Loughborough Design School

Designing for sustainable behaviour in cross-cultural contexts: a design framework

by

Gloria María Elizondo Elizondo

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CERTIFICATE OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this thesis, that the original work is my own except as specified in acknowledgments or in footnotes, and that neither the thesis nor the original work contained therein has been submitted to this or any other institution for a degree.

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Abstract

This thesis investigates the influence that cultural differences have in the designing of products and services that encourage sustainable lifestyles. This was researched through a case study of dishwashing practices in Mexico and the UK, and the development of a methodological framework for supporting designers working in cross-cultural contexts.

Designers can shift user behaviour to be more responsible, and by doing this, reduce a product's impact on the use phase of its lifecycle. Nevertheless, designing products that successfully drive behaviour towards a more sustainable path can only be accomplished if they are conceived to fit the user and the specific context of interaction. In order to do so, designers must truly understand the users, and take into account the complex web of factors that lay behind individual behaviour.

A comprehensive review of the literature established an understanding of human behaviour and the emergence and evolution of practices and routines. This brought to light the diverse behavioural patterns in different contexts; and was further investigated with a scoping study in two different locations (Mexico and the UK), exploring general water consuming practices in the home, specifically manual dishwashing practices. The preliminary findings shaped a study that aimed to deepen the understanding of these practices in the selected sites, involving the use of Cultural Probes and videoing people in their common kitchen environment. A robust and clear image of washing-up practices emerged with rich and detailed data presented in different media, ideal to be implemented in a design process.

To this end, a series of multicultural Personas were created as the direct outcome of the Cultural Probes and the scoping study, giving way to the design studies phase of the project, carried out with industrial design students in Mexico and the UK. A design brief for sustainable washing-up practices was delivered. Design experiments were used to provide interesting evidence of the influence in the design process of the designers' understanding of the target user.

The findings indicate that designers benefit from exploration and creativity tools tailored directly from the user-research findings in the early design process. This increases the level of empathy towards the user, particularly making it easier to design for users with different needs and contexts than the designers themselves. It also helps designers to better apply design for sustainable behaviour framework to their concept designs.

Keywords: sustainability, sustainable design, design for sustainable behaviour, cultural probes, sustainable development, sustainable consumption, cross-cultural research, design methods, domestic water consumption.

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Publications

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1 Introduction

This chapter presents the background within which this research was set up, and an overview of the thesis structure. The research focuses on investigating the link between designing for sustainable behaviour for users with different cultural background, exploring a series of tools to assist user-research and design, in the context of domestic dishwashing practices.

1.1 Sustainable development and achieving sustainability through design

The concept of *Sustainable Development* was first labelled in a 1987 publication commonly known as the Brundtland Report, as an outcome of the World Commission on Environment and Development summit in 1983. Sustainable development was defined as development that satisfies the needs of the present society, without compromising the ones from future generations; taking into account societal, cultural and economical development within the capacity of ecosystems.

We live in a world full of products created by people to satisfy their (real or made-up) needs. These products and services require the user's interaction to fulfil their direct purpose (Heiskanen *et al.*, 2005). It is during the early stages of the design process that most of the human-product interaction is determined. A thorough understanding of the user experience can help designers achieve an evolution towards more *sustainable ways of living* (Rodríguez and Boks, 2005; Nilstad Pettersen and Boks, 2008). Sustainable design has traditionally focused on the supply side of a product's life cycle analysis (LCA) (Wever *et al.*, 2008), and it is only recently that the use phase has been recognised to cause the greatest environmental impact, especially in durable consumer goods (Abele *et al.*, 2005; Bhamra and Lofthouse, 2007; Mascle and Ping Zhao, 2008; Wever *et al.*, 2008). Designers benefit from understanding the triggers and drivers

of people's attitudes and behaviour, to identify possible ways of reducing negative social and environmental impacts of products during use, facilitating the journey towards sustainable development.

1.2 Introducing the specific context of study

This research project covers two main subjects of study: *user behaviour research and understanding*, which feeds into *product design* (for sustainable behaviour).

At the core of this research lies also the acknowledgement that *cultural background* has a strong influence on the development of routines and patterns and that it should be taken into account when designing for sustainable behaviour. Users from different backgrounds have different needs, and designers must understand them in order to provide them with appropriate solutions.

For the purposes of this research *cultural background* is defined as:

> *the circumstances and factors that surround one person or group of people in terms of the lifestyle derived from: cultural origins –traditions, habits passed through generations, word of mouth–, social, economical, technological and political circumstances, geographical situation –weather, natural resources availability–. It covers current, as well as past situations, since the first is a consequence of the latter.*

The literature review presented in chapter 2 illustrates how people's actions are influenced by a complex web of surrounding factors and circumstances in which they are carried out. Matters like sustainable attitudes and behaviour are touched upon, and design issues such as design process and Design for Sustainable Behaviour (DfSB) are also dealt with.

To fulfil the purpose of this research of exploring design for sustainable behaviour in specific cultural backgrounds, a more limited context was chosen to work on during the research project. **Domestic water consumption** in the form of manual **dishwashing** was set as the subject to explore; and both of the abovementioned cores of this research have this subject as a starting point.

The following section steps back from the two cores of this research, providing an overview of the importance of the issue of water, setting a background to why it was chosen and why it is a recurrent subject in the literature review and the rest of the thesis.

1.3 Water importance and availability

Clean, unpolluted water is essential to life, and even though it is considered a renewable resource, pollution and over-usage are threatening the world supplies of this precious liquid. In

many regions of the world groundwater is extracted at a rate that exceeds the natural precipitation rate that completes the natural water cycle.

Water extracted from the ground has three main uses: agriculture (70%), industry (23%) and urban consumption (Wales, 2008). While domestic water use accounts for only a low percentage (7%) of the overall use of water (Dworak *et al.*, 2007; Wales, 2008), it is an issue that every person can relate to – and act upon. It is therefore essential for research to be carried out concerning behaviour related to water usage at home: it is a matter that the whole population of the globe can have an input in: *'every day practices multiplied across the 6.4 billion people in the world that impact the air, water and earth'* (Goldsmith and Goldsmith, 2011). Figure 1-1 gives a simplified overview of the distribution of water consumed at home (bathroom, kitchen, laundry and outdoors).

Figure 1-1. Domestic water use distribution by house-area. Percentages from Butler (2006)

1.3.1 Routines and water use

People tend to use water unconsciously, not referring to the use of water as an activity itself, but as a tool to accomplish other activities (Medd and Shove, 2005a; Gram-Hanssen, 2008), whether related to hygiene (brushing teeth or washing clothes) or home care (gardening or mopping the floor), for pampering and relaxation (a nice bath after a long day of work) or even as a daily practice (the morning shower to *feel fresh and awake*).

Within the context of today's hectic lifestyle, people are not fully aware of the amount of water they consume (Randolph and Troy, 2008), nor which activities consume the most. The majority of domestic water related activities (in which this research has a special interest) such as laundering, washing dishes or working in the garden are often performed in time-space coordination with other activities (Crabtree and Rodden, 2004): watching the children, rushing off for a social engagement, or trying to finish before the 3pm football match. Most of the water related actions at home are continuously performed as part of habits or routines that are more complex than one simple action. Moreover, *'many of household practices have a long and honoured history passed down through the generations*' (Goldsmith and Goldsmith, 2011) and are influenced by many contextual/cultural factors. These are fundamental facts that helped setting the grounds for the course of this research.

Population growth and change in lifestyle are two of the many factors that contribute to the rise of water use in households. People living in individual households, a growing trend in the present, may increase the water consumption per capita by up to 40% (DEFRA, 2006). One two-person household consumes around 300 litres of water per day, whereas a single occupancy household consumes 210 litres (DEFRA, 2006; Dworak *et al.*, 2007; Memon *et al.*, 2007). A study by Memon *et al.*,(2007) based on the UK population, supports this trend, having found that indeed '*households with single occupancy have the highest* consumption [per person] *from taps and those with high occupancies have the lowest'*.

Weather and climate change are two additional factors that influence user behaviour in water consumption. Research has found that domestic water consumption and rainfall are inversely correlated (the less the rain, the more water use) and in contrast, water consumption is directly correlated with temperature (Kindler and Russell, 1984 cited in Dworak *et al.*, 2007:21). Temperatures above 25°C appear to increase per-capita daily water use by 11L per grade Celsius (1°C) (Intergovernmental Panel on Climate Change, 2007, cited in Dworak *et al.*, 2007:21). All this points towards how cultural background and habits should also be regarded as influential factors of water consumption. Ethnicity and religion have been less researched as factors that influence water-actions and consumption patterns (Smith and Ali, 2006). All the above mentioned issues can be encompassed in a bigger category referred to as *cultural background (*see definition in section 1.2).

Culture is here used as an analytic, not a descriptive term: *'the term does not describe a set of traits of a group but refers to a form or pattern abstracted from observed behaviour'* (Schwandt, 1997, p.26).

Altering routines to make true long term changes is a long process. New, more-sustainable habits might be well embraced in the beginning, but with time they tend to decline allowing the old routine to retake its place (Pelletier *et al.*, 2008). During this attitude-behaviour evolution, user perception, lifestyle, technologies, infrastructure and social acceptance are transformed.

Once people become comfortable with the new behaviour and it becomes almost automatic, it turns into a habit or routine that remains.

Trying to change people's behaviour into a more sustainable one –either through replacing a technology with a more efficient one, through a conscious change of routines on the part of the user, or by changing behaviour through product design– has to take into account to the situation-context of the activity in play.

1.4 Personal motivation

The essence of this research was partly driven by the researcher's interest in how many habits and routines that in one place are considered *the way* of doing things, in other places are performed in various different manners. Having completed undergraduate studies in Industrial Design in Mexico, she undertook an MSc in Sustainable Product Design in the UK, where she researched into and designed a water saving system for manual dishwashing. This project led the author to undertake the research project described in this thesis.

Personal experiences brought up particular differences between Mexico and the UK that made the author realize that carrying out a cross-cultural analysis of these two regions would probably provide interesting findings to start understanding how cultural background influences people's behaviour. Domestic water related activities presented obvious differences in habits regarding personal hygiene and house cleaning manners, which later converged into the focus of the research.

Clearly, water-related practices involve some personal notions and circumstances that make them possible to be accepted and used by some and not by others. The researcher considers *cultural background* to be essential in understanding the drivers that shape habits. It is in this way that, for instance, watering terraces and streets by one's house every nightfall –to keep dust from rising– is a common and accepted practice in some hot and dusty cities in Mexico; while maybe in other contexts it would be regarded as senseless: the amount of water wasted is enormous, and yet people there consider it a positive thing to do.

1.4.1 Funding

The research presented in this thesis was made possible by the sponsorship of two Mexican Institutions: Consejo Nacional para la Ciencia y la Tecnología (CONACYT) and Secretaría de Educación Pública (SEP). Santander Banking Group and Loughborough University's Graduate School also provided funding for the cross-cultural research stages.

1.5 Research aims and objectives

The overall aim of this research is twofold;

a) To build an understanding of the influence of cultural differences on behaviour with respect to daily practices and their resource consumption.

b) To construct a methodological framework to prompt consideration of the users' cultural background when Designing for Sustainable Behaviour.

The general aim of the research will be achieved with the completion of four specific objectives:

1. To carry out a literature review in the fields of sustainable consumption, behaviour and routines (relating the findings to water consumption), designing for sustainable behaviour (DfSB) and other relevant subjects.

2. To explore parallel routines of people with different cultural backgrounds, by using washing-up practices and perceptions in the UK and Mexico as a case study:

    a. To carry out a survey on washing and cleaning habits and water perception in both locations

    b. To carry out ethnographic studies to gain a detailed understanding of individual/personal dishwashing practices

3. To develop, from the identified practices and perceptions, tools to support the process of designing for sustainable water consumption for washing-up, producing a methodological framework for supporting designers working in cross-cultural contexts.

4. To assess the use of the methodological framework produced, through a series of design studies that aim to build awareness of, and empathy with the user, their context and cultural differences when Designing for Sustainable Behaviour.

To explain the flow of this research in a simple manner, it was decided to break it in four main phases, as illustrated in Figure 1-2 and explained in detail in the Methodology chapter.

- Phase 1: Setting the grounds of the project (Literature review and scoping study)
- Phase 2: Dishwashing behaviour exploration (Cultural Probes with video observation)
- Phase 3: Translating user knowledge into visual data (Personas creation)
- Phase 4: Design studies

Research flow

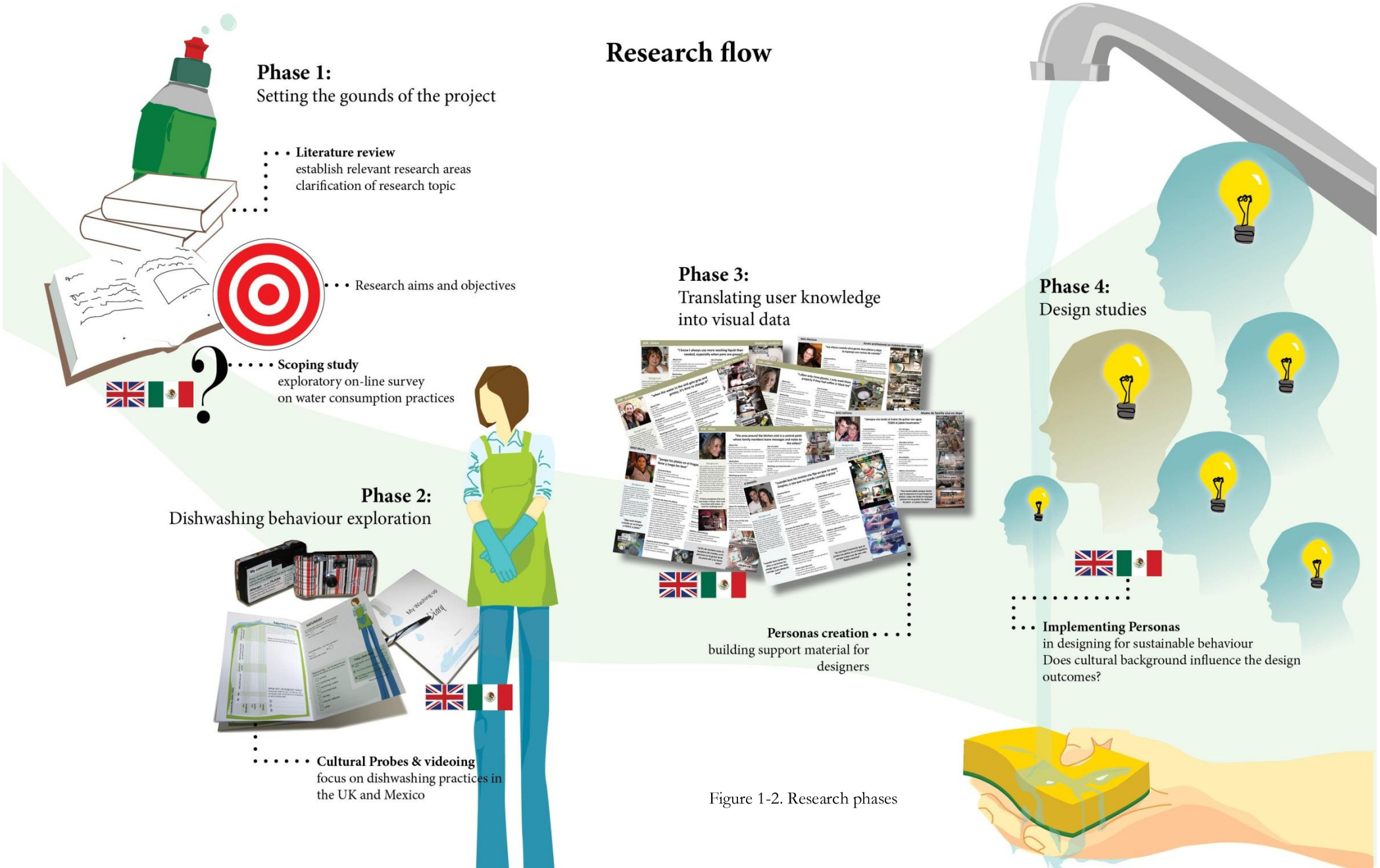

Figure 1-2. Research phases

1.6 Thesis structure

This thesis is organised in eight further chapters, whose contents are briefly explained below.

Chapter 2: Literature review

This chapter reviews the literature that gave shape to this research. It covers subjects concerning consumption, behaviour, and routines within the context of water consumption in the household. It ends by indicating the direction of the thesis towards user-research and designing for sustainable behaviour.

Chapter 3: Methodology

This chapter outlines and justifies the research framework used in this project. Through the discussion of the individual research methods and analysis techniques used, it illustrates how the different research phases are brought together to accomplish the aim and objectives of the project.

Chapter 4: Scoping study: online-survey

This chapter discusses the scoping study carried out at the beginning of the project, as a direct consequence of the literature review. It presents the findings from an online survey applied in both Mexico and the UK to investigate and map general perceptions and thoughts on domestic water use and dishwashing experiences.

Chapter 5: Investigating washing-up practices: Cultural Probes

This chapter presents the designing, application and results of Cultural Probes as a method to investigate Mexican and English washing-up practices. A robust and clear image of washing-up practices emerged with rich and detailed data presented in different media, ideal to be implemented in a design process.

Chapter 6: Personas: translating user-research findings into design tools

This chapter introduces Personas as a design tool, discussing their different uses and misuses. It then illustrates a series of Personas created as the direct outcome of the Cultural Probes, giving way to the design studies phase of the project.

Chapter 7: Design studies

This section presents the planning, development and results of a series of design studies, as part of the concluding phase of this research. These experiments illustrate the influence of the designers' understanding of the user in the design process. They also provide detailed insights

into the use of Personas in the design process, and illustrate the outcomes from a design brief for sustainable washing-up practices.

Chapter 8: Discussion

This chapter integrates and discusses the findings of this research with those of the literature review. It builds on additional issues of interest that came to light during this research project.

Chapter 9: Conclusions and further work

This chapter brings together the general conclusions from all the chapters above, making a link with the completion of the general aim and objectives of the project. It discusses the contribution to knowledge of this research and reflects on the limitations and recommendations for further research.

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2 Literature review

This chapter reviews the literature that gave shape to this research. It covers subjects concerning consumption, behaviour, and routines (making a link within the context of domestic water consumption). It ends by indicating the direction of the thesis towards user-research and designing for sustainable behaviour.

2.1 Introduction

The World's environmental problems are closely related to social issues: the way people act, and the choices they make have an impact on the environment and communities (Jackson, 2005), driving us towards (or away from) sustainable development. In order to tackle unsustainable consumption and behaviour, it is of key importance to understand what provokes it, what lies behind it (Jackson, 2005). However, human behaviour and consumption patterns are very complex, and *'acquiring consumption-related knowledge is a life-long process'* (Goldsmith and Goldsmith, 2011). Different knowledge areas need to be considered, from sociology, anthropology and psychology, to engineering, design, home economics, policy and legislation (Pelletier *et al.*, 2008). Furthermore, as commented in the introduction chapter, industrial and product designers can help improve consumer's wellbeing and (sustainable) behaviour from the early design stages of products and services.

This literature review explores the issue of consumption and its role in (un)sustainable development, it investigates some relevant behavioural models, setting a basis for the understanding of how behaviour is shaped, and which factors can help changing or directing it into more sustainable practices. This way, the early sections of the literature set the ground for the design and implementation of the user research stages of this project (phases 1 and 2). Having covered the main issues on behaviour and routines, the second half of this chapter introduces and discusses the different approaches of design for sustainable behaviour (DfSB), a

relatively new topic that has been formally developed in the last decade, which played a major role in phase 4 of this research (design studies). Figure 2-1 illustrates the flow of the literature review presented in this chapter.

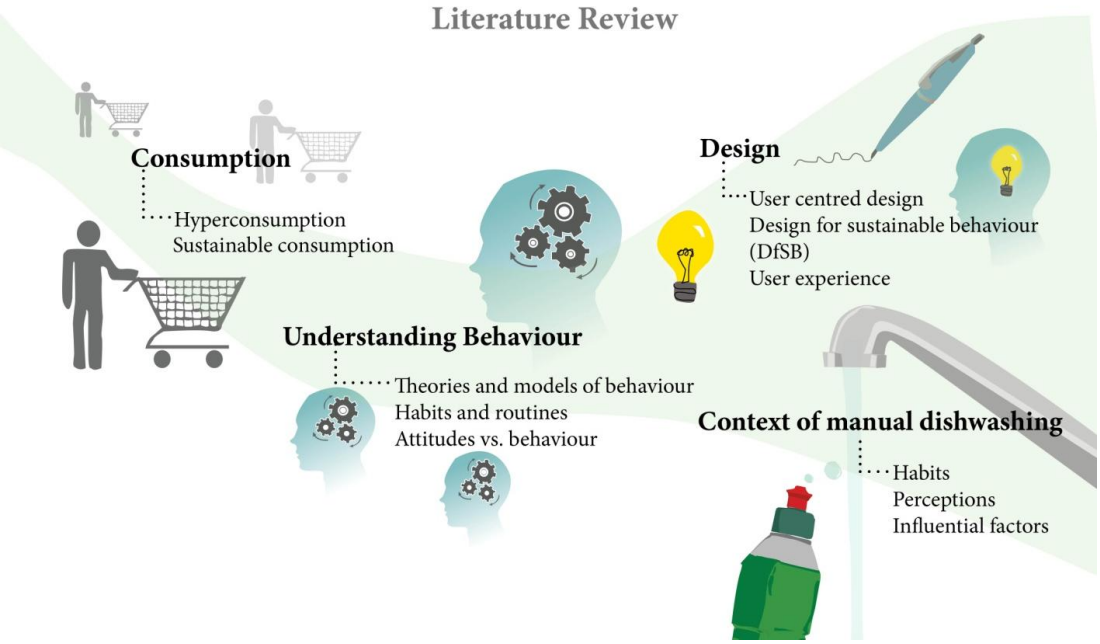

Figure 2-1. Literature review flow: a general overview

2.2 *Today's consumption practices*

Consumers are persistently being bombarded with new products and services pushed by technological development, industrialization, marketing and mass-communication media. This constant availability of something newer and better the second after purchasing a product encourages people's insatiability for more and more goods, as Campbell (2005 :37) points out:

> '[…] *the process* [of buying products] *is ceaseless and unbroken; rarely can an inhabitant of modern society, no matter how privileged or wealthy, declare that there is nothing that they want* […]'

Hyper-consumption takes place when the act of consumption itself is no longer related to fulfilling a *basic* need, but to consume for the sake of consuming (Kilbourne *et al.*, 1997). This new *buy-buy-buy* lifestyle can be considered more than just an economic phenomenon, but also a social one. Society's culture is profoundly connected to the goods and services purchased, ever going

through a constant change of values and significances. The value of people often is set by the goods they possess, and a consumerist society has been gradually created. Miles (1998:7) states:

> *'Consumer capitalism was able to exploit a situation where the symbolic value of consumer goods was endowed with an increased social significance'* […]

The phenomenon of hyper-consumption –as powerful as we know it now– emerged in the second half of the twentieth century and acquired an even larger importance in people's lives in the beginning of the 1980s, when changes in the socio-economical structure became more noticeable with the boom of globalization (Miles, 1998). Dewberry (1996) portrays the decade of 1980 as the time when *'the consumer was encouraged to believe and desire products, particularly designer "labelled" products; and ownership became a status symbol'*. Indeed, production/consumption has shifted in the last fifty years from an activity to fulfil one's needs to a way of life to fulfil society's whims and wants. Consumers find themselves, very often, *'"locked-in" to unsustainable patterns of consumption, either by social norms which lie beyond individual control, or else by the constraints of the institutional context within which individual choice is negotiated'* (Jackson, 2005).

Along these lines, and similarly to consumption's importance in the *societal value*, individuals' wellbeing has traditionally been measured through economic growth in terms of macroeconomic indicators such as the gross domestic product (GDP). This has led to government and business setting objectives to providing people with disposable incomes and maintaining unsustainable consumption patterns (Nilstad Pettersen and Boks, 2008), as *'the higher a country's GDP, the higher* (supposedly) *its wellbeing'* (Escobar-Tello, 2010). However, in recent years and due to numerous critics of this method, a series of alternative indicators of wellbeing have arisen, linking factors other than economic progress, such as happiness, or sustainable development (Escobar-Tello, 2010).

2.2.1 Sustainable or responsible consumption

In parallel to hyper-consumption, minority groups of eco-concerned consumers (and designers) started to emerge (*i.e.* O2 Green Design networks) and environmental issues such as global warming and the greenhouse effect began appearing regularly in the media. Governments started paying attention to, and preparing policies to address, such issues (Dewberry, 1996). *Green consumption* appeared as a trend that promoted consuming more efficient products in terms of resources used and impact on the environment. The term evolved, both in words and in connotation, into *sustainable* or *responsible consumption*, which in addition with efficiency, it takes into account the quantity of products consumed and the social integrity of the processes behind it (Marchand and Walker, 2008). The term *sustainable consumption* was first established at the 1992's Earth Summit in Rio de Janeiro, where more than a hundred country-representative's

gathered together to address urgent environmental matters, and determined that major changes in consumption patterns had to be made in order to solve global environmental and development issues (Dolan, 2002). It was indeed an important event in the history of sustainability, as it was the first time that terms like sustainable development were defined and officially used.

Throughout the years, the term sustainable consumption has been approached with different shades, all along the same lines but with minor differences that mostly lie in whether sustainable consumption means consuming *differently*, consuming *responsibly* –as in efficient products– or simply *consuming less* (Jackson and Michaelis, 2003).

2.3 Strategies for changing behaviour into sustainable practices

Marchand and Walker (2008) recognize that both in designing and consuming, focusing on *efficiency* –e.g. doing more with less– falls short in the quest for sustainable consumption. One needs to focus also on *sufficiency*, which is characterized by reducing the amount of goods and services needed/wanted. Product designers, policy makers and information campaign managers should go beyond the product-centred design towards a consumption-*re*design, focused on the user and his/her interaction with the product. Jensen (2008) mentions a point often missed: people think of sustainable consumption as consuming *'green goods'* (using low energy appliances, low energy bulbs, travelling to eco-centres in Africa). The possibility of *non*-consumption as an eco-strategy is often excluded: choosing to let clothes air-dry instead of using a tumble dryer, or having holidays in a local place instead of taking a flight to a faraway destination.

Different opinions have arisen regarding different approaches to promote user-understanding and most importantly, user-action towards a better and more sustainable behaviour. Barr (2004) states a perfect question for this: *'what transforms aspiration to reality, or indeed if such aspirations have anything to do with reality?'*. The answer to this question has been researched in many fields: alcohol abuse, drugs, energy (Barr, 2004; Herring and Roy, 2006) and water (De Oliver, 1999; Corral-Verdugo *et al.*, 2008).

There are different possible solutions to constrain consumption, but real changes are hard to obtain *'due to the complexity of interests and driving forces on all levels'* (Nilstad Pettersen and Boks, 2008). Possible strategies can be applied through legal methods, educational approaches or even through product design:

- Legal methods: metering, technology rating, building (technologies) regulations, fiscal incentives

People carry out environmental actions either when they are made easily accessible and convenient (*i.e.* technology) or if they find themselves obliged to behave in a certain way by law or fines –*'carrots and sticks'*– (Barr, 2004).

- Educational approaches: pamphlets, handbooks and campaigns (Geller *et al.*, 1983)

  Voluntary campaigns (for sustainable behaviours) have an impact only in certain socio-economic groups of society, whereas when the actions are made compulsory –and punished if not carried out– *all* people commit to the cause (Corral-Verdugo and Frías-Armenta, 2006).

  The majority of people, when reflecting upon the possibility of changing their consumption or behaviour patterns, consider their own wellbeing first (health, or ease of activity/maintenance, financial situation) before thinking for the sake of the nature or welfare of future generations (Marchand and Walker, 2008).

  Educational campaigns towards more sustainable behaviour fail because the information given refers to problems of large scale which the user cannot relate to directly (Lilley *et al.*, 2005).

- Product Design: steering the user's behaviour by encouraging (or forcing) the user to behave in a certain way.

  Research indicates that with the conscious installation of efficient devices – where the user knowingly installed them– the predicted savings of resources (*i.e.* water, energy) are *not* usually achieved (Geller *et al.*, 1983). This phenomenon is referred to as *rebound effect* (Herring and Roy, 2006) in which psychologically, people justify the over-use of the resource and end up consuming the same or even higher amounts. For example, fitting energy saving bulbs outside the house could justify leaving them on all night to improve *security* (Herring and Roy, 2006). The study on water consumption by Geller *et al.* (1983) confirms the rebound effect as only the users unaware of the water devices being installed in their homes achieved the savings predicted from the laboratory testing on the water devices.

2.4 Explaining behaviour

Nevertheless, before jumping into sustainable consumption strategies and trying to influence behaviour, a heuristic understanding of the triggers and determinants to people's behaviour is needed. The following section examines the complexities of behaviour and routines gathering literature from a number of fields (sociology, psychology, ethnography).

There is a vast, ever-growing literature on both consumption and behavioural models from a variety of disciplines, which has given a wide range of perspectives and explanations about what shapes people's behaviour, from which only the most relevant (to this research) are discussed below.

Ajzen and Fishbein (1980) proposed in their widely used *theory of reasoned action* that a behaviour or action is always preceded by an *intention,* which is built up by personal beliefs about what *others* think about that behaviour (a sort of normative or moral belief). The *Theory of Planned Behaviour* adds another variable to the equation, the *perceived behavioural control*, in other words, the perceived self-efficacy.

Schwartz (1977) in his Normative-activation theory tries to explain pro-environment, or altruistic behaviours. He proposes *personal norms* (strong feeling, or moral obligation) are the direct trigger to such behaviours. Based on Schwartz's work, Paul Stern's *Value-Belief Norm* approach to understand environmentally significant behaviours is particularly interesting. In his model (Stern *et al.*, 1999), he proposes that pro-social values such as altruism, are strongly related to pro-environmental behaviours, and egoistic values have a negative impact on them. That is, if I have altruistic values, then I accept ecological norms or actions; once I accept them, I can become aware of the consequences of my actions and feel a responsibility to reduce those consequences. The chain ends with developing a personal norm that guides my behaviour.

The abovementioned models (Ajzen, Schwartz and Stern's) consider behaviour a deliberate action, something people are aware of, they choose to act on. They have been widely used to explain behaviour in a number of fields. Nevertheless, they fail to predict repetitive behaviour (Jackson, 2005; Klöckner and Blöbaum, 2010). Some actions are performed as a matter of habits or routines that do not require major cognitive deliberation (Jackson, 2005). Triandis (1980) pointed out this difference and added *habits* to the equation to predict behaviour in his *Theory of Interpersonal Behaviour* (TIB) always keeping in the picture intentions, and situational constraints and conditions (see Figure 2-2).

