighted the use phase as accounting for a major share of their environmental impact. For example,Life Cycle Assessment (LCA) studies showed that 90% of the total environmental impact of fridges and washing machines is generated during its use phase (Simon et al. 2001, Rüdenauer et al. 2005). While ecodesign and the related field of LCA is still very much alive (e.g. European Commission Ecodesign directive 2009/125/EC, International Journal of Life cycle Assessment), this realisation led to the development of a new branch of sustainable design approaches that specifically focuses on reducing the resource consumption of products during their use in households.

2.3 Reducing resource consumption during use

The issue of high levels of resource consumption in households lies at the core of this thesis, so approaches targeting this specific area of the product life-cycle will be explained in more detail. They can roughly be divided into two waves: a focus on resource efficient products and a focus on resource efficient product-user interactions.

2.3.1 Resource efficient products

The idea behind the focus on resource efficient products is that through technical optimisation, appliances can be redesigned in a way that their functions, which are in these approaches taken for granted, are fulfilled using minimum amounts of resources (Elias 2007). For example, studies on the performance of refrigerators showed that up to 80% of their energy consumption could be reduced by improving the insulation qualities of the walls and door (Rüdenauer et al. 2005). Another often used example of energy efficient technology is the compact fluerescent lamp, which uses up to one eigth of the energy of incandescent light bulbs, with the same light performance. Through changes in technical features, the energy efficiency of appliances has indeed improved over the past decades. According to the European Environment Agency, the average energy consumption per unit for large appliances such as washing machines, dishwashers and cold appliances like refrigerators and freezers fell by 21% between 1990 and 2002 (EEA 2005). Making appliances more energy efficient still recevies attention in companies due to regulations (Council Directive 1992, now replaced by Directive 2010/30/EU), and energy labels have become a common sight in electronic appliance stores. However, when energy efficient technology turned out not to render the energy savings it promised, limitations of the approach started to become clear.

One of the most discussed limitations of the resource efficiency approach is the so-called rebound effect, where the introduction of resource efficient appliances goes hand in hand with increases in consumption, which reduce, nullify or even counteract expected savings. In case of the light bulbs example in Chapter 1, lower energy consumption per light bulb has gone hand in hand with an increased consumption of light (Herring and Roy 2007). According to Verbeek and Slob, people replaced their incandescent bulbs with more energy efficient ones, but also used them 'to illuminate places where there was no light before, such as the garden or the garage.' (2006: 3). Another example offered by these authors is that of the washing machine, where potential savings of water and electricity consumption of 20%, due to efficiency improvements made between 1980 and 1990, were reduced by 10% due to increases in washing frequencies over the same period (Verbeek and Slob 2006: 7). In conclusion, Verbeek and Slob argue that approaches focusing on the energy efficiency of devices alone is not sufficient, instead, an 'integrated approach to technology and behaviour' is required.

Other authors have come to the same conclusion, but from a slightly different perspective. They argue that by focusing on the resource efficiency of products alone, opportunities for reductions in consumption are missed. The way a product is used, they argue, accounts for an important part of the energy consumption of the product. Some

authors have even quantified this share, stating that '26-36% of in-home energy use is due to resident's behaviour' (Wood and Newborough 2003). These observations gave rise to an area of research generally referred to as 'Design for Sustainable Behaviour'.

2.3.2 Resource efficient interactions

The basic idea behind Design for Sustainable Behaviour approaches is that even if an appliance is fulfilling its functions in a resource efficient way, the way the appliance is used might make its level of resource consumption 'sub-optimal'. Therefore, these approaches aim to influence users to 'operate the appliance in a more efficient way' (Lockton et al. 2008). A related group of approaches is called persuasive technology design (Fogg 1999). Because behaviour in these approaches always refers to the way in which a product is used, they encompass the technology focus. In this light, it is therefore more appropriate to ascribe them an interaction, rather than a behaviour orientation. From this point onwards they will be grouped under the term interaction-oriented approaches to sustainable design.

Efforts in this area have focused on identifying, developing and ordering design strategies and applying these strategies in, mostly fictive, design cases. Elias (2007), Lockton et al. (2008), Wever et al. (2008), Lilley et al. (2009) and Zachrisson and Boks (2012) all present similar orderings of design strategies for developing products that 'may stimulate desired behavioural patterns or help avoiding undesired ones' (Zachrisson and Boks 2012). The scales on which these design strategies are presented range from less to more forceful ways of stimulating or steering users of the selected products towards particular desired behaviours. The goal of these approaches is 'designing products in such a way that unsustainable behaviour is made difficult or impossible, while sustainable behaviour is made easy or easier, or even automatic' (Wever et al. 2008). Implicitly, three types of potential users are distinguished in these strategies.

Three types of users
The first type is users who already want to change their behaviour towards a 'good', already known form and technology is designed to help them in that pursuit. Zachrisson and Boks call them 'positive users' which are 'users that are willing to make an effort to behave sustainably' (Zachrisson and Boks 2012), and Lockton describes the aim of such strategies as 'making it easier for users to be more efficient' (Lockton 2008)).

The second type is users who do not yet have such good intentions. For these people the design is there to persuade them to 'take responsibility'. For example, Bhamra et al. explain that '[p]roviding consumers with options through product and system or service design could encourage them to think about their use behaviour and take responsibility for their actions.' (Bhamra et al. 2011: 431). Persuasive technologies focus on this type of users. The strategies described by Fogg were developed in the specific area of digital, computing devices and the cases he uses include but go beyond environmental sustainability (Fogg 2002).

A third type is users who cannot be convinced to change their behaviour voluntarily. While 'consumers should be given the choice to behave in the 'right' way: only if they

failed to do so should the product take action to prevent their behaviour' (Bhamra et al. 2011: 440). These strategies allow 'inefficient' operating procedures to be prevented (Lockton 2008) without requiring cooperation or even acknowledgement from the user. For example, automatic lighting and water taps that only operate when a user is present. The responsibility of turning off the device after use is then delegated (using the term of Latour (1992)) to the technology.

Good and bad behaviour

In line with these three possible types of users (willing but helpless user, ignorant user, or disobedient user), the widely cited redesign strategies proposed by Lilley (2009) range from merely informing people about what is 'good' and what is 'bad' behaviour, via helping people to quit the 'bad' and perform the 'good' behaviour, to 'automatically control' the user to perform the 'good' behaviour.

Similar in all approaches is that an existing device is selected, analysed and redesigned using one or more of the design strategies. Design is thus viewed as a means to 'solve environmental problems of use behaviour' (Bhamra et al. 2011) and (persuasive) technologies as having potential 'to be incredibly effective, offering a more reliable and replicable method for ensuring more sustainable behaviour' (Lilley 2009). Elias adds that once the optimal use of a product has been determined 'engineers and designers can work in confidence to reduce user-related energy losses by locking in good energy efficient user behaviour at the design stage' (Elias 2009). Relatively little attention is paid to defining these good or sustainable behaviours, seemingly because they are considered evident. This is reflected in for example Blevis' statement that

> 'It is easier to state the kinds of behaviours we would like to achieve from the perspective of sustainability than it is to account for how such behaviours may be adequately motivated.' (Blevis 2007: 508)

With such a clear idea of what sustainable and unsustainable behaviours are, the question central to this literature becomes 'how products can be designed to achieve sustainable behaviour' (Zachrisson and Boks 2012). Based on the idea that '[e]nvironmentally relevant behaviour lies at the end of a long causal chain involving a variety of personal and contextual factors' (Stern 2000), researchers draw on theory from psychology and social psychology to identify factors that affect behaviour. Models like the 'comprehensive action determination model' (Klöckner and Blöbaum 2010), the 'theory of planned behaviour' (Ajzen 1991), Triandis (1984) Theory of Interpersonal Behaviour, or Stern's (2000) attitude-behaviour-context theory (ABC theory) aim to explain behaviour using a varying number of factors like attitudes and norms. These causal models of behaviour represent rational choice or decision processes, but also acknowledge that sometimes these processes are avoided when behaviour is habitual (which according to Verplanken and Wood (2008) comprises about 45% of human action). Habits are defined as learned, automatic scripts that are performed in response to fixed contextual triggers. In interaction-oriented approaches in sustainable design, these models are used to formulate design guidelines for 'designing sustainable behaviour' (Zachrisson and Boks 2012). Fogg[1], for example poses

[1] Notably, Fogg does not acknowledge the relation of his ideas to existing theory and models in (social-)psychology.

that behaviour is a product of three factors, being motivation, ability and triggers. For a person to perform a certain target behaviour, they must be sufficiently motivated, have the ability to perform it and be triggered to perform it. This model provides designers with a systematic way to think about behaviour change when designing interactive technologies (Fogg 2009a). Importantly, some factors are considered unchangeable, such as 'personal norms' (Zachrisson and Boks 2012).

To offer some more body to this theoretical explanation and to illustrate points of critique in the next section, four examples from the interaction-oriented literature will be briefly explained. They focus on the refrigerator, the electric kettle, the television and the shower. These particular examples were selected because they occurred in several publications. Elias is cited frequently because he is one of the few authors who specifies and quantifies the 'sustainable' and 'unsustainable' behaviours so central in the strategies. The refrigerator example is somewhat more elaborate than the rest because it explains in detail how this quantification was made.

2.3.3   Four illustrative examples of interaction-oriented design projects

The *refrigerator* is used as an example in Bhamra et al. (2011) and in Elias (2009). As mentioned before, the fridge has been identified as a product with a large environmental impact during its use phase, not in the least because it is a product that is on 24/7. Both Bhamra and Elias select the time the fridge door is opened as the focal 'behavioural problem' to be addressed by a redesign of the fridge. For calculating potential savings, Elias uses a 'typical' domestic 200 litre refrigerator that was measured to use 250kWh per year when in use. To calculate potential savings through changing user behaviour, Elias determines the user-related losses – being 'the amount of energy that has been used over and above the optimal use of a product' (Elias 2009). Based on observational studies of actual fridge use, he defines the optimal way of using the refrigerator as opening it 24 times a day for 5 seconds. Any difference between this optimum and the actual use is designated as 'inefficient actions of the user', something he elsewhere refers to as 'bad behaviour'. To calculate potential user-related savings, Elias presents different use scenarios based on empirical data. In one of these scenarios, a family opens their fridge door 42 times per day, of which 6 times for extended durations (more than 3 minutes). If this family would, as a result of an interaction-oriented redesign, reduce this to the calculated optimum, the potential of 27%, or 90kWh per year of savings could be achieved. Proposals to do so include a beep sounding after the door has been open for 'too long' (Elias 2009), a rearrangement of the interior to 'lock the location of the food so that the user always knows where to find it', or a system to see what is in the fridge without opening the door, e.g. a glass door or digital 'food-shopping record' (Bhamra et al 2011).

The *electric kettle* is referred to by Lockton (2008) and Elias (2009). The main use behaviour problem identified in relation to this appliance is that people boil more water than they need. For example, Elias refers to an Australian study (Remmen and Munster 2003), which found that 15% of the electricity consumption related to electric kettle use is 'unnecessary', something later specified as 'water that is boiled but not immediately used'.

Re-design proposals include only heating water that is poured out, as for example in the Quooker or a kettle with additional reservoir that stimulates precise dosing of the number of cups, as in the Eco Kettle[2].

The *television* features in Wever et al. (2008) and again in Elias (2009). The focal behaviour related issue identified by both authors is the situation where the television is on but not being used 'in any beneficial sense' (e.g. because no-one is there or they are asleep). The design intervention proposed is introducing a blind mode that can either be activated through the remote control or will activate automatically when the 'smart' TV senses a situation where nobody is watching. Potential savings are calculated by taking the baseline scenario of watching 3,6 hours of television per day, which refers to the average television consumption per household in the UK at the time of the study (Elias 2009).

Finally, the *shower* is the topic in Laschke et al. (2011), Ravandi et al. (2009) and Kappel and Grechenig (2009). In all these studies, targets were to reduce shower durations through different forms of persuasive technologies, all involving feedback in combination with some kind of reward or motivating meganism. For Laschke this is a shower calendar with dots that shrink in response to water use beyond 4 litres, up to a maximum of 60 litres. For Ravandi, it is a game where creatures can be earned when self-set targets are met (they give an example where anything below 160 litres per day is a reduction), and for Kappel and Grechenig it is a cord with eight led lights that light up after every 5 litres, up to a total of 80 litres. Field tests by Kappel and Grechenig are most explicit about the savings obtained. They report reductions from an average of 45 litres per shower to 35 litres per shower over three weeks. Ravandi et al. have not done actual tests but show a simulation in which savings add up to as little as 0,08 litres per person per day, as compared to an implicit benchmark.

From these examples it becomes clear that the approaches are relatively straightforward to implement; for all products some form of redesign implementing the suggested strategies is available in the market today; refrigerators with beeps, one-cup kettles, blind mode buttons and shower timers are all for sale. The design problem is presented relatively orderly and the metric of change (e.g. reduced fridge opening time) is convenient to handle and measure. This contributes to a relatively short time to market of this type of interventions. For some situations, as for example shown in Kappel and Grechenig (2009), reductions can be achieved with minor effort. However, not disregarding these strong points, a variety of concerns relating to interaction- oriented approaches have been raised as well.

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[2] www.ecokettle.com

2.4 Limitations of interaction-oriented approaches

Potential limitations of interaction-oriented approaches have been raised from different angles. Here they are summarized into four related points of concern that are explained using the examples introduced in the previous section.

2.4.1 Potential savings disappear in other changes

Interaction-oriented approaches, Scott et al. (2011) argue, are limited because they focus on specific products, user types and moments in time. Similarly, Brynjarsdóttir et al. (2012) find that framing sustainability as the optimization of simple, measurable metrics does not do justice to the complexity of sustainability issues. As will be illustrated using the examples introduced above, this strategy of simplification to reductions of single metrics of specific interactions runs the risk of disappearing in on-going changes that are part of daily life. Even if the re-design results in the intended behaviour change (e.g. reduced fridge opening times, shorter showers), the energy savings obtained with this change are easily lost in trends in product development and use behaviour.

In case of the *fridge*, for example, a clear trend can be observed of increased volumes of refrigeration per household. According to a study by the Energy Saving Trust, penetration rates of fridges in the UK increased from 58% to 107% between 1970 and 2003. Different from Elias' 250 kWh benchmark, this same report defines a 339 kWh fridge as 'normal' and identifies a trend in the growing popularity of the large size American fridge that uses 500kWh per year (EST 2006). The 90kWh potential savings are in this case strongly reduced or nullified by trends in increased volumes of what is refrigerated. Moreover, larger fridge sizes are likely to result in longer door opening times, simply because more stuff needs to be taken out that is more difficult to find.

A similar analysis can be made of electric kettles. Eco Kettle is mentioned as a product with 30% potential savings compared to a 'standard kettle', but keep-warm kettles, identified as a potential new trend in kettle design, were calculated to potentially increase energy use by 46% in the same study (MTP 2008).

In *televisions*, 'normal' size has rapidly increased with the introduction of the flat screen. Where Elias (2007) takes a 32" television as a benchmark, a quick round amongst colleagues and web shops in the fall of 2012 indicates that a 32" is by then considered small, and 36" now fulfils this, probably temporal role of being the standard screen size. Moreover, time-use studies indicate that average hours of television consumption per day show a strong rise in the past years. Vergeer et al. (2008) identify an increase from 100 minutes in 1980, to over 180 minutes in 2002. In the UK, average television watching time per household was 3,6 hours in 2007, 4,8 hours in 2009, over 6 hours in 2012. In addition, penetration rates have now increased to well above 100%; 98% households own at least one TV, with average on 2,3 sets per household, a rate predicted to grow (Owen 2012).

Finally, in *showering*, a Dutch study by Foekema and Van Thiel (2011) finds a relatively constant shower duration of around 8 minutes, but increasing showering frequencies and an increasing popularity of so called comfort showers that release 14,4 litres per minute instead of the regular 7,7 litres. Over the past years, water use for showering has thus increased by 25%.

In sum, a focus on product-user interaction tends to isolate specific situations and metrics and thereby runs the risk of disappearing in larger trends. In addition, the European Environment Agency does not only ascribe disappointing effects of energy efficiency efforts to increased use of appliances, it also points to the increasing number of appliances overall (EEA 2005). This means that even when taking into account larger trends, it is limiting to look at individual appliances alone. Additionally, as the next section will argue, achieving the intended behaviour is certainly not ensured by following the proposed design strategies.

2.4.2 Intended behaviour change may not be achieved

Because interaction-oriented approaches tend to assume rather specific use scenarios that are optimized by the proposed re-design, there is a risk that actual use situations will not reflect these specific scenarios. Not in the least because the redesign itself changes the 'base case' scenario in ways beyond the specific intended behaviour change (Akrich 1992, Oudshoorn and Pinch 2007). In such cases, desired effects may not be achieved, or, as some argue, even countered. Users may resist the predefined use scenario by simply ignoring it or even sabotaging the particular function (Verbeek and Slob 2006, Brynjarsdóttir et al. 2012). In other situations, specific use scenarios may even contribute to increases in resource consumption; because they tend to assume the current status quo, redesigns run the risk of confirming undesirable standards or even setting higher ones (Pierce et al. 2010, Strengers 2011).

With regard to the beeping *refrigerators*, a quick search online reveals forum messages with titles like 'how to turn off the beeping'. Ehow.com offers methods to stop the beeping sound of a particular fridge brand with the observation that 'many users find it annoying'. What is also interesting to note is that this same refrigerator beeps after the door is open for more than 60 seconds. Rather than reducing fridge door opening times, such a function may confirm that anything up to 60 seconds is good or allowed, possibly having the opposite effect. Moreover, an 'optimal arrangement' of the fridge contents or 'locking the location of food items' may make it easier to find things in some specific situations, but is likely to be inappropriate for any scenario diverting from this specific situation. Clearly, eating habits and ways of using fridges are highly varied (De Jong and Maze 2010).

In case of the *electric kettle*, Elias himself expresses concern about this type of rebound effects. The almost instant availability of boiling water in for example the Quooker could 'result in a much greater usage of boiled water than would have previously been required, the rebound effects of this product would therefore be large, negating any energy saving and in fact increasing it beyond previous levels' (Elias 2009).

In case of automatic detection of viewers by *television* sets, errors may be made, leading to irritation. For example, automatic standby functions exist on some televisions, but they use interaction with the remote control as an indicator for presence (e.g. Sony), which is not really accurate in case of for example watching a movie. Moreover, a blind mode may reduce energy consumption in scenarios where the television was left on just for the sound, but it also communicates this type of use as normal. While listening to the radio might be a more energy efficient way of providing the same service.

In the *shower* examples, the feedback device designed by Ravandi et al. (2009) explicitly assumes daily showers, while showering isn't necessarily a daily affair (yet). Average shower frequencies in the Netherlands are 5-6 times per week (Foekema and Van Thiel 2011). Moreover, such a device necessarily sets a standard for 'normal' shower durations that may be higher than current routines of part of the potential users, the 160 litres example taken by Ravandi et al. is more than twice the Dutch daily average.

Because interaction-oriented strategies assume certain specific and partial use scenarios to be representative for the wide range of ways in which the re-design will be used, there is a risk of scenarios not corresponding to actual use situations. Next to irritations and frustrations, such situations may lead to nullification of intended results, but also to affects opposite of those aimed for. Moreover, as the next section will argue, there is another concern related to these specific use scenarios, which lies in the rhetoric that accompanies it.

2.4.3   Strong rhetoric of right and wrong behaviours

Besides the question of whether or not intended reductions in household resource consumption can be achieved, several authors show a concern with the strong rhetoric of 'right' and 'wrong' behaviours that is present in interaction-oriented sustainable design literature. For example, Elias poses that '[t]he use of a product will inevitably include a range of good and bad behaviours, with good behaviour being more energy efficient than bad' (Elias 2009). Brynjarsdóttir et al. (2012) find that this simplification of 'good' versus 'bad' behaviours places technologies as 'seemingly objective arbiters over complex issues of sustainability'. What is 'good' or 'bad' behaviour is defined by the designers of the technology, placing them in an unjustified position of authority over other people's lives.

For example, according to Elias, 'unsustainable' behaviours occur when 'the product is misused, used unnecessarily or excessively' and in such cases using the product 'will waste energy' (Elias 2009). For example, a fridge door that is opened 'too often' (more than 24 times a day) or kept open 'too long' (more than 5 seconds), or water that is boiled but not used for tea directly In such a view, a birthday party, or a child helping to fetch the milk may easily constitute 'bad behaviour'. The rhetoric of 'unsustainable' behaviours gets quite strong, when habits, such as for example 'long' showers are equated with alcoholism, smoking, drug and gambling addictions (Laschke et al. 2011 citing Rachlin 2009).