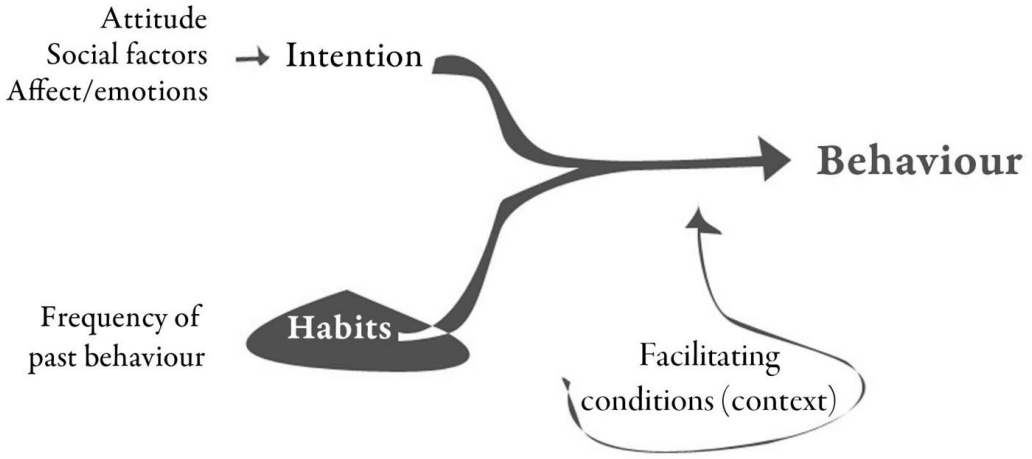

Figure 2-2. Triandi's *Theory of Interpersonal Behaviour (TIB)*, image adapted from (Jackson, 2005)

Triandi's model seems to capture well the complexities of behaviour by integrating normative, situational and habitual influences into the behavioural model. As Jackson (2005) puts it:

> *'I am neither fully deliberative, in Triandi's model, nor fully automatic. I am neither fully autonomous nor entirely social. My behaviours are influenced by my moral beliefs, but the impact of these is moderated both by my emotional drives and my cognitive limitations'* (Jackson, 2005 p. 95).

Triandi's TIB –as with most other sociological or psychological behavioural theories– has been complemented by other theorists (e.g. Klöckner and Blöbaum, 2010). Behavioural models that take into account habits and context into the equation of behaviour can be particularly useful to this research. Triandi's and Klöckner's models propose that behaviour (habits included) is influenced by both internal (i.e. attitudes, values) and external characteristics (physical constraints, regulatory incentives, social practices), which are strongly related to the cultural context.

Section 2.8 complements the effect that culture has on behaviour, building on this thesis' starting point: cultural context's influence on behaviour and how it must be taken into account when designing products or services.

2.5 Daily activities in the form of routines

Routines are composed of several sub-activities that may happen in parallel in space and time (Schatzky, 1996). Most of our simpler every day activities are carried out routinely. Habits and routines develop over time from childhood, with the influence of direct social contact (*i.e.*

family) and the environment (Gram-Hanssen, 2008), evolving along with the circumstances presented in the way (Medd and Shove, 2005b). People stick to those routines to create a *feel-safe environment* (Guiddens, 1990), referred to by Krantz (2006) as a *'matter in place'* state, which when disturbed, changes into a *'matter out of place'* state –*i.e.* a clean tidy kitchen (matter *in place*) that at one point has dirty dishes laying around (matter *out of place*). This change triggers a (re)action to re-establish the original state –in the example, the reaction would be washing-up and putting the items away.

Many routines are learnt and carried-out without a conscious thought. We develop habits that we are able to do on *automatic pilot*. Constraints and available resources are unique to each occasion, and it is according to them that the individual chooses to carry out one or another version of the habitual routine (Krantz, 2006).

People's choices of behaviour are attached to many drivers, some very distant from environmental concerns (*i.e.* comfort, convenience, cleanliness, economy and design). According to a study carried out in Denmark, environmental qualities rank the lowest amongst the drivers for one's actions (Wiese, 2001; Jensen, 2008). Along these lines, for example, is the phenomenon referred to by some as *'time squeeze'* (Hand *et al.*, 2003), where people often opt for the most convenient solution in terms of time and ease, rather than for the best solution regarding performance or environmental consequences.

Figure 2-3 presents some of the determinants that the author considers to influence behaviour and routine emergence and evolution (Hand *et al.*, 2003; Shove, 2003; Haines *et al.;* Maréchal, 2009), it also illustrates how behavioural intentions, often referred to as attitudes, are just one aspect of behaviour, situational and psychological circumstances play a role and interrelate with other variables to finally produce one's actions.

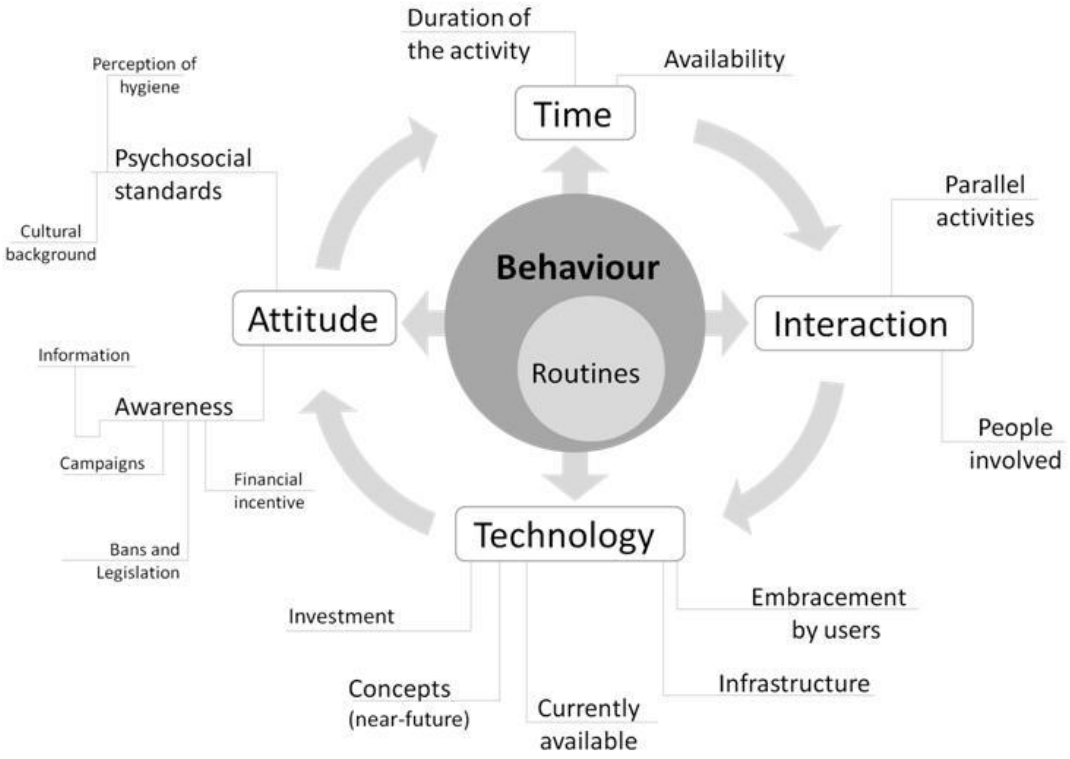

Figure 2-3. Factors influencing the creation of patterns and routines

Even though routines and habits are indeed personal, similar situations can be recognized and regarded as widespread amongst people. Even though everyone acts differently, similar lifestyles and patterns can be grouped into different behavioural styles, (as will be demonstrated for dishwashing practices in the following chapters of this thesis, and has been published in: Elizondo *et al.*, 2011).

Some studies on sustainable/environmental behaviour have categorized people into environmentally-*active* and environmentally-*inactive* individuals (Gilg and Barr, 2006). Other studies have further split the environmentally active people into sub-categories according to their personal perception of environmental commitment. Following this second approach, Marchand and Walker (2008) propose four different sustainable-consumer personalities:

- *Eco-efficient*, where they consume efficient products to achieve a status, but not necessarily to consume less.
- *Better world simplifiers*: who act sustainably for a better world (socially, environmentally, personally).
- *Quality of life simplifiers*: to improve their quality of life first, then environmentally.

- *Involuntary*: they consume less mostly because of financial constraints (but not necessarily the most eco-efficient products).

2.5.1 Breaking old habits, creating new ones

Behavioural psychologists consider that the process of changing habits and routines into more sustainable (or unsustainable) ones happens in different stages (Jackson, 2005; Pelletier *et al.*, 2008). One of the most referenced models is that of Dahlstrand and Biel (1997): being aware of the problem, identifying the different possible solutions; choosing one and initiating a behaviour, and making the behaviour a long term habit, or in the worst case scenario, reverting to the original behaviour. Different approaches must be taken for each stage in order to succeed, as people need to process at their own pace. It is important to assess attitudes and behaviours and their evolution throughout time, since people tend to react favourably to sustainable or green campaigns in the beginning, but the interest seems to decline over time, as *'behaviour returns to baseline if the source of motivation is withdrawn'* (Lehman and Geller, 2004).

2.6 The broken link between attitudes and behaviour

A review of literature indicates that in general, people from developed countries have a sound awareness of the environmental issues going on in the world (Barr, 2004). When questioned, people declare being in favour of *environmental* actions. Expressing support for conservation policies is often regarded as *socially correct*, as it adds on to the '*cultural capital*' –lifestyle and social status– (Askew and McGuirk, 2004; Medd and Shove, 2005b) and it adheres to the social norms (Corral-Verdugo and Frías-Armenta, 2006). For one reason or another, this *perceived* rightness found in supporting environmental behaviour struggles to go beyond the attitude into a real sustainable behaviour (De Oliver, 1999; Jensen, 2008).

The link between attitudes and behaviour is sometimes broken.

One possible partial explanation can be that people, even feeling responsible for their own actions (either pro or anti-environmental), may assume that their individual behaviour has little weight (or none at all) in the whole global-environment picture resulting in a dismissal of the intention of behaving sustainably (Eden, 2000; Barr, 2004). Lilley (2005) points out that people often think of the environment on a large scale, rather than local scale, causing them not to relate to the larger consequences of their actions, and thus behave unsustainably. The often inconspicuous consequences of environmentally damaging behaviour are seen as less important than the immediate comfort and convenience of many antisocial and unsustainable behaviours (Lehman and Geller, 2004).

2.6.1 Changing attitudes, changing infrastructure

Trying to change people's behaviour into one which is more sustainable, can be approached in different ways, some of which include replacing a technology with a more efficient one, making people aware of the consequences of their actions, by transforming their attitudes, or by changing behaviour through product design. Any option has to take into account the context of the activity in play. Introducing environmental values through campaigns in the consumer's culture is important, but combining it with a good infrastructure and law enforcement that impose restorative actions towards responsible resource consumption is a complete solution (Barr, 2004: on studies about domestic water consumption; Corral-Verdugo and Pinheiro, 2006).

As many of the behavioural models presented earlier indicate, behind people's behaviour often lies an intention towards the behaviour itself. Nevertheless, changing people's *attitudes* is not enough to produce a more sustainable behaviour, adapting infrastructure and introducing technologies that support the intended behaviour is also required (Røpke, 1999).

2.7 The influence of culture on behaviour

Differences found between cultures have been traditionally acknowledged and investigated from different parting points. Cultural psychology, for example, recognises the rich diversity found across cultures and tries to understand the *'psychological human universals'* (Gardner *et al.*, 1999). Ethnographers and anthropologists also acknowledge the existence of sometimes radical ways of being amongst different cultures, and attribute this partly to issues of space and place, along with others such as location, community and identity. Gupta (1992) gives a very clear view of this position: *'The distinctiveness of societies, nations, and cultures is based upon a seemingly unproblematic division of space, on the fact that they occupy "naturally" discontinuous spaces'*. Gupta goes on to explain how this simplistic view has more complexities integrated: the representation of the world into different countries does not mean that each country is one nation, or that they don't overlap sometimes, or have smaller divisions (different cultures in one same country) (Hannerz, 1986). Thus, culture can be regarded as a collective phenomenon. People that live in a defined social environment have, to a certain extent, shared patterns of rationalisation and perception of their environment, which potentially have an impact on their attitudes and behaviour (Chau *et al.*, 2002). It can be said then, that the internal and external factors from Triandi's TIB theory are directly influenced by culture and cultural background.

This research takes this into its core, and investigates differences in patterns of behaviour in two geographically different situations: Mexico and the UK.

In the field of design, the issue of how to approach multi-cultured environments and specific cultural environments has special importance. People's reactions to products become more

understandable and predictable when taking into account the cultural context. Cultural differences manifest themselves in a culture's choices of symbols, heroes/heroines, rituals, and values, all of which are critical for a product's acceptance into daily life. The (supposedly) simplest things, like the choice of colours in a product or interface could have a huge impact on people's response to it (Ou *et al.*, 2004). For instance, the colour *red* is used in the Chinese culture as a symbol of celebration and luck, thus it is a traditional colour in weddings. In most western cultures, such event would (traditionally) call for the use of *white*, as it represents purity. White, in most eastern culture is the colour of death and mourning (Globalization Group, 2011).

Going beyond cultural connotations and symbolism, designers could build on theories that try to explain cultural differences, Hofstede (1997), for example, identified five main dimensions or categories that vary throughout cultures and could potentially influence behaviour (and thus, help steering behaviour):

- Power distance,
- Collectivism vs. Individualism,
- Femininity vs. Masculinity,
- Uncertainty avoidance and,
- Long- vs. short-term orientation.

Each one of the five categories can be integrated into a product or service's design, concretely aiming at a certain population. Culture and usability often end up intertwined in a way that cultural preferences influence how user-friendly, foolproof, attractive and accessible a product or service is. Culture-focused design processes can be found in interaction or web design, where multi-cultural users are naturally expected. As Marcus and West Guld (2000) put it, '*in a multi-cultural world, it is necessary to cooperate to achieve practical goals without requiring everyone to think, act, and believe identically*'.

Other researchers have investigated specific cases of symbolic meanings of different products and consumption practices in different countries, which are an inherent part of (local) society's conventions, that is, the *'collective ideas that exist in society of what is normal practice'* (Kuijer and Jong de, 2009). For instance, Ger *et al.,* (Ger *et al.*, 1999) found striking differences in what it means to be 'modern' in Turkey and Japan, and what is regarded as 'normal' in USA, and Nordic countries like Denmark and Norway. They compared certain practices in different cultures (owning a car, using air-conditioning), revealing interesting insights into the reasons for purchasing/using certain products and how these differ according to the country. They suggest that an understanding of the symbolic meaning of consumption practices should be taken into account as a part of a larger strategy for sustainable consumption, along with a consideration of infrastructure and technology availability, as well as the economic and societal factors.

Recent research has looked into daily practices from a practice theory and human-centred design point of view. Closely connected to this thesis' focus on dishwashing, Stamminger *et al.* have carried out various studies on dishwashing practices in different European countries. They, however, have a quantitative approach that aims to measure the amounts of water consumed when dishwashing, and link it with other dimensions such as cleaning performance, time, and energy consumed. Their studies, carried out in a laboratory environment, bring to light interesting differences related to sub-practices embedded in the wider washing-up process: rinsing (or not) with clear water at the end of the process, using a washing-up bowl or using water directly from the tap, and people's own perception of the *'proper'* level of cleanness, and it's relation with the amount of water or washing media used. Great Britain (out of Germany, France, Spain, Portugal, Italy, Turkey, Poland and Czech Republic) came up with the lowest cleaning index, although it came second best in water conservation after Germany (Stamminger *et al.*, 2003). Stamminger recognises three main *'personalities'* of dishwashers: the *'super-dish-washer'* who makes an effort to ensure good cleaning, the *'dish-washing-economizer'* who seeks the least consumption of water, energy and soap, and the *'carefree-dish-washer'* who does not seem to mind the resources used nor the cleanliness of the dishes afterwards (Stamminger *et al.*, 2003). One of the shortcomings of these studies is the controlled environment in which the washing-up practices were studied, which does not reflect the complex context that often surrounds such activity in daily life (refer to section 2.12, Linking the literature to dishwashing practices).

Also interested in everyday activities, Matshuhashi et al. (2009) set out to investigate bathing practices in different cultural environments, specifically in Japan and the Netherlands. Different bathing and showering styles were found in the different countries, along with variations on the context in which the activity itself takes places. Kuijer and de Jong (Kuijer and Jong de, 2009; 2011) went further in investigating bathing practices, and possible redesign solutions for a lower resource requirement, by using a qualitative research technique similar to the one proposed in this thesis (see Cultural Probes chapter) with 16 participants from five European countries. The participants from the user research stage were also involved in a co-designing phase, the outputs of which are currently being tested with a prototyping phase, which will help in evaluating the actual effects of the design on bathing practices. One of the possible limitations of the study lies in the recruitment of the participants for the user research stage (with the probes), who mainly had design and architecture backgrounds, possibly influencing the way they performed and recorded the 'original practice' that served as a starting point to understanding the context of use. Nevertheless, the on-going study (Matsuhashi *et al.*, 2009; Kuijer and Jong de, 2011), looks promising in bringing valuable insights into the impact of multi-cultural design teams on the design outcomes for behavioural change.

Each of the two projects discussed above (one investigating dishwashing, and the other bathing practices) have interesting characteristics in the fundamental questions they raise, the

methodologies used, and specific techniques applied that feed into the research development. This research will build upon the foundations of these prior studies.

2.8 Using behaviour, user experience and product acceptance models in designing for sustainable behaviour

Fogg (2009) suggests a much-simplified behaviour model than the ones mentioned in section 2.4. Moving away from the psychology and sociology uses, and into the context of human computer interaction (HCI), he suggests three factors required for certain behaviours to take place: *motivation*, *ability* and *triggers* (see Figure 2-4). Motivation and ability (simplicity of the task) are trade-offs. If there is a lot of one, but none of the other, the behaviour will not take place. However when both motivation and ability are present, the third factor, a *trigger*, should appear. Triggers need to be noticeable and be associated with the target behaviour.

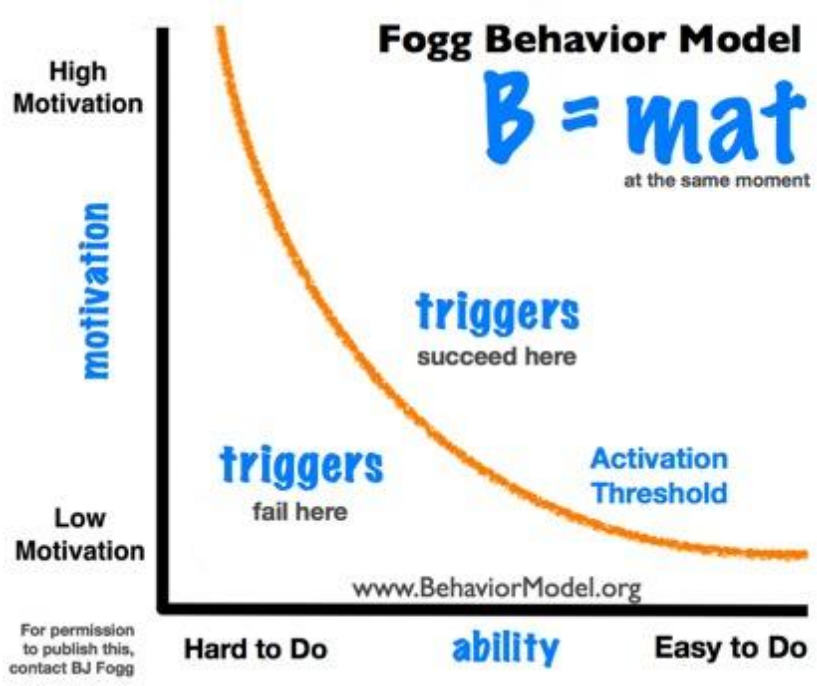

Figure 2-4. Fogg's (2009) behaviour model.

Fogg's (2009) behaviour model is helpful in organizing early ideas of what can be improved or designed for a product or service, but designers need also primary research about the user's context in order to come up with a successful user experience.

Setting out from a recycling-behaviour study, and looking into behaviour in a wider context than Fogg, Barr (2004) recognized three main categories of factors that are related to the way people act:

- Environmental values: weak or strong sustainability, *eco*centrism or apathy towards the environment
- Situational factors: facilities, demographics, knowledge and awareness
- Psychological variables: personal perceptions: altruistic, intrinsic motivation, influence of significant others (e.g. *'if others do it, it is good to show that me too'*), believe that their actions matter, do good in order to avoid harm (self-interest – do good so they can enjoy good)

Although not coming from psychology, Barr's three factors can easily be related to Tirandis' TIB, or Stern's models, for example.

2.8.1 Designing for user experience

Further on people's choices of behaviour, Shackel and Richardson (1991) provide a clear panorama of the factors that influence the consumer or user assessment of a product, using what they call the *paradigm of usability* (1991:22). In their model, represented in Figure 2-5, they suggest that the user's acceptance of a product or service is affected by critical factors which are linked in the form of a trade-off paradigm;

- Utility – *will the user be able to work the product successfully?*
- Usability – *will the product do what is needed functionally?*
- Likeability – *will the user feel it is suitable?*
- Cost – *terms of purchase and maintenance and social*

The model illustrates how a person would decide in favour of a product, or behaviour, if it was considered adequately useful, usable and likeable in reference to what it costs.

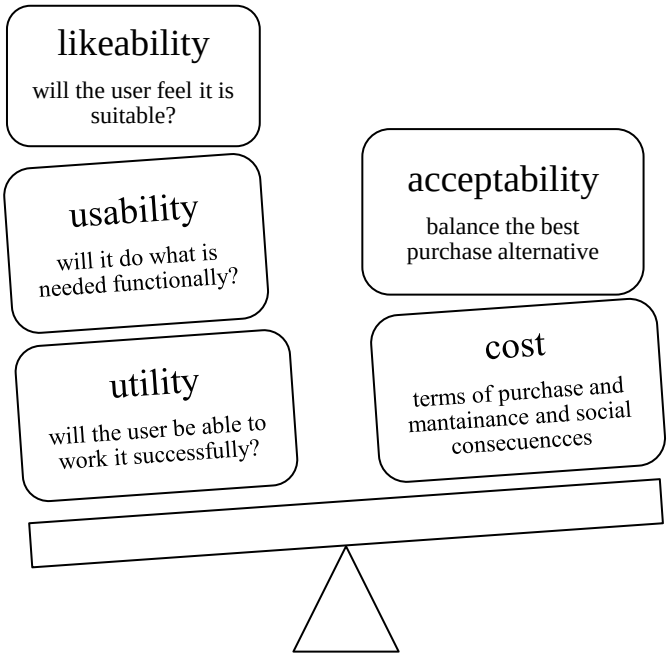

Figure 2-5. The paradigm of usability and related concepts. Adapted from Shackel and Richardson (1991)

As it has been stated before, and partly exemplified in Shackel and Richardson's model, if designers are to influence user's behaviour through design, it is important to understand the user-product interaction and what lies behind it. Designing products that can decrease negative impacts (social and environmental) through new technologies or new behaviours is just as important as *'getting it right'* in terms of public acceptability. Efficient technologies and all sustainable products are only beneficial when people actually use them (von Hippel, 2001; Wever *et al.*, 2008).

User centred design (UCD) strategies evaluate a product's aspects from the user's point of view, trying to improve the quality of the user-product interaction (Wever *et al.*, 2008), which involves both internal (user) and external (context, product) factors. Jääsko and Mattelmäki (2003) present the UE as a series of qualities or factors, touching both active and tacit aspects of the circumstances that surround the product or service. Amongst the UE aspects, they include user personality, appearance of the product, user interface, product meaning, environment, interaction and product novelty. Kankainen (2003) proposes a model of UE defined as '*the result of motivated action in a certain context'*, (shown in Figure 2-6) which is influenced by the user's previous experiences and expectations, and is also fed into future user experience processes (Buchanan, 1999).

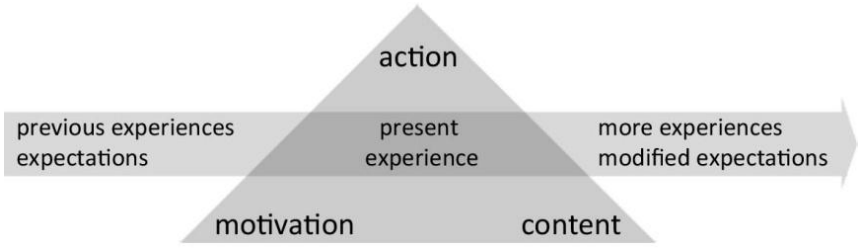

Figure 2-6. Kankainen's (2003) conceptual model of UE

When exploring user-product interaction, as part of the user experience, Shackel and Richardson (1991:23) propose four basic factors to consider: user, task, product and the environment in which the action takes place. Wever *et al.* (2008) adds other elements to the picture: products and people other than the direct user that might have an impact in the interaction. The need to understand such a complex context of user-product interaction has driven the development of new and innovative approaches in the design field to carry out user research that can look into both external and internal motivators and triggers, in a way that designers can create products that reflect the user's needs as well as self-image, social perspective and ideologies.

2.8.2 Going beyond functional products: emotions matter

In order to change behaviour, a thorough knowledge of its triggers has to be considered in the design process to design products that guide people's actions towards more sustainable ones. Beyond coming up with products that encourage certain behaviours, the products themselves have to be accepted and used by people in order for them to be successful in their objective. Literature shows how consumers are becoming more and more demanding, searching for more than the traditional aspects of functionality or aesthetics, but wanting to create some sort of *emotional bond* with the products (Jordan, 1997; Jordan, 2000; Congress *et al.*, 2007). Jordan (1997) adapted Maslow's pyramid of *human* needs into one which simplifies *consumer* needs (see Figure 2-7), placing pleasure 'one step further' than usability, right after the basic need of functionality of the product. Along the same lines, new design-paths have emerged in the last decades promoting enhanced experience for the users: design for emotion (i.e. Norman, 2002; Forlizzi *et al.*, 2003; McDonagh *et al.*, 2004; Norman, 2004) , design for happiness (i.e. Hofstetter *et al.*, 2006; Khalid, 2006; Escobar-Tello and Bhamra, 2009), and persuasive design or design for sustainable behaviour (Lilley, 2007; Fogg, 2009; Lockton *et al.*, 2010; Spangenberg *et al.*, 2010), are only some of the new design routes that promote special attention to human factors in the design of products or services.

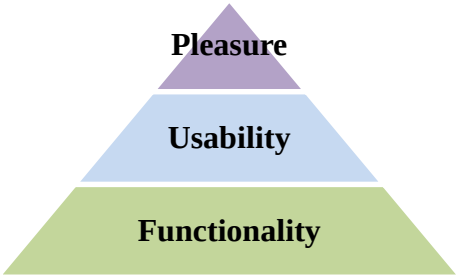

Figure 2-7 . Jordan's hierachy of consumer needs (Adapted from: Jordan, 1997)

2.9 *Behavioural models for the design of products and services*

The literature presented brings to light various models of user experience, usability and behaviour. Each of these models can be combined in a way that they complement each other and result in a more comprehensive vision of behaviour. Figure 2-8 illustrates the result of the amalgamation of Kankainen's (2003) and Jääsko and Mattelmäki's (2003) user-experience models, linked to Shackel's usability paradigm (1991) and Fogg's (2009) behaviour model.

This theoretical model, although only presented in a simple manner, could be further investigated and applied throughout the design process and referred to when evaluating design concepts to give a clear understanding of some of the elements that designers must look into when designing. It illustrates how intrinsic and extrinsic factors should be related when designing for behavioural change. Internal triggers, often linked to psychology and sociology, are *tacit* characteristics that can be approached with UCD research methodologies.

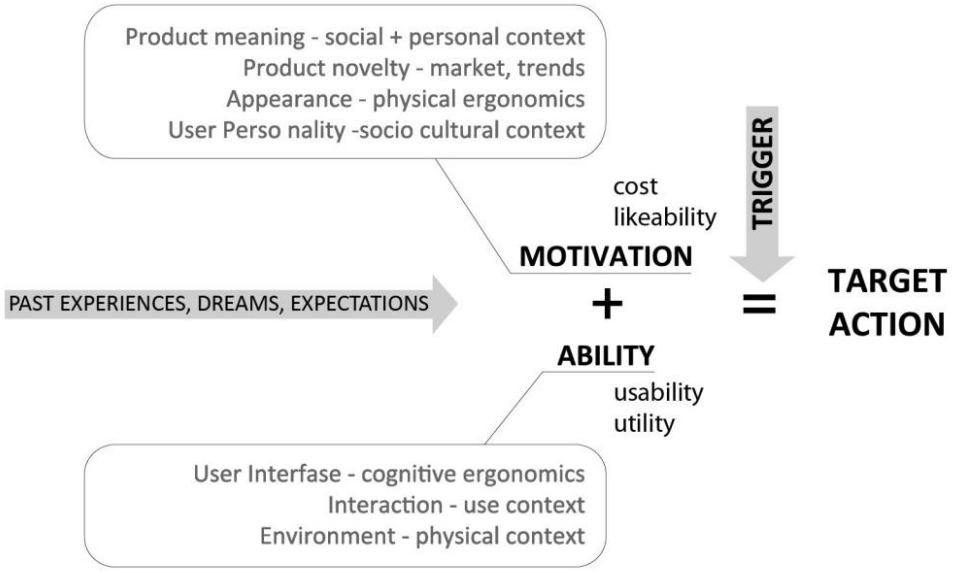

Figure 2-8. A persuasive design model, an outcome from the literature review.

From his behaviour theory, Fogg (2011) has an ongoing project developing a series of guides to help designers that are working on behaviour change projects. In his free-access online-tool, he tackles the intended behaviour according to the time frame in which it will be performed, and the type of action intended (initiate, encourage, decrease or stop certain behaviours), as illustrated in Figure 2-9 below. He then gives examples of the different possible cases of behaviour, and links it with his three elements for behaviour: ability, trigger and motivation, suggesting different possibilities of 'playing' with those elements to achieve the intended outcome, that is, he *'proposes a sequence by which the requirements (of the 3 factors) should be altered'* (Zachrisson and Boks, 2011).

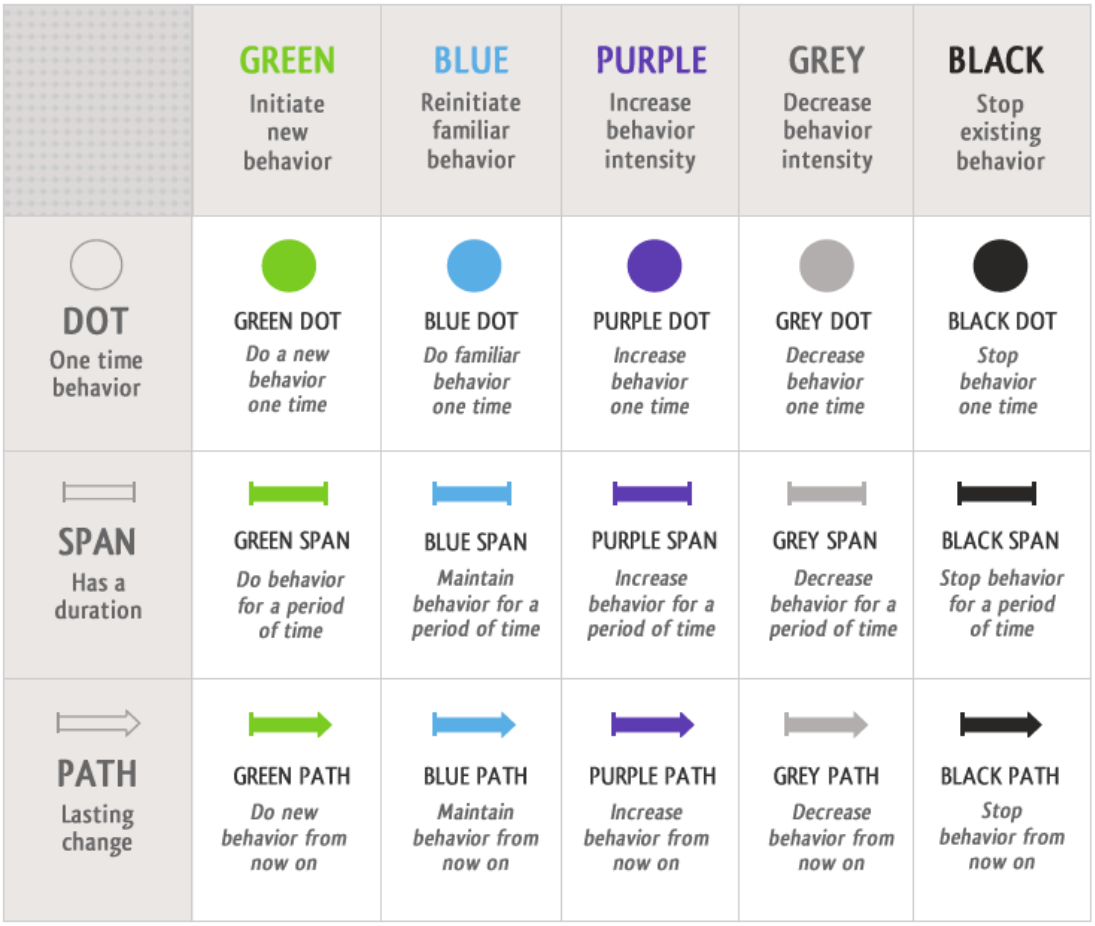

Figure 2-9. Fogg's (2011)behaviour grid

For example, if a designer was aiming to, through design, make the user perform a familiar behaviour at a certain time, then he/she would want to go for a *blue dot behaviour*, for which Fogg (2011) recommends all elements coming together at once:

> *'you must* ***Trigger*** *the behaviour when the person is both* ***Motivated*** *and* ***Able*** *to perform it. If any of these three elements is missing, the behaviour will not occur'* (Fogg, 2011).