Mirroring this idea of 'unnecessary' consumption is the idea of 'necessary' consumption, which 'fulfils people's (actual) needs' (Bhamra et al. 2011). What is necessary consumption is determined from observing examples of people's current behaviour and looking at statistics on average consumption patterns. For example, in Elias (2009), opening the fridge 24 times for 5 seconds is the 'base case' or 'optimum behaviour' that was determined from observational studies. The normal duration of watching 3,6 hours of television per day is based on the then counting UK average. Alternatively, in Laschke et al. (2011) a 'free' amount of four litres of water was determined by one of the authors. For this person, it turned out to be at minimum required to 'achieve a comfortable feeling of cleanliness' with a shower. Clearly, this is a very situated result. For a rain shower for example, four litres translates into a showering duration of 17 seconds.

Besides being unilaterally determined by the designer, these 'good' behaviours remain unquestioned. For example, in case of the television, rendering the time it is watched as beneficial ignores studies that show that benefits of watching television may be minor, while undesirable effects have also been identified, especially amongst children, such as obesity, and behavioural and (language) development problems (e.g. Close 2004, Christakis 2009).

Summing up, the particular use scenarios aimed for in interaction-oriented sustainable design contain rather narrowly defined ideas on what is considered necessary and unnecessary energy consumption. Moreover, which forms of behaviour fit in one or the other category is determined by the designer, who uses existing, particular or average use situations without questioning their representativeness or desirability. For example, is a 36 inch television a waste of energy? Thus, the 'need' for the services these devices offer is taken for granted (Scott et al. 2011). For example, when calculating the theoretical minimum value and defining the targeted 'sustainable behaviour' of a certain device, Elias explains that 'essential product features or functions must be kept constant'. In case of a tumble dryer, line drying can therefore not be taken into account, since it 'shares none of the convenience or speed of the tumble dryer' (Elias 2009). Questions of why refrigeration, hot water, watching television, showering or clothes drying are needed at all, and how much of it, is not or only sideways addressed. As a consequence, clearly less resource intensive options, like line drying, are excluded as a form of 'sustainable behaviour', because the 'need' for convenience and speed in clothes drying is assumed. Similarly, focusing on fridge door opening times diverts attention from questions on the growing role of refrigeration in today's Western food systems (Shove and Southerton 2000).

What is good or bad behaviour is something that is understood and clear in the minds of the designers, so much so that it often does not need explicit discussion. All the while, questions of what 'sustainable behaviour' is, who determines it and whether it can be ensured or 'designed' at all, are left unaddressed. These more fundamental questions open up complex discussions on what products are actually about and would, as critics argue, be more appropriate questions when addressing an issue as complex and intertwined with daily life as household resource consumption. Moreover, by following such static use scenarios, important opportunities are missed.

2.4.4   Opportunities for larger scales of change are missed

A fourth and final critique that touches on the core of these approaches is that they delegate responsibility for the reduction of society's resource consumption to individuals – whether designers or users. Critics argue that within given cultural, social and material surroundings, the changes that can be made on an individual level only go so far (Scott et al. 2009, Shove 2010). Not only does this focus divert attention away from other agents of change, it also tends to result in investments in relatively small reductions (if reductions are achieved at all).

In case of the refrigerator for example, the role of the kitchen industry in fuelling larger fridge sizes, the role of the food industry in introducing more products to be refrigerated, the role of EU or national regulations surrounding best before dates, or the role of

cooking books in assuming the availability of a refrigerator, are not taken into account. Nevertheless, they all eventually play a role in the resources consumed for refrigeration in households. Inversely, choosing a smaller fridge that does not fit a household's kitchen design and eating habits, or extending best-before dates is not something that individuals can simply do by themselves.

Because many of these changes lie beyond the individual product-user interaction, they tend to be overlooked in existing interaction-oriented approaches. This poses the risk of making unsustainable levels of resource consumption a problem of the consumer, while other institutions clearly implicated in the issue can simply continue with business as usual. Moreover, the change that is aimed for tends to concern small changes to the status quo. Something that is, as Manzini nicely phrases it, not sufficient to address the challenges faced by society:

> 'increasing improvements in the existent are not enough: the transition towards sustainability requires a systemic change. It is not a question of doing what we already do better, but of doing different things in completely different ways.' (Manzini 2009)

Besides critiquing interaction-oriented strategies, these authors propose alternative approaches for sustainable design that address these limitations. A recurring element in these alternatives is an expansion of the fundamental unit of analysis from product-user interactions to socially shared practices. Taking practices instead of products or interactions as a unit of analysis is argued to help understand 'the dynamic relation between things and those who use them' (Shove et al. 2007), help think beyond the individual (Julier 2007), address complex issues of consumption (Munnecke 2007), take into account the dynamics at play in everyday consumption (Pettersen 2009), consider energy consumption in the context of broader sociocultural practices (Brynjarsdóttir 2012), highlight 'the dynamics within and between households, the practices consumption is implicated in, and shifting expectations of normality' (Strengers 2011), provide opportunities for sustainable living (Hielscher et al. 2008), and offer 'a more systemic approach that can help design for sustainability efforts to grapple with the uncertainties of consumption, such as rebound effects and user acceptance issues' (Scott et al. 2009).

2.5   Conclusions

This chapter set out to identify existing approaches in sustainable design that concern themselves with household resource consumption and to give an overview of their strengths and limitations. Two approaches have been highlighted, one focusing on the resource efficiency of technologies and the other expanding this focus to product-user interactions. It was concluded that the interaction-oriented literature offers a relatively coherent and well-developed set of strategies that are relatively easy to implement for industrial designers. This is reflected in the fact that a range of products adhering to the principles promoted in this body of literature is available in the market. However, some important limitations were found as well.

The limitations of interaction-oriented approaches can be summarized into four main points of concern. The first two, being the risk of targeted reductions disappearing in larger trends and targeted reductions not being achieved or even countered, can largely be attributed to a reliance on specific use scenarios. These scenarios tend not to be representative for the variety of actual situations (re-)designed products end up in, and necessarily overlook the way use situations tend to change over time. Another limitation is then found in the way these scenarios are composed, which tends to be done rather unilaterally by the designer. Moreover, the scenarios contain a strong rhetoric of right and wrong behaviours, neither of which are questioned. Together with a focus on individuals as primarily responsible for changes towards sustainable levels of resource consumption, this unquestioned acceptance of the status quo runs the risk of missing opportunities for the larger scales of change required for achieving a more sustainable balance between consumption levels and the planet's capacities.

Several authors in (sustainable) design have suggested drawing on social practice theory as a potential way to overcome these limitations. This area within design research is referred to as 'practice-oriented design' (Shove et al. 2007). It is a relatively new area of research that emerged in response to a series of workshops and publications emerging from the 'Designing and Consuming: objects, practices and processes' research program (2005-2006)[3]. Before going deeper into practice-oriented design and remaining research challenges in this area, Chapter 3 will first elaborate on practice theory to explore in more detail what this group of theories has to offer design theory.

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[3] www.consume.bbk.ac.uk

3 Practice theory

3.1 Introduction

Chapter 2 has provided an overview of approaches in sustainable design and a summary of some of their limitations. As highlighted in the previous chapter, it has been argued by several authors that an approach drawing on practice theory may offer a way to address these limitations. This chapter will go deeper into practice theory. Both practice and theory are familiar terms used in common parlance. But what is practice theory? Starting from its origins in social theory, this chapter offers an overview of concepts that are considered relevant for developing a practice-oriented approach in sustainable design.

   The chapter will first explain the position of practice theory within social theory, then elaborate on two central concepts: one being that practices are comprised of constellations of elements, the second being the importance of distinguishing between practice-as-entity and practice-as-performance. Because this introduction to practice theory is design oriented and positioned in relation to human-product interaction focused approaches in sustainable design, it will subsequently go deeper into the ways in which people and things are conceptualised in practice theory. Finally, zooming out from single practices, the web of interconnected practices will be discussed. The conceptual framework thus laid out forms the basis for the practice-oriented design approach presented in the chapters 5 and 6.

3.2   Practice theory in social theory

When introducing practice theory, it is important to note that the meaning of 'practice' in practice theory is similar to, but basically different from some more general uses of the term. In general speech, it is for example common to speak of 'practice' as opposed to 'theory', in which practice refers to bodily action, while theory merely concerns thinking. In design research in particular, the term 'design practice' generally refers to the realm of professional design in commercial companies as opposed to design performed in universities (e.g. as in Stolterman 2008). More generally, the verb 'to practice' refers to the repeated performance of something with the objective to get better, for example practicing ones drawing skills.

In practice theory however, 'practice' refers to a practice or practices as a noun. There is no case of practice vs. theory, practice vs. research or practicing as a particular type of activity. Instead, any action or behaviour can be viewed as part of a practice, or, as Schatzki poses it, 'people are always carrying out this or that practice' (Schatzki 2001:54). Doing research, practicing design or learning how to draw can all be viewed as practices. To understand practice theory, it is important to realise that it represents a particular way of understanding society: a way that takes practices as the fundamental and smallest unit of social analysis. In the words of Reckwitz, practice theory, like other versions of social and cultural theory offers a system of interpretation, a conceptual framework that comprises a certain way of seeing and analysing social phenomena, which enables certain empirical statements, and excludes others (2002a: 257).

To make this point clear, Reckwitz (2002a) positions practice theory in relation to other forms of social theory. He does so on two levels. First, he positions practice theory as a form of cultural theory. According to Reckwitz, sociological methods of conceptualising human behaviour and the way it is organized take one of three forms, these being: purpose-oriented theories, norm-oriented theories and cultural theories. In purpose-oriented theories, behaviour is explained in terms of individual purposes, intentions and interests. Social organization is then a product of the combination of single interests and the smallest unit of analysis is human action. In sustainable design, such a position tends to place a focus on demonstrating personal gain, such as showing how much money can be saved when turning off lights or turning down the thermostat. In norm-oriented theories, behaviour is explained through collective norms and structures. Social organization is a result of normative consensus and the units of analysis are normative structures, such as values and social rules. In sustainable design, a norm-oriented position could for example lead to a product in which levels of resource consumption of different people in a neighbourhood are compared. Cultural theories reject this dichotomy and place the social in collective symbolic structures of knowledge. Cultural theories have so far not clearly manifested in sustainable design. This thesis investigates what the particular position of locating the social in practices (i.e. a form of cultural theory according to Reckwitz) could mean for sustainable design approaches and outcomes.