That is, for the *blue dot behaviour*, a trigger must prompt a person to act at that time (a button in a *Facebook* email 'click here to respond'). At that same time, the person must have enough motivation to act, either in the form of sensation (pleasure/pain), anticipation (hope/fear), or belonging (acceptance/rejection); and have the means to perform the task (an internet connection). Different sequences of the three elements are proposed for the different kinds of intended behaviours.

As the example above illustrates, Fogg's resource provides designers with guidelines to take into account when designing the user-product interaction. Fogg complements these guidelines with some (not very visual) case studies and examples for each of his 15 possible approaches (see Figure 2-9).

Fogg's is one of the most recent attempts to produce guidelines to successfully affect behaviour, but not the only one. Designers can tackle behavioural change with a series of different design strategies and approaches studied and expanded by various researchers in the last decade (Fletcher *et al.*, 2001; Lilley, 2007; Nilstad Pettersen and Boks, 2008; Wever *et al.*, 2008; Lilley, 2009; Tang and Bhamra, 2009; Lockton *et al.*, 2010; Zachrisson and Boks, 2010). The following sections dwell in the field of design for sustainable behaviour (DfSB) and expand on some of the most important design approaches used today.

2.10 Design for sustainable behaviour strategies

'*Changing situational conditions is a promising way of modifying behaviour*'
(Klöckner and Blöbaum, 2010)

In the last few years, design researchers have recognised a number of design strategies to influence user behaviour and promote a sustainable use of products and services, reducing negative impacts. Jelsma (1997) introduced the concept '*script*' to product use and design. A script *is 'a kind of user manual inscribed into an artefact'* which guides the way users interact with it. Lilley (2005) takes this concept and proposes a range of sub-divisions to it in a framework that tries to capture most strategies for design for sustainable behaviour. She identified, categorised and illustrated most product-led approaches according to the level of intervention (from the designer) into the user's behaviour or (in other words) to the level of control (on the behaviour) given to the user. At one end, the eco-feedback approaches leave the user the choice of acting sustainably, and at the other, with intelligent products, the user barely notices the choice of behaviour. Between these extremes, a number of other approaches appear, under the name of behaviour steering approaches. Figure 2-10 shows Lilley's classification.

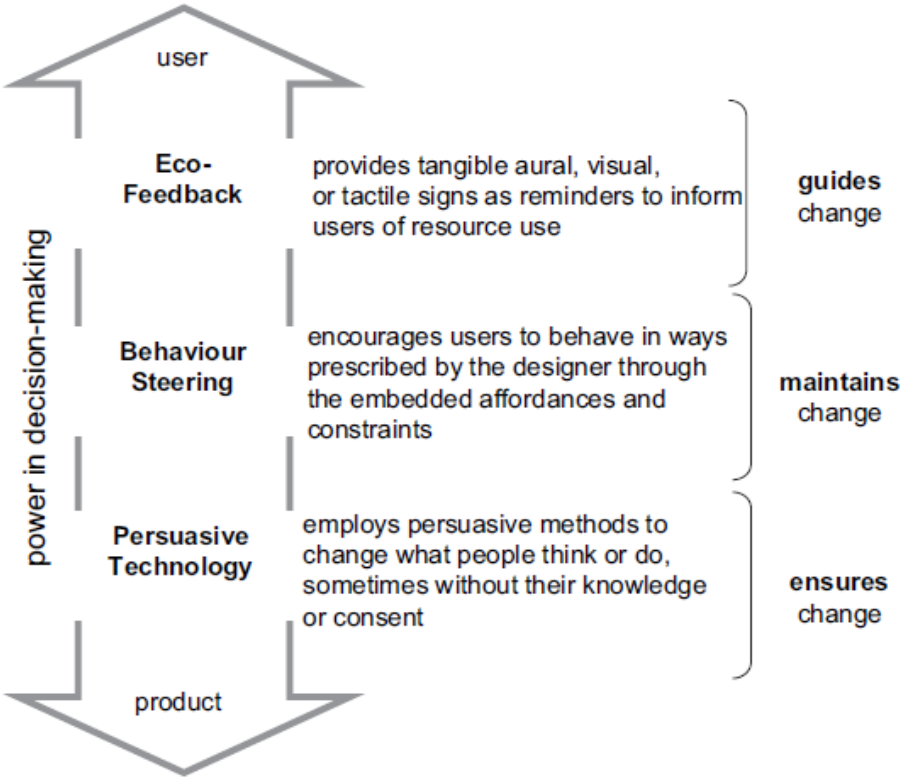

Figure 2-10. Lilley's approaches for designing behavioural change (2009)

Building on Lilley's work, Tang (2008) carried out work in further extending the three strategies identified by Lilley, keeping the structure of user/product control and interaction, to develop what is now referred to as the 'Loughborough model'. Figure 2-11 provides an overview of the seven design strategies proposed by Tang, with a brief description of each. The Loughborough Model is presented in *Design-Behaviour*, a web-based resource developed by Lilley (Lilley and Lofthouse, 2009) to help designers understand and apply these approaches with practical examples from real products, and serve as an inspirational tool to produce design solutions to design challenges. The resource, besides including sections on theory and examples of DfSB, also provides the reader with tools to understand the ethical issues involved in applying such approaches, and an overview of some user-research methods (Lilley and Lofthouse, 2009; Lilley and Lofthouse, 2010).

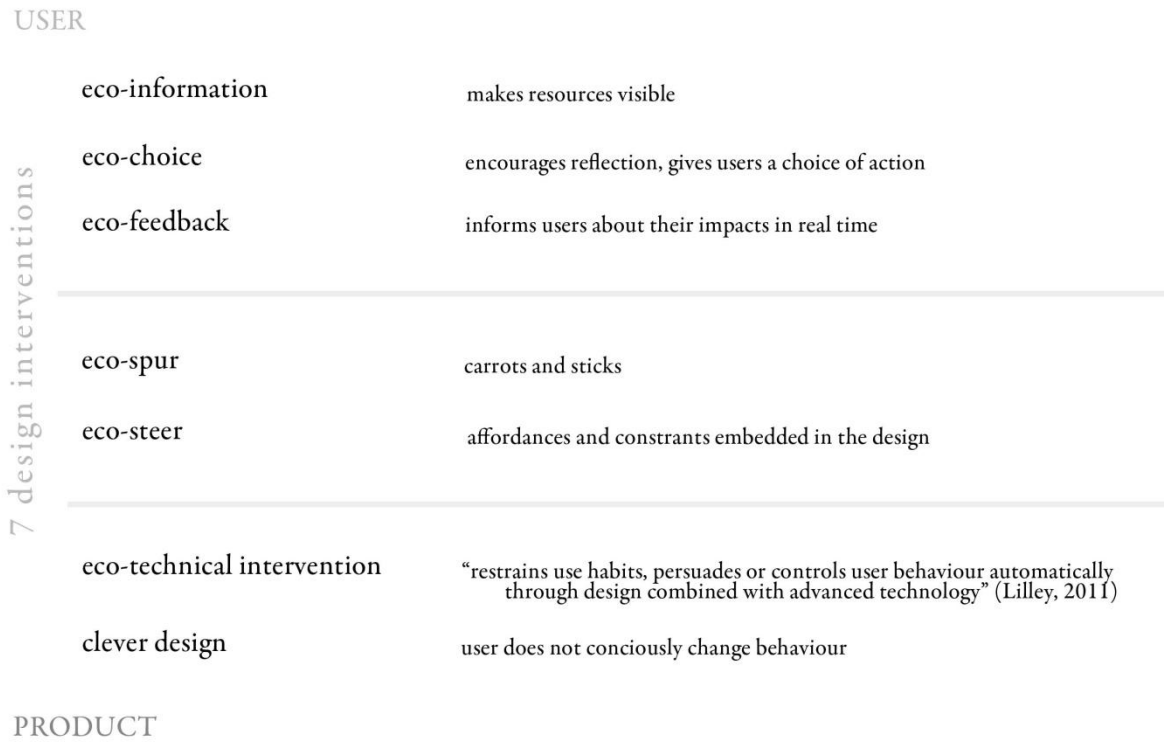

Figure 2-11. An illustration of the DfSB interventions identified by Tang (2009)

Lockton (2010), contemporary to Lilley and Tang, approaches DfSB with a *suggestion tool* for designers which suggest relevant design techniques for influencing different types of behaviour by providing examples from a range of fields that can serve as inspiration for designers. The toolkit starts off from a series of identified *target behaviours* and *design lenses* (different field of use, *i.e.* architectural, error proofing, security, persuasive...), that are structured in different patterns (see Figure 2-12). The examples are meant to trigger creativity and help designers *'draw parallels between the designers own brief and the solutions offered'* (Wilson *et al.*, 2010), and encourage *outside-of-the-box* thinking.

Figure 2-12. Lockton's (2010) Design with Intent Toolkit, with a close up for Social proof, one of the proposed design patterns.

Although DfSB strategies are being developed in a very promising way, up until now, they have been limited to theoretical use and early prototypes (Wilson *et al.*, 2010). Zachrisson and Boks (2010) have on-going work on producing a strategy to guide designers in their choice of design for sustainable behaviour approaches, to facilitate applying DfSB strategies beyond an academic or conceptual stages.

They have identified a link between the factors that affect the (specific) behaviour and the control distribution allowed by the approaches (see Figure 2-13). Looking into Lilley's approaches, *'the more control the user has, the more cognitive load the interaction requires'* (Zachrisson and Boks, 2010); therefore, if the behaviour to 'guide' requires the users undivided concentration, then it would be preferably to have an 'intelligent product' approach.

Figure 2-13. Zachrisson's (2011) control distribution in DfSB approaches

Zachrison's (2011) most recent on-going doctoral work is trying to make a link between Fogg's behavioural model and behaviour wizard (see previous section) to help designers select a more-design-specific approach such as one of Lilley's (2009) or Lockton's (2010). They have identified a benefit on giving the user control in the same amount that his/her attitudes correspond to the desired behaviour. This is, if it is really easy (the least-effort, straight forward way of doing it) to do an unsustainable behaviour, and the person is not particularly a pro-environmentalist, then a less (or no) control should be used, otherwise, the user would be prone to go for the easy (unsustainable) way.

2.10.1 Identification of a cultural dimension gap in the DfSB strategies

As discussed in section 2.7, cultural background is a key influential factor on people's reactions to, and interaction with, products. Although the discussed DfSB strategies all take into account the immediate context of people, they do not take account of the wider cultural context. This represents a significant gap in these existing frameworks.

The choice of using an eco-feedback strategy over persuasive technology in the design of a product could be better informed if cultural background was introduced as an additional dimension to take into account. It cannot be taken for granted that the designer has the same background as the target user and that he/she has an understanding of the cultural nuances that lie beneath the surface. Therefore the appropriation process of the DfSB approaches and their translation into concept ideas has to include a careful consideration of local traditions, routines and other cultural aspects. If a designer was to explore the user's culture –*i.e.* one could use Hofstede's dimensions (1997), refer to section 2.5– he/she could go through the different DfSB strategies (Loughborough Model) or design patterns (Design toolkit) and make a more informed choice of the best approach to take and possibly get a better idea of the possible design solution within it.

2.11 The user centred sustainable design process

It is clear that the DfSB strategies presented in this chapter give particular importance to the user-product interaction and promote the design of enhanced experiences for the user. They fall therefore within the user centred design (UCD) realm.

Wever *et al.* (2008) point out that design is no longer a linear process in which the researcher studies the user, gives information to the designer so that he makes something of it, whilst the user is only the final receiver of the design outcome. Design processes have evolved to be a series of questioning, understanding, creating and evaluating concepts in an iterative way. Designers now often act as researchers, and users are being encouraged to participate more and more in the design process. This brings out to light the growing multi-tasking sense in the roles

of all the people involved. Designers must have access to different tools and methodologies that allow them to analyse and predict actions, and understand the environmental impacts that might be implicated. Wever *et al.* (2008), based on the previous work of Roozenburg and Eekels (1995), represent the design cycle with four iterative design stages: analysis-synthesis-simulation-evaluation.

In another simplified view of the design process, Sanders (2008) gives emphasis to this pre-design stage, referred to as the *fuzzy front end,* a stage in which designers have open ended questions and try to understand the different elements of the human-product interaction, to later generate concepts and evaluate them, going back to the beginning of the cycle until the final design is completed. If we were to consider too the involvement of other users or stakeholders in the design process (as in collaborative design), we would need to include them too in the model, dividing it in sub-design-stages.

Figure 2-14 illustrates a proposed version of a merger between Sanders' (2008) and Wever's (2008) design models. The core of this new model is the interaction and collaboration between the *designer* and the *user*, possibly interchanging their roles along the process and also, both of them, acting from time to time as *researchers* (in the case of some of the UCD approaches). Such ability of role-shifting shows a dichotomy of functions with designer-researcher, designer-user, user-designer, user-researcher. The interaction abovementioned may happen in three stages of the design process. It starts with an *exploration stage* in which designers and researchers get acquainted with the design **context, the user, technologies and investigate all other related complexities**, this stage can be aligned with Sander's *pre-design*. The *co-design* stage comprises the designing of concepts from the ideas generated, both as a team of all-designers, or with the involvement of users and other stakeholders with an active role in the conceptualization stage. An *evaluation* of these concepts follows, having in mind usability and other related aspects of UE, to then continue the creative cycle until a final design is reached.

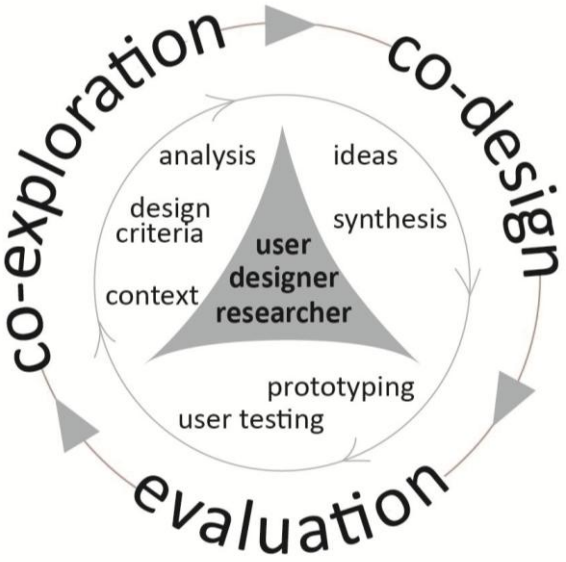

Figure 2-14. An illustration of the cyclic user-centred design process.

Within, and beyond participatory design, it is vital to make accessible tools that promote a collaborative environment between designers and other stakeholders and team members that might be involved. Users, researchers, other team members that designers might work with (marketers, engineers, sociologists and other decision makers) might not have the same perceptions of matters and mental processes. Designers are known to see the world differently, and they are innovative and creative (Shedroff, 2009). With the appropriate tools, each member of the team can provide their expertise to design products/systems that are a perfect fit to the *real world* (Bødker, 2000).

2.12 Linking the literature to the thesis context: dishwashing

As mentioned in the introduction, this thesis, although is strongly linked to behaviour and design, it also explores (by taking as its context) manual dishwashing practices. This section attempts to briefly relate such context to the literature presented in this chapter, in an effort to set the grounds for the design of the user-research stages of this project (phases 1 and 2 of the research, in chapters 4 and 5), which are introduced in the methodology chapter.

This review of contextual issues of dishwashing is presented here, not as part of the literature that has been done on behaviour and DfSB, but to illustrate the gap in knowledge of how contextual issues are important to have a holistic view of a subject, and better understand which possible design approaches might or might not work. If the behaviour is conspicuous or not to the public, if *what others say and think* is important, if there is a possible opportunity in developing '*sustainable community'* approaches... or if it is better tackled as an individual issue. All these are

important matters to which this research is trying to give special relevance, and build on this *cultural background* to better use DfSB approaches in the design process.

2.12.1 Manual dishwashing as a daily activity

Dishwashing is an unavoidable task for most people, one that is often not dear to people, and so it is performed as fast as possible, trying to achieve *more or less* clean dishes (Richter, 2011). The use of dishwashers is becoming more and more common in western societies (Stamminger *et al.*, 2007) probably as a way to avoid the time-consuming task of washing-up. Technologies are evolving, becoming more efficient, different sizes are being created to accommodate smaller households, and prices are dropping, making such an appliance more affordable to wider audiences. Indeed, in terms of sustainability, there are a number of studies that prove how, if used efficiently, electric dishwashers reduce the amount of water used by 50-80% (Richter, 2011), and they also provide savings in energy consumed. Nevertheless, in reality those studies are carried-out in labs, with the *optimal conditions* (full loads, best technology), which are not representative of the use regular use consumers give them. Moreover, households with dishwashers almost always combine manual and automatic processes; hence the importance of looking into transforming the manual dishwashing practices into more sustainable ones.

(Manual) dishwashing is an activity often performed without giving much thought to it, and as with most water-related activities in the home, it takes place in a routine way (Gilg and Barr, 2006). Water related habits have evolved over time in very different directions. Common habits are always developing as new technology and infrastructure arise, hygiene standards change and social and economic situations evolve. There is a wide range of contextual and personal factors that influence the way people perform the dishwashing practices, resulting in different resource consumption rates. Early studies on manual dishwashing behaviours (Stamminger *et al.*, 2007; Berkholz *et al.*, 2011; Fuß and Stamminger, 2011; Richter, 2011) provide quantitative data of water and energy consumption from laboratory studies, whilst indirectly showing how different elements and routines are performed in each of the studies regions (mostly European).

From previous dishwashing research, it is clear that there is a lack of formal studies on the *qualitative* aspects of the dishwashing practice, which, to this researcher, is key to finding alternative solutions to reduce resource consumption. Studies done in real environments, in people's natural contexts are the optimal way to get a genuine understanding of what is done and why, preparing designers to better identify potential resource saving solutions.

2.12.2 Technologies and products to reduce water consumption

There are a number of simple product examples in the water-consumption domain that in one or another way use design for sustainable approaches. Some of them replace other appliances keeping the old routines while using less energy and water –see *Autotaps'retrofit* infrared sensor (2008) in the middle image in Figure 2-15–, while others are meant to encourage or sometimes even force the user to behave more sustainably –*i.e. Sinkpositive* (Environmental Designworks, 2008) in the left hand-side in Figure 2-15)– by giving no option but to change behaviour. Finally, others simply give feedback on the resource consumption and leave the user the choice of changing or maintaining behaviour –see *faucet buddy* (Uyeol, 2008) in the right hand-side image in Figure 2-15. Appendix A presents some concept designs and products currently available in the market to reduce water consumption in the household.

Figure 2-15. Products in the market that help reducing water and energy consumption in the home

Some products available on the market include systems that connect the hand basin or shower/bathtub with the toilet cistern –*i.e. Aqus* (WaterSaver Technologies, 2007) in left of Figure 2-16– which accounts for a major part in water consumption in the bathroom; and shower systems that have the option of cycling the water to have a longer shower without huge water waste –see *Wow shower* (Thomas, 2005) in middle and right hand side images below.

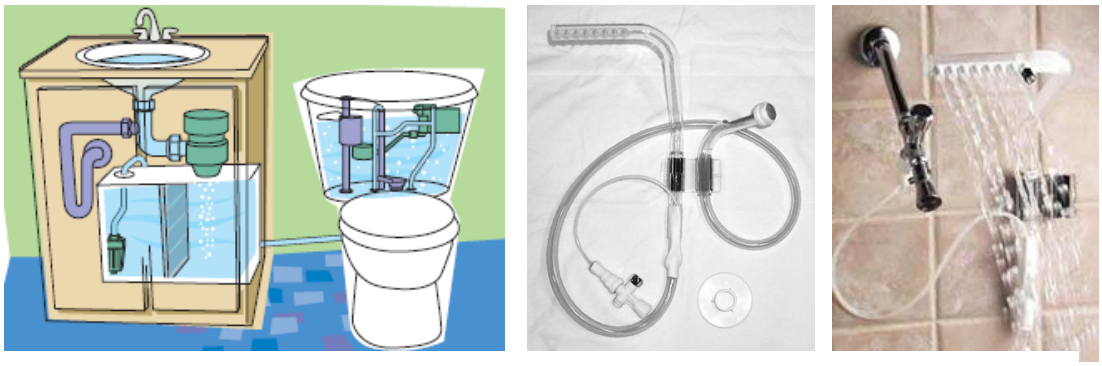

Figure 2-16. *Aqus* (WaterSaver Technologies, 2007) and *Wow shower* (Thomas, 2005).

Toilet flushing accounts for 34% of the household water consumption in the UK (Butler, 2006). Some water supply companies in the UK, such as Severn Trent, distribute for free water saving devices such as *Save-a-Flush* bags (see Appendix A for more product examples), a water displacement device that saves 0.5 to 2.5L per flush (Environmental Agency, 2007). Water saving campaigns in Mexico promote a *simpler* version of cistern displacement device by placing a closed half litre bottle of water in the toilet's tank (see Figure 2-17). It translates as: *'Spread the word. One single action=1,000L of water saved. Place a closed-full half a litre bottle of water inside the toilet's cistern and you will save at least 1,000 litres of water a year'.*

Figure 2-17. Mexican water saving campaign (Instituto para el estudio de la biosfera, 2007).

New products and technologies are only effective if the consumer embraces them and uses them the way they were designed to be used, and for that, the design process has to take into account a number of user and context- related issues that are key to the success of the product or service. That represents a great challenge for designers.

2.13 Conclusions

The findings of the literature review provided a wider understanding of human behaviour and today's consumption practices; starting from a general picture and then narrowing down the focus, touching issues from human behaviour theories and routine emergence and evolution, to design strategies for sustainable behaviour and the importance of the use of user centred research/design approaches.

Regardless the field of action (policy making, education, or product/service design) understanding what lies behind people's actions and behaviour is elemental for conceiving

successful strategies to change behaviour into sustainable practices. The literature shows how multidisciplinary behavioural models can be integrated into design practice, and describes the different tools and approaches that have emerged from the field of Design for Sustainable Behaviour. Being DfSB a relatively new field, there seems to be a lack of comprehensive studies about the effectiveness of the integration of DfSB approaches into the design process, production, use and end of life of real-life products, being limited (until now) to theoretical use and early prototypes (Wilson *et al.*, 2010). However, a knowledge gap in existing DfSB frameworks was identified, pointing towards the need for inclusion of cultural context as a new aspect to consider from the early stages of the design process. There is huge potential to the innovative development and use of DfSB approaches, especially if combined with adequate user-research and UCD strategies.

To successfully apply any of the reviewed DfSB strategies, it is of key importance to understand the cultural background (or context) in which the activity takes place. Tools and techniques to identify and fully comprehend internal or external influential factors according to the specific context are needed. In this thesis, chapter 5 and 6 explore some possible methods of user-research and user-data representation and transfer.

The literature review also brought to light some questions that direct the focus of this research specifically into comparing multi-location dishwashing behaviours in a contextual, qualitative manner. The evidence provided gives way to a scoping study that investigates general dishwashing patterns in both sites (see chapter 4), to later deepen the knowledge with other research techniques (described in detail in the following chapter).

Furthermore, the findings from the literature on the design process and design for sustainable behaviour approaches shape the path of this project towards bringing together the research of water use and sustainable behaviour, with the investigated design methodologies and tools in a series of design studies (see chapter 7).

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3 Research Methodology

This chapter outlines and justifies the research framework used in this project. Through the discussion of the individual research methods and analysis techniques used, it illustrates how the different research phases are brought together to accomplish the aims and objectives of the project.

3.1 Research strategy

The following sections discuss the type of research and overall *program theory* under which this research is structured. The term **program framework** can be defined as the assumptions made during the planning process about how the proposed methodology will achieve the intended aims and objectives of the PhD (Robson, 2008).

A cross-disciplinary literature review was undertaken to obtain an overview of the knowledge available on the subject of water availability and consumption, consumer behaviour, sustainable design and design for behavioural change. As discussed in chapter 2, there is limited knowledge of linking cultural differences in behaviour with designing for sustainable practices. The research was directed at investigating and documenting additional knowledge on water consumption practices during the dishwashing process in different geographical situations. The research strategy built upon qualitative techniques and provided evidence of the importance of understanding the users' cultural background throughout any design process, exploring this through a series of design studies.

All research projects aspire to provide new knowledge. Then again, research often follows one of three motivations (research purpose): to explain, to explore, or to describe a certain event or situation (Robson, 2008). The aforementioned intentions of this research marked its **purpose** as ***exploratory***, as it looked at the main topics from a point of view that had not been approached

before (Robson, 2008). This research developed into a pragmatic approach that leant more into **constructivist** inquiry, as *'the researcher always presents a specific version of social reality, rather than one that can be recorded as definitive'* (Bryman, 2004). It focused on the richness of the particularities in the studied cases rather than in generalising dishwashing patterns, design process' or designers abilities of both studied countries.

> *'the particular value of qualitative research lies in its ability to explore issues in depth and from the perspectives of different participants, with concepts, meanings and explanations developed inductively from the data'* (Ritchie and Lewis, 2003, p.268)

3.2 The research journey

The exploratory purpose of this research was marked from the beginning, as the project developed from the curiosity of the researcher to better understand the differences in behavioural patterns that emerge in groups of people with different cultural background. This, linked with the researcher's interest in sustainability and water, gave shape to this research. The project progressed with the different research stages overlapping at certain times, and feeding into each other's development, up until the very end of the project. For instance, user-research stages fed into the later stages of design studies, but these also brought to light new insights that led the researcher to return to the data collected and examine it from new angles.

It was an interesting and rich iterative process in which each step brought new facts to light that enriched the project as a whole. To explain the flow of this research in a simple manner, it was decided to break it in four main phases, visually illustrated in Figure 1-2 in the Introduction chapter, and explained in detail in the following sections.

- Phase 1: Setting the grounds of the project (Literature review and scoping study)
- Phase 2: Dishwashing behaviour exploration (Cultural Probes with video observation)
- Phase 3: Translating user knowledge into visual data (Personas creation)
- Phase 4: Design studies

3.2.1 Research type

Data was collected through a wide range of techniques that varied to best fit the purposes of the specific objectives at that stage of the research (Robson, 2008). It is worth stressing how this research developed an inclination to a **qualitative** direction, as *'qualitative research* [and so does this project] *seeks instead illumination, understanding, and extrapolation to similar situations'* (Hoepfl,

1997). Quantitative data collection happened almost uniquely at the beginning of the project, during phase 1 of the study.

Literature states that different methods used can be applied either sequentially or in parallel, and they can be independent or interdependent with one another; that is, looking into same issues or different ones, or one deriving from or overlapping with the other (Alexander *et al.*, 2008).

> *'[...] to acquire valid and reliable multiple and diverse realities, multiple methods of searching or gathering data are in order. […] Engaging multiple methods, such as, observation, interviews and recordings will lead to more valid, reliable and diverse construction of realities'* (Golafshani, 2003).

3.3 Research data collection techniques

A thorough literature review and an online survey (phase 1) reflected on the general water use at home, explicitly in the *washing* and *cleaning* practices. This was further explored through the application of cultural probes and video observation (phase 2), carried out in both Mexico and UK to later cross-analyse the outcomes. The user-research results in these stages were validated by triangulation, *'the use of multiple data collection techniques to reinforce conclusions'* (Angrosino, 2007) obtained from the three methods.

Phases 3 and 4 of the research project consisted of applying the knowledge originated, first by creating a tool for designers to feed into their design process, and then testing the tool in the context of design studies for behavioural change. During these stages data collection was made iterative through observation, surveys and pre-structured conversations (face to face or online).

3.3.1 Research data collection techniques used in phase 1

Phase 1 of the project set the grounds for this research with regards to behavioural patterns and introduced the context of water consumption in the home. It was conducted through two sub-phases that brought the research questions of the project to light:

- → A cross-disciplinary literature review (see chapter 2),
- → and a scoping study, based on an online survey (further detailed in chapter 4)

3.3.1.1 Scoping study: online survey

Surveys in the form of questionnaires are widely used to collect information about the distribution of people's characteristics and the relationship between them. With the right

questions and the right analysis, it is possible to go beyond the descriptive to the interpretive, using the questionnaire to explain certain events and patterns that might come up (Robson, 2008). Adapted from Robson (2008), Table 3-1 presents side by side some of the main advantages and disadvantages of this technique.

Table 3-1. Advantages and disadvantages of questionnaire-based surveys. (Adapted from: Robson, 2008)

Disadvantages	Advantages
Data affected by the characteristics of the respondents (e.g. their memory, knowledge, experience, motivation and personality)	They provide a relatively simple and straightforward approach to the study of attitudes, values, beliefs and motives
Respondents might not accurately report their beliefs, attitudes, etc. (e.g. there is likely to be a social desirability response bias – people responding in a way that shows them in a good light	They may be adapted to collect generalisable information from almost any human population High amounts of data standardization
Typically have a low response rate	Often this is the only, or the easiest, way of retrieving information about the past history of a large set of people
Ambiguities in, and misunderstandings of, the survey questions may not be detected	They can be extremely efficient at providing large amounts of data, at relatively low cost, in a short period of time
Respondents may not treat the exercise seriously, and you may not be able to detect this	They allow anonymity, which can encourage frankness when sensitive areas are involved

Phase 1's user-research began with an *unsupervised questionnaire* (Bourque and Fielder, 2003) – often called *self-administered* or *self-completion* questionnaire (Robson, 2008). An online distribution allowed data collection to be carried out simultaneously both in Mexico and the UK. A total of 102 British respondents, and 135 Mexican ones were achieved. Chapter 4 describes the setting-up of the survey and its results in detail.

The survey consisted of a combination of pre-coded questions (quantitative) and open-ended questions that aim to provide insights and personal views of the respondents (qualitative data). To seek consistency and neutrality, the questionnaire was *standardized* with the same wording for all respondents, and *scheduled with* the same order of questions for all respondents (Seale, 1998), also ensuring reliability and validity in the qualitative paradigms (Golafshani, 2003). The survey's design was based on Bourque & Fielder (2003), and Fink's (2006) guidelines for written surveys, which state that a questionnaire should:

- stand-alone by itself;
- be short in number of questions –and this reduces the number of topics covered;

- be mostly made of close-ended questions;
- offer to send the respondents a summary of the findings;
- ask personal questions at the end or middle, to get the respondent to feel comfortable to answer –and if needed, give reasons for that question.

3.3.2 Means of distribution:

The survey was set up on the *Bristol online survey* (BOS) platform and then distributed with the help of various organizations and media, such as the Environmental Sustainability Team from Leicester City Council, the Loughborough Echo, the Sustainable Design Network (Loughborough University) in England; and Mexico's National Water Commission (CONAGUA) and other Mexican NGO's (such as *www.agua.org*).