Cultural theory is more than practice theory alone. Within cultural theory, Reckwitz (2002a) distinguishes four main tendencies that each locate the social (or collective) differently: in the human mind (mentalism), in discourse (textualism), in communication (intersubjectivism) and in practices (practice theory). Of these four, only practice theory will
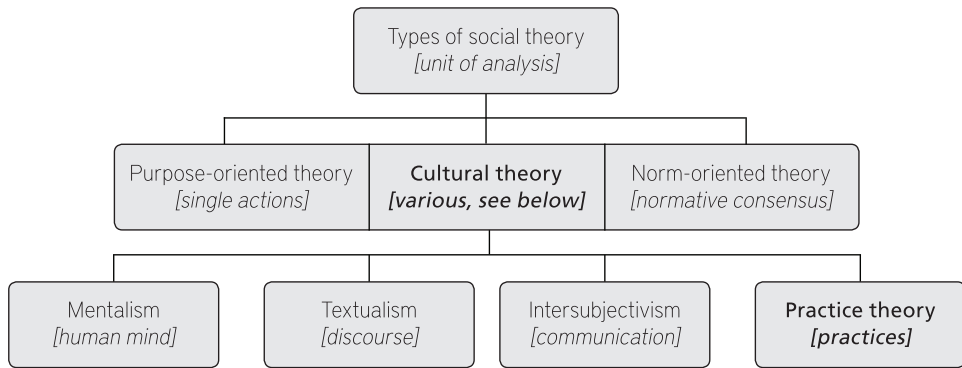
Figure 3-1 The position of practice theory within social theory based on Reckwitz (2002a).

be discussed in detail. In Figure 3-1, the position of practice theory within social theory is depicted graphically.

Although not using the same terms or going as far as Reckwitz, all practice theorists emphasize the positioning of practice theory as a middle ground between opposing dichotomies. This middle ground positioning is highlighted because it is important for how practice theory is understood. While containing recognizable elements for researchers in both sides of the scale, practice theory is fundamentally different. Schatzki explains this position as follows:

> 'In practice theory […] accounts all undermine the traditional individual-nonindividual divide by availing themselves of features of both sides. […] it appropriates in transfigured form a variety of individualist *explanantia*, while grounding these in a supraindividual phenomenon.' (Schatzki 2001:5)

In other words, taking a practice theoretical approach does not mean that individuals or norm structures are ignored, rather the contrary. However, individual behaviour is not viewed as explanatory of structures and structures nor as capable of explaining individual behaviour, neither is the field of practices explanatory for either. In fact, practice theorists, Schatzki poses, are 'suspicious of "theories" that deliver general *explanations* of why social life is as it is' (Schatzki 2001: 4 emphasis in original). Rather, practice theory offers a conceptual framework to give a 'general and abstract account' (Schatzki 2001:4) of the topic of study and as such, gain understanding of that particular topic.

So while the positioning of practice theory by Reckwitz seems rather clear, the vocabulary offered by practice theorists does not offer a 'systemized' (Reckwitz 2002a:257) language as prescriptive and encompassing as some of the other social theories. Neither does practice theory offer one coherent account. Practice theorists agree on some points, for example to take practices as a fundamental unit of analysis, but they disagree on many others, for example on the role material objects play in practices. Therefore, the explanation offered in this chapter is an interpretation of practice theory. This is an interpretation that takes from various sources and versions of practice theory those aspects that are, in the opinion and experience of the author, relevant to design and sustainable design in particular.

To return to the issue of what 'practice' means, 'practice-oriented design' in this thesis does not refer to design approaches specifically tailored for professional designers working in commercial companies. Practice-oriented design here groups a set of design approaches, currently mainly existing in the realm of design research, which explicitly take practices as their fundamental unit of analysis, and in fact, as a unit of design, as will be elaborated on later. First, it is time to go deeper into the conceptual framework practice theory offers.

3.3   Elements and their links

A practice, in the widely cited definition of Reckwitz is:

> 'a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge.' (Reckwitz 2002a:249)

From this definition, it becomes clear that practices can be viewed as sets of interconnected elements. While their interconnectedness is essential in practice theory, this section first zooms in on the separate elements. Reckwitz provides a rather loose and non-exhaustive list. Other authors have proposed shorter lists of three or four elements (Gram-Hanssen 2011 provides an overview of different groupings). The terminology used in this thesis is stuff, skills and images (Figure 3-2), or alternatively materials, competences and meanings; an interpretation and terminology used by Shove and colleagues (e.g. Shove and Pantzar 2005, Shove et al. 2012), and adopted in several design-oriented papers (Scott et al. 2011, Kuijer and De Jong 2012). Because this interpretation makes explicit mention of material elements, it has clear relevance for design. What follows is an explanation of the concepts these three elements represent in this thesis.
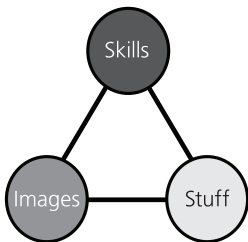
Figure 3-2 Images, skills and stuff model, adapted from Shove and Pantzar (2005)

3.3.1   Stuff (materials)

Stuff refers to the tangible, material elements deployed in the practice. Shove et al. (2012) summarize them as objects, infrastructures, tools, hardware and the body itself. In line with Latour (1993), no clear distinction between humans and things is made; together they can form a hybrid entity. Moreover, the body itself and other things not directly man-made, like air, bacteria etc, are also part of the stuff in practices. Stuff is socially shared because the same or similar things are available (although certainly not equally accessible) to groups of people. This makes a link to design, since mass produced products form part of the material world.

3.3.2 Skills (competences)

Skills are learned bodily and mental routines, including know-how, levels of competence and ways of feeling and doing. The important point here is that in this approach, ways of feeling about and appreciating things and situations is seen as part of the practice, as learned through doing. Again, this model of practice makes no clear distinction between humans and things. Skills are distributed, and can be redistributed between people and products through what Latour (1992) refers to as delegation. Moreover, know-how does not only manifest in knowing how to act appropriately, but also knowing how to talk about, how to recognize and how to prompt and respond to such actions (Schatzki 2001: 54). Skills involve (inherently shared) knowledge about what is good, normal, acceptable and appropriate (and what is not) and learned, bodily/mental competence to reach these standards to more or lesser extents.

3.3.3 Images (meanings)

Images are socially shared ideas or concepts associated with the practice that give meaning to it; reasons to engage in it, reasons what it is for, or as Shove et al. put it, 'the social and symbolic significance of participation at any one moment' (Shove et al. 2012:22). Images bring to the fore concepts of association, relative positioning, norms, values and ideologies (Shove and Pantzar 2005:47). Explicitly treating meaning as an element of practice, and not as something that stands outside of it as a motivating or driving force has far reaching consequences for practice-oriented design, as will become clear later on in this thesis.

It has to be noted that, although seemingly straightforward, the images-skills-stuff framework offers only a loose grouping of elements. The three categories overlap and elements mutually influence and shape each other. Moreover, for understanding practices, the links between the elements are just as important as the elements themselves. To Shove et al. (2012) practices consist of elements that are linked together in and through performance. Moreover, since 'practices emerge, persist and disappear as links between their defining elements are made and broken' (Shove et al. 2012:21), these links are important for understanding change in practices. Helpful to understanding the role of links in practices is the distinction between practice-as-entity and practice-as-performance.

3.4 Practice-as-entity and practice-as-performance

Schatzki distinguishes between practices as a 'temporally unfolding and spatially dispersed nexus of doings and sayings' or 'spatio-temporal entities' and practice as performing an action (Schatzki 1996:89-90), a distinction he later refers to as the organization dimension and the activity dimension of practices (Schatzki 2001). Shove et al. (2007), like Warde (2005) summarize these two forms of practice as practices-as-entity and practices-as-performance. A terminology that will further be used in this thesis.

The practice-as-entity refers to the practice as a structured organisation, i.e., capturing how the elements and their links which specify 'how actions (including speech acts) ought to be carried out, understood, prompted, and responded to; what specifically and unequivocally should be done or said (when, where, …); and which ends should be pursued, which projects, tasks, and actions carried out for that end, and which emotions possessed – when, that is, one is engaged in the practice.' (Schatzki 2001: 101). Importantly, as opposed to practices-as-performance, practices-as-entities evidently endure over space and time. This is why they are recognisable as practices.

The practice-as-performance, the moment of doing in which the elements are integrated by people in specific situations, is slightly different each time. When zooming in on practices-as-performance, it becomes clear that this is not a uniform or constant picture: practices are 'internally differentiated on many dimensions' (Warde 2005: 138). The elements and their links (practice-as-entity) form a guiding structure, within which however, there is ample space for variety.

The practice-as-entity and practice-as-performance are so closely related that they constitute each other. Not only does entity order performance, it also arises from this same performance. The practice-as-entity is dependent on repeated performances to remain alive – Shove et al. refer to practices that are no longer performed as fossils (Shove and Pantzar 2005) – but is also transformed through them. Because the practice-as-entity persists beyond situations of performance, it ensures a certain uniformity and continuity of performances over space and time. However, while having

> 'some considerable inertia', 'practices also contain the seeds of constant change. They are dynamic by virtue of their own internal logic of operation, as people in myriad situations adapt, improvise and experiment.' (Warde 2005:140-141)

Through recurrent performances that are similar, yet more or less different in each situation, practices-as-entity are both stable and dynamic. In other words, the way the practice-as-entity is constituted at any one moment is a result of a preceding sequence of performances. This relation between practice-as-performance and practice-as-entity will become central to the discussion of the role of design in the way practices change, discussed in Chapter 6.

3.5   People and practices

People are not central in practice approaches (other than as carriers of practice), but because people play such a central role in interaction oriented sustainable design approaches, their position in practice theory will be elaborated on here. Reckwitz summarizes the role of people in practice theory as 'body/minds who "carry" and "carry out" social practices' (Reckwitz 2002a: 256). This section will first explore the concepts of body/minds and carriers, and subsequently use them in introducing the idea of careers, a concept central in understanding change in practices.

3.5.1 Body/minds

Reckwitz describes people as body/minds. To understand this somewhat curious use of terminology, it is important to know a couple of things. Practice theorists explicitly distance themselves from social theories that emphasize the life of the mind and conceptualise people as autonomous (rational) thinkers and decision makers. The human body nonetheless plays an explicit role in practice theory. In the words of Reckwitz (2002a) practices are 'routinized bodily activities'. Because these routines are learned over time through repeated performance, the body is seen as an important realm of knowledge. In Giddens' Theory of Structuration, this knowledge is present in the form of practical consciousness:

> 'practical consciousness consists of all the things actors know tacitly about how to 'go on' in the contexts of social life without being able to give them direct discursive expression.' (Giddens 1984: xxiii)

Through performance, the body becomes trained in a certain way, when knowledge about the practice becomes embodied in the practitioner. However, this knowledge is not easily verbally expressed. For example, walking is not difficult to do for most people, but exactly putting into words how to do it is nearly impossible.

The human body is important in practice theory, both as a carrier and performer of practices. However, by describing people as body/minds instead of simply as bodies, Reckwitz seems to agree with Schatzki that there is more to practices than unconscious or subconscious bodily routine. Based on the observation that 'people can explain almost all of their actions in great detail' (whether right or not), Schatzki acknowledges the existence of mind and mental states. However, he immediately distances himself from models in which mind is conceptualized as 'a thing or apparatus that causes behaviour'. Rather, he states, 'mind is a medium through which the activities that compose a practice are *noncausally* organized'. Mental states are expressed in behaviour. Behaviour manifests or signifies them, e.g. joy in crying and belief in God in praying. These states do not inform behaviour by causing it, but by determining what makes sense to people to do' (Schatzki 2001: 50).

Here, Schatzki explicitly pulls practices out of the corner of merely unconscious routine activity and broadens the concept to encompass all forms of human behaviour. Routine is then seen not as unconscious patterns simply repeated in different situations, but as recognizably recurrent forms of behaviour that nonetheless vary in each occurrence. Along these lines, Shove et al. frame practices as 'whatever actual and potential practitioners recognize as such' (Shove et al. 2012: 82). This notion becomes important in later chapters, where the issue of selecting and describing target practices is discussed.

3.5.2 Body/minds as carriers

Referring back to Reckwitz, people carry and carry out social practices. When taking a practice-oriented approach, the researcher will therefore view people as carriers and performers of practices. However, people are not seen as puppets acting out a pre-determined scenario. The practice-as-entity (partly) resides in people in the form of bodily and mental knowledge, but is also dependent on people performing it to remain existent. Moreover, in practice theory, it is the performer of the practice who actively integrates the elements and thereby reproduces, but also transforms the practice-as-entity. This transformation happens through variations in the practice-as-performance when people adapt, improvise and experiment, to refer back to the terms of Warde (2005), in the ever changing circumstances of daily life.

It is essential to note though that people do not *have* practices, and cannot transform a practice on their own. Although not so in common use, in practice theory it is awkward to speak about *someone's* practice, for no one has 'complete' agency or authority over a practice. In fact, Reckwitz later corrects himself by saying that 'social practices' is a tautology, for practices are socially shared inherently[4]:

> 'A practice is social, as it is a 'type' of behaving and understanding that appears at different locales and at different points of time and is carried out by different body/minds.' (Reckwitz 2002a:250)

However, 'social' does not necessarily mean social as in actual person to person interaction. A practice can be socially shared even if it is performed predominantly in private, like for example bathing or going to the toilet. Because people are linked by a 'profound mutual susceptibility' (Barnes 2001:24) they are able to sustain practices as 'oversubjective' (Schatzki 2001:6), collective achievements. Latour, as will become clear further on, offers a more materialized view on this phenomenon of oversubjectivity.

3.5.3 Careers of people and practices

People and practices are related, because practices reside in people's bodies, and are maintained and transformed when performed by people. In order to understand this concept of transformation, which is highly relevant for sustainable design, it is necessary to add a time dimension to the conceptual framework. As explained above, the idea of a relatively stable practice-as-entity that exists beyond situations of performance, makes it possible to trace a practice back in time. In practice theory, this time dimension manifests in the concept of careers.

To complicate matters, both people and practices can be viewed as having careers. As Shove and Pantzar conclude from their analysis of the historic trajectories of digital photography and floorball, 'the careers of individual practitioners determine the

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[4] which is why this thesis speaks of practice theory rather than social practice theory, although the latter might be more clear to those unfamiliar with it and is therefore used in the title of the thesis.

fate and future of the practice itself. As more or different people become involved so the meaning and experience of involvement changes and so the practice evolves' (2007: 154). Practices, over the course of their career are carried and carried out by a changing group of variously skilled practitioners, while people, over the course of their lives will carry and carry out varying sets of practices. An individual can thus be seen as 'a unique crossing point of practices' (Reckwitz 2002a: 256).

The notion that practices can only exist when regularly performed by people and the fact that they are socially shared entities implies that for any practice to exist, a certain number of practitioners is required. It does not mean, however, that this is a fixed and constant group of people. According to Shove et al. (2012: 70-71) practitioners can become recruited into a practice and will, in case of repeated performance, follow a path from novice to expert. But level of competence is not the only way to differentiate between different practitioners. Warde lists theorists and technicians, generalists and specialists, conservatives and radicals, the highly knowledgeable and relatively ignorant (2005: 138), implying not only various types and levels of competence, but also of commitment, down to the level of no commitment at all.

It has to be noted that, from the perspective of the practice, it can be carried by changing numbers of practitioners at various levels of competence and commitment. However, people are not free to take on any practice they like. The required elements of the practice need, at the least, to be available to them. This notion will be explored further in Chapter 6.

3.6   Things and practices

Naturally, things, material objects cannot remain implicit in this discussion of the implications of practice theory for sustainable design. Although materials are one of the elements of practice in this thesis, they are, like people, certainly not central in practice theory. In fact, in most strands of the theory they hardly feature at all. However, those who do recognize the role of things in practices argue that this role is important; both for the way the practice is organized and for the way it spreads and changes.

3.6.1   Constitutive and irreplaceable

Reckwitz is one of the practice theorists who has explicitly addressed the role or materiality in practices. He has done so by combining Schatzki's view on practices as nexuses of doings and sayings with Latour's idea of a 'symmetric anthropology', in which humans and non-humans are treated as equals (Reckwitz 2002b). Reckwitz explains that according to Latour, the material world 'should be understood as "artefacts" or "things" that necessarily participate in social practices just as humans do' (2002b:202). In such a view, 'both the human bodies/minds and the artefacts provide "requirements" or components necessary to a practice' (Reckwitz 2002b:212), i.e. artefacts are approached as 'active, constitutive elements in the reproduction of daily life and social order' (Watson 2008) and are placed at the same level as people.

Moreover, things are not just any-thing; they have a certain materiality. In addition to being 'interpreted' by people in certain ways, they are at the same time 'applied and used, and must therefore be handled within their materiality'. By specifying performance as performing with things, it becomes clear that things are not 'arbitrarily interchangeable'; they are 'irreplaceable, constitutive elements of practice' that 'enable and constrain the specificity of a practice' (Reckwitz 2002b). However, things do not shape practices in a strict causal way. In practice theory, interaction between person and product is viewed as 'situationally contingent', meaning that specific engagement unfolds in the 'emergent doing of practice' (Watson 2008) which is different in each situation. Along the same lines, Hand and Shove (2007) find, in their analysis of home freezing that the same object can be used for and interpreted in highly varying ways, from which they conclude that objects have a 'persistently dynamic status in daily life'.

Importantly, 'because not only *bodies* but also *artefacts* are sites of understanding', practices, according to Reckwitz, can only be adequately understood through their 'double localization: as understanding incorporated in human bodies and as understanding materialized in artefacts' (2002b: 213). In other words, (elements of) practice reside both in people and in artefacts. This point will be elaborated on in Chapter 5, where the analysis of practices for sustainable design is addressed.

Other theorists who have explicitly engaged with the material elements of practice are Shove and colleagues, who, moreover, make an explicit link between materiality in practice theory and resource consumption. Inspired by the work of Jalas (2006), they argue that one of the merits of their interpretation is 'recognition that most consumption, including environmentally significant consumption, takes place not for its own sake, but as part of the effective accomplishment of social practices' (Shove et al. 2007: 152).

3.6.2   Reproduction and transformation of practices

Besides being irreplaceable, constitutive elements of practice, artefacts according to Latour (1996), play an important role in enabling the social reproduction of practices beyond temporal and spatial limits. Because the material things handled again and again in different situations endure, he argues, artefacts enable interaction beyond face-to-face encounters. This explanation at least partly demystifies the 'profound mutual susceptibility' Barnes ascribes to people in explaining this same phenomenon of social sharing in absence of actual social interaction.

Besides contributing to the uniformity of a practice over space and time, new artefacts play a role in the transformation of practices; 'as [new] things are integrated into practices-as-performance […] so they are of consequence for the emergence [or transformation] of practices-as-entities' (Shove et al. 2007: 148). However, the relation is recursive. Things transform practices, but through integration in a practice, things also come to "'materialize' or 'incorporate' knowledge particular to that practice (Reckwitz 2002b: 212). In other words, 'designed artifacts shape and are shaped by the contexts in which they are used' (Ingram et al. 2007). Consequently, practices cannot just be shaped by introducing new products. Interaction between humans and products is situationally contingent, their status is persistently dynamic and they are co-shaped both by their designers and the collectives of practitioners who integrate them in performance.

However, this does not mean that nothing further can be said of the role of things in social change. Reckwitz's final remark that 'if *social change* is a change of complexes of social practices, it presupposes not only a transformation of cultural codes and of the bodies/minds of human subjects, but also a transformation of artefacts' (Reckwitz 2002b: 213, emphasis in original) provides a nice bridge to the role of (designed) materiality in processes of change. A topic that will be further explored in Chapter 6.

3.7   The field of practices

So far, the chapter has talked about single practices. However, Schatzki ascribes the central unit of concern in practice theory to the 'field of practices' (2001: 2), which is the total of interconnected human practices. In his words, 'practices can […] overlap, form hierarchies, and join to compose more complex practices' (Schatzki 1996: 96).

For understanding this field of practices, it becomes important to know something about the relation between practices. As becomes clear from the explanation by Schatzki, this is not a matter of different practices simply existing next to each other. The sections below will go deeper into how practices overlap and join in what Shove et al. (2012) refer to as bundles and complexes, how they can be categorized into dispersed and integrated varieties, and how they don't simply co-exist, but mutually influence each other.

3.7.1   Bundles and complexes of practices

Practices interact in different ways. As mentioned in section 3.5, one node or nexus of practices can be found in individual carriers. Other ways in which practices interact is by taking place in the same location (e.g. the kitchen) or in sequence to each other. As already indicated by Latour, like people, artefacts have the capacity to connect situations otherwise separated in space and time. Things, through their material persistence do not only connect different performances of the same practice, they can also connect different practices. For example, the same bicycle can be an element in commuting and in leisure practices. Moreover, this connecting role is not restricted to material elements. Both skills and images can bind different practices as well. For example, skills in surfing and skateboarding also come in handy when snowboarding (Donnelly 2006), and images of cleanliness connect practices such as laundering and bathing (Shove 2003).