Internet based surveys have better response rates compared to the amount of people prepared to be interviewed by a person they do not know either in their home or by phone. The internet also gives the option to the respondent to answer the questionnaire at their time and place of convenience (Bourque and Fielder, 2003), and allow the survey to collect data from different geographic locations without additional costs. Postal delivery was considered, as it would give a more personal touch that might encourage people to respond, and would as well permit the reach of people that are not computer-literate. Nevertheless, the project's time constraints and the unreliability of the post services in Mexico made this option unviable.

No monetary incentive was offered to the respondents. Instead, after the first contact, follow-up emails were used to increase the response rate. At the end of the questionnaire people were encouraged to pass on the internet link to people that fit the profile, starting also a snowball distribution.

3.3.3 Research data collection techniques used for Phase 2: Cultural Probes

Phase 1 of the project informed the design and application of a more specific and deep user-research study. This section reports on the designing and distribution of the Cultural Probe pack and the video observation (phase 2), which explored the actions, perceptions and thoughts of UK and Mexican volunteers on domestic washing-up practices.

3.3.3.1 Cultural probes and their use in design

Cultural probes (CP) are a qualitative data collection technique first developed by Gaver *et al.*, (1999), particularly useful when investigating and exploring domestic life, especially in sensitive

or intimate activities (Kjeldskov *et al.*, 2004). They provide good complementary information to more traditional user-study methods such as surveys, interviews or observation, as they support self-reflection and documentation of the participant's part (ibid). Cultural Probes are normally designed by the researcher, and given out to the volunteers, encouraging them to do the data collection themselves. They are also a good way to collect qualitative information over a certain period of time and allow the researcher to study multiple locations simultaneously using fewer resources than other ethnographic approaches (Hemmings *et al.*, 2002).

Mattelmäki (2006) outlines three basic characteristics of this technique:

- → Probes are based on user participation (as self-documentation)
- → They take into consideration the user personal context and perceptions
- → They have an exploratory character

These points are fundamental when deciding on the use of Probes in the user-research phase. Cultural Probes are advantageous to the purpose of this project, and to the multi-site and time constraints that it is limited to. Cultural Probes are a useful method to explore and identify personal views and patterns in the dishwashing process (phases 1 and 2 of the research project). Also, they can be used to enrich the design process and promote empathy (Mattelmäki, 2006) – an objective from the second half of the project.

> *The abovementioned qualities build up on the bigger aim of this research, which is linking the user knowledge to the design of products that encourage more sustainable behaviour in terms of water use in the domestic dishwashing practices.*

Probes have been typically used in home settings (Gaver *et al.*, 1999; Hemmings *et al.*, 2002; Mattelmäki and Battarbee, 2002). Although in the last decade they have also been employed in other contexts, such as in classrooms with children (Chorianopoulos and Polymeris, 2010) in human-computer interaction studies (Dörner *et al.*, 2008), or in professional settings, to encourage collaboration between cross-disciplinary teams and with users (Jääskö and Mattelmäki, 2003).

Gaver *et al.,* (2004) are amongst the first researchers to use Probes. They exploited them for inspiration purposes: *'the probing process and the accumulated material provided a source of inspiration for the designer when they worked out concepts visualizing alternative futures'*, not analysing them systematically, but they only *'wanted to dive into the material in order to come up with their own ideas, and to develop and share stories that sparked off new ideas'* (Mattelmäki, 2006:43, commenting on Gaver's work). Wensveen *et al.,* (2004) use the Cultural Probes on which to base *'imaginary situations'*, or create scenarios to empathize with families and the need of family members to constantly keep in touch.

Probes provide stimuli for participants to express visually, verbally or through action, and record the data in the process. Each element of the CP should record participant's feelings about their life in the home, trigger some emotional response and invoke different reactions within a category of acceptable emotions. Studies using probes have reported that photography assignments end up being a key element, and participants always seem eager to complete the tasks and see and reflect on the photos when interviewed (Mattelmäki and Battarbee, 2002). Figure 3-1 shows the Probe pack created for this study.

Figure 3-1. Essentials from the Cultural Probe pack designed for this research: a diary, a camera and some extra elements.

3.3.3.2 Video recording alongside the cultural probes

The Cultural Probes were complemented with the videoing of the participants' kitchen for at least a day. This allowed the researcher to observe the *natural context* of the activities surrounding the kitchen sink, and brought robust data to complement and pair up with the qualitative contextual information contained in the rest of the Cultural Probes' elements. Chapter 5 describes the Cultural Probes and videoing process and outcomes in detail.

3.3.4 Research data collection techniques used in Phase 3: Persona creation

Given the vast amounts of data that had emerged during the user-research stages (phases 1 and 2 of the project) it became evident that in order to accomplish linking the generated user-knowledge to the design process, a stage of *translation* into a usable tool for designers would be needed.

Building *Personas*, also (misleadingly) called *fictional people* (Pruitt and Grudin, 2003) was considered to be a good way to gather together the data from the different elements of the Probes, as many particularities were found in the patterns and perceptions of the participants. Using Personas allowed fully visualizing the richness of the visual data from sketches, photos and videos produced. Although Personas are shown as specific individuals, they work as *archetypes*, representing a class or type of user interacting on a specific activity or product, so they represent a specific set of behaviour patterns regarding the use of that product or circumstance. Personas *'do not seek to establish an average user, but rather to express exemplary or distinct behaviours within these identified ranges*' (Cooper *et al.*, 2007:83). The building of Personas was based *only on real data* collected from the survey (phase 1), and the different elements from the Cultural Probes and videoing (phase 2).

A set of five personas per cultural branch was built (10 in total). More Personas would have brought a too-high level of complexity to the design process, and having fewer Personas was thought to over-simplify the different data possessed. Five Personas allowed for a good level of hierarchic distribution during the design process.

In phase 4, Personas proved to be a good means to focus designers on the users' specific needs, and avoid basing design decisions on the designers own beliefs or hunches. A comprehensive review of the Personas creation, proposed use, and the generated Personas for the design studies can be found in chapter 6.

3.3.5 Research data collection techniques used in Phase 4: Design studies

Already with a developed tool to feed the user-research findings into the design process, a set of design studies were carried out. With the project's scope and limitations, the need for a controlled environment was clear, but also, that of an environment that naturally brought out the 'design mode' of people. The design studies also called for the designers to have certain knowledge of sustainability and Design for Sustainable Behaviour, as the brief to work on involved those subjects.

Carrying out the design studies in an academic environment emerged as the most beneficial approach for this research phase. Collaboration with Universidad de Monterrey (UDEM) was established at the early stages of the project, where the researcher was allowed to design and

carry out a biannual sustainable design course with undergraduate students, during the duration of which she included the design studies (phase 4). Loughborough University also opened the doors to this project and the researcher had the opportunity to participate and apply the design studies with certain groups of students (a pilot with undergraduates, then one masters group).

The dual geographic location of the design experiments studies called for the use of digital/online communication. During the planning and administration of the online course (UDEM), which prepared the students to take part in the design studies, the researcher had a *digital presence*, communicating with the participants through emails, Skype and sometimes short-online surveys to get input on specific issues. A series of presentations (slides with audio, and video) were presented to students throughout the project's duration, to guide and enrich their design process.

The specific deliverables produced by students (UDEM) are shown in Table 3-2, along with a description and the key information they provided. The UDEM groups had an on-site teacher making sure that they followed the presentations and kept the researcher (based in the UK) up-to-date. Mexican students approached the researcher via email in a weekly basis to talk about, and get feedback on, their progress. It was only to the final submission that the researcher had the opportunity to be face to face with the UDEM students and could collect general data and comments straight from the participants.

Table 3-2. Student project deliverables (UDEM students)

Deliverable	Description
Document	A detailed document in which the young designers described their journey in the design process, from the user understanding stage (with the personas), the early concept design, detail design, possible mock ups and the final design outcome.
Log book	Containing sketches, ideas, and a visual illustration of their design process and reflections.
Posters	Explaining the design concept, product-user interaction, sustainability side and user fit.
Video	A mean to give another view/explaining of their product.

In the case of the Loughborough group, the design experiment took place as part of the sustainable design course. In this case, it was possible to personally give the presentations on the design brief, Personas and their use, and work face to face with the students. This interactive experience, along with a presentation from the students in the middle of their design process, and the posters and logbook collected at the end of the project, provided the data to analyse this intervention.

At the end of the project, an **online survey** was applied to the students in both UDEM and Loughborough, in which they reflected on their experience of using Personas in their design process and in the designing for the specific user of their brief. Chapter 7 illustrates in detail the different stages of the design studies phase, the design processes and results obtained.

3.4 Research analysis techniques

There is no consensus for a 'best' analysis for qualitative data. Nevertheless, one could find common features in the analysis techniques of many writers (Creswell, 1998). The process of analysing qualitative data is described by many as *learning by doing*. It is commonly recommended for the researcher to read and familiarise him/herself with the collected information to start with; then memos, notes to oneself, metaphors, coding categories and sorting of the data are some of the facets of the analysis that occur in an iterative way (Tesch, 1990; Creswell, 1998; Robson, 2008).

Creswell illustrates the analysis process in what he calls the *data analysis spiral* (Figure 3-2), in which *'the researcher engages in the process of moving in analytic circles rather than using a fixed linear approach'* (Creswell, 1998, p. 142).

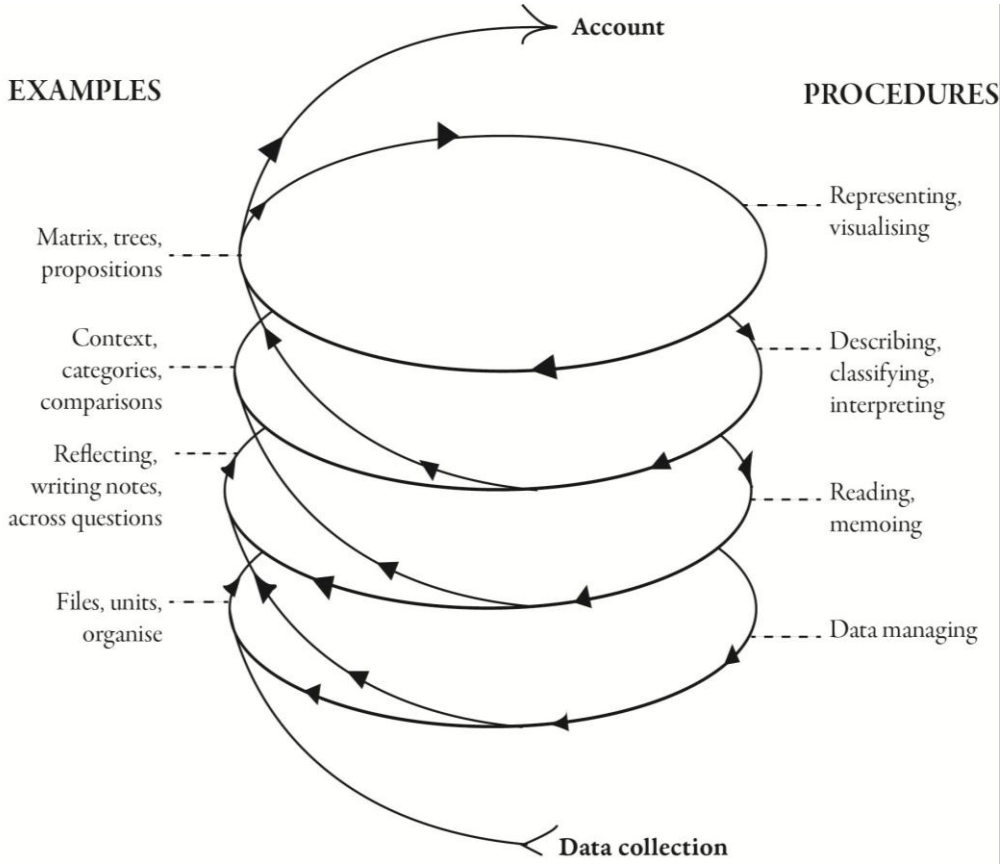

Figure 3-2. Creswell's data analysis spiral (1998)

3.4.1 Research analysis techniques used in phase 1: survey

As the online-survey collected both quantitative and qualitative data, different methods of analysis had to be used. For pre-coded questions (quantitative data), basic statistics such as counts (frequencies), proportions (%), and central tendency (*i.e.* mean) were used (Fink, 2006). The correlation between qualitative variables was achieved through **coding** (and colour coding) and **clustering** done manually in Microsoft Excel, a common practice in qualitative research (Lofthouse, 2001:57). Open ended questions (qualitative data) were analysed using the codes and filtering the data, mixing and matching different filters searching for patterns and links in the responses. A snapshot from the table can be found in Appendix B.

A template with *a priori* codes was created to analyse the responses. Whilst analysing the data, some other codes emerged –referred to by Gibson (2009) as *empirical codes*, revealing new insights and new themes to look upon in the latter phases of the project. The analysis of responses consisted in looking for similarities and differences, as well as *surprising* comments that could bring interesting and enriching data to the analysis.

Each set of responses from the two sets of respondents was analysed separately, to draw conclusions from each country's respondents, and only afterwards a second analysis was made comparing the two countries. A thorough manual analysis aided by simple data analysis software such as excel was performed, the spread sheet permitted an easy visualisation and coding of the data. A different option was the use of qualitative analysis software, such as *NVivo*, but the time and resources available for the project made this unviable.

3.4.2 Research analysis techniques used in phase 2: Cultural Probes

Cultural objects (photos, drawings, posters, etc.) need to be analysed with grounds in methodological controls, rather than an arbitrary and subjective way personal to the researcher (Seale, 1998). They must be analysed with well detailed and documented methods in order to be reliable. The majority of qualitative data in written or recorded documents and observations was analysed with *content analysis* (Fink, 2003). The first step of this general technique is to familiarize oneself with the data and create concepts (codes) to categorize the data in, according to the research questions; then assign the data to those categories and see how it all relates. The content analysis tends to be inductive, as it goes through the data and looks for dominant patterns, to then *'put forward theories to explain culture, values and behaviour'* (Fink, 2003:112). As can be done for small pieces of research, such as this one, the researcher was capable to do the content analysis by hand.

The grade of reliability was based on the coding of the images. In the best of cases, an *inter-coder* reliability would be optimal, so that a number of different researchers are asked to code the

images using the same set of categories and definitions and guidelines (Seale, 1998). Nevertheless, due to the time and resource constraints of the project, the coding was done by the only researcher, going over the coded images iteratively to ensure an appropriate categorisation, taking care in well documenting the process with multiple notes. The coding categories, according to Seale (1998), must be:

- exhaustive (all images must fit at least into one category), and
- mutually exclusive (not overlap)

Cultural probes, as a technique, has sometimes been disapproved of for a (supposed) lack of formal analysis and theoretical methods, along with the possibility of misinterpretation of the qualitative, personal and subjective information –normally given in the form of visual stories. In the case of this project, the trustworthiness of the evaluation of the data collected through the Probes was pursued by using *triangulation* as a strategy. The use of other data collection methods, such as the survey and the videoing, was a way to maximize validity and reliability (Golafshani, 2003). Each method reached a different level of depth in the understanding of the dishwashing phenomenon and the context of our volunteers, complementing each other and resulting in a more holistic understanding of the phenomena studied.

When Cultural Probes were first used by Gaver *et al.,* (1999), they were not analysed with a rigorous method, but meant to be used for exploring and inspiring. Nevertheless, more recent pieces of research have developed different methods of analysis, increasing their validity and reliability. Affinity diagrams (Holtzblatt *et al.*, 2005), content analysis (Fink, 2003) and card sorting (Spencer, 2009) are only some of the possible ways of analysing the rich data gathered with Cultural Probes. The analysis method used for this research is further explained in chapter five.

3.4.3 Research analysis techniques used in phase 4

The early steps for the analysis of the design studies consisted of going over the projects and trying to pick out both uncommon details and common generalities, to later construct a pilot coding framework, based in the research objectives and general research questions.

Certain *a priori* themes had emerged from the previous phases of the project, and were used as a ***provisional coding technique*** (Saldaña, 2009:120). This allowed the researcher to establish a predetermined set of categories prior to the actual coding stage.

A further **editing approach** was developed (Robson, 2008:457) as the codes emerged from the data itself using no a-priori codes, but only the a-priori categories to place them. ***Descriptive coding*** was used to develop the codes, *'summarizing in a word or short phrase the basic topic of a passage*

of qualitative data' (Saldaña, 2009:70). This method is ideal for studies with multiple data sources (as here, the video, the sketches, mock-up images, the logbook, the explaining document). This first round of coding lead to a categorized inventory of the content of the data, forming an *'essential groundwork for second cycle coding and further analysis and interpretation'* (Saldaña, 2009). Analytic memos –notes summarising possible interpretations of the data– were also written, linking specific segments of data with arising patterns, themes, concepts and thoughts that might help in the reviewing and detailing of the coding method.

The coding process, the outcomes of the codes and their categorisation was reviewed by visualising the data using different-coloured sticky notes and forming towers and mental spaces, a sort of affinity diagram. Categories were represented with pink sticky notes, macrocodes with orange, and microcode with yellow ones (see Figure 3-3). By visualising the code map this way, it became evident that a rearrangement and re-labelling of the codes and categories was needed to facilitate a better and more organized analysis of the data, as well as the coding process of the rest of the student projects. A list of codes and definitions was prepared, to keep record and feed into the process of coding the rest of the design projects.

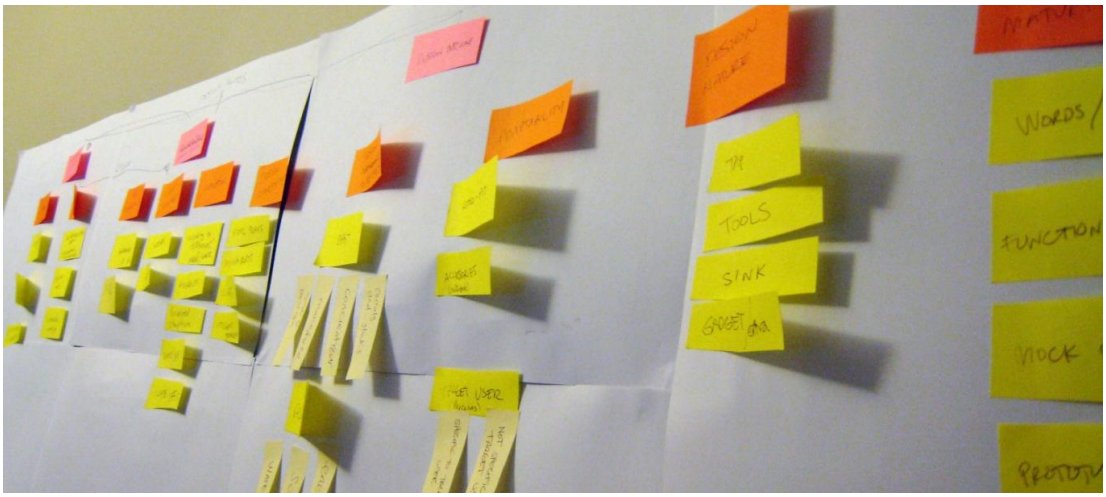

Figure 3-3. Code scheme of the student projects using coloured post-it notes

3.4.3.1 Main coding and analysis methodology

The key codes determined in the first coding cycle were used in a **template approach** (Robson, 2008) for the remaining of the design projects. The codes were kept flexible enough to undergo through changes, as analysis continued and the coding system was fully developed. Empirical evidence (*i.e.* text, images, sketches, comments) from each of the design projects was linked to the codes in the coding matrix (in excel). Relevant supporting quotes were added to illustrate and enrich the codes with the designers' experiences. Subsequently, analysis was made through

filtering and conditional formatting (colour coding) of the codes, a tactic which ultimately allowed the researcher to easily cluster, compare, find intervening variables and generate meaning from the data.

3.4.3.2 Sampling strategy

Schwandt (1997) identifies two main issues about sampling in qualitative studies: selecting the field site to study a phenomenon (see section 3.4.4), and the sampling within that field site.

For the purpose of this project, the sampling processes within the site can be better described in regards of the two main purpose-lead stages of the project: user research (phases 1 and 2) and design studies (phase 4). The following Table 3-3 illustrates the sampling strategy of this research.

Table 3-3. Purposeful sampling strategy

Purpose	Project stage	Sample panel	Type of sampling
User research	*Phase 1*	British dishwashing-person	Criterion sampling, Snowball or chain sampling
		Mexican dishwashing-person	
	Phase 2	East midlands household (British background)	Criterion sampling (Nationality, household composition)
		Nuevo Leon household (Mexican background)	
Design studies	*Phase 4*	Industrial design students (UDEM & Loughborough University)	Opportunistic sampling (follows new leads; taking advantage of the unexpected)

3.4.4 Selecting the sites to cross-analyse

The selection of a site to focus the research in is generally done on the basis of a combination of criteria revolving around the knowldege interests, but also influenced by issues such as accessibility and availability (Schwandt, 1997). Also, site selection involves the assumption from the researcher, that such site(s) are likely to show great contrasts, or similarities, and bring light to enriching circumstances for the research.

One of the main axis of the research was to join together a cross-analysis of (1) behavioural patterns in different cultures, and (2) design studies with designers from different backgrounds. Therefore, the research called for an ethnographic approach. The need to fit in and adapt to the place of research is considered by many authors as crutial when doing *on-site* research (Angrosino, 2007) referred by many as ethnography. Mexico and the UK encompassed robust positive attributes to being the sites to cross analyse. The two cultures present different backgrounds in water availability and significant cultural differences (further discussed in chapter 4) . Also, the researcher was at the time based in the United Kingdom, but originally came from Mexico, therefore spoke fluent English and Spanish, very convenient when undertaking research in the abovementioned countries. Time and financial resources also played an important role in the decition. A *Santander* grant was obtained to fund the research travels to Mexico and within the UK; and a collaboration with Universidad de Monterrey was agreed for phase 3 of the project.

3.5 Trustworthiness of the research

Ensuring the quality the research happens as a process throughout the data collection, analysis and report writing of the qualitative inquiry. Lincoln and Guba (1985) developed four main criteria to judge qualitative research:

- Credibility (internal validity) – accurate identification and description of the subject of enquiry
- Transferability (external validity) – or generalisability
- Dependability – reliability and validity
- Confirmability - objectivity

Different approaches have been identified to verify the alignment of the qualitative research to the abovementioned criteria. **Generalisation** concerns how far the study evidence can be transferred to populations other than the individuals in the sample. This research presents a particular setting that is unique, however, with the writing of rich, thick descriptions of the setting under study and development of it, gives the chance to readers to *'evaluate whether or not the case described can be transferred to other settings'* (Robson, 2008, p.405)

Using evidence from different sources to back up the investigation (*triangulation of methods*) helped enhance **credibility** and **dependability** of this research (Robson, 2008). Engaging in *discriminant sampling* (performing the data categorisation in many cycles, posing questions and going back to the data from time to time), was useful for establishing **confirmability** and **validity**. Replicating the design studies with various groups of students contributed to the **internal validity** of the research.

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4 Scoping study

This chapter discusses a scoping study carried out at the beginning of the research project, as a direct consequence of the literature review. It briefly introduces the two sites of study, and presents the findings from an online survey applied in both Mexico and the UK to investigate and map general perceptions and thoughts on domestic water use and dishwashing experiences.

4.1 Selecting the sites to cross-analyse: Mexico and UK

The literature review brought to light interesting information regarding the establishment and evolution of routines, and the influence of cultural backgrounds on these processes. The research then sought to investigate and bridge the gap in knowledge on the influence of culture on the development of routines. A specific interest in domestic water routines was taken, using manual dishwashing practices as case study. In order to achieve objective 2, that is*, to explore parallel routines of people with different cultural backgrounds*, a user research stage with a cross-analysis between Mexico and the UK's washing-up practices was carried out.

This introductory section briefly compares some aspects of water consumption and availability in the two sites, providing the reader with a context in which to locate the findings of the user research stages of the project (phases 1b and 2). To better understand Mexico and UK's water practices, factors such as local climate and water abstraction and availability figures are especially important, as they help illustrate the contrasts in these two countries.

Firstly, water abstraction levels per capita are considerably different. Figure 4-1 points out how Mexico abstracts more than twice the amount of water than the UK per inhabitant. This is particularly interesting when regarded from a *water stress* perspective.

'*Water stress is related to the amount of water available per person for a given area, both now and in the future. An area of serious water stress is defined as an area where the current household demand for water is a*

high proportion of the current effective rainfall or, the future household demand for water is likely to be a high proportion of the effective rainfall available to meet that demand. When the demand for water is high or growing, this can result in a serious level of stress on the available water resources'. (Environment Agency, 2007:4)

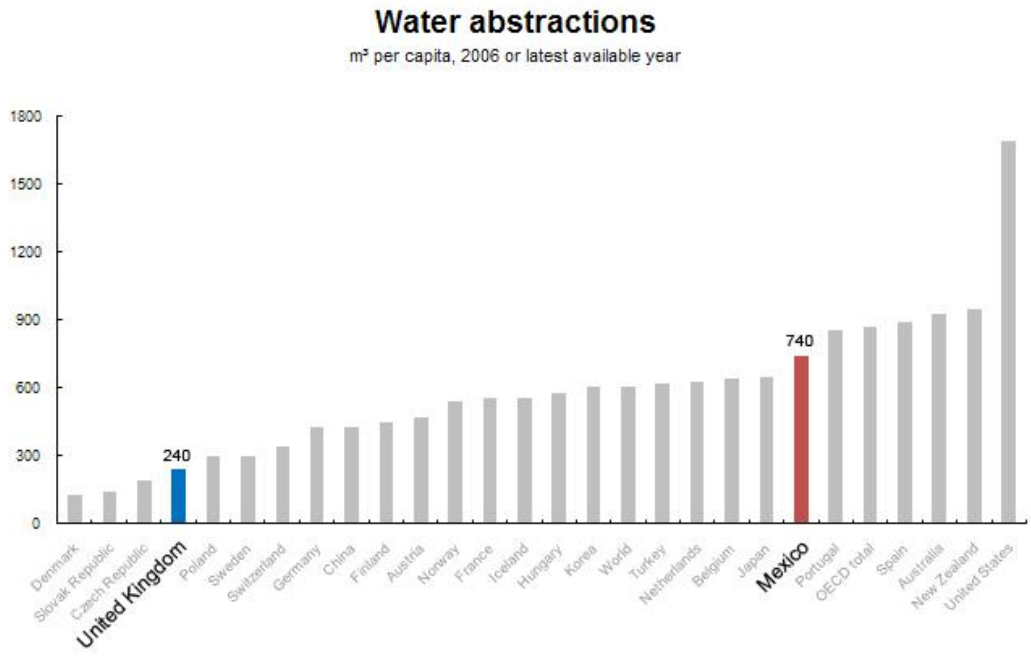

Figure 4-1. Water abstractions per capita UK-Mexico in 2006. Adapted from: (OECD, 2009)

While two thirds of Mexico is under a serious water stress, a larger part of England is considered as a low water stress region overall. Figure 4-2-provides a clear representation of the contrast of water availability in the two countries. The focal areas for this research are England's Midlands region, which is considered as experiencing moderate water stress and the North/Northeast Mexico, which is currently experiencing serious water stress.

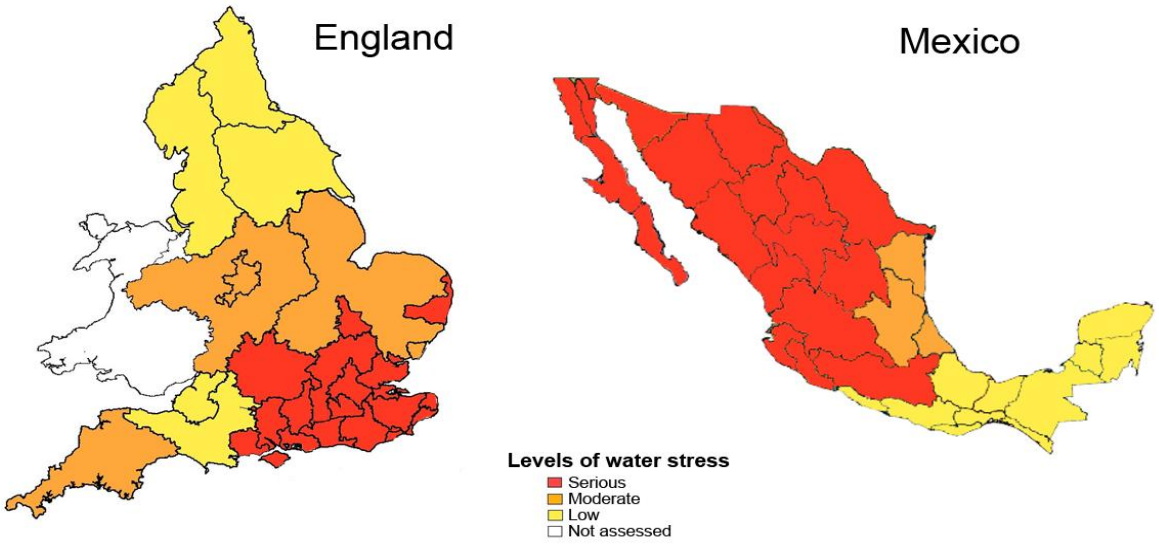

Figure 4-2. Water stress regions in England and Mexico. Adapted from (Environment Agency, 2007:9; Sistema Nacional de Información del Agua, 2008:159)

Throughout the last three decades, México and the UK have changed their water-abstraction patterns in different ways. Table 4-1 shows how while Mexico has augmented the water abstraction per capita by almost 40% over the past four decades, the United Kingdom has succeeded in maintaining a stable extraction. Although the figures presented here represent the overall water abstraction, and do not specifically represent water used in the domestic context, they give a fair idea of the differences in water use in the two countries.

Table 4-1. Mexico-UK water abstraction. Adapted from: (OECD, 2009)

Total gross water abstractions

Million m3

	1980	1985	1990	1995	2000	2006 or latest available year	1980-2006 compared
United Kingdom [27]	**13514**	**11533**	**12052**	**12117**	**15022**	**12990**	down 4%
Mexico [17]	**56003**	**..**	**..**	**73672**	**70428**	**77322**	up 38%

[17] 2006: volumes of water granted in concessions; prior data are estimates.

[27] England and Wales only. 2006: 2005 data including Secretariat

Reflecting on personal experience, the researcher finds the differences in attitudes and simple water-related behaviours between British and Mexican people especially interesting. As explained in the introduction, the researcher has had the opportunity to live in both countries.

This experience has led to an observation that Mexican people have a more wasteful way of using water in general than the British. Little things like washing the car regularly with a fully open hose, having sprinklers in the garden that are set off for at least an hour on a daily basis, and even washing the dishes under the running tap are habits considered *'normal'* in most, if not all, Mexican people (amongst the researcher's acquaintances). On the other hand, the researcher's experience in the UK –although of shorter duration, – is of people being more conscious of their water usage, having less resource-consuming routines embedded in their lifestyles. It could be that the researcher's personal/limited experience has created a notion of Mexican people consuming on a rather egoistic basis, and more on the lines of 'if I am paying for it, then I will use as much as I like', and 'If others are not making an effort to reduce their water consumption, why should I?'; whilst the notion of the British water/energy consumer, is more environment conscious and has a common-resource awareness.

Besides from water availability, Mexico and the UK present many other contrasts that make them rather interesting to compare. Mexico was the home for numerous advanced Amerindian civilizations (Aztecs, Mayans, etc.). For three centuries it was governed by the Spanish crown, up until winning Independence in the nineteenth century. On the other hand, England, as part of the British Empire had once under its reign over one fourth of the world (CIA, 2011), and has played an important role in global history, both ancient and modern.

In terms of population, Mexico has over 113 million people, with Mexico City being the second most populated city in the world, and 10 other cities with over a million inhabitants. The UK in contrast, has London, its capital, with over 8 million people, and two other cities (Birmingham and Manchester) with a little over 2 million. Interestingly, both countries have about 80% of the population living in urban areas.

Geographically, Mexico's surface is about 8 times greater than the UK with all its islands. With such a large surface also comes a wide range of landscapes and climates, from hot sandy desserts in Northern Mexico, to tropical jungles in the south and south-east, passing through the mild weather from the mountains in central Mexico. The UK also presents different topography and climate, but with a stereotype of being overcast, always within a temperate range, with colder winters. Such different climates could play an important role in water consumption per capita. Weather and climate change are two other factors that influence user behaviour in water consumption. It has been found that household water consumption and rainfall are inversely correlated (the less the rain, the more water use) and in contrast, water consumption is directly correlated with temperature (Kindler and Russell, 1984 cited in Dworak et al., 2007:21). Temperatures above 25°C make daily per-capita water use increase 11litres per grade Celsius (1°C) (Intergovernmental Panel on Climate Change, 2007, cited in Dworak et al., 2007:21).

Further differences between these two contexts are outlined in Table 4-2 below.

Table 4-2. Comparing some aspects of Mexico and UK (CIA, 2011)

	MEXICO	UK
Location	North America, south of USA	Western Europe, islands between the North Atlantic Ocean and the North Sea; northwest of France
Area	total: 1,964,375 sq km land: 1,943,945 sq km water: 20,430 sq km	total: 243,610 sq km land: 241,930 sq km water: 1,680 sq km
Climate	varies from tropical to desert	temperate; moderated by prevailing southwest winds over the North Atlantic current; more than one-half of the days are overcast
Terrain	high, rugged mountains; low coastal plains; high plateaus; desert	mostly rugged hills and low mountains; level to rolling plains in east and southeast
Natural Resources	petroleum, silver, copper, gold, lead, zinc, natural gas, timber	coal, petroleum, natural gas, iron ore, lead, zinc, gold, tin, limestone, salt, clay, chalk, gypsum, potash, silica sand, slate, arable land
Environment - current issues:	scarcity of hazardous waste disposal facilities; rural to urban migration; natural freshwater resources scarce and polluted in north, inaccessible and poor quality in centre and extreme southeast; raw sewage and industrial effluents polluting rivers in urban areas; deforestation; widespread erosion; note: the government considers the lack of clean water and deforestation national security issues	continues to reduce greenhouse gas emissions (has met Kyoto Protocol target of a 12.5% reduction from 1990 levels and intends to meet the legally binding target and move toward a domestic goal of a 20% cut in emissions by 2010); by 2005 the government reduced the amount of industrial and commercial waste disposed of in landfill sites to 85% of 1998 levels and recycled or composted at least 25% of household waste, increasing to 33% by 2015
Ethnic groups:	mestizo (Amerindian-Spanish) 60%, Amerindian or predominantly Amerindian 30%, white 9%, other 1%	white (of which English 83.6%, Scottish 8.6%, Welsh 4.9%, Northern Irish 2.9%) 92.1%, black 2%, Indian 1.8%, Pakistani 1.3%, mixed 1.2%, other 1.6% (2001 census)
Languages	Spanish only 92.7%, Spanish and indigenous languages 5.7%, indigenous only 0.8%, unspecified 0.8%	English and regional languages
Religions:	Roman Catholic 76.5%, Protestant 6.3% (Pentecostal 1.4%, other 3.8%), Jehovah's Witnesses 1.1%, other 0.3%, unspecified 13.8%, none 3.1% (2000 census)	Christian (Anglican, Roman Catholic, Presbyterian, Methodist) 71.6%, Muslim 2.7%, Hindu 1%, other 1.6%, unspecified or none 23.1% (2001 census)
Population	113,724,226 (July 2011 est.)	62,698,362 (July 2011 est.)
Urbanisation	urban population: 78% of total population (2010) *note:* Mexico City is the second-largest urban agglomeration in the Western Hemisphere, after Sao Paulo (Brazil), but before New York-Newark (US)	urban population: 80% of total population (2010)
Major cities - population:	MEXICO CITY (capital) 19.319 million; Guadalajara 4.338 million; Monterrey 3.838 million; Puebla 2.278 million; Tijuana 1.629 million (2009)	LONDON (capital) 8.615 million; Birmingham 2.296 million; Manchester 2.247 million; West Yorkshire 1.541 million; Glasgow 1.166 million (2009)
Literacy: definition: age 15 and over can read and write	total population: 86.1% male: 86.9% female: 85.3% (2005 Census)	total population: 99% male: 99% female: 99% (2003 est.)
Cuisine	intense flavours, colourful decoration, variety of spices and chillies. Three main (big) meals in the normal diet. Hot sauces are often used. Main ingredients: corn, tomato, chilli, beans, rice.	traditionally simple, but has evolved from the ethic migration from countries like India or Pakistan.

4.2 Scoping study: an online survey

An online survey was designed to explore in a wide context the aspects related to water use and perception of cleanliness in the homes of Mexican and British people, involving activities like dishwashing, laundering, bathing and showering and use of water-saving technologies. The aim was to complement the literature review findings and map the relevant issues to be further investigated in an in-depth study on *manual dishwashing practices* in the two selected sites (phase 2 of the project). Figure 4-3 shows in more detail the general topics covered, and Appendix C contains the actual survey in the form of a questionnaire as it appeared online.

Figure 4-3. The online survey covered subjects related to water use in the home

The survey, which provided rich qualitative data on water-related routines, was used to get an overall idea of the way Mexican and British people use water in their homes, and allow the researcher to get an understanding of the bigger context of dishwashing routines (encompassed within *domestic water use* as a whole). The richness of the data collected lay in the open-ended questions. The majority of the respondents expanded on their answers providing a good level of detail in the issues looked upon in the survey. It was with this intent that the questions were designed in the first place.

The results of the survey reinforced dishwashing as a promising topic to make a cross-cultural study on. From that point onwards, the user research stages of the project (this study, and phases 2 and 3) were narrowed down to the context of dishwashing in the Mexican and British home. To align this chapter with the purposes of this research, only dishwashing-related results are presented in this chapter.

4.3 Applying the survey

The online nature of the survey permitted a simultaneous application of it in both Mexico and the UK. Snowball sampling was encouraged, informing the participants beforehand the preferred criteria for respondents (shown in Table 4-3). A hundred and seven answers came

from the British respondents, and 143 from the Mexican ones, which were reduced to 102 and 135 respectively after discarding respondents outside the geographical areas of interest.

Table 4-3. Participants' sampling criteria

Attribute	UK	Mexico
Geographic location	Midlands and East Anglia	North region
Age of respondent in household	At least one adult (+21) respondent	At least one adult (+21) respondent
Other	British and based in the region for the last 10 years	Mexican and based in the region for the last 10 years

An english version of the survey was developed and tested with a pilot group of five British people. After identifying ambiguities with wording and resolving all software issues to set up online, the final questionnaire was set using the BOS`s Platform (Bristol Online Survey). The spanish version was first piloted with Mexican people living in the UK before being opened to a larger audience in Mexico.

Invitation emails were sent out to prospect respondents, and follow-up contact was established as a reminder for the questionnaire completion. The questionnaire was completed by only one person per household, as that *'individual would be responding on behalf of a group or organization'* [such as the household] (Robson, 2008:236).

4.4 Findings relevant to the washing-up practice

The online survey covered a wide range of water use activities in the home; however for the purposes of this research, only issues relevant to washing-up are presented.

As explained in the introduction section of this chapter, the survey's primary use was to narrow down the scope of the research. Therefore, the findings presented here discuss the responses of both Mexican and British participants with regards to their dishwashing practices; also covering factors that might influence behaviour related to water usage, and the use of electric dishwashers and house-help; discussing the similarities and differences found in each country's set of responses.

4.4.1 Influential factors on water conservation

As discussed in the literature review, one's attitudes can potentially influence behaviour. Therefore, the questionnaire investigated some factors that might have an influence on people's motivation to use water responsibly; the factors being climate change, cost of water bill, regional

water scarcity situation, example for youngsters, and doing *'the right thing'*. In general, Mexican respondents identified all categories with a high influence in their attitudes and behaviour, whilst British respondents' distributed the attribution of influence more evenly throughout the different options available; some interesting findings are detailed hereafter.

Over half the Mexican respondents rated regional water scarcity as a high influential factor towards responsible water use, whilst in contrast only 23% of Britons considered it to have some sort of influence on their attitude. This can possibly be related with geographical differences along with local climate, as these are factors that affect the way people perceive water. A similar situation appeared with other factors like *'doing the right thing'*, to which Mexican respondents gave high importance; a finding that is in line with previous research studies that highlight the importance people give to the 'cultural capital' and 'social acceptance' with regards with their attitudes towards pro-environmental behaviour (Askew and McGuirk, 2004; Medd and Shove, 2005b; Corral-Verdugo and Pinheiro, 2006).

4.4.2 Owning a dishwasher vs. having house-help – social matters?

Mexico is considered as a developing country, and has a lower average income than the UK (CIA, 2009). It is not surprising then, that only 12% of the Mexican respondents have a dishwasher, and well over half of the UK respondents do. However, and in paradox, 60% of the Mexican respondents employ a house-help (41% of them, daily), whilst only 15% of the UK respondents did (81% of them weekly or less frequently, none of them daily). This raises the question of whether the economic situation can indeed be considered as the crucial factor for these particular differences in approaching the 'dishwashing avoiding' attitude; or if it is a combination of other factors such as culture, the way society is formed and has evolved, or the local history. It is perhaps embedded in the culture.

> *'In Mexico almost nobody buys a dishwasher, the ones with enough money to buy them have someone to do the dishes for them, so they don't need it'.* (Mexican participant)

Again, drawing from the researcher's personal experiences of living in the two countries, it is important to point out how Mexico, as a colonised country, still has a good number of indigenous population that migrates more and more to the urban areas. They are usually a good source of low-cost labour and are often employed as house-help. As they often come from little villages in sometimes remote locations, it is still common in medium/high income households, to have the house-help living in the home, offering room and board as part of their salary.

Although there are some interesting discussions and perspectives, there is no agreed-upon weight or importance of influential factors on sustainable behaviour on the washing up process, as it is an activity that varies from person to person, it has become difficult to arrive to an

agreement. Having house-help, just as renting a place instead of owning one, have before been commented as factors that might compromise sustainable intentions/behaviours (Gilg and Barr, 2006). Just as using a dishwasher with full loads has been recognized to be less resource consuming than washing dishes by hand (Stamminger *et al.*, 2003).

4.4.3 The '*Mexican way*' and the '*British way*'

Regarding the particularities of the dishwashing process in each location, the questionnaire brought up some interesting results. Seventy percent of British respondents use a *washing-up bowl* when doing the dishes by hand, which they *'fill up with hot water, and soap, wash up stuff; once water is dirty, repeat (if needed)* (British respondent). Another British-washing up pattern that came to light with the questionnaire, was that a good amount (57.7%) of the British respondents tend to not rinse-off the soap from most items. From these, 37% rinse off only when washing glassware.

[I don't rinse the soap mainly because]:

> *'It drains off'* (UK12)
>
> *'I have never done it, nor my mother, nor my grand-mother, nor anyone I knew. My chemistry teacher did suggest to do it saying "You wouldn't eat soap now, would you?" True. I then started rinsing my dishes when washing up for my mother but soon gave it up again. I think it just was more work'.* (UK53)
>
> *'Most of the time I don't* [rinse]. *I pull it out of the water quick enough and very little soap clings to the item anyway'* (UK43)

A final rinse was invariably present in Mexican respondents' description of their washing-up process; also, none of them said they used a washing up bowl or filled up the sink, they made reference only to the taps and a small container with a solution of water and liquid soap.

> *'I rinse the soap container; I put in some dishwashing-detergent and water. With the tap open I get rid of food residues from the items. Then with the sponge I start washing glasses first, then plates and saucepans. At the end I open the tap and rinse everything and place it in the drying rack'.* (MX62)

Similar to the quote above, the *soap container* was a motive constantly mentioned amongst the dishwashing descriptions of Mexican participants. It consists of a small container (usually less than 1L.) where washing liquid (or any form of soap) and water are mixed to make foam and recharge the sponge with soap between scrubbing items. Phase 2 of the project allowed the collection of media that enabled a better understanding of this element of the Mexican washing-up practice.

Related to the abovementioned trait, a very interesting situation arose when analysing the answers that most Mexican respondent gave when asked if they *rinsed the soap at the end when*

washing the dishes by hand. The expected answer was to be related to rinsing-off the foam from the dishes before placing them to drip-dry, but in a considerable number of cases, the connotation of the question was changed from what the researcher expected. Through the analysis of open-ended attached sub-question (why do you do so?), the researcher learnt that all Mexican respondents that had responded NOT to do a final rinse, they were, instead referring to a rinse of the container with soapy water used to dip the sponge in during the washing-up process, taking for granted that a rinse of the soap from the dishes themselves was obvious.

These findings (difference in washing-up bowl use and soap use and rinse) were kept in mind to further investigate in the Cultural Probes, as part of phase 2 of the project, from which visual images/videos were collected, giving a more clear explanation of the processes used in each country.

4.4.4 Discussion and survey follow-up

The survey was not intended to draw sweeping statements from the two countries' population, as that would be an oversimplification of the subject and the sample taken was not representative of all household composition or all socio/economical groups of the two countries. More importantly, the questions aimed to set general grounds for the following user-research stage, and to raise points of interest for expanding through the design of the methods used.

In regards to the general attitudes/behaviour towards water, no definite distinction (between the two sites) could be made at this stage, as people's actions are often different from what they say. In both countries, a vast majority of the respondents considered themselves *water conscious* when using water at home. One could argue that *'using water responsibly'* potentially has different meanings for one and the other sets of respondents, or even between members of the same group. For example, drawing on personal experience, it is the researchers view that, if the Mexican respondents are used to doing the washing-up under the tap, and they grew up with that, and they wash as quickly as possible (less water used), they might think of themselves as being 'water conscious'. The thought of washing-up differently (and possibly using less water) may never have crossed their minds: and it would certainly be culturally unacceptable to wash up with a set amount of water, in a bowl, and not rinse items afterwards.

In some questions, the responses gave the idea of people answering *'what the researcher wants to hear from me'* or *'what I want people to think of me'*. Possibly a different wording of those specific questions could have hidden the purpose of the whole survey (water and sustainability) so that it would not make the respondent feel judged. In general, the responses to the questions asked

provided a good level of background knowledge on the importance people give to water in general, and their attitudes towards it.

The question of which of both washing-up techniques was more sustainable was not approached, and remained out of the scope of this research project, as no quantitative data on water usage would be gathered. One must have in mind that even with the similarities in the processes of washing-up found amongst each of the study sites, there are no identical approaches to dishwashing, as it is an activity that varies according to personal circumstances.

Only an electrical dishwasher could be said to have the same resource consumption at different times, although the amount of items washed would always remain a variable, influencing consumption.

4.5 Conclusions

With the aid of the survey it was possible to set a general background on attitudes towards water in Mexico and the UK, and get an overview of the particularities of British and Mexican dishwashing practices. The main use of this information was to narrow down the scope of the research to specifically **dishwashing practices**, making the completion of the project feasible in the given timeframe (three years) and with the available resources.

The results brought to light various important social and practical issues and differences in the washing-up routines of the sites analysed, requiring further investigation with a more 'ethnographic' approach, to get a fully understanding of the behaviours presented.

Most interesting differences found out through this scoping study lie in the way people use soap and the use of water in the washing process: British use a semi-full sink or a washing up bowl, and Mexican people tend to use the water flow directly by opening-and closing the taps as needed. Although most respondents provided a good amount of 'explaining' in their answers, the researcher believes that visual data (from the participants) could help to better understand the *big picture* of the behaviours. The survey pointed out the direction for the research and helped give shape to phase 2 of the project: the design and application of Cultural Probes to unveil actual behaviour during the dishwashing practices in Mexico and the UK.

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5 Investigating washing-up practices: Cultural Probes

This chapter presents the designing, application and results of the Cultural Probes (phase 2) as a method to investigate Mexican and English washing-up practices. A robust and clear image of washing-up practices emerged with rich and detailed data presented in different media, ideal to be implemented in a design process (phase 4).

5.1 Introduction

The literature review and online-survey (phase 1) set the course for this stage of the user research. Cultural Probes were considered as a useful data collection technique and used to deepen the understanding of dishwashing practices in Mexico and UK households. This section reports on the process of developing the Probes, transforming them into reality and making sense of the gathered data, responding in particular to objective 2b of the PhD:

> *To explore parallel routines of people with different cultural backgrounds, by using washing-up practices and perceptions in the UK and Mexico as a case study:*
>
> > *a. To carry out a survey on washing and cleaning habits and water perception in both locations*
> > *b. To carry out ethnographic studies to gain a detailed understanding of individual/personal dishwashing practices*

Cultural probes do not give comprehensive information about people, but *'fragmentary clues about their lives and thoughts'* (Gaver *et al.*, 2004). Hence the aim of the Cultural Probes was to explore and get **details** on **individual** contexts and actions during participant's daily life-dishwashing activities; and not to obtain or make sweeping statements and generalise about Mexican or UK

dishwashing processes. The intent was to later generate supporting media to aid the design of products for sustainable water consumption for specific users (phase 4) by building different scenarios and Personas (phase 3) based on the data collected and the questionnaires previously carried out.

5.2 Designing the probe pack

For the purposes of this PhD, the Probes were designed for the specific context of washing-up in UK and Mexican households, prompting people's memory and encourage reflection upon their behaviour on dishwashing.

Based on the examples of other probe studies (Gaver *et al.*, 1999; Hemmings *et al.*, 2002; Mattelmäki and Battarbee, 2002; Gaver *et al.*, 2004; Kjeldskov *et al.*, 2004) the probe pack aimed to capture all sorts of ideas and thoughts on dishwashing, and reflect on the types of patterns that people follow. It was designed to facilitate people's expression on specific matters that were important for the research and that may otherwise be considered as irrelevant or obvious by the participants. One example encountered during the analysis of the Probe Packs, was that Mexican participants sometimes failed to mention the final rinsing of the soap out of items when asked to briefly describe what they do when washing-up. People often tend to believe some practices to be universal, and too obvious to mention, whilst in this case, a good number of British participants (and questionnaire respondents in phase 1) expressed they did not rinse all items all the time.

The probe pack incorporated as focal elements a semi-structured diary and a disposable camera with a 21-photo task list. Figure 5-1 shows the elements included in the Probe packs. The design of the diary had an informal approach and used colours, images and a display of information to prompt, captivate and engage the respondent. The diary was divided in seven different spreads, one for each day. They all had different entries and different photo tasks to complete, all united in the common theme of dishwashing. Blank spaces were also provided to incite people to express themselves by scribbling and drawing.

Figure 5-1. The Probe-pack: Diary, photo task, disposable camera, pen, fridge magnet prompt and magnetic clip.

As most activities related to the probe pack would be carried out in the kitchen, and with the premise that fridges are something people see all the time, respondents were given a reminder **fridge magnet**, an extra **photo task list** and a **magnetic clip for the diary**, so that they could have all the elements prompted every time they passed the fridge.

The Probe packs were complemented by a **36-hour video** recording of people's kitchen sink, which made use of a webcam small enough to be set up with flexibility with a strategic view of the kitchen sink. Motion detection software was also used to make sure that every activity around the kitchen sink was recorded, keeping the amount of video footage to review and analyse with the project's time and resource constraints as low as possible. The video provided yet another point of view of the situation, so the researcher could pair it with the qualitative contextual information contained in the cultural probes, building a more-robust picture of the participant's dishwashing process.

A timeframe of one week was set for the completion of the Cultural Probes, seven days was thought to be long enough to gather different circumstances in the synergy of the household, without making it a too long and effort-needing task so that people would grow bored of it and stop or decrease the enthusiasm in their participation.

5.3 Getting participants involved

A flyer describing the project was distributed mainly via the Internet to get the attention of possible participants, asking people to forward the invitation to others, aiming for snowball sampling. The households that expressed a willingness to participate were approached during an informal meeting on-site during which participants were provided with the Cultural Probe pack and all elements involved in the research were explained, setting also an appropriate date for the video recording.

Participants were either British or Mexican and based in the East-Midlands area (UK) and in North-east Mexico respectively. With the assumption that different household sizes would bring out a good variety of synergies and insights, the participants were selected trying to get a range of the following household categories:

- Single occupancy
- Double occupancy (couples)
- Shared house (+3)
- Small family house (couple +1)
- Bigger family house (+3)
- Family house with grown children

Eight Cultural Probe packs in the UK and six in Mexico were returned completed with considerable entries and for the analysis. Appendix E shows all the probe tasks contained in the diary, taking the examples from different respondents. Table 5-1 and Table 5-2 give a brief description of the participants' demographics and other characteristics important to this study. In Mexico, no males expressed an interest in participating in the task, resulting in an all-female sample, whereas 2 out of 8 UK participants were male. Other key differences in the two sets of participants are the manual dishwashing frequencies and ownership of electric dishwasher (both higher in the UK), and the hiring of house-help (higher amongst the Mexican participants).

Table 5-1. British participants characteristics

British participants	UK01	UK02	UK03	UK04	UK05	UK06	UK07	UK08
Sex	M	M	F	F	F	F	F	F
Age range	40-49	40-49	50+	40-49	20-29	20-29	50+	30-39
Nationality	UK	UK	UK	UK	UK	UK	UK	UK
Household members	2	3	2	4	shared/ 4	2	1	1
Role in household	Husband /team	Husband /team	Wife *'goddess'*	Mum/ team	House-mate	Partner /team	*'every thing'*	Partner/team
Frequency of DW by hand[bulk]	1xday	1xday	1xday	1xday	1xday	1xday	1xday	1xday
Electric dishwasher?	Y	N	Y	Y	Y	Y	Y	N
House-help	N	N	N	N	N	N	Y	N

Table 5-2. Mexican participants' characteristics

Mexican participants	MX01	MX02	MX03	MX04	MX05	MX06
Sex	F	F	F	F	F	F
Age range	40-49	50+	20-29	20-29	30-39	20-29
Nationality	Mx	Mx	Mx	Mx	Mx	Mx
Household members	5 + herself	5	1	shared/3	3	2
Role in household	House-help	Mum	*'every thing'*	House-mate	Mum	Wife
Frequency of DW by hand [bulk]	3x a day	every 2 days	1x a day	every 3 days	1x a day	every 3 days
Electric dishwasher?	Y	N	N	N	N	N
House-help	N/A	Y	N	Y	N	Y

5.4 Analysis methodology

A first, general, non-detailed review of the diaries and photographs allowed the researcher to get familiarised with the participants and their entries. Four main *a-priori* categories acted as a lens when reviewing the data: hardware and space issues, dishwashing context, temporal issues, and specific actions.

Early in the analysis it became evident that not all participants' Probes would present the same amount and depth of information in each of the abovementioned categories, mainly because they were given instructions to write on the diaries as much as they wanted, and skip any parts that they felt like not completing. Some participants shared thoughts and activities in detail in their diary, whereas some others gave only general information, or ignored information that they (probably) thought to be too basic or obvious. For example, not all participants mentioned whether they had (or not) a dishwasher, a water meter, house-help, or if they usually rinse items before recycling. Most of these gaps in information were later filled with data gathered through informal conversations and unstructured interviews that took place when presenting the Probe pack to the participants, when setting and picking up the video camera, and through follow-up conversations.

A first round of pattern searching in the diaries provided a first set of codes that developed into more specific ones depending on the semantics and context in which they were presented in the diaries. For example, *hygiene perception* (HYG PRCP) as a general code could be developed into more specific ones by joining it with *hot water* (HYG PRCP_HOT) when people would *wash-up with hot water* because they perceive a link between water temperature and hygiene. A full list of the coding used to analyse the diaries entries can be found in Appendix D.

Specific information from the probes in the form of images or quotes was used to back up the coding process and facilitate the exemplification of the findings, as illustrated Table 5-3 below.

Table 5-3. Coding scheme and analysis of the Cultural Probes (extract)

Category	Code	Definition	Quote from the Probes
Actions	RNS-LKS	rinses for aesthetic reasons	*'...dried bubbles leave nasty marks...'* (UK01)
	RNS-SFTY	rinses for health & safety reasons	*'...someone told me washing-up liquid is bad for you'* (UK05)
Context	HOT-CMFRT-HYG PRCP	uses hot water for comfort and hygiene reasons	*'hot water makes it cleaner and nicer on hands, plus feels nice in the cold mornings'* (UK06)

5.5 *Understanding participants: Cultural Probes findings*

The Cultural Probes provided an enormous amount of visual and textual detail in participants' dishwashing activities. The findings are structured in a cross-comparative way pointing out the most interesting issues that arose from the elements of the Cultural Probes. The following sections discuss the variations in the context of the dishwashing activity and a number of particularities of the dishwashing process itself.

5.5.1 Teamwork in domestic chores

The concept of *teamwork* came up frequently in all Cultural Probes (with the exception of the single person households) either as something already present in the dishwashing process, or as a wished for attribute of the process. Chore-sharing in the home proved to be less common with Mexican participants than in British ones, who all expressed sharing the chores amongst household members. Dishwashing wasn't the exception: most British participants shared the workload of the task by sometimes splitting activities (washing, keeping company or drying and putting away items) or simply alternating who should do the washing-up on certain days. In the case of Mexican participants, washing-up appears to be a one-*women's* job, and half the volunteers expressed their wish/need to make it a teamwork task (MX02, MX04 and MX06) – exceptions of MX01 (she is the house help, it *is* her job), MX05 (likes her alone-time, where neither her son or her husband will get near *'they don't want to be asked to help'*), and MX03 (single household).

> *'I always end up doing the dishes alone now, and I hate it! I remember when* [at the beginning of the marriage] we *would do it together, I would wash and he would be drying up the dishes at the same time...it wasn't long before he found some excuse not to help!'* (MX06)

> *'I am the one that does the dishes. Juan* [husband] *is never around the sink... he keeps drinking coffee in different mugs, even when I tell him just rinse and reuse the old one. At the end of the day I have loads dirty mugs for only one coffee drinker'* (MX05)

> *'He knows he has to help with the chores, it's not MY job, it's shared'* (UK08)

5.5.2 People's perception of the time invested in dishwashing

Washing dishes is an activity that *has* to be done and consumes both time and effort, two elements that appeared highly valued by participants. Thus, most participants consider dishwashing as a *low importance* activity in their *to-do list*.

> *'I try not to let myself invest much time in dishwashing; there are better things in life to give my time to'* (UK07)

> *'I have to say that sometimes we forget and the* [dirty] *dishes stay there for a couple of days'* (UK06)

As identified in the literature review, with modern rushed lifestyles people pay less attention to details in their actions, unless it is something really important or dear to them –something that dishwashing is not–. On these lines, a handful of participants expressed they would often wash-up giving more importance to speed/time than to final quality of the work.

> *'I am never home, and when I am, I fix me something to eat and wash-up in a flash. If it* [the dish] *sort of looks clean, then I am happy'* (UK05)

> *'I am constantly making excuses not to wash-up, but it is only because I takes so long because I am a perfectionist... my wife is the total opposite: quick quick quick!, even if it is not sparkling clean'* (UK02)

Based on this study, there is no clear difference between Mexican and UK rate of speed versus quality on the dishwashing practices, but one fact worth mentioning is that the rushed lifestyle pushing them to a quick wash-up often came up in the British ones, but was never directly mentioned by any of the Mexican participants. This could possibly relate back to the frequencies in which they do the washing up, the employment of dishwasher/house-help to do the dishes, as detailed in the section below.

5.5.3 *Extra-help* in washing-up

Washing dishes is an activity that *has* to be done and consumes both time and effort, two highly valued elements. It was no surprise (after phase 1 of the research) that most participants consider dishwashing a *low importance* activity in their *to-do list* and have a slight feeling of avoidance towards it. People don't look forward to doing the dishes, and often have a slight feeling of avoidance towards it.

Some participants (UK01, UK02, UK03, UK08, MX01, and MX02) use common accessories like music devices or a TV to *distract, pass the time or keep company and make the chore more bearable*. Figure 5-2 shows some of the photos participants took when asked about parallel activities to washing-up that make it *better*.

Figure 5-2. Parallel activities to washing-up. Selected photographs from the Cultural Probes (text added).

The participants' general dislikes towards washing-up are 'translated' into different solutions to avoid the dishwashing process. For example:

- In the UK, by the purchasing and use of an electric dishwasher (7 out of 8 participants own one) to decrease the amount of manual washing-up needed –for practicality, time-saving, or similar reasons;

  'I don't know what I would do without my dishwasher; if I wash by hand I feel I spent my whole day washing dishes' (UK03)

- In Mexico, by engaging house-help (4 out of the 6 had a maid)

  'I suppose here in Mexico we would rather employ a maid than buy a dishwasher, it's just simpler and she does more than just the dishes' (quote from questionnaire, phase1)

From the Cultural Probes (and the questionnaire in phase 1), it is clear that electric dishwashers are more common in British households than Mexican. Only one of the Mexican participants has a dishwasher, but it is used only when the maid is not available to do the washing-up. In this particular case, the Cultural Probe pack was given directly to the house-help (MX01) seeking real insights on the chore. The rest of the Mexican participants with house-help expressed that they do wash-up during the week as it is needed, but when the house-help days come close they accumulate dishes and wait until it is done by them.

Not all participants though had an avoiding attitude towards dishwashing. One Mexican participant (MX05)takes a certain amount of pleasure when dishwashing, it is a time *for herself* when she knows she will be left '*in peace'* as no-one in her home would want to go near –and risk being asked to help. The participant who was the house-help herself expressed that washing up one of the '*easy, simple chores'* of her job (MX01).

5.5.4 Dishwashing process: the fundamental differences

Interestingly, a basic element that distinguishes one culture's dishwashing process from the other was the *washing-up bowl*, an element that has different connotations for each culture. Mexican and British ways of using soap and water are clearly exemplified in the participants' drawings and photographs (see Figure 5-3).

Washing-up bowls are a common piece of equipment in British domestic washing-up practice. It consists of a plastic container that fits inside the kitchen sink and is used to pour hot water and a squirt of soap in it to wash the dirty dishes (sometimes the sink itself is turned into the washing-up bowl with the use of a plug). This practice is unfamiliar to Mexican participants, who did however have a different version of the washing-up bowl. It consists in a much smaller container that holds ¼ to ½ L of soapy water in which they dip the sponge and then scrub each one of the dishes. These two different basic washing-up methods can be appreciated in the participant's drawings shown in Figure 5-3.