Shove et al. (2012: 81) categorize the various ways in which practices can be related as co-existence, such as being tied by a shared location or time slot, or the stronger form of co-dependence, forming looser practice bundles or stronger practice complexes. Cooking and eating, for example, are co-dependent and form practice complexes together with shopping and storing food. These connections between practices are not fixed. Rather, they can be viewed as 'webs of co-dependence that are not evenly arranged (but include knots, nodes, relays, etc.) continually rewoven as practices are reproduced' (Shove et al. 2012:94). For example, where chauffeuring and repairing were once tightly joined in the practice of driving (Borg 1999), they are today clearly separated.

3.7.2   Integrated and dispersed practices

Schatzki distinguishes two types of practices, dispersed practices and integrated practices. Dispersed practices are 'widely dispersed among different sectors of social life' (Schatzki 1996: 91). Examples of dispersed practices are describing, following rules, explaining, and later in Chapter 6 improvising and experimenting will be discussed as such. Dispersed practices are sets of doings and sayings mainly linked by a 'knowing how to', including knowing how to perform, recognize and judge the practice. Integrative practices on the other hand are 'found in and constitutive of particular domains of social life' (Schatzki 1996: 98). Examples are cooking practices, cleaning practices and religious practices. Dispersed practices are often but not always transformed in integrative practices and when carrying out a dispersed practice, people are usually also engaged in a dispersed one, for example explaining something within the performance of cooking.

3.7.3   Mutual influencing

When practices interact in different ways, 'lessons are learned, innovations borrowed and procedures copied' (Warde 2005: 141); practices mutually influence each other. Due to spill-over effects, a change in one practice can have far reaching consequences for other practices with which it co-exists or is co-dependent. For example, the introduction of the freezer has not only changed practices of storing food, but also of cooking, eating and shopping, and in a broader sense 'the scheduling and co-ordination of domestic life' (Shove and Southerton 2000).

Moreover, Shove et al. (2012) argue that practices do not only compete for limited resources like time (one can simply not be watching television and working in the garden at the same time), but that it is in the relations between practices that *understandings of space and time are formed*. They give the example of 'prime time', a concept formed collectively by millions of viewers, which has influenced programming and in turn affects all kinds of domestic activities such as the time household members eat – whether at the table or in front of their favourite program (Shove et al. 2012: 90).

While in this thesis focus will mainly be on individual, integrated practices, it remains important to keep in mind that these practices are always more or less closely intertwined with other practices, and that when they change this is likely to have effects beyond the practice itself.

3.8   An overview of the conceptual framework

Based on the introduction of theories of practice in this chapter, an overview can be made of the main concepts in the framework:

- Practice theorists explicitly position themselves at the middle ground between the opposing theoretical stances of explaining human behaviour through models of rational individual action on the one hand, and collective normative consensus on the other.

- Rejecting the idea of general explanations, practice theory offers a framework for giving a 'general and abstract account' on the topic of study.
- Practices consist of interrelated elements that can be grouped as stuff, skills and images. Stuff includes human and non-human elements, skills can be viewed as distributed between people and things and images explicitly incorporate meaning as formed in practices.
- Constellations of elements form relatively stable and recognizable practices-as-entity that are reproduced and transformed when elements are integrated in different situations in the practice-as-performance.
- This recurrent relationship gives practices both their stability and inherently dynamic nature.
- People figure in practices as body/minds, carriers and performers. Through repeated performance, practices become carried as bodily *and* mental routines, but not without reflection; people adapt, improvise and experiment.
- People cannot *have* practices, practices are inherently shared, collective achievements.
- Practices can be viewed as having a career that develops over time, involving various numbers of practitioners at various levels of commitment and competence.
- Practices (or the elements of practice) reside both in people and in artefacts.
- While things are irreplaceable, constitutive elements of practices, they both shape and are shaped by these same practices.
- In the field of practices, practices dynamically relate to each other in looser bundles or stronger complexes by sharing carriers, locations, images and skills and can be viewed either as dispersed or integrated.
- Due to spill-over effects, practices mutually influence each other, moreover, understandings of space and time are formed in the relations between practices.

3.9   Conclusions

Without having explored its implications for approaches in sustainable design so far, it becomes clear that practice theory offers a theoretical basis that is fundamentally different from the theories that interaction-oriented approaches in sustainable design build on. Most basically, human action is in interaction-oriented approaches viewed as behaviour that is determined by factors in causal models, while in practice-oriented approaches behaviour is viewed as performances of practices that are governed by an entity. This entity, however, is not determining the performance. Rather, it both guides and is formed and maintained by the collective sum of its performances. What this shift in ontology means for the way sustainable design is organized and whether this leads to a higher effectiveness in reaching its goals is something that is further explored in this thesis. This exploration starts with a review of previously published examples of design approaches drawing on practice theory. Chapter 4 assesses both the strengths and limitations of these approaches.

Implications of Social practice Theory for Sustainable Design

4 Practice-oriented design

4.1 Introduction

As mentioned in Chapter 2, this thesis in not the first study situated at the touching point of practice theory and design research, and even in the area of sustainable design other researchers have pondered over the question of how to 'operationalize' a practice-orientation in design projects.

This chapter first offers an account of the origins of practice-oriented design, after which it offers a critical review of publications, published before the start of the current research, in which a practice-oriented design approach is elaborated on and applied in a design project. After providing an overview of selected publications, their varying ways of interpreting the implications of a practice theoretical approach to design are compared. The chapter will close by identifying areas of further research to be addressed in the rest of this thesis.

4.2 How practice-oriented design started

The term 'practice-oriented design' was first launched in the 'Designing and Consuming: objects, practices and processes' research program (2005-2006). The program was designed and executed by a multidisciplinary team led by sociologist Elizabeth Shove. Shove et al. (2007) introduce practice-oriented design against what they characterise as two dominant working understandings in design: product-centred design and user-centred design. Where product-centred design incorporates the idea that designers can embed economic, ergonomic or semiotic value in objects. In user-centred design, value is viewed

as residing in the relation between people and things, rather than in things alone. In contrast to these approaches, practice-oriented design takes practices as its unit of analysis and inquiry and focuses on understanding and influencing the evolution of practices over space and time. Value is viewed as emerging in practice and as varying from one setting to another. According to the authors, practice theory implies that 'designers have an indirect but potentially decisive hand in the constitution of what people do' (Shove et al. 2007: 134). Moreover, they make a link to sustainable design by arguing that 'most consumption, including environmentally significant consumption takes place not for its own sake, but as part of the effective accomplishment of social practices' (Shove et al. 2007: 152).

The most concrete example toward application of practice theory in design from the Designing and Consuming program is the 'POPD Manifesto' (Shove and Watson 2006), in which POPD stands for Practice Oriented Product Design. It is a one page provocative pamphlet used in a series of workshops with sociologists and designers. In its eight 'POPD tenets', the manifesto describes the type of mind-set typical for POPD as taking a 'perspective beyond single products and individual users towards practices as the basic unit of analysis' and recognizing that products, designers, consumers, needs, values and practices are related and constantly evolve under each other's influence. The main methodological implication is that 'POPDers study practices, now and over time' through 'large scale data sets, statistics on the use of time, money and energy, market research and detailed qualitative exploration of situated practice'. In short, the manifesto offers designers a complex worldview in which practices are the fundamental unit of society. This worldview implies a form of analysis that is both broad and continuous, with the aim of 'understanding the dynamics of practice' and 'identifying points for intervention'.

Although a promising point of departure, the book chapter and manifesto do not offer designers something to readily apply in a design project. The work of Shove and her multidisciplinary team discusses what the role of design is in a practice-oriented view. It also builds a strong point in explaining why design should take a practice-oriented approach, especially when aiming for sustainability. However, understandable from their position in the social sciences, the question of how design should take a practice-oriented approach is addressed only superficially. However, in order to perform practice-oriented design, besides a different mind-set, designers require novel or adjusted design approaches and methods applicable in the context of design projects.

4.2.1 Overview of selected publications on applying practice theory to design

Initially triggered by the ideas, workshops and writings of Shove and colleagues, practice theory has been picked up by several design researchers. An intensive search for references to practice theory in design literature resulted in a collection of fourteen publications. The criteria for inclusion in this review were that the articles had a focus on product development from the perspective of design, references to practice theory, elaboration on a design approach and the use of a case study, preferably with outcome descriptions. Grouped together by author, a list of eight (groups of)

	Publications	Author or author group	Project topic
1	Blyth and Roberts (2005); Roberts (2005); Prendergast and Roberts (2009)	Roberts	Tongue cleaning Health and seniors
2	Korkman (2006)	Korkman	Family cruise
3	Julier (2007)	Julier	iPod community
4	Munnecke (2007)	Munnecke	-
5	Hielscher et al. (2007); Hielscher et al. (2008); Fischer and Hielscher (2008)	Hielscher	Hair care Plastic waste
6	Bakker, De Jong and Scott (2008); Scott (2008); Scott et al. (2009)	Scott	Bathing
7	Pettersen (2009)	Pettersen	Laundry care
8	Jegou et al. (2009)	Jegou	Heating the home

Table 4-1 Overview of publications on practice theory in design projects.

authors emerged. An overview of these authors and the topics of the described design projects are provided in Table 4-1, in order of the author's first publication. These authors have engaged with practice theory for different reasons. Although in most cases multiple reasons were mentioned, generally two categories can be distinguished. Roberts, Korkman, Julier and Munnecke primarily focus on the potential commercial benefits (from a business perspective) of a practice-orientation in design, like 'creating new innovation ideas', 'preventing market failure' and 'obtaining better customer insights'. The other four authors – Hielscher, Scott, Pettersen and Jegou – primarily express ideological objectives (beneficial from a societal perspective), with a focus on environmental issues, such as 'rising household resource consumption'.

The theoretical descriptions the authors offer of practice theory vary in level of detail, from a short mention of several concepts to an elaborate explanation containing all the concepts introduced in Chapter 3, but by and large they convey the same message. Differences between the papers mainly lie in the methodological implications of practice theory for design approaches that these authors elicit. These differences lie in the ways in which information is gathered on the practice and the ways in which this information is used to identify opportunities for design. Approaches are evaluated against the tenets set out in the POPD manifesto and the concepts introduced in Chapter 3. Specifically, the review evaluates to what extent 'understanding of the dynamics of practice' is achieved and what the potential for sustainable design is of the 'opportunities for intervention' that are identified. In the analysis of approaches, a distinction emerged between approaches analysing current situations, aiming to understand how things are and approaches that explored potential future situations, aiming to get an idea of how things could be. This distinction structures the present analysis of different approaches in these papers set out below.