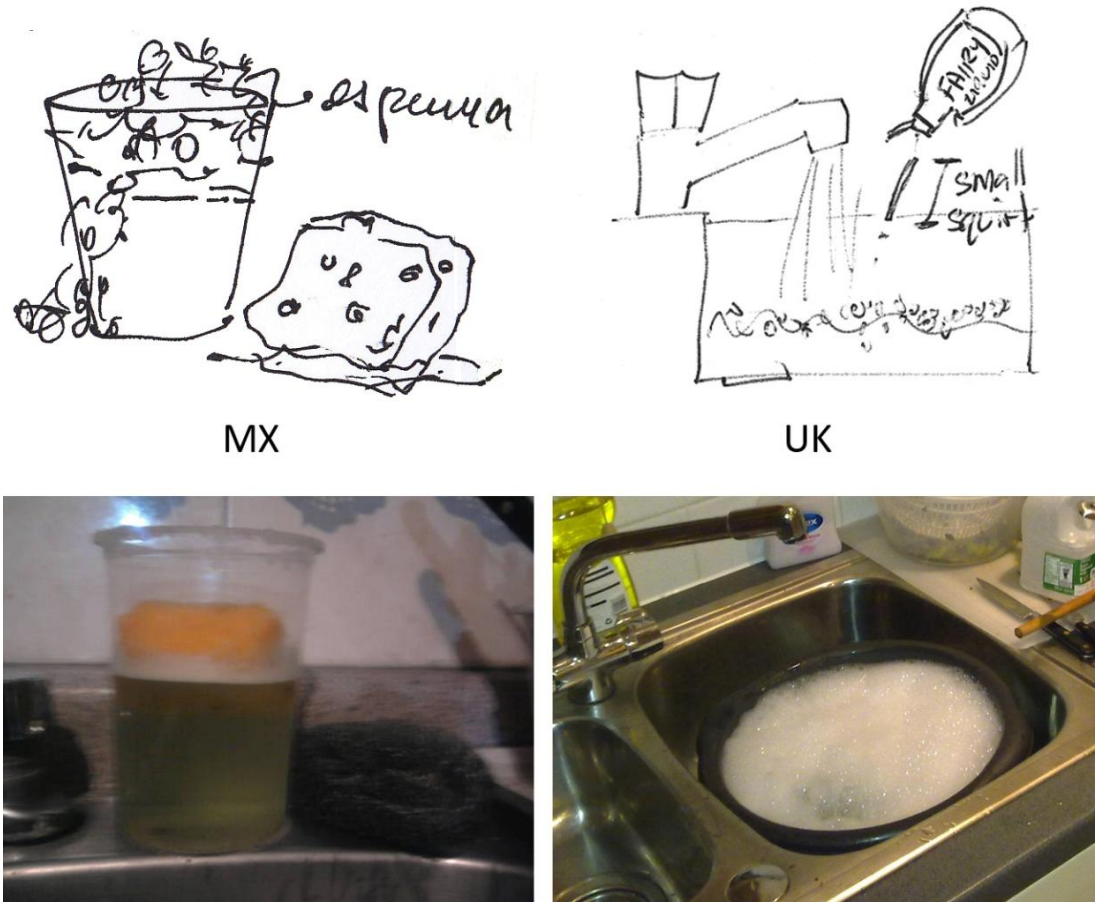

Figure 5-3. Mexican and British ways of using soap and water during the washing-up.

5.5.5 Activity and surrounding area layout

The use of the space around the kitchen sink presented shared patterns amongst Mexican and British participants. Dirty dishes seemed to be placed in a specific *waiting-space* before being washed-up; participants showed that this is done in a routinely way, repeating the same pattern every time. Some participants use the **sink** as a *hiding place* for the dirty dishes for aesthetic reasons, to *'keep the kitchen looking nice a clean'* (see Figure 5-4), whilst others choose to place the dishes **on the countertop** next to sink for more practical reasons, to keep it clear for other uses (*i.e.* Figure 5-5): *'easy access to the sink is important to me, in case I need filling the kettle, washing veggies, or getting water to boil vegetables'* (UK01).

Figure 5-4. Dirty dishes out of sight –photo from MX03 (text added).

Figure 5-5. UK02's photo of the functionality of the dishwashing space, placing dirty dishes to '*wait*' in the countertop next to the sink (text added)

Available countertop space around the sink, as well as having a single or double sink, seems to have an important role in the arrangement of the abovementioned habits of space and distribution of the washing-up practice. All British participants had a single sink, but extra counter space. Five out of the seven UK participants use this countertop to place dirty dishes before washing; this could be due the constant need to have the sink cleared to use the *filter jug* or fill the *kettle*, elements found in the UK home but not in the mexican home, where, based on the researcher's personal experience and corroborated with this study, making tea or drinking tap water are not common habits (Figure 5-6).

Figure 5-6. Constant easy tap access was important for all British participants.

The two UK participants that used the sink to place dirty dishes instead of the countertop *may possibly* do so because produced very little amount of dishes to create an accesibility problem for the tap (it is a single household and a 2 person household that electric-dishwashes nearly everything).

On the other hand, half of the Mexican participants had a double sink, and the other half had very little countertop space next to their single sink. These circumstances bring a partial explanation for Mexican participants keeping the dirty dishes **inside the sink**. The need to *hide* the dishes inside the kitchen sink could also be related to the **frequency** with which they do the dishes (refer back to Table 5-1 and Table 5-2), which in the UK was constant with one wash per day, whilst the Mexican participants varied it between three times a day (MX01) to twice a week (MX07). This variation in the dishwashing frequency, combined with other circumstances (*i.e.* occurrence of house-help, household size) might cause more dirty dishes to be produced, and thus the need to *hide* them so that the space does not look untidy might be greater.

Both sets of participants generally perform the dishwashing process in a relatively linear way: dirty dishes either inside the sink or next in the countertop go through the process of srcubbing and soaping inside the sink and the final drip drying on the other side of the sink, as illustrated in Figure 5-7.

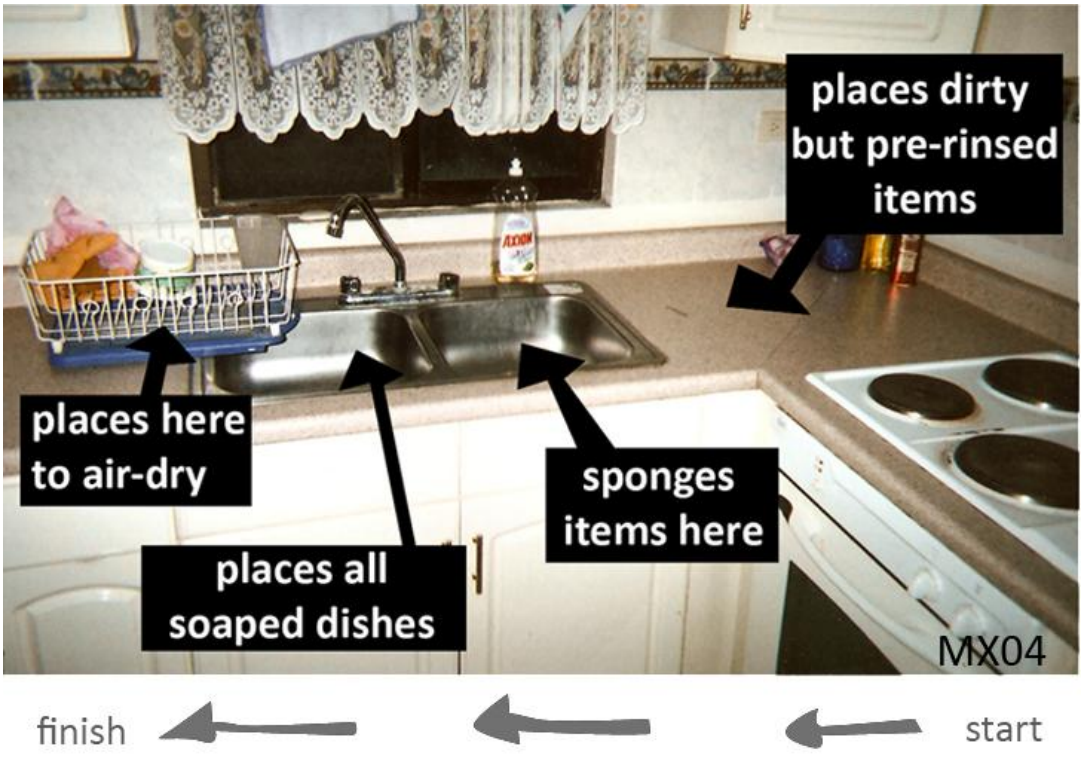

Figure 5-7. This picture from MX04 illustrates the linear nature of the dishwashing logistics that most participants followed (text added)

There are, however, some variations to the simplified process mentioned above. Mexican participants with a double sink tend to use one of the sinks for dirty dishes, keeping the other one always clean for other uses and to host the dishes once they are soaped, as shown in Figure 5-8 below.

Figure 5-8. MX01's usual dishwashing process, using one sink for dirty dishes, the second one for soaped ones, and a third space for the drying rack (snapshots from video recordings, text added)

5.5.6 Rinsing recycling

British participants have the habit (not identified in Mexican ones) of recycling tetrapacks and other containers. They would rinse containers before placing them in the recycling bin. This activity was observed to be less standarised than the dishwashing process itself, varying the rinsing techniques and the amount of water used (no quantitative measurements of the water usage were taken). Some participants (UK01, UK02, UK04) let a small amount of tap water flow into the container in question, close the lid and shake the container to clean it, then repeat the process if required. Different, less-sustainable behaviours were observed in the videos, in

which the container was placed in the sink, right below the open tap until it would overflow and *clean itself* (UK03). Figure 5-9 illustrates some of the recycling-rinsing behaviours.

UK01 and UK04 said they recycled washing-up water and vegetable washing water by sometimes collecting it in the washing up bowl and feeding it to house-plants or the garden itself.

Figure 5-9. British participants showed an inclination to rinse containers to recycle. (UK03, UK01 and UK02 in the picture, text added)

5.5.7 Pre-rinsing and soaking dishes

Trying to make things easier when doing the washing-up, the vast majority of participants pre-rinse or soak dirty dishes for at least 15 minutes, especially ones with burnt food on them (frying pans, oven trays) or difficult stains (certain colourful sauces or drinks like coffee or tea, as can be seen in Figure 5-10).

> '*...for me, the ideal way of doing the dishes is pre-rinsing to wash later on, that way food rests come out easier*' (MX04)

Figure 5-10. Soaking dishes proved to be a common practice between the two washing-up cultures.

To take advantage of the water in the washing-up bowl after a wash cycle, a number of British participants leave the difficult and burnt *Pyrexes* or dishes **soaking** in the same water **overnight**, this way, they say, it saves them time in the actual washing-up process. An example of this *'day after'* washing is illustrated in Figure 5-11.

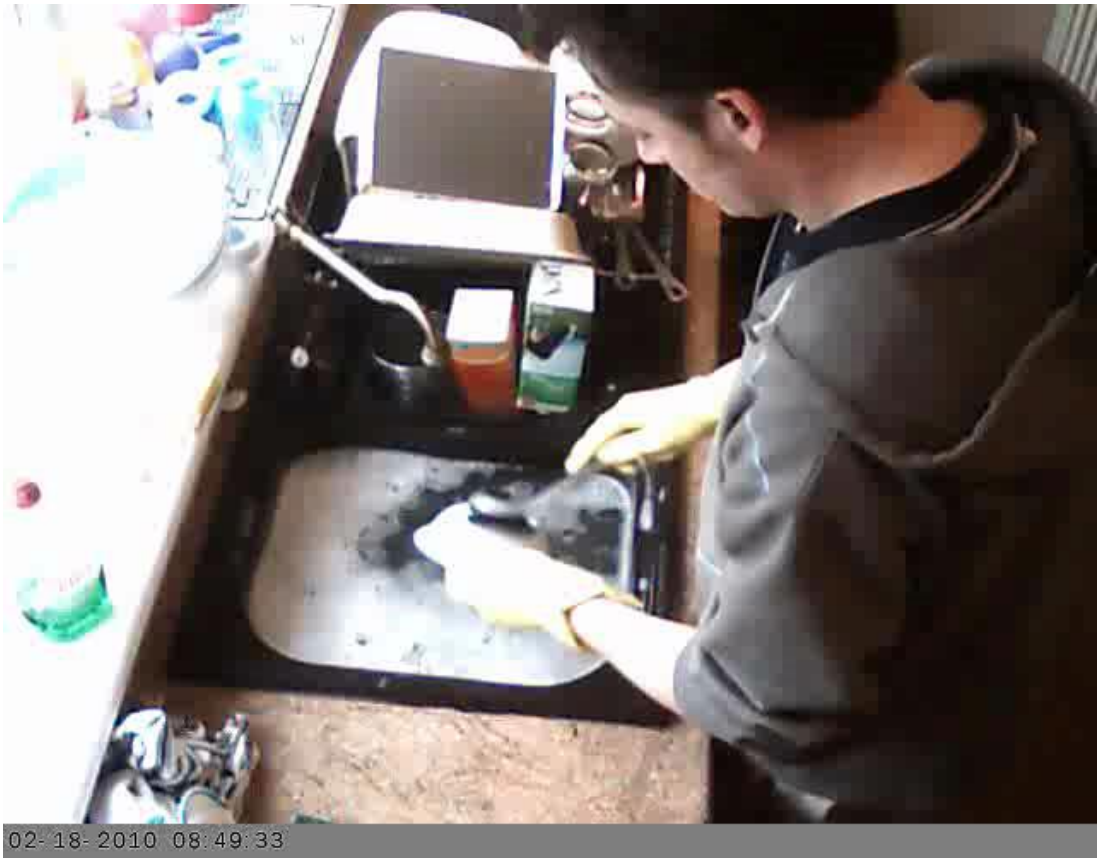

Figure 5-11. Some British participants re-used washing-up water to soak difficult dishes overnight. (Image from video recording).

Pre-rinsing dishes was also observed in participants that used the electric dishwasher, even when modern dishwashers do not require this pre-step for a thorough cleaning. It was observed that an important quantity of water is used in this process, as it is generally done under the running tap, using a sponge or a brush to aid the cleaning (as in a normal wash-up). It seems that in these cases having the two cleaning processes (pre-rinsing and electric dishwasher) is useless extra energy and water usage. Figure 5-12 shows some snapshots of participant's rinsing dishes before placing them in the dishwasher. They claim that the dishwasher is not turned on every day, so the pre-rinsing has hygiene reasons behind.

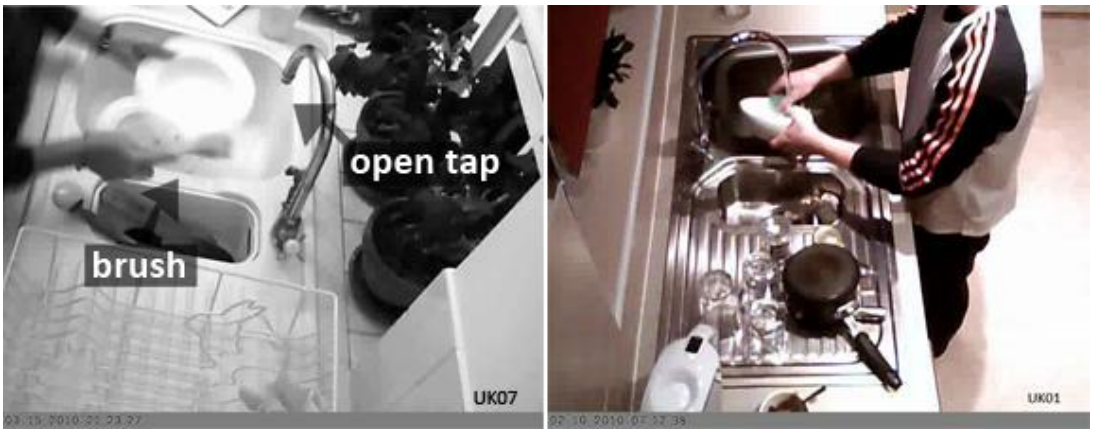

Figure 5-12. Pre-rinsing before placing the dishes in the dishwasher was a common practice amongst British participants.

5.5.8 Rinsing soap out of dishes

Another interesting difference in Mexican and British hygiene perception and practicality importance arose in terms of the rinsing of the foam after soaping process (as illustrated in Figure 5-13). The majority of the British participants do not give a fresh-water rinse to the dishes at the end of the washing-up process in the soapy water; exceptions were made for aesthetic reasons when washing glasses and other transparent items. Some argue there is no need for a rinse, as the *'little foam left in the items'* drips-off when in the drying rack (UK08, UK01, UK02), and also that it would mean an extra step in the washing-up process, adding to time and water consumption. In contrast, all Mexican participants give a final rinse after the scrubbing/soaping process.

'...it would be crazy not to rinse, who would want to drink water with the taste of soap?' (MX03)

Figure 5-13. The majority of British participants showed the habit of skipping the rinsing of the foam.

5.5.9 Choice of water temperature

Hot water is perceived in both countries as being linked to hygiene, killing germs and effectively cutting through grease. Moreover, water temperature is sometimes driven by comfort standards, depending on the outside weather. Some British participants expressed directly to like the feel of hot water in the British cold weather, and one from Mexico expressed to set the water temperature according to the weather: cold in summer, hot in winter time.

Practically all British participants use hot water to fill the washing-up bowl and do the dishes. Significant amounts of water are wasted in the *waiting* for hot water. In the case of Mexican participants, soaping the dishes tends to be done with cold water (except with greasy items), but final-rinsing is preferred with hot water (MX01, MX02, MX04). Interestingly, MX02 has a strategy to make the *'warming time'* of the water productive: she starts scrubbing and rinsing the least dirty items, and by the time she gets to the *greasy ones*, the water had time to heat up.

5.5.10 Extra activities in the kitchen sink

All participants showed a number of activities other than dishwashing taking place inside and around the kitchen sink. Participants with babies in the family showed through their diary and their photographs that toys, clothes, baby bottles and similar elements were often washed in the sink. In these houses the hygiene of the empty sink and the surroundings was given high importance, and special attention was paid to the post-washing-up cleaning process.

The Cultural Probes and video recordings also provided evidence of other activities being carried out in the sink: rinsing vegetables; washing curtains and other *delicate* items; using the inside of the sink as a work surface to prepare meals; and even using the sink as a plate when eating in a rush, avoiding this way to dirty any dishes and reducing the amount of cleaning to do afterwards (see Figure 5-14).

Figure 5-14. Videos revealed some surprising alternative uses for the sink

5.6 Discussing the Cultural Probe elements and unexpected outcomes

The ludic approach of the activities in the diary, and the careful design stage focused on **engaging** so as not to bore participants (see Figure 5-15, and appendix E for the entire diary). It is considered that the success of this element is partly due to the variations in the entries asked for on each day. Blank spaces were included in the diary to incite people to express themselves by scribbling and drawing; although not used by all participants, when used, they brought interesting and useful extra data that enriched the analysis and understanding of the participant as an individual.

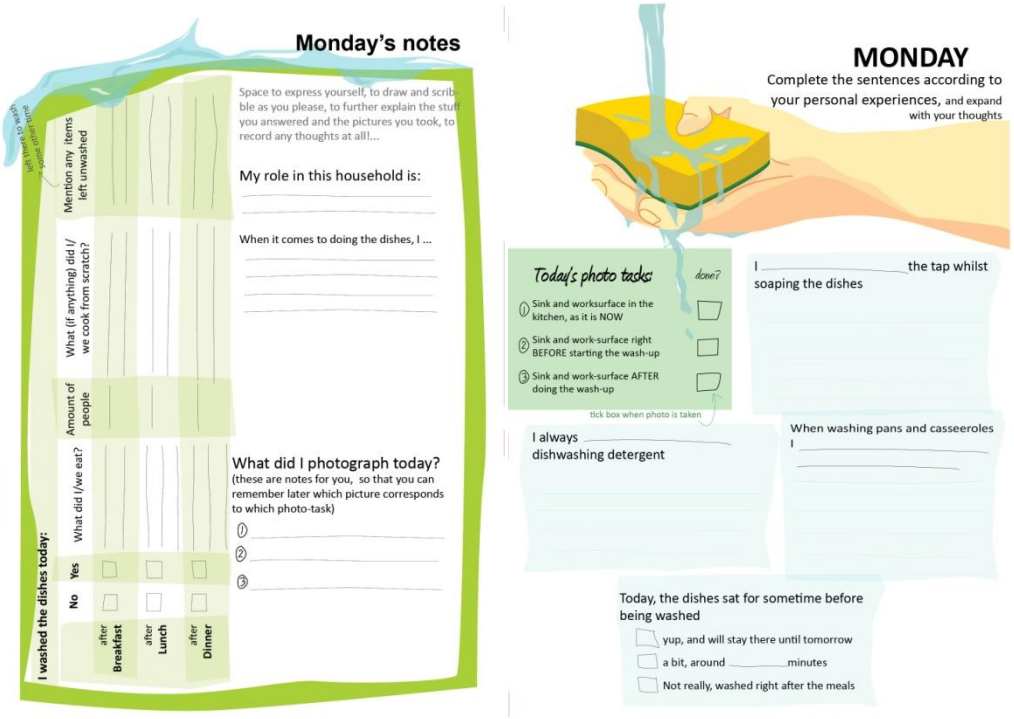

Figure 5-15. Diary's sample from one day's spread.

The sometimes quirky or ambiguous tasks in the diary gave participants the opportunity to distance themselves from reality and use their imagination to put across different realities from their home. One particular task from the diary unveiled an interesting point of view to the use and care of the kitchen sink. Participants were asked to write a short story about what usually goes on in their kitchen sink's mind throughout a day or a week, personalising the sink itself (written in first person). While some participants wrote very serious/real stories, others revealed the imaginative storyteller side of themselves and "gave life" to the sink. One of the stories, presented below, illustrates how little importance is given to the sink, that cooking is not really a big issue in the home, and how untidiness is sometimes overlooked!.

> *'I don't get much use really; my day is usually quite boring. From time to time, when pots are washed I get the odd treat dropped at me, perhaps a mushroom or a soggy carrot or two. I hope at that point someone will turn on the tap so I can gobble it up down the plughole. At the moment I am stained brown from the mouldy coffee that is poured on me, I don't like this particularly. The horrible green washing detergent tastes even worse than the coffee though. I let them know how I upset I am though by burping and making a horrible smell'.*

Other tasks throughout the diary brought out other rather interesting habits that are related to cooking and dishwashing. One of the Mexican participants showed throughout the diary how she doesn't do the cooking for the family, instead, she buys *home cooked* meals from a place near her house, which comes in disposable foam dishes. She transfers the food into '*real*' dishes before having the family meal. Figure 5-16 shows how she keeps the disposable dishes when friends of her son come to have lunch at home, as *"it makes it easier"*.

Figure 5-16. The Probes showed some interesting habits, like eating from disposable dishes

5.7 Discussing Cultural Probes' elements and their usefulness

The use of Cultural Probes as a user-research method was proven to successfully gather valuable rich data on the participant's daily activities and thoughts related to washing-up. There were some crucial changes proposed to the original elements from the pilots, which were (and remained) based on work from Gaver *et al.* (2004) and other Cultural Probes supporters (Hemmings *et al.*, 2002; Mattelmäki, 2006). The early Probe packs used in this research initially contained disposable analogue cameras, as do many other traditional Probe studies but it quickly became evident that a low-cost **digital camera** would bring better results in terms of time and

money invested, preventing faulty flashes and too-dark unusable pictures (common in the first attempts with disposable cameras). With the availability of affordable digital technology, various projects have taken the digital approach, such as Gaver's (2004) use of digital memo takers, and Iversen's (2003) use of mobile phones with camera and Dictaphone functions.

From informal conversations with participants, the researcher gathered that even if people are enthusiastic about the process, it is crucial for the successful completion of the tasks to send **follow-up** emails or SMS texts with prompts to encourage the participants to continue with the Probe pack. A number of participants expressed that giving them the means to place the pack in a pre-defined spot in their homes (through a magnetic clip to the diary in the fridge door, etc.) was a good reminder to go through with the project.

The videos were extremely helpful to triangulate the information and identify the *set-up* or *lack of reality* in people's answers, always with a certain level of subjectivity and interpretation from the researcher, which was tried to be kept to a minimum. For instance, in her diary, UK03 said that foam was **not** given a high importance in regards to hygiene, and the videos confirmed it. Nevertheless, when asked to take a picture of the kitchen sink right before washing up, she photographed a full sink with vast amounts of foam (see Figure 5-17), inviting the researcher to understand that sometimes it is hard to keep the participants from saying/writing/photographing the things that they think are the *correct things to do* or the *normal way* instead of what they really do.

Figure 5-17. What people say and what they actually do is sometimes different. UK03's *set-up* photo.

5.8 Conclusions

The probe packs were successful in generating a variety of different insights on styles and practices of washing-up representative of each of the investigated cultures, completing one of the intended objectives of this research (objective 2, specifically 2b):

> *2. To explore parallel routines of people with different cultural backgrounds, by using washing-up practices and perceptions in the UK and Mexico as a case study:*
>
> *a. To carry out a survey on washing and cleaning habits, and water perception in both sites*
>
> *b. To carry out ethnographic studies to gain a detailed understanding of individual/personal dishwashing practices.*

Water practices are performed as parts of routines and habits which are carried out in diverse fashions, varying slightly from one person to another, with common traits amongst groups of people and important differences between different regions or cultures. This chapter explored and illustrated some differences and commonalities of dishwashing practices gathered from a study based on the administration of Cultural Probes in Mexican and British households. The conclusions do not intend to make generalisations of the countries' population, but to detect the particularities in the participants' cases.

- A clear difference in domestic chore division was marked, teamwork when washing-up was present in most of British participants, whilst none of the Mexican households presented such trait.
- Dishwashing is an activity generally considered to have low-priority between the participants. British participants tend to opt for an electric dishwashing to ease the process of washing up reducing time and effort invested, whereas Mexican participants appear to opt for hiring house-help with the same purpose.
- The use of a washing-up bowl semi-filled with hot water and dishwashing liquid to wash the dishes in was found to be a common practice in British participants, but an absent one amongst Mexican ones. Instead, the latter use the turning on and off of the tap, along with a small container with soapy water to dip the sponge in and then scrub the dishes.
- The logistics of the manual dishwashing process appeared to be shaped by the kitchen space layout, but presented a general pattern of linear dishwashing: dirty dishes either inside the sink or next in the countertop go through the washing-up process inside the sink, to a final drying stage on the other side of the sink, as illustrated in section.
- Performing a final rinse of the items after the soaping process was identified as another fundamental difference between the two cultures. All Mexican participants rinsed every soaped item; whilst the majority of British participants showed to generally skip this step.
- Rinsing recycling proved to be a common habit of UK participants and an inexistent habit for Mexican ones (who usually don't recycle).
- The kitchen sink showed to host many activities other than dishwashing such as rinsing vegetables, washing garments, using the inside of the sink as a workspace (preparing meals or holding packs of ice during a party), or even using the sink to eat hovering the food above not to dirty dishes.

The study presented in this chapter gave a deep understanding of some of the particularities in participant's differences and commonalities in the dishwashing process. These results, although not generalisable for all British or Mexican households, allow distinguishing a partition between these two culture's dishwashing patterns into two clear groups of general behaviours, which can evidently be broken down into the individual washing-up practices.

The findings are linked to the larger aim of this research of linking user knowledge to the design process, through a series of support tools for designers, presented in the following chapter.

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6 Personas as a design tool

This chapter introduces Personas as a design tool, discussing their different uses and misuses. It then illustrates a series of Personas (phase 3) created as the direct outcome of the Cultural Probes (phase 2), giving way to the design studies stage of the project.

6.1 Introduction

The user-research stages of this project generated in-depth insights of the washing-up practices of Mexican and UK participants. Enormous amounts of data often come from ethnographic research. Cooper (1999; 2007), amongst other researchers, propose the use of *models* to present the information in a useful, abstract way, in the form of *Personas*. Personas are a *composite archetype* of a set of users, based entirely on data gathered from real people research (Mulder and Yaar, 2007). Although Personas are shown as specific individuals, they work representing a class or type of user, interacting on a specific activity or product, so they represent a specific set of behaviour patterns regarding the use of that product or circumstance. Personas '*do not seek to establish an average user, but rather to express exemplary or distinct behaviours within these identified ranges*' (Cooper *et al.*, 2007:83).

For the purpose of this project, and to facilitate knowledge transfer, the user-knowledge generated in the user research phases (on-line survey and Cultural probes) was translated into Personas, which were intended to be used as supporting media in phase 4 of the project. In phase 4, UK and Mexican designers developed products/concepts for their own culture aided by the respective Personas provided. This helped establish the opportunities and restrictions, from a design perspective, associated with designing for sustainable behaviour for target users from specific cultural backgrounds.

This chapter presents the rationale behind the decision of using Personas, discusses the different opportunities and limitations of the technique, and presents the two Persona sets created: Mexican and British washing-up users. This chapter completes the first half of objective 3 of this research:

> 3. *To develop from the findings identified practices and perceptions, tools to support the process of designing for sustainable water consumption during the washing-up, producing a methodological framework for supporting designers working in cross-cultural contexts.*

6.2 Understanding the user

As identified in the literature review, a thorough understanding of the user is the key to the design of successful products, especially if designers seek to influence user's behaviour through their products or services. The need to understand the complex context of user-product interaction has driven the development of new and innovative approaches in the design field to carry out user-research that can look into both external and internal motivators and triggers. User centred design methodologies, and design for sustainable behaviour approaches both have the understanding of the user in their core. This way, designers can create products that reflect the user's needs as well as self image, social perspective and ideologies.

User research often provides vast amounts of knowledge about users that needs to be analysed and processed in a way that it becomes useful and actionable.

> *'Personas put a face on user research in a way that turns data into the kind of knowledge that leads to better user experiences'* (Mulder and Yaar, 2007:14)

6.3 Advantages from the use of Personas

After the introduction of the Personas-method by Cooper in the late 1990s, many companies, especially software specialized ones such as Microsoft (Pruitt and Grudin, 2003), started applying Personas in their design teams as standard in the user-experience work.

Personas can provide designers with precise information about how users behave, how they think, what they want to accomplish and the reasons behind. Using Personas during the design process is supposed to encourage creativity and innovation (Cooper *et al.*, 2007), and create empathy as the designer acquires both cognitive and emotional dimensions of the user. Cooper

and Reimann (2007), and Mulder and Yaar (2007) point out how Personas can help preventing some common mistakes that designers tend to make, such as:

- Falling into *self-referential design*, which occurs when designers project their own goals, motivations, likes and dislikes onto a product's design, and end up measuring it up to *their* standards, not the real users.
- Designing for an *average* user, as if everyone would have the same goals, needs and way of thinking, idealising a *'single abstract to simplify the decision-making'* (Mulder and Yaar, 2007). Personas are said to help to focus on a specific type of individuals with specific needs, instead of trying to think of an audience so diverse, that it would be extremely difficult to satisfy (Cooper, 1999).
- Thinking of an *elastic user* - making the user's needs and contexts so flexible, that it is stretched to fit the opinions and presuppositions of the design team.
- Personas also help staying away from *edge cases*, that is, extremes, uncommon users, as the focus of the design, helping to prioritise functions with great clarity for the designers.

6.4 Creating Personas

Personas are gradually built up taking into account the different segments of users found during the user research phase. Mulder and Yaar (2007) recommend looking into the data trying to find patterns and stories, paying particular attention to *'goals, behaviours and attitudes of the users'*, rather than traditional demographics (age, gender, etc.). It is recommended to have 3 to 6 different Personas of each group of users, and prioritize them (*i.e.* primary, secondary, unimportant) to facilitate decision making if conflict of interests are found between the Personas.

The Personas used for this project gathered inspiration from Cooper (1999; 2007), and Pruitt and Adlin's (2003; 2006) interpretation and further development of the technique, and Mulder and Yaar's (2007) approach in making the Personas real during the design process. The process of building the Personas for this research used the approaches from the abovementioned authors. The information from the survey and the Cultural Probes served as pillars for the development of each Persona, resulting in two sets of five Personas, one set Mexican, and the other British. Both Persona sets were built in both Spanish and English, so that designers (in phase 4) could easily relate and understand their users. The English version of both sets of Personas can be found in Appendix F.

The Personas were presented in the form of A3 posters which presented the most vital attributes that made each Persona unique, trying to go to a certain level of detail that made the Persona realistic and very specific, aided with visual information (*i.e.* pictures) and quotes. Figure 6-1 illustrates an example of one of the Personas and the different components:

- Persona's name and descriptor (to aid memory);
- A *photo* of the Persona, to make them come to life as a real person;
- A short profile, to introduce some personal information and details that bring the Persona to life (generally made up information following the findings from the user-research stage);
- Detailed information on the particular subject of interest (*i.e.* washing-up), which in this case was based mainly on specific findings from the Cultural Probes, illustrated with contextual photographs and quotes that make the Persona more understandable. This includes defining goals, behaviours and attitudes.

Each Persona also had an extended profile in a narrative form almost in the form of a story that tells the designer who the Persona is; his/her context, interactions, behaviours and the psychological/emotional side of the dishwashing process, trying to be as specific as possible.

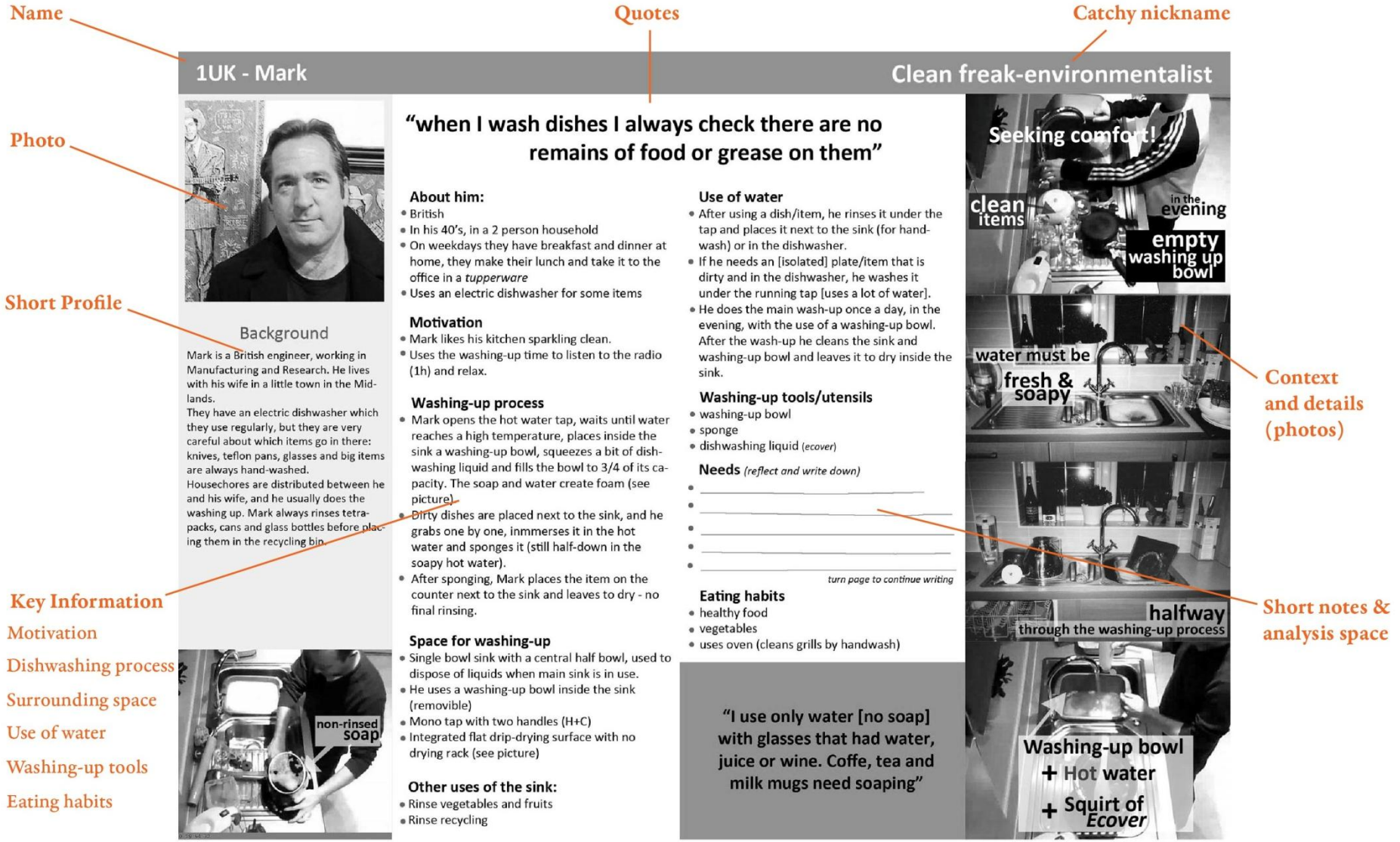

Figure 6-1. Key differentiators in the Personas (shown in grey scale for easy visualisation, originals are in colour)

6.5 Keeping the Personas alive through the design process

Creating Personas represents only the first step in the process of understanding the user and making him part of the design process. The key lies in successfully delivering the Personas to the design team and other teams involved (sales, marketing, engineering, etc.) so that they can accept them and use them as decision-making tool.

It is crucial that people understand Personas are based on data from real user-research, so that they take them seriously. Designing a process of early familiarisation with each of the Personas (when introducing them to the design team) is important to make them stick and stay in people's minds.

Coming up with creative ways to *make Personas alive* is recommended for better results (Mulder and Yaar, 2007). Keeping the Persona-documents always in sight in the workspace (as posters on the walls) and having *memory refreshing* meetings about the Personas often are effective ways to keep them active throughout the design process. Some other Persona-users/researchers propose other less-traditional ways of giving life to them like making life-sized cardboard cut-outs of the Personas, creating a Persona's blog or email address and acting as if she/he was real, sending the designers (and other team members) thoughts and comments from the Personas themselves to help them immerse in the idea of him/her being a real user.

A Persona can be considered a success when designers start asking themselves *'what would Mark think if the product had this feature?'*.

For the purposes of this research, the process of bringing the Personas to life, and keeping them that way, was embedded in the structure of the design studies. Both the target user represented (either UK or Mexican), and the users of the Personas (that is, the designers themselves), were taken into account in the conception of the Persona poster, their delivery and use. A thorough explanation of the research that originated the Personas and the way they were intended to be used, was presented to all designers taking part in the design studies. During the building of the Personas, attention to take advantage of the rich information from the Cultural Probes (sketches, comments, quotes, photos from the participants and videos taken) was paid from the beginning, having in mind the specific design brief that was to be assigned in the design studies. Additionally to the Persona-posters, different videos from the Personas *in action* (taken from the Probes) were regularly shown to the designers, so that they could understand them and *get to know them* better. Different activities for reflection and creativity tools were also designed to facilitate a design process with the Personas always present on it. More detail to this can be found in section 7.6.

6.6 Conclusions

This chapter presented a review of the theory and reasoning behind the building and use of Personas. This tool was identified as an ideal bridge between the qualitative data of the Probes (phase2) and the design studies to be carried out in phase 4 of the research project, as they could encompass rich, qualitative data in different media (writing, drawings, photos, and video recordings) and be easily used for the design of products and services.

- Personas are detailed *archetypes* of user-population segments built from user-research (quantitative and qualitative). They help designers and other team members (from marketing, sales, or engineering) to create empathy and understand what users' do, think and feel, and the reasons behind it.
- Two sets of Personas (five Personas each, one corresponding to Mexican washing-up users, and the other to British ones) were designed and built with the intention of being used in phase 4 of this research project for the specific domain of domestic dishwashing practices. Hence, they were designed from the previous user-research stages and enriched with the multi-media raw data from the Cultural Probes. The english version of the complete sets of Personas can be found in Appendix F.
- In order for the Personas to become an integrated part of the design process, the design team has to be provided with the appropriate *know-how* of working with Personas, and a constant support that ensures their engagement with them throughout the duration of the design project.
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7 Design studies

This section presents the planning, development and results of a series design studies, as part of phase 4 of this research. These experiments illustrate the influence of the designer's understanding of the user in the design process. They also provide detailed insights into the use of Personas in the design processes, and illustrate the outcomes from a design brief for sustainable washing-up practices.

7.1 Introduction

As established in the literature review, domestic water-related routines emerge and develop thorough time to be personal and different for each individual. The user research stages of this research, which involved an online questionnaire and the application of Cultural Probes, provided evidence that cultural background has a noticeable influence in the development of dishwashing routines. The analysis of the rich data gathered from the Cultural Probes and videoing (see chapter 5) offered a wide range of information in the form of diverse media (photographs, quotes, comments, sketches, videos, etc.) which helped understanding the complexities and peculiarities of personal dishwashing process, and both Mexican and UK participants' perceptions of the activity itself.

Nevertheless, this project intended to go beyond investigating dishwashing practices in the two locations, and build a set of tools that assist designers to take into account the user's cultural background and test them in the design of products that encourage more sustainable behaviour. In order to do this, it was decided to carry out a series of design experiments using the data from the user research to feed and support the design process of young designers.

In preparation for this, the rich data from the user research was collated into a series of *Personas* (see chapter 6), so that designers could use them to feed into their design process. A specific

brief was given to the designers*: redesigning the manual washing up experience to make it more sustainable,* and a specific target user (either Mexican or British) was also imposed in the groups. The following sections describe this process in detail.

7.2 Design studies objectives, validity and reliability

The purpose of the design studies was to explore how varying the target-user in the design brief influenced the design process, evaluate the effectiveness of the use of Personas as a design tool, through feedback from the participating designers coupled with an analysis of their final design outcomes. The study was carried out under the assumption that *Personas* help designers empathise with the users and start validating the design concepts with users in the early stage of the design process.

Personas were used as the main tool to support the understanding of the user, saving designers' time in the user research phase, and allowing them to focus on the actual design process. The aim was to make the project possible in the constrained timeframe available. Seeking validity and reliability, this experiment was carried out with different groups of designers, to ensure the trustworthiness of the outcomes.

The design studies (phase 4) marked the completion of objective four of this research:

> **4.** *To assess the use of the methodological framework produced, through a series of design studies that aim to build awareness of, and empathy with the user, their context and cultural differences when Designing for Sustainable Behaviour*

7.3 Environment, equipment and logistics of the design experiments

The design studies were carried out in a University environment. Participants were industrial design students, enrolled in a sustainable design course either in Loughborough University, UK (masters students), or Universidad de Monterrey (UDEM), Mexico (3rd year undergraduate students). Such an academic environment offered the researcher the possibility to control:

- The inputs designers got for the development of the project (such as having a specific brief and working for a specific user),
- the level of knowledge in sustainability and Design for Sustainable Behaviour Theory (DfSB),
- the instructed design process that they would follow (*i.e.* using Personas),

- the timing of the projects and elements of submissions

7.3.1 Location, space and moderation of the design process

As detailed in chapter 3, the geographical distance from UDEM, where a number design studies were to be carried out, resulted in online communication being of crucial importance. The key input regarding sustainability, design for sustainable behaviour and user of Personas were delivered through audio/video presentations (online for Mexican designers, and live in the UK). The presentations included, but were not restricted to, information on:

- Sustainable design approaches[1];
- detailed presentation of the design brief and follow-ups;
- Design for Sustainable Behaviour techniques[1], inspired from the work from researchers such as Lilley, Tang, and Lockton (refer to section 2.9)
- user research Methods and user centred design;
- the use of Personas as a concept design tool, presenting also the specific sets of five Personas for the project brief (either Mexican Personas or UK ones).

Figure 7-1 illustrates the standard display and distribution of information in the online presentations. The slides were presented in the centre of the screen, with a synchronised video of the researcher giving the actual presentation. The video provided a way to make a link with the students, and allowed the researcher to better communicate the ideas, comments, recommendations, etc. A series of notes and additional information were included in the file, which was set online for readily and easy access for the students.

[1] Covered by Vicky Lofthouse and Debra Lilley in the Loughborough group, as part of the sustainable design masters module, and covered by the researcher in the UDEM groups.

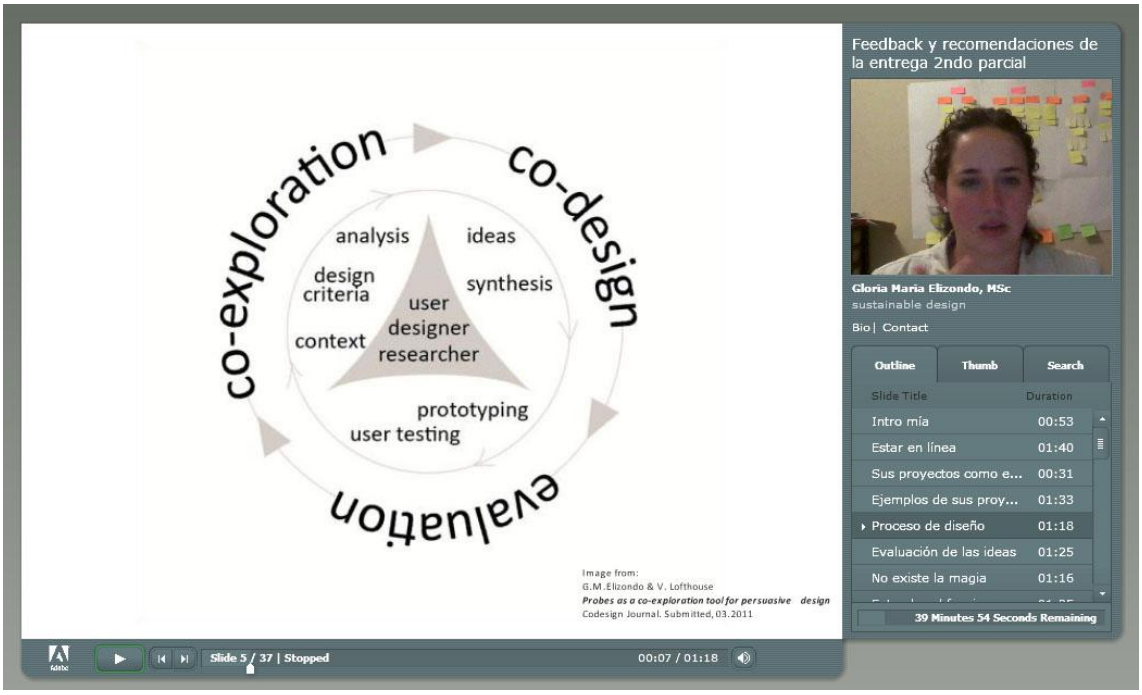

Figure 7-1. Audio/video slideshows were presented to the students throughout the design project's duration.

With the aid of these presentations students were expected to complete the design process in a period of 4 weeks, and produce deliverables in the form of a logbook and three presentation boards, with some extras for the UDEM groups to balance the details that might have been lost due the distance learning. These extras included email and *skype* communications during the design process, a written document about the design process, and a video presentation. A final feedback and reflection survey was applied to the students after the analysis of their projects (refer to Appendix H), which tried to expand on the issues found in the analysis of their outcomes (use of Personas, specific brainstorming activities, etc.).

Details on the deliverables and their purpose can be found in chapter 3.

7.3.2 Categorising the design groups

As previously stated, one of the design studies' objectives was to explore the design process and design concept outcomes from both mixes of designer/user relationship, and to evaluate in the use of Personas as an empathising tool throughout the design process.

It was with this intent that all groups of young designers were given the same design brief, with the sole difference in the target user for whom they would design for, either Mexican or British users.

All UDEM students had Mexican backgrounds, and Loughborough ones came from different backgrounds (Chinese, Indian, Dutch, and one British). To make the distinction more straightforward in this thesis, the designers were divided into three categories:

- Designers designing for an *alien* user: designing for a user with a different background than him/her (*i.e.* Mexican designer designing for UK user);
- designers *familiar* with target user (*i.e.* Mexican designers designing for Mexican users), and ;
- designers *semi-familiar* with target user (*i.e.* Loughborough group, referred to as *'mixed-knowledge'* group throughout this chapter.).

The Loughborough students were set in a special classification, due to the group's diverse cultural backgrounds. In their design-brief, they worked with the UK user and used the British Personas. Even though they were not all from the UK, they had been living and interacting in the UK environment during their masters course, which set them in a mid-position in respect to the designing for an *alien* or a *familiar* user. Even though they had not grown up with this culture, they had been exposed to it for some time.

This designer/user relationship can be better appreciated in Table 7-1, which illustrates the particular design categories, groups, number of participants and description of the experiment used for the design studies.

Table 7-1. Design experiment groups

Category	Group	No. Participants	Description	Logistics
Familiar user	PR2010_mx	10	Composed of Mexican undergraduate industrial design students, designing for a Mexican target user. A set of 5 Mexican Personas were provided. A key aspect here is that they were designing for a user that they knew and understood.	Online communication. Face 2 face only in submission
	OT2010_mx	5		
Alien user	PR2010_uk	8	Composed of Mexican design students, designing for the UK user, with whom they are not familiar with. The set of 5 British Personas was the main source of information to get to know and empathize with the UK user's needs.	Online communication. Face 2 face only in submission
	OT2010_uk	4		
	PR2011_uk	14		
Mixed knowledge	LBORO_uk	9	Composed of students from Loughborough's Product Design Masters program, a group of international students (only 1 British). This diversity makes it interesting for the design study, as even if they are designing for UK users, they would most probably not be in direct contact with the UK dishwashing practices, therefore they would be designing for a *semi-familiar user*, using the Personas as a mean to understand and empathise.	Face 2 face communication

7.4 Scope and limitations of the design studies

The academic environment in which the study was carried out allowed the researcher to control variables such as timing, logistics and input to the students. Nevertheless, this research recognises the limitation in terms of the modest design experience from the students, and the differences with a real-job environment. The geographical distance between the researcher and the designers meant that one had to rely on the information and insights that the designers provided in their emails and final submissions. Only one face to face unstructured interview for each group at the end of the project was possible.

7.5 Analysis of the design studies' outcomes

The literature review, the cultural probes, and research questions were used as a lens to look at the outcomes of the design practice experiments. Data came in a wide range of media (sketches, emails, videos, audio conversations, descriptions of thinking process in writing, etc.), and this diversity of elements called for a flexible analysis strategy described in the following sections.

7.5.1 First cycle of coding the student projects

In a first round of coding, information from the different elements of each participant's deliverables was divided into *analytically relevant codes* (Coffey and Atkinson, 1996) and placed under the appropriate *a-priori* categories (understanding the user, design process and design outcomes, sustainability and use of Personas).

A pilot coding of the data was carried out with one group of design students (PR2010_mx). Sticky notes proved to be a good tool to construct order in an ocean of codes, facilitating the positioning and re-positioning of the categories, macrocodes and micro-codes, according to the links between them and the patterns found in the set of data coded. Patterns were characterised either by similarity, difference, frequency, sequence, correspondence (to other activities or events) or causation (Hatch, 2002). Frequencies were determined, as Namey *et al.* (2008) suggest, *'on the basis of the number of individual participants who mention a particular theme, rather than the total number of times a theme appears in the text...'*. The categorisation and analysis of the data up-to-that-point was discussed with other researchers as a way of validating the code development and coding processes.

A second review of the data and the codes was carried out, resulting in a more refined coding scheme. Some of the first cycle codes were subsumed by other codes, or eliminated altogether. Some data was reclassified into new codes or different categories. Figure 7-2 shows the theme/category-map that emerged from the refined coding exercise, which served as guide to carry out the final coding of the data (by substituting the themes with shorter-codes).

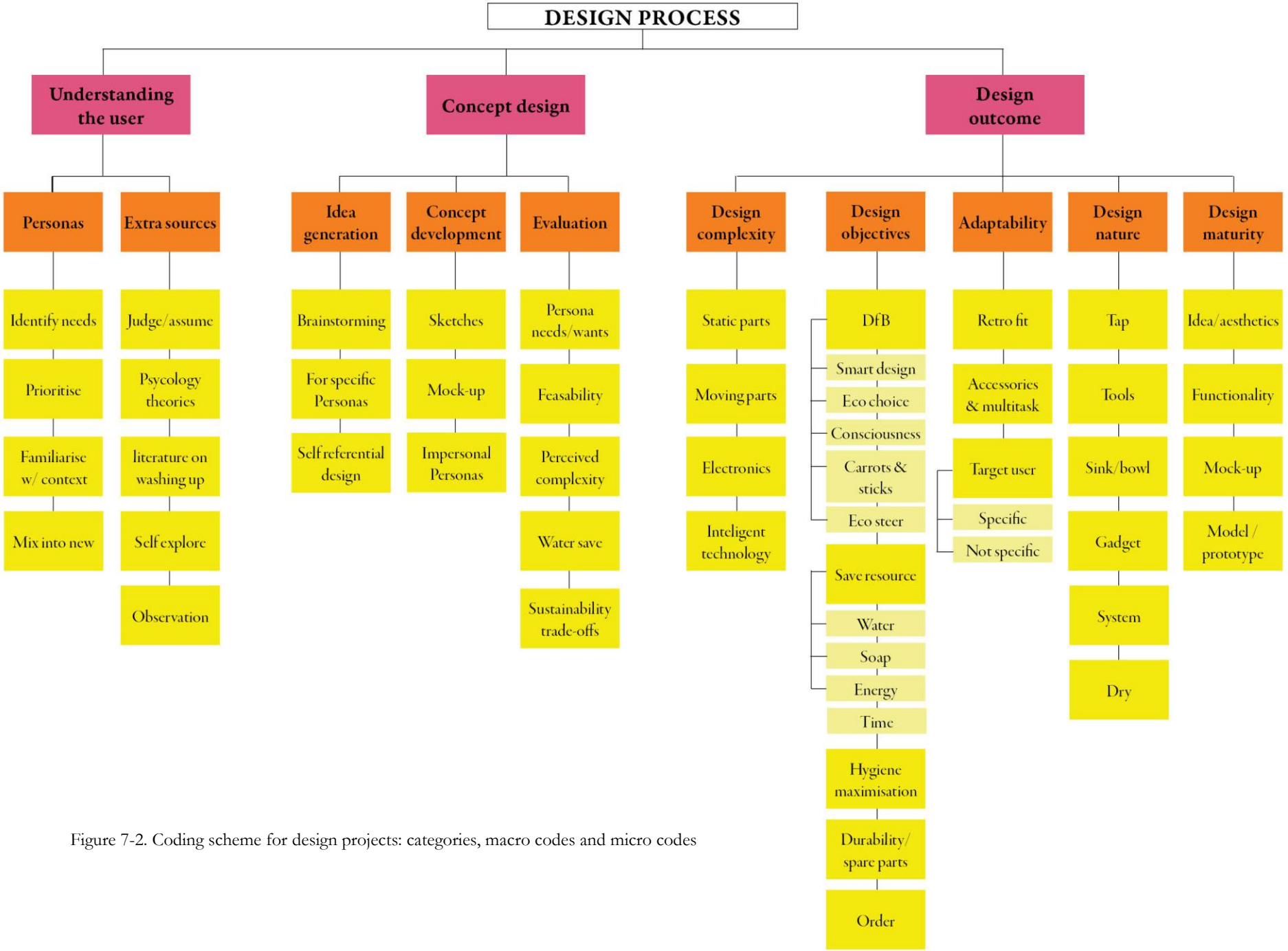

Figure 7-2. Coding scheme for design projects: categories, macro codes and micro codes

7.5.2 Finalising the coding system

The scheme above was used to produce a list of codes that remained flexible and dynamic whilst coding each element of the design projects, until a final coding criterion was decided on, giving specific definitions to the codes, and performing a second round of coding to the projects, for the purposes of validity and consistency. Table 7-2 below presents an extract of the full coding system, which can be found in Appendix G.

Table 7-2. Example of codes and definitions used in the design studies analysis

Code	Code definition
Understanding-the-user phase	
UNDuser_PERS_FAMconxt	Use of Personas to familiarize himself with context of use of the product
UNDuser_PERS_PRITY	Prioritise the Personas' needs to design
Concept-design phase	
CPTdes_IDEAgen_BRAINST_DfSB	Use of DfSB techniques in brainstorming in the idea generation stage of concept design
CPTdes_IDEAgen_PERS	Generation of ideas and concepts using specific Personas as an inspiration or basis
Design outcomes	
DESout_DESobj_DfSB_SMRTdes	Clever designs that make the product use less water by using a certain technology, or designing in a way that the water or soap use is restricted regardless of the behaviour
DESout_DESobj_DfSB_CONSC	Call for conscious resource use mostly by giving visual or audible feedback to the user about their water consumption
DESout_DESobj_DfSB_carr&stck	Reward or punish certain behaviours or amounts of resource use

7.6 Design studies' development and findings

The design brief was presented in a fairly *fuzzy open-ended way* ('*redesign washing up experience to make it more sustainable')*, without setting limitations on the design routes to be taken. Hence, a range of design solutions came up, with some commonalities, differences, and particularities amongst the different designers. The following discussion of ideas and results combine the analysis and reflections of the different elements of the design projects collated during the design studies (*i.e.* document, posters, presentation/video, and logbook). Additionally to the design projects, a short **survey** with open-ended questions was applied to the designers after the completion of the project to deepen the researcher's understanding of their use of the Personas, and to get further insights from the designers themselves about their experience of the design process. The questions asked can be found in Appendix H.

7.6.1 Introducing Personas into the design process

It was interesting to see how designers used the Personas at the beginning of the design process to familiarize themselves with the context of dishwashing, and to help the identification of users needs to take into the design. Evidence of this was seen in the logbooks and in the Persona posters themselves, which designers had personalised with notes, and with the identification and completion of the *needs* subtheme, as shown in Figure 7-3.

1UK - Mark

Clean freak-environmentalist

Background

Mark is a British engineer, working in Manufacturing and Research. He lives with his wife in a little town in the Midlands.
They have an electric dishwasher which they use regularly, but they are very careful about which items go in there: knives, teflon pans, glasses and big items are always hand-washed.
Housechores are distributed between he and his wife, and he usually does the washing up. Mark always rinses tetrapacks, cans and glass bottles before placing them in the recyding bin.

"when I wash dishes I always check there are no remains of food or grease on them"

About him:
- British
- In his 40's, in a 2 person household
- On weekdays they have breakfast and dinner at home, they make their lunch and take it to the office in a *tupperware*
- Uses an electric dishwasher for some items, which he pre-rinses under running tap.

Motivation
- Mark likes his kitchen sparkling clean.
- Uses the washing-up time to listen to the radio (1h) and relax.

Washing-up process
- Mark opens the hot water tap, waits until water reaches a high temperature, places inside the sink a washing-up bowl, squeezes a bit of dishwashing liquid and fills the bowl to 3/4 of its capacity.
- Dirty dishes are placed next to the sink, and he grabs one by one, inmmerses it in the hot water and sponges it (still half-down in the soapy hot water).
- After sponging, Mark places the item on the counter next to the sink and leaves to dry - with no final rinsing.

Space for washing-up
- Single bowl sink with a central half bowl, used to dispose of liquids when main sink is in use.
- He uses a washing-up bowl inside the sink (removible)
- Mono tap with two handles (H+C)
- Integrated flat drip-drying surface with no drying rack (see picture)

Other uses of the sink:
- Rinse vegetables and fruits
- Rinse recycling

Use of water
- After using a dish/item, he rinses it under the tap and places it next to the sink (for hand-wash) or in the dishwasher.
- If he needs an [isolated] plate/item that is dirty and in the dishwasher, he washes it under the running tap [uses a lot of water].
- He does the main wash-up once a day, in the evening, with the use of a washing-up bowl.
- After the wash-up he cleans the sink and washing-up bowl and leaves it to dry inside the sink.

Washing-up tools/utensils
- washing-up bowl
- sponge
- dishwashing liquid (*ecover*)

Needs *(reflect and write down)*
- se espera al agua caliente
- necesita espacio para secar
- lo pre-lava antes de lavar
- [illegible] agua para un solo plato
- lavar para sus fiestas y vegetales

turn page to continue writing

Eating habits
- healthy food
- vegetables
- uses oven (cleans grills by handwash)

"I use only water [no soap] with glasses that had water, juice or wine. Coffe, tea and milk mugs need soaping"

Figure 7-3. An example of the customisation of the Personas by the designers (MX08_4UK)

The first two groups of students to carry out the design studies participated in a time-parallel manner (PR2010_mx and PR2010_uk). The process of interaction with the Personas in those first groups made evident that the information in the Persona-posters was adequate and was comprehensively examined offering an understanding of the needs and context of the target users. Figure 7-3 shows an example of the personalisation of the Persona information from the designers.

> *'Seeing the personas and having the open spaces to write on them helped me reflect and find things that I needed to redesign or change entirely the dishwashing experience. If I hadn't' had the Personas I think the design opportunities would have been more difficult to detect and we would have come up with too simple and superficial solutions'* (MX17_4UK, in questionnaire)

Nevertheless, the early brainstorming activities had, from the researcher's point of view, opportunity for improvement. The subsequent feedback from the designers mainly through email communication, showed that it was difficult to mentally recreate the users' context and behaviour (step by step) solely with the Persona posters, especially when it was an alien user (*i.e.* MX_4UK).

> *'The Personas were very useful to get an idea of how the British wash-up, especially since I had never seen such a method, but I felt I had to use a lot of imagination and assume the details of their specific actions, sometimes it was a bit hard to imagine the particularities'* (MX05_4UK, by email communication).

Based on remarks such as the one above, additional **video selections** from the cultural probe's videoing stage were provided, and supplementary **Persona analysis templates** were given to the students to brainstorm ideas whilst looking into each Persona (see Figure 7-4). Designers were randomly divided into small groups to brainstorm using the templates, after being introduced to the Personas. It was evident that with the use of this extra material, many mental barriers were overcome and more design concepts began to emerge from the early stages, first articulated in text form, but later *translated* into sketches.

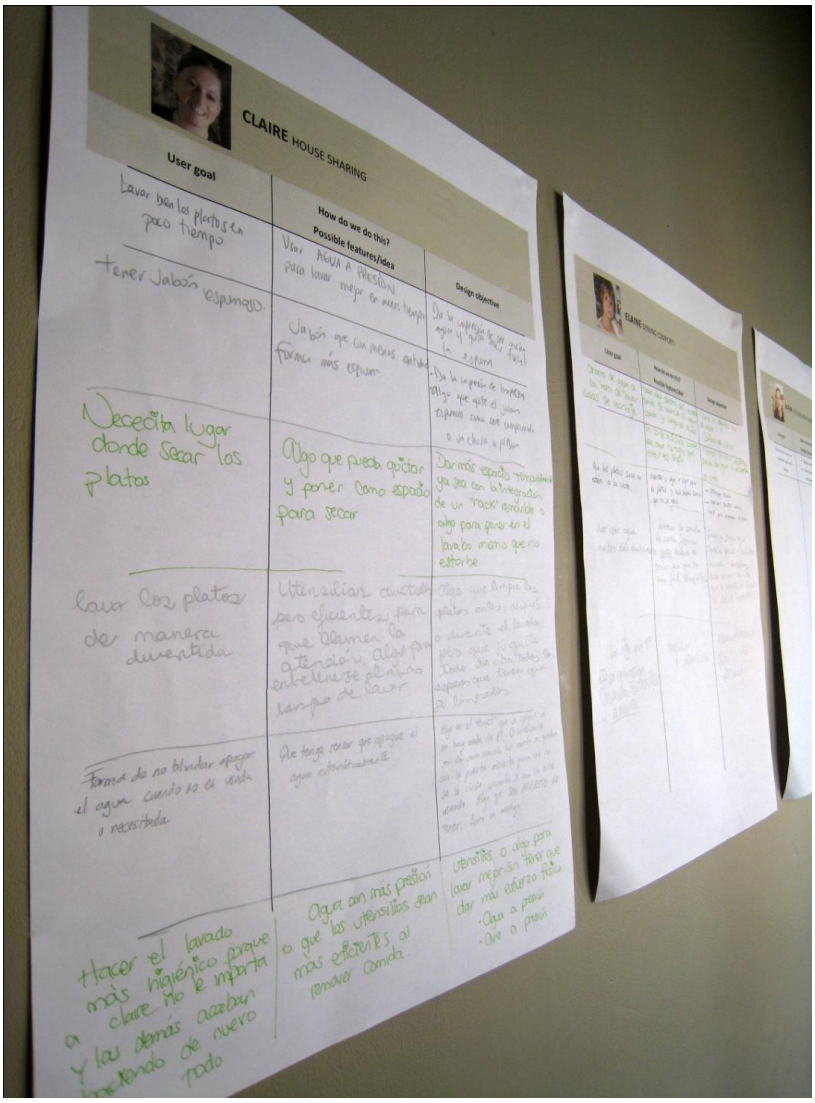

Figure 7-4. Persona analysis templates

In the third category group, the *mixed-knowledge* group (LBORO_uk), most designers commented on the usefulness of the template approach (Figure 7-4) to keep in mind the Personas in the idea generation process.