4.3   Analysing current practices

While the authors take a practice-oriented approach for various reasons, these reasons all come down to the capacity to approach consumption or use as a complex and dynamic phenomenon. The approaches themselves show large differences however. In describing them, a distinction can be made between exploring situated practice and exploration of the practice over time and space.

4.3.1   Exploring situated practices

A recurring element in six of the eight approaches is what the POPD manifesto refers to as the qualitative exploration of situated practice. This is done in various ways. Three of the studies involve in-situ observation by the researcher of respectively the internet usage and modes of learning of elderly (Roberts), family cruise practices (Korkman) and iPod use in a community of teenagers (Julier). These observations are supplemented with interviews with the observed. Korkman in particular elaborates on his immersive ethnographic fieldwork on the family cruise. Because hair care is a private practice, Hielscher (in Hielscher et al. 2008 and Fisher and Hielscher 2008) shifts focus from observations to interviews and describes the gathering of data on situated practices through in depth interviews in peoples own homes. For similar reasons, two studies, by Hielscher (Hielscher et al. 2007) and Scott explore the details of situated bathing and hair care practices, but do not 'go into the field'. Both obtain their data through cultural probes; playful workbooks or -packages with tasks of self-observation and reporting. Their views on the role of the probes slightly differ. Hielscher refers to cultural probes as a source of inspiration for both the designers and participants as advocated by Gaver (1999). Scott on the other hand, places emphasis on the probe as supporting participants' self-analysis and the co-design aspect of engaging them in a design process, which is more in line with the work of Mattelmaki (2008). Finally, Jegou combines approaches and gains an image of the way households deal with heating their home through e-mail interviews, self-observation and visits to these households. Viewed over all publications, participants were individuals, households, families and communities and varied in number from 3 to 16. The duration of the exploration ranged from several hours to an (intended) 'one year engagement' (Prendergast and Roberts 2009).

Techniques of observation, interviewing, cultural probes and home visits are existing methods, not specifically developed for these studies. What makes these approaches practice-oriented is the unit of inquiry. Rather than the product or the user, the practice is – or is claimed to be – the main unit of analysis. This difference manifests itself as an interest in the different elements of the practice (images, skills and stuff), an inclusion of multiple products and people and a turning away from looking into people's minds, towards a main interest into what people do and the rationales they offer about this. However, there is a wide variety in focus between the authors. Julier for example, starts out with and more or less centres on a product, the iPod and Roberts seems to focus more on 'users' (elderly) than on a particular practice. Similarly, Korkman explores different

practices of families on a cruise, thereby centralizing the families. As will be explained further below, when exploring situated practice, there seems to be a challenge in capturing the practice-as-such, beyond the familiar units of the people and artefacts that carry it.

4.3.2   Exploration of practices over time and space

In contrast to the elaborate attention paid to situated practice, attention to other types of data for 'tracing the practice over space and time', as prescribed by the POPD manifesto is marginal in the papers. Exceptions are Munnecke, Hielscher et al. (2008) and Scott. Munnecke, in his 'deep-dive' approach gives diving into a practice's historic development a central role in order to extrapolate its dynamics to future scenarios and thus an 'overview of future innovation opportunities'. However, he does not work out his approach in a case example.

Both Hielscher and Scott are more specific and describe how they gathered data from a wide variety of sources. Hielscher, for example, combines in-depth interviews with 24 women and 12 hair care experts with analysis of historical work on hair care. She deliberately traces the elements of the practice – images, skills and stuff – and their co-evolution back in time. Because the paper focuses on resource consumption for hair care, starting points are rationales of interviewees for washing or not washing hair. The search starts with an exploration of ideas of what is clean and consequently of what constitutes dirt. Ideas of dirt that exist among practitioners are then compared to expert knowledge regarding the physiology of the scalp. After concluding that images of 'good' and 'bad' grease have changed over time and that ideas of clean today have little to do with the health hazards that routines of frequent washing were initially set out to conquer, the paper goes deeper into different ways of dealing with grease and the products used in the process.

Although their topics are closely related, the approach Scott takes to the study of bathing practices is quite different. In her thesis, she first devotes a section to the quantification of bathing impacts, distinguishing between water use, energy use and product use, drawing on a range of statistical reports. Like Hielscher, she goes deeper into what she calls 'the biology and chemistry of bathing-as-cleaning', not by talking to experts, but by consulting the website of a large cosmetics producer. This exploration leads her into the world of surfactants, sebum, follicles and emollients. Next, she uses a variety of literature sources (including Hielscher) to paint a culturally diverse overview of the histories of bathing and current trends, concluding for example that bathing in the past 50 years has changed from a two-weekly bath to daily showers. Finally, she devotes a section specifically to trends in bathroom technologies for which bathroom supplier websites are an important source.

Because the history of a practice generally dates back much further than the lives of individual people or things, it seems to be useful for breaking free from the product or user bias. Tracing a practice back in time reveals the sequence of historical events that have formed the ideas of what is normal, good and appropriate today, and how they have co-evolved together with a range of different human and non-human carriers.

Korkman confirms this idea in a footnote mentioning that including an historical analysis 'would most certainly have given the practice description more depth' (Korkman 2006: 93). A similar effect seems to be sorted from comparing practices in different cultures. Moreover, this form of looking beyond or behind the taken for granted is also present when analysing the 'science' of bathing and hair care. The physiology of the scalp and skin is not something that can be directly observed or that people will talk about in interviews. Nonetheless, they play a determining role in the practices. In conclusion, exploring a practice over space and time seems to be a possible answer to the challenge of identifying the practice-as-entity behind the people and things in which it resides. However, there is little guidance in design literature, so far, on the type of data that is useful to include in this form of analysis and its narrative, and how it can be gathered.

4.4   Exploring future practices

Gathering data on the current practice and its evolution over time is, in some of the projects merged with the generation and evaluation of ideas about how the practice could or should be in the future. These future oriented ways of approaching practice analysis are in addition to the starting points offered in the POPD manifesto.

4.4.1   Disruption as a means of changing practice (as performance)

A concept that recurs in several approaches is that of 'interfering' in the situated practice. Jegou, Hielscher and Scott are deliberately 'disrupting' the practice, with different purposes. One purpose of disruption is to gain insight into the composition of the elements of practice. Hielscher expresses this mechanism as creating disorder – or with reference to Reckwitz, generating potential 'crises of routines' (Reckwitz 2002a: 255) – with the aim of provoking routinized behaviour to 'rise to a state of consciousness' (Hielscher et al. 2007: 8). Scott uses simplified concepts from practice theory, like the images, skills, stuff visual to frame exercises for participants to 'deconstruct' their bathing practices (Scott 2008: 44). In addition, she challenges her participants to explore bathing of yore through interviews with their parents or grandparents.

Another purpose for interference, explicitly mentioned by Jegou and Scott is to gain insight into possible changes in the practice – rather than understanding the current practice better. Jegou mentions that their 'co-design process', including propositions of different ways of organizing ones domestic environment, functioned as a 'toolkit to question domestic practices, to take a distance from them and enable the families to re-invent progressively their daily ways of living' (Jegou et al. 2009: 28). Scott mentions something similar. In her study 'practice-oriented ('discursive') triggers' were used to 'stir up creativity in practice' and eventually 'to help people reinvent ordinary practices' (Scott et al. 2009: 5). Such a discursive trigger was for example a story of a group of women who had stopped using shampoo.

4.4.2   Integrating new elements in performances

Moreover, in all three studies participants were challenged to actively integrate new elements in their daily routines. Hielscher describes the probes used in their study as objects that 'participants had to use during their everyday routines of hair care' (Hielscher et al. 2007: 6). Jegou gives mock-ups of products supporting their idea of semi-manual thermal regulation to the families to try out at home. Scott did not offer specific new elements, but challenged participants to come up with and do experiments in their everyday bathing routines, thus leaving the selection of novel elements up to the participants.

The approaches to explore possibilities for change show similarities to participatory design and action research. Participatory design involves future users in the design process of new products; i.e. the product is central in the project. Action research addresses 'social system change through action' (Foth and Axup 2006) and is thus focused on processes and more open as to what elements in the system require change. Both, like the approaches in the studies are iterative in nature, involve subjects as collaborators and may involve researchers as participants. While Hielscher and Jegou seem to stay closer to participatory design and thus to a focus on products, Scott emphasizes the role of the community as a breeding ground for change. The small community of participants forms a (temporal) justification to deviate from existing norms about for example frequencies of bathing. This could be regarded as action research in which the 'social system' is approached through tinkering with instances of the performances of specific practices. A limitation of these approaches is that they all tend to focus on performances, without making reference to changes in the practice-as-entity.

Something of a designer's mind-set seems to add to practice-oriented design is a future orientation. The idea of probes developed in the design field turn out to be a potentially useful way of unravelling those elements of practices that have become so taken for granted that they become obscured from the eye of the researcher. Moreover, the idea of performing future configurations shows potential in taking practice-oriented design beyond a thorough understanding of the present, to what could be in the future. The next section will go deeper into the types of future opportunities that can thus be identified and their value for sustainable design.

4.5   Identifying opportunities for change

While gathering of data leads to an understanding of the dynamics of practices, the main goal for design is to identify points for intervention. As explained by Shove et al. (2007), a practice-oriented designer conceptualizes value in a particular way, not as something that can be provided, but as emergent in practice. This section starts with an explanation of this difference. It elaborates on the work of Korkman in some considerable detail, because it usefully illustrates some of the tensions that can occur when merging practice theory with ideas of value common in the field of design, or in this case service development. This analysis is followed by two examples of what the author considers as promising opportunities for sustainable design that have resulted from practice-oriented design projects.

4.5.1   Improving the value of services by analysing practices?

In his ethnographic study of family cruise practices, Korkman looks for ways in which the cruise provider can 'improve the value' of the service offered to the families. He claims that service providers should look beyond the improvements customers suggest in interviews and perform analysis of the practice by observation of the actual actions of the customers. His idea is that this type of approach can find opportunities for improvement that customers are not consciously aware of themselves. To do this, he unravels the family cruise into different practices and identifies 'problems/disjunctures' in each. His proposed approach may be novel and valuable for service development, but when viewing it from a practice theoretic perspective, some tensions arise.