> *'...in the research stage, I tried to find their needs, their habits and how water were wasted during their washing up process, then in the idea generation stage, I used the templates and listed their needs and possible ways to reduce the water waste, that's how I generated my design ideas'* (UK06_4UK)

Personas were generally treated as *real* people; designers referred to them by their name, and made up scenarios to try to predict the user's reaction to certain aspects of their designs. This was particularly evident in the groups that were shown the videos of 'the Personas' and completed the templates for the idea generation.

> *'Seeing the videos helped me make the Personas more real, and understand. Reading about how a British person does the washing up was alright, but watching him or her doing it brought a whole other level of understanding of the details'* (MX15_4UK in questionnaire)

Some designers *played-out* the Personas and gave them a voice when looking at their designs. For example, UK06_4UK showed in her logbook what she thought each Persona would think about one of her particular early solution ideas (see Figure 7-5).

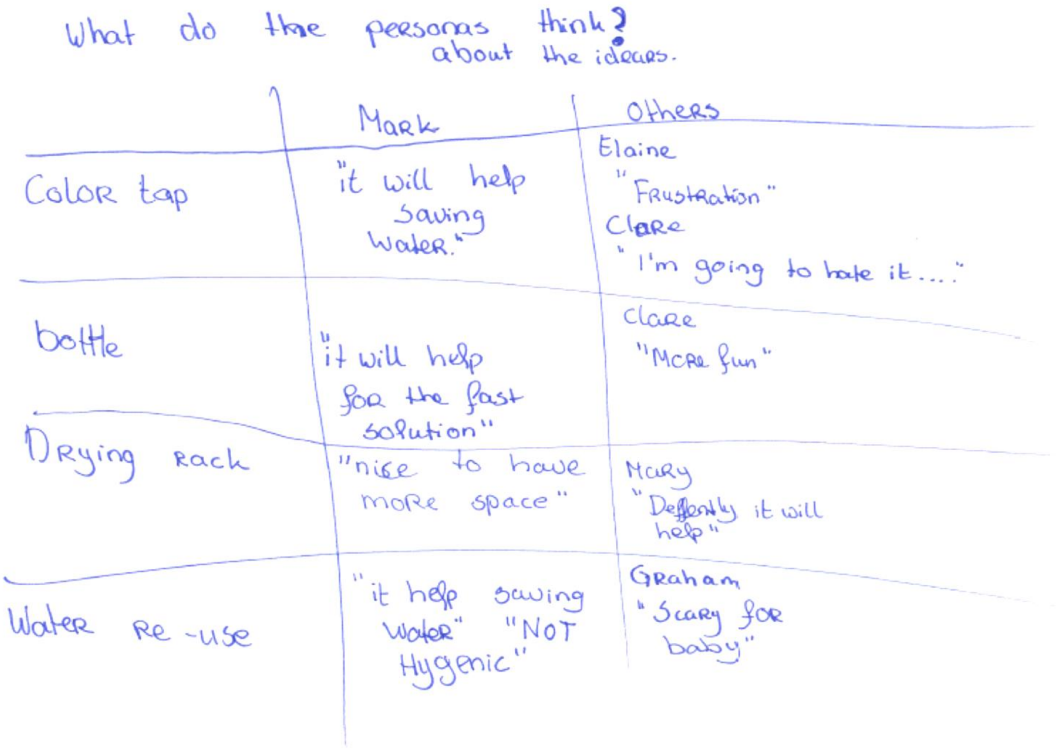

Figure 7-5. Designers made the Personas alive by giving them an active voice

7.6.2 Empathising and understanding the user

Designers also expressed that when using the Personas they felt less prone to base the design on their own experiences, regardless of their prior understanding of the target user. Before the studies, a clear tendency to base early design ideas on the Personas was expected from designers designing for an *alien* user, who they did not know beforehand (*i.e.* MX_4UK). It was a pleasant surprise to observe that also designers designing for users that they were more *comfortable* with (*i.e.* MX_4MX, UK_4UK) actively used the Personas in their design process. This is consistent with the ideas of Cooper and Reimann (2007)and Mulder and Yaar (2007), who recognise *self-*

referential design as a common mistake in design, and proposes the creation and use of Personas as a tool to promote empathy from the early beginning of a design project.

Designers recognised the Personas to be a particularly useful tool for understanding the target user, regardless if it was known or alien.

> *'...it is useful to have all that information, and to know how* [the users] *feel during the dishwashing process, because when you don't have that info, the design ends up being based in you as designer think'* (MX13_4MX)

> *'...the Personas were a sneak peek into the lives of the users. It helped me understand their needs, aspirations and perceptions very clearly, and led to many initial concepts.'* (UK05_4UK)

> *'I had no idea of what their culture was like, what their washing-up process was like... I was a bit clueless until I was introduced to the Personas'* (MX01_4UK)

During the design process, and in a number of design outcomes, it was possible to identify examples that provided supporting evidence that the methodological framework developed to support the design process (e.g. cultural probes translated into Personas, and the use of DfSB approaches) succeeded in supporting designers to understand cultural differences. For example; a relatively small number of designers felt the need to use research methods and sources of information other than the Personas to understand the user. A good number of them, especially in the MX_4UK group decided to get into *the user's shoes* and try washing-up themselves. Using the information from the Personas, Mexican designers were able to gain an understanding of the dishwashing process of the British personas, and **replicated the dishwashing process** whilst noting and analysing the actions and the elements involved (see quotes below). Figure 3 shows some of the pictures that the designers included in their logbooks of them trying to better understand what went through the users' mind when doing the dishes.

> *'To better understand the basic issues, there is no better way than to wash the dishes yourself. By doing this I realised that the easiest, fastest way is to leave the tap open at all times'* (MX07_4MX)

> *'My experience* [of trying the British style] *was rather unpleasant; there were food residues in the water that stuck to my arms and hands. I understand what it is like now, the good (little water used compare to our style) and the bad of it (disgusting)'* (MX05_4UK on an email contact)

Figure 7-6. Designers empathised with the user with some self-exploration.

The group of designers in Loughborough University (LBORO_UK), who had different nationalities and were designing for a user present in their location (UK) also found trying out the washing-up processes described in the Personas useful, and additionally used **observation** of neighbours and other British users. The Mexican designers did not use this *extra* user research method, even though the MX_4MX group did have geographical access to their user to do observations if wanted. For obvious reasons, the MX_4UK designers did not use direct observation, but tried it out themselves.

> *'I found Personas very useful, but also complemented it with a couple of observation with British users, that gave me even more stuff to think about'* (UK05_4UK)

Other information sources additional to the Personas were used to complement the design process. A particular designer (MX04_4UK) used psychology theories to build on the early stages of brainstorming, and a number of designers studied research on washing up practices published in academic papers (MX04_4UK, MX06_4UK, MX08_4UK, MX02_4MX, MX13_4MX, UK01_4UK, UK03_4UK, and UK09_4UK)

7.6.3 Prioritising the Personas

As mentioned in chapter 6, in order to prevent conflict of interests between the Personas, it is recommended that designers give them different weights to simplify the design decisions (Pruitt and Grudin, 2003; Mulder and Yaar, 2007). Subsequent to the findings during the user research stage of the project, the young designers were advised to use *Mark* as the main UK Persona, and Adriana for the Mexican Personas, as their main washing-up characteristics were consistent with the questionnaire (phase 1 of the project) result's, which helped guide the Personas creation. Designers were also instructed that in the use of Personas, secondary, unimportant and exclusive Personas could be identified (none unimportant nor exclusive were given to the students).

With this in mind, designers came up with various ways of using the Personas. Some considered them to be only in primary or secondary categories, and some other gave specific sub-hierarchies amongst the secondary Personas themselves.

> *'Graham dislikes washing-up. It is a tedious task that gives him great pain. This differs significantly from Mark's* [primary Persona] *view of washing-up with is a relaxing and enjoyable alone time. The two are on opposite ends of the design strategy table. For these reasons Graham is for me a low (4th) priority'.* (UK01_4UK)

7.6.4 Integrating the Personas into the idea-generation phase

Designers had different approaches when it came to relating to the Personas and using them to develop design ideas. The majority of designers used the Persona-posters and the abovementioned templates in a hands-on manner (scribbling and making notes on the posters themselves). Some others did the same thorough analysis and needs identification (through the templates) first, and then *transcribed* their findings into their own Persona versions. Most of the designers that had this practice felt that it helped to *'digest'* the information from the posters better. Figure 7-7 illustrates this trend, which is complemented with its designer's comment below.

> *'I used the Persona posters to scribble around, but then I found it very useful to re-do my version of the posters, just as by writing it down myself it was easier to remember who is who'* (UK03_4UK)

A few students added early design ideas to each of their re-written Personas, as illustrated in Figure 7-8, which presents a selected piece from a logbook with an analysis of a Persona, identifying needs and niches of opportunity for design, proposing early *off the top of the head* solutions.

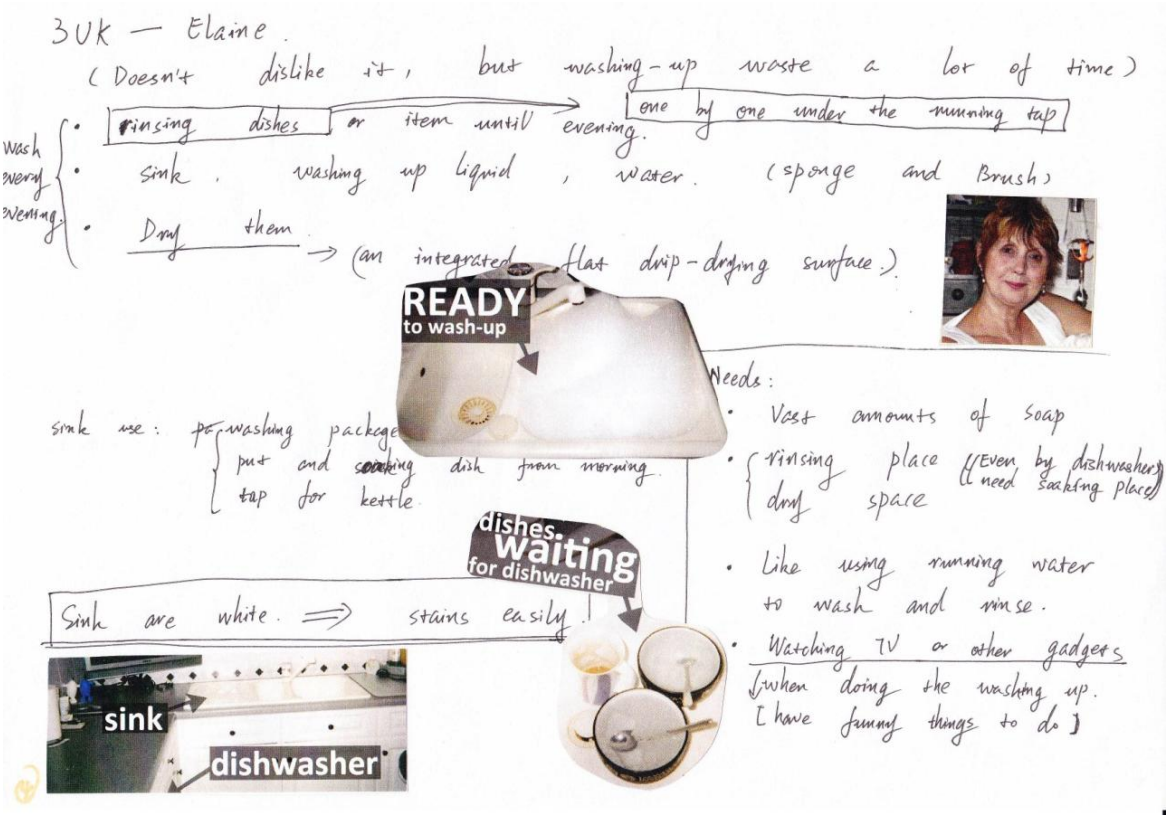

Figure 7-7. Some designers transcribed the Personas and worked with their version (above Persona by UK03_4UK)

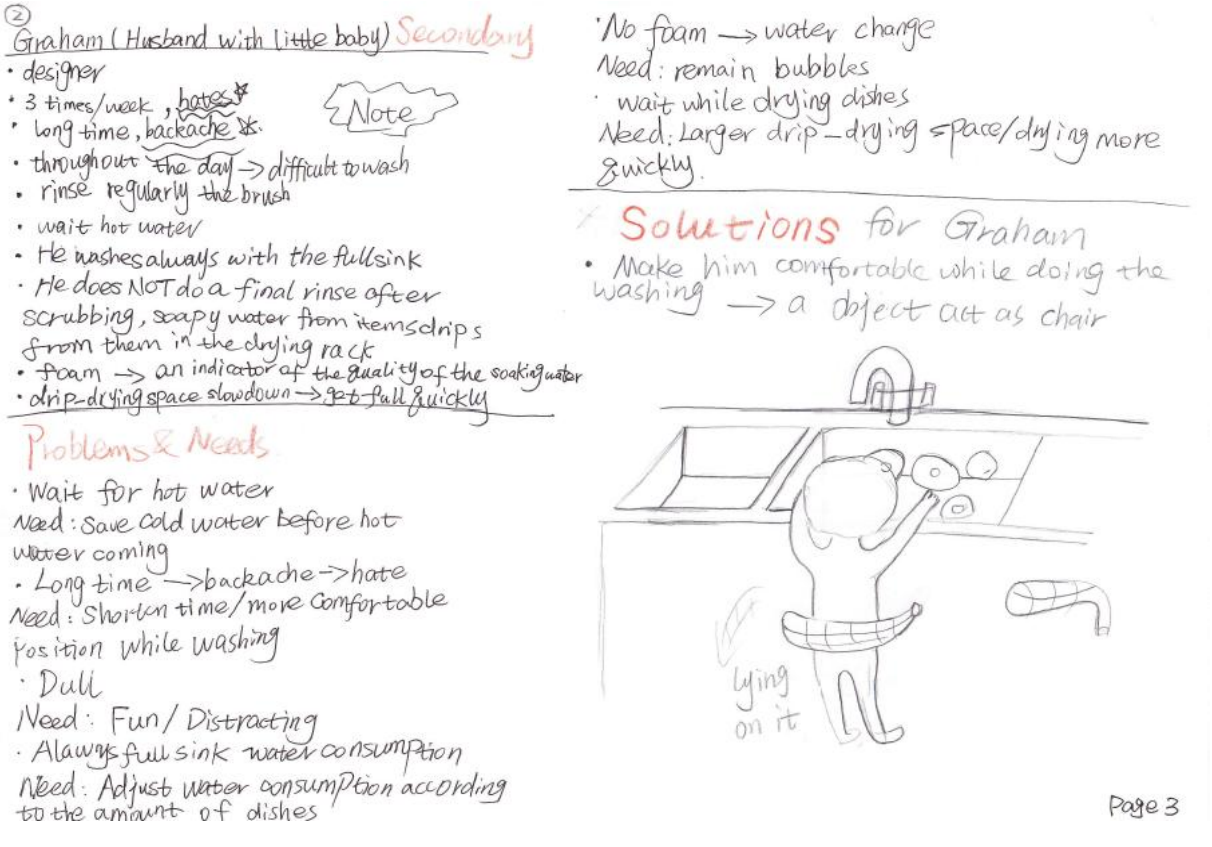

Figure 7-8. Example of brainstorming session with a re-writing of the Persona and early idea development.

In the concept development phase, most students started the more in-depth brainstorming after having identified users' needs and ordered them in terms of their importance, measured mostly by frequency and potential impact on water consumption.

> *'Personas give us a starting point. They definitely made it easier to catch the unsustainable issues to focus on from the very start of the project'* (MX11_4MX)

> *'After getting to know the Personas, I started the brainstorming based on the needs they present to have a better dishwashing experience, and started exploring from there'* (MX09_4UK)

> *'...with these Personas I could identify the general washing process, and from these process, I was able find where the water are wasted, then begin to think about how to change this.'* (UK04_4UK)

7.6.5 Concept development and evaluation issues

A number of designers evaluated their early ideas constantly during the concept development stage, assessing them against the Personas and their specific needs and possible reactions, identifying issues to work on and starting again the design cycle (explore, design, evaluate).

Some designers used improvised mock-ups to test their early design ideas. For instance, one particular MX designer wanted to use a system of water steam to replace the habitual water flow, with the use of a hand-held steam iron she found previously unseen design-issues to work on, as illustrated in the quote below and in Figure 7-9.

> *'It was actually when I tried to simulate my design proposal with the iron machine that I realised the brush was way too wide and some items (like glasses) were just impossible to clean with it. That is what made it modify my design'* (MX13_4UK)

Figure 7-9. Example of mock-up used to test and improve design idea developments

In most cases, and especially with designers designing for an unknown user, the links between the Personas and the design outputs were very clear. A good number of Mexican designers came up with design concepts that included the use of the washing-up bowl as a main element in the dishwashing process, coinciding with all Personas' habits. Figure 7-10 shows one of these cases, in which the designer stepped out of his/her comfort zone and dived into using the concept of a washing-up bowl for one of the early design ideas.

Figure 7-10. Design concept of a Mexican designer for the British user, with a washing-up bowl as main element.

When it came to selecting the concept, or alternative to develop in detail, it was observed that designers based their decisions on one or several of the following aspects:

- Specific Persona's needs and wants,

'...the final concept was chosen considering which concepts met the needs of the priority Persona [...] *it solves the issues that all 5 Persona have with using too much water during a "quick wash" with a running tap...'* [continues explaining the issues: fun, time, etc.] (UK01_4UK)

'Each concept was evaluated with a tradeoffs matrix and the user needs from the primary and secondary Personas. Identifying which issues were solved and being able to choose the best product to further develop [...] this product answers needs of all the Personas, especially the primary user and the common point for all the secondary user' (UK05_4UK)

- Concept design feasibility (in the projects timeframe and with their design skills),

'I thought it [the chosen concept] *was the most feasible idea to achieve water savings and successfully develop within the projects timeframe, as it was a retrofittable'* (MX02_4MX)

- Concept's perceived complexity (related to the user-product interaction),

'the concept was discarded because even if it would make people think twice before using more water than needed, the required user-product interaction [to produce a water flow] *is too complex, and it would be difficult to wash dishes AND focus on doing the other things at the same time'* (MX10_4UK)

- Potential water savings,

'I went for the concept that would save water in a visible way for the user, giving an immediate solution to the issues of wasting water whilst waiting for it to get "hot enough"' (MX11_4UK)

- Other sustainability trade-offs (use of more energy vs. water savings).

'I discarded the idea because the amount of parts and energy needed to get the water to a steam point was too high, and the negative impacts could be higher than the benefits of water-saving' (MX01_4MX)

7.6.6 Integration of Design for Sustainable Behaviour strategies

The majority of designers carried out the idea generation and concept development stages with an explicit linking in their sketches and notes with the *Design for Sustainable Behaviour* approaches introduced during the preparation stages before the design brief was presented. Final concepts often were related to one or more of the following DfSB approaches:

- *Smart design*: Clever designs that make the product use less water by using a certain technology, or designing in a way that the water or soap use is restricted regardless of the behaviour

'Unused water wasted whilst getting hot will be stored for a reuse through the 'recycled' tap, and the user will not have to do anything for that, the design makes it happen' (UK08_4UK). See image below.

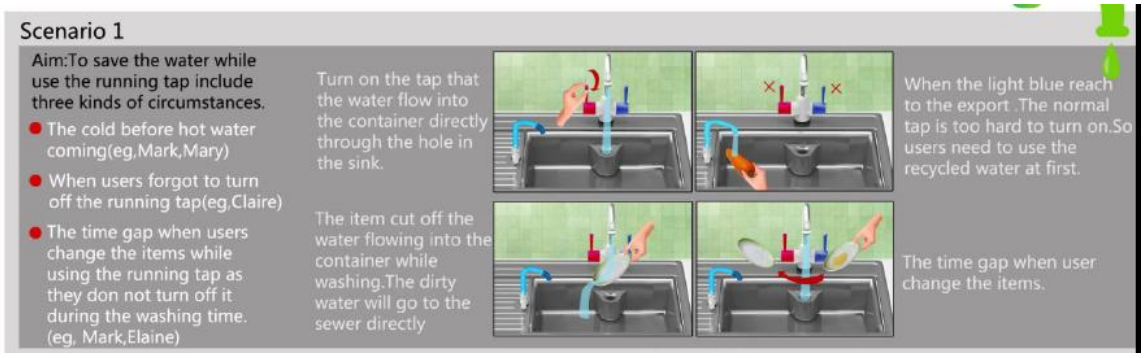

Figure 7-11. Example of the use of smart design approach.

- *Consciousness-call*: Call for responsible resource-use, mostly by giving visual or audible feedback to the user about their water consumption

'The colour-changing gloves activate at the contact with water and change their aspect from lively-green ones to dried-dead, trying to alert users on the amounts of water used' (MX06_4MX). See image below.

Figure 7-12. Example of a design that hoped to have an impact on people's consciousness when using water.

- *Carrots & sticks*: Reward or punish certain behaviours or amounts of resource used, see Figure 7-13,

'The idea is to link the iPod or other 'fun' item with the water flow, the quality of the sound could be compromised with the increase of water used, punishing the user if much water is wasted, but keeping him happy (with good music) if he behaves correctly' (MX07_4UK)

Figure 7-13, A case of a design output using punishment as a DfSB strategy (eco-spur), degenerating sound quality when using high quantities of water.

- *Eco-choice*: the user has the option to act sustainably thanks to the product design.

'But at the end, it is the user that has the responsibility of using the product in the way that is most responsible. He could easily step on the pedal all the time, and then the product would be pointless for water saving. The important thing is that given the 'right' use, the user can save a lot of water' (MX08_4MX, referring to the limitations of his product: a pedal that regulates water flow, trying to avoid leaving the tap on between soaping and/or rinsing dishes (dead time).

- *Eco-steer*: the product has constraints towards certain behaviours or certain uses of water (*i.e.* stops after x amount of litres used)

'The concept consists of a small 'world' next to the sink that starts being full of water and empties little by little as more water is used. When the world is totally empty, the water flow shuts-off, and so the user knows that he has to use only a certain amount of water... or it will run out. I guess this could be used also for showering!! No-one would like the water flow to stop when soaping' (MX05_4MX). See image below.

Figure 7-14. Example of restricting water consumption complemented with visual feedback

7.6.7 Unforeseen steps in the design process

The theory of Personas (see chapter 6) promotes the need to determine a hierarchy of primary and secondary to prevent conflicts of individual Personas' needs. But there is evidence that a good number of designers, instead of doing that, generated an 'average user' from the analysis of the set of Personas given to them, mixing everyone's needs and building the design ideas from that point. This was not regarded as a failure of the Personas use but simply as an unexpected use of them. In these cases, the outcomes still fit the general practices of dishwashing of the population sets, mainly because the thinking process behind the making of the average Persona included a thorough analysis of each of them, taking into account their particular needs and their former hierarchy.

Self-referential design, is present in some of the designers' thinking process (captured in the logbook), but in most cases, not in a depth that was considered prejudicial to the user empathy process. The statement below illustrates how one designer introduced his own context and experiences into the thinking process when analysing the Personas:

> *'I also do that when I wash the dishes, and my dad always tells me off. He always soaps everything, then rinses everything at one go'* (MX13_4MX, in comparing himself with a particular Persona context)

Only one case of **detrimental-self-referential design** was observed. A Mexican designer introduced an element of Mexican washing practices, which was clearly outside of the British way of washing-up, taking for granted that it would be embraced and used the same way as in his culture. The element called for a change in behaviour with no particular, beneficial purpose (in hygiene, water saving, time, soap or energy). Figure 7-15 illustrates how the designer tried to introduce the little washing up bowl (in the middle) into a design for the British users, clearly not making the link between the users' habits and context (Personas) and the design outputs,

> *'...as the mock-up represents, there is an opening in the right side of the sink to attach a container for the soapy water for the sponge*' [a common practice in Mexican households, see cultural probes findings] (MX14_4UK)

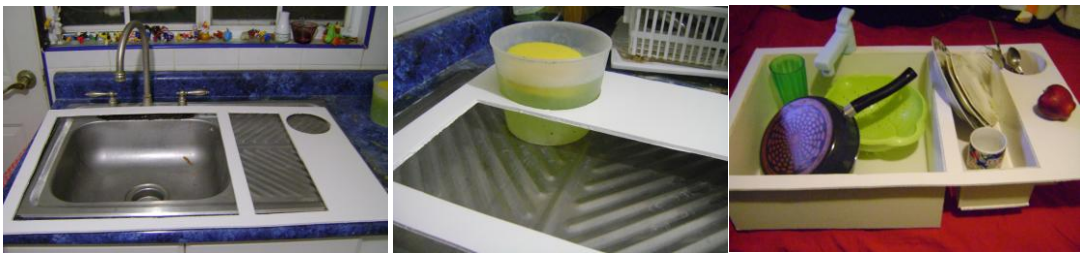

Figure 7-15. An example of a case in which the links between the Personas and the outputs do not match.

Along the same lines of the abovementioned error of judgement, some (Mexican) designers expressed from the beginning certain **stereotypes or judgements** about the users, some of them even before analysing the particular practices of the Personas. Some quotes from logbooks include *'Mexicans waste way more water in the dishwashing process than British'* (MX13_4UK*), 'It will be difficult to decrease water use in British washing-up styles because they are better than us Mexicans'* (MX02_4UK*), 'British use less water because everything is too expensive in the UK'* (MX03_4UK*), 'This project focuses on the Mexican user, who has terrible patterns when washing up'* (MX05_4MX), *'The British washing up techniques is not hygienic at all'* (MX03_4UK*) 'I will try to improve the hygiene of the dishes after washing them, so that I am not rinsing them in the same dirty-soapy water'* (MX01_4UK).

7.7 Development of a design framework

The successful completion of phase 4 (and all previous phases) of this research led to the creation of a design *framework* within user centred design, taking in user research strategies and design for sustainable behaviour approaches. This framework encompasses three main elements:

- **Cultural Probes** (see chapter 5) as a user research method (allowing designers to immerse themselves in the user's context from the early stages of the design process, up to the application of strategies and reviewing of the concepts with respect to the Personas);
- **Personas** (see chapter 6) as a translation of the rich data outcome (being in a format ideal for knowledge transfer and sharing in design and multi-background teams – marketing, IT, design, engineers);
- and **sustainable product design strategies** (through the reviewed Design for Sustainable Behaviour approaches).

The three elements complement each other as a mechanism that promotes new thinking, creativity and user research and empathy. This is done through a design process in which researchers and users both carry out hands-on research on the context of design (in this project, manual dishwashing in UK or Mexico), getting familiarised with it and with one another, questioning what is normal and obvious whilst discovering new standpoints through the use of Cultural Probes and videoing. Personas come handy after reviewing the rich data from the probes and trying to apply the user knowledge and transfer it through the different team mates, or during the different design stages. Design for Sustainable behaviour approaches provide designers with the know-how and inspiration on different ways to address the identified social and environmental impacts of the situation (or product) through design which modifies user behaviour.

With this thesis, only an initial structure of this framework has been achieved. Nevertheless, it is perceived as promising to further investigate, build-on and strengthen it. These possibilities and limitations are further commented in chapter 8 and section 9.3.

7.8 Conclusions

Phase 4 of this research consisted of a series of design studies that focused on applying Personas (created in phase 3) in the context of designing for more sustainable manual washing-up practices for UK and Mexican users, completing objective 4 of this research:

4. *To assess the use of the methodological framework produced, through a series of design studies that aim to build awareness of, and empathy with the user, their context and cultural differences when Designing for Sustainable Behaviour.*

The design studies were carried out in an academic environment with groups of industrial design students in Loughborough University (UK) and Universidad de Monterrey (Mexico). A series of presentations feeding into their knowledge of sustainability, sustainable design and design for sustainable behaviour were prepared and administered to the groups, setting a common ground to carry out the design brief. Groups were designing either for Mexican or UK users, making them *'comfortable', 'alien'* or *'mixed-knowledge'* in regards to their previous knowledge and understanding of the user.

During the design studies it was made evident how the course of action in regard to the introduction of the basics of sustainability, design for sustainable behaviour (DfSB) theories and the Personas themselves, helped to enhance the depth of sustainability-reflection and thinking in the design process. Designers were able to look beyond the specific design brief and consider other aspects of sustainability than just the water consumption itself, expanding to time, energy, soap usage, hygiene and creating a sense of community between household members through what was considered as a dull and worthless activity.

Designing for users that were different than the designers themselves showed to have triggered them to question their habitual ways of thinking, and the reinforced the importance of trying to *really* understand the user, rather than starting the design process with only personal experiences to work from.

Personas were found to be a successful tool to set-off a process of empathy and consideration for the users. Nevertheless, better results were found when Personas were complemented with other sources of visual information, such as the video recordings of participants carrying out the activity. This was particularly useful for designers that were designer for a user they were not acquainted with, helping in the mental visualisation of the development of the activity that the still images in the Persona posters could not deliver. It was found that most designers found useful replicating themselves the activity in question, to fully grasp the interaction of the different elements involved.

The use of the Personas, besides the abovementioned, proved to be very valuable in the academic environment. It gave the design students the advantage of truly understanding the user in a relatively short time (compared to the time that should have been invested if they had to do the user-research themselves) and being able to focus in the design process, completing a design project in a relatively short timeframe.

Design for Sustainable Behaviour approaches were widely used amongst the designers. A straight forward and simple guiding of the possibilities of DfSB before the project seemed to give the idea-conception stage a certain order, and open the designer's minds to a good number of possibilities to work on, breaking mental barriers and setting-off creativity and innovation.

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8 Discussion

This chapter integrates and discusses the findings of this research with those of the literature review. It builds on additional issues of interest that came to light during this research project.

8.1 Introduction

This research had the final purpose of assessing the use of the methodological framework produced, through a series of design studies that aimed to build awareness of, and empathy with users and their context and cultural differences when designing for sustainable behaviour. Although strongly related to *product design* and *Design for Sustainable Behaviour* (DfSB) (in theory and practice), this project's foundations do not lie in the physical products themselves, but in the interactions required to *design* them (*i.e.* tools and methodologies used in the design process). Also important to this research is the *journey of exploration of Cultural Probes* as a user-research methodology and the *findings* they provided, which were represented in the form of *Personas*. Hence, this thesis provides three main areas for discussion with consideration both to the theory and practice:

- the *user research* carried out (phases 1 and 2), the methods used, their planning and execution;
- their integration into the *design studies*, with the use of the proposed tools and design process' with DfSB strategies;
- and finally, the specific findings of the user-research in the context of dishwashing activities and the specific experiences/design outcomes from the design studies carried out in phase 4.

The research path followed can be clearly distinguished throughout the chapters of the thesis. Early chapters set the background for the main body of the research. The tactics and findings of the user-research carried out in Mexico and the UK are presented and discussed in chapters 4 and 5. Linking such user knowledge to the building of a tool to assist designers is presented in chapter 6; giving way to chapter 7, which explores actively the use of Personas in Design for Sustainable Behaviour.

This chapter discusses and brings up alternative issues that arose during the different stages of the research, and the overall implications.

8.2 Linking different behaviours, different users, different designers

One of the distinctive traits of this research is the way it links the *cross-cultural* user-behaviour research to the concept-design stage of products. As presented in the literature review, the design stage of a product is acknowledged as an opportunity to reduce a product's impact through the (re)directing of its users' behaviour, resulting in a decrease of resource consumption (environmental impact), and/or the decrease of antisocial behaviours (community impact), driving towards sustainability as a whole.

Coming-up with products that encourage more sustainable behaviour remains just part of the 'big solution' to the rising *hyper-consumption* issues discussed in chapter 2. Consumption presents itself as a well-oiled mechanism being shaped by both internal and external factors, which result in people being *locked-in* in to specific behaviours, as Jackson (2005) points out. Well targeted design of products and services can help break the bad cycle (of habits). A complex web of parties (governments, producers and consumers) and an even more complex web of circumstances (social thoughts, cultural acceptability