One main tension lies in the idea of problems in practices and the related concept of improvements. Korkman observes the actions of his 'subjects', labelling them as practices, but judges their behaviour and identifies problems from a frame of reference that lies outside of these practices. What then remains as 'the practice' seems to be merely actions that happen in the specific setting of the cruise ship. In describing the 'practice of buffet' for example, Korkman uses an implicit idea of 'normal' dining (in which all family members sit at the table throughout the meal and courses are eaten at the same time, in a 'proper' sequence) as a frame of reference to judge the actions of the family members. He concludes that although some families

> 'are successful in keeping the practice together and actually perform a form of "dinner" with the family'. 'It is very hard to have this kind of easy pace of dining, due to the fact that the practice does not support it.' (Korkman 2006: 96-97)

In the view of Korkman, families' 'actual need' is to 'dine in an easy pace', while the practice of buffet dining seems, in his observations, not to allow this. He even literally refers to the practice of buffet dining as 'strange' (Korkman 2006: 95). However, when viewed from its own internal set of meanings and rationales, the practice of buffet dining is an acceptable way of dining for the families, simply because it is performed. In fact, a quote by one of the family members indicates that it is even an essential element of taking a cruise

> 'It is important to eat at least once at the buffet, because that is the way cruises are carried out.' (Korkman 2006: 93)

The freedom of getting your own food at your own time apparently compensates for a way of dining that is somewhat more disorderly than having a meal in which everyone remains seated at the table gets their dishes at the same time and in a fixed sequence. Moreover, disliking the buffet might even be part of the practice, as Korkman notes 'a number of families express rather straightforward dislike towards the buffet, but nevertheless most of them use it' (Korkman 2006: 94).

Another example confirms how Korkman dismisses the internal logic of the practice. He relates what he refers to as a 'rather extreme story', which in his view explains 'why the buffet restaurant does not work for families with smaller children' (Korkman 2006:

94). It is a story of how two parents eat in the buffet restaurant with their children, while dividing tasks and eating in shifts. Contrary to what Korkman aims to show with the story, it in fact explains how, although not in the 'orderly way' preferred by Korkman, families with smaller children do make buffet dining work. Moreover, labelling this type of performance as 'rather extreme' might stem from Korkman's own, non-parent (Korkman 2006: 77) perspective.

What this example highlights it that the idea of 'improving the value' of a practice is a tricky one. In a practice theoretic view, because the practice exists – is performed repeatedly by a certain group of people – it somehow works the way it is. The practice, as carried by the collective of its practitioners, has a logic of its own that exists as a shared understanding between these practitioners. It therefore makes little sense to 'evaluate' a practice (buffet dining) using standards from a different practice ('normal' dining).

4.5.2   Problematizing existing practices to create change

A different approach to value is proposed by Roberts. He states that there are no problems or consumer needs that simply exist 'out there' waiting to be found and met, but that 'needs' can be constructed. To illustrate this point, he gives an example of tongue cleaning:

> 'Consumers in the UK may not currently claim a great need to clean their tongue. Thus there is little demand for a tongue cleaner of the sort routinely used in India. Start however communicating that bacteria on the tongue is a major source of bad breath; introduce a new innovative thing called a tongue disinfector and we may find that we have a got a new product on the shelf meeting a new need.' (Blyth and Roberts 2005: 13)

According to Roberts, the success of such an innovation needs the 'problematization' of the existing situation. For example, when introducing the tongue disinfector, bacteria on the tongue that are currently not considered problematic, are problematized in communication around the new product, for example as sources of bad breath. In short, as opposed to Korkman, Roberts does not suggest that commercial organisations should look for problems, but create them. It can be argued that this is what Korkman actually does; by 'ignoring' the internal logic of the practice of buffet dining, he is problematizing it as strange, extreme, disorderly and hasty.

While the point of view of Roberts resonates with the with the idea of finding or creating opportunities for design interventions and provides a way out of the problem-solution paradigm that is so dominant in design, creating a new practice of tongue cleaning does not sound like a way to reduce household resource consumption. However, the idea that 'material artefacts configure (rather than simply meet) what consumers and users experience as needs and desires' implies that 'those who give them shape and form are perhaps uniquely implicated in the transformation and persistence of social practice' (Shove et al. 2007: 134), also when this concerns desirable transformation in the direction of lower resource consumption. What this approach

shows is that not only should a practice be judged according to its internal logic, i.e., its own ideas of what is good, normal and appropriate. These ideas of what is good, normal, desirable or needed are constructed and subject to change, partly under the influence of new product development and the way in which these products are positioned. Therefore, the following section investigates how Hielscher and Scott have used a practice-orientation to identify opportunities for sustainable design.

4.5.3 Project outcomes, sustainable design and transforming practices

Hielscher finds opportunities for desirable change in the combination of her historical review of the elements of hair care practices, interviews about current ways of dealing with hair care and expert knowledge on grease and the scalp. This exploration of hair care from different angles reveals that ideas about 'acceptable' quantities and types of dirt and ways of detecting and dealing with it, are important dimensions for resource use, and that these ideas change over time. As a direction for sustainable design, she suggests that design might engage with ideas of 'good' and 'bad' grease, for instance by making oils naturally produced by the scalp more acceptable. This would be a way to reduce frequencies of washing hair and thus the resource requirements of this practice. Hielscher clearly approaches the practice from its internal logic and uses insights on the historic dynamics of this logic to identify pathways for future desirable change. Thereby acknowledging and working with the idea that needs; like the need to remove natural grease from the skull, are subject to change.

Hielscher also identifies the mechanism of problematization highlighted by Roberts. She mentions that in hair care, advertising has contributed to the problematization of conditions like 'dryness' or 'lack of shine'. However, directly following these observations, she illustrates the use of these same mechanisms for the purpose of encouraging less resource intensive techniques for cleansing:

> 'if technology can supply synthetic substances that 'do the job', the design and marketing of those substances can also define what the job is.' (Hielscher et al. 2008: 11)

For example, spreading natural grease rather than removing and replacing it. Although not offering concrete product examples, Hielscher does propose directions for sustainable design. A focus on practices leads her to the identification of relations between images – ideas of what are acceptable levels of grease – and frequencies of washing. The historic development of the practice demonstrates that ideas of good and bad grease are changing over time, partly under the influence of advertising and new products. Furthermore, exploration of hair care practices of the past reveals ways of hair care that were less resource intensive than those of today. These insights imply that less resource intensive ways of hair care are possible, but that a 'reconceptualization' of what is considered normal – such as normal levels of grease in hair – can be promoted

through the 'right' mix of advertising and products. These include for example the (re-) introduction of natural-bristle brushes and skills of spreading natural grease through hair. Scott follows a similar approach, but goes a bit further in working out directions for design. In addition to (self) analysis of current bathing routines, she asked participants to experiment with different ways of doing bathing at home. Thus learning something about the complex social processes involved in this type of change. From analysis of the current practice and the historic development of its elements, she identifies the connection between flowing water and luxury as one of the problematic aspects of European styles of bathing; a connection that is currently maintained, confirmed and even strengthened by trends in the bathing market. One of the design opportunities that follow from the analysis of Scott is a slow bathing concept. This idea or intervention tries to shift the relation between luxury and flowing water towards concepts of retaining water and heat in connection to for example gentleness and relaxation.

Notably, like Korkman, Scott here uses a frame of reference that lies outside of the logic of the practice. Namely, the idea that resource consumption in bathing should be reduced, something that isn't necessarily shared by most practitioners. In fact, this is also present in the work of Hielscher who judges common frequencies of washing hair as ' too often' from a resource consumption point of view. When taking a practice-oriented approach to sustainable design, it is important to be aware of this normative frame of reference used when approaching practices.

When evaluating the potential effects of these outcomes on household resource consumption, it is not possible at this point to quantitatively assess what they may be. What can be argued is that the ideas resulting from the practice-oriented approach taken by Hielscher and Scott indeed differ from examples with similar aims available today. Efforts for reducing the resource consumption involved in body washing have resulted in the development of technologies like low-flow showerheads, recycle showers and the behaviour oriented timers for use in the shower that aim at making people take shorter showers (ISH 2009). All assume the 'need' for showering, and none address shower frequencies like Hielscher or consider alternatives for the paradigm of flowing water like Scott. However, before being able to say something about the potential of such alternatives to spread and lead to actual reductions in resource consumption, further research is needed.

4.6   Conclusions and directions for further research

From the review of design approaches and projects drawing on theories of practice, conclusions were drawn that make a distinction between taking practices as a unit of analysis and taking practices as a unit of design.

When looking at implications for taking practices as a unit of analysis, it can be concluded that the isolated analysis of situated practice that seems to be the first response of designers makes identification of the practice-as-entity – beyond its manifestations in performances, people and artefacts – challenging. For understanding its dynamics, a broader analysis of the practices' history and cross-cultural diversity has

proven to be essential. A structured approach to this broad form of analysis is so far lacking, and therefore forms an area for further research. This topic will be addressed in Chapter 5 through the question:

> What does it mean for approaches to sustainable design to take practices instead of interactions as a unit of analysis?

From the analysis of approaches, a distinction emerged between understanding current practices and exploring future practices. A design orientation is inherently future oriented and this view on practice-oriented design has resulted in two methodological avenues that were not present in the POPD manifesto. One is the interference in existing practices (as performances) through probes, the other is active experimentation with what could be viewed as possible future practices. The potential of these designerly, future oriented approaches has so far been explored only superficially and will be the topic of Chapter 6. The question addressed here will be:

> What does it mean for approaches to sustainable design to take practices instead of interactions as a unit of design?

A practice-orientation does not only imply gathering particular data in particular ways, it also has implications for the ways in which opportunities for design are identified. While practice theory acknowledges that practices have their own internal logic (inertia), it also highlights the fact that needs are made and subject to change, partly under influence of products and their positioning. This offers opportunities for design to contribute to forms of change at a scale far beyond tinkering single interactions. All the while, the practice-oriented designer should be aware that the idea that household resource consumption should be reduced is a normative framework that is not necessarily part of the logic or sense of the practice.

While showing potential for large scale reductions in household resource consumption, the opportunities for intervention highlighted in the publications that were reviewed have not been worked out. For further exploring this potential, Chapter 7 and 8 will describe empirical projects on two divergent topics – bathing and staying warm at home – that provide more insight into the potential effects of opportunities for design on household consumption that are highlighted by a practice-oriented approach. It has to be noted that these empirical projects are not merely cases in which the proposed approach has been applied. Rather, consistent with the research through design approach taken in this thesis, the proposed approach has both been developed through and is illustrated by these empirical projects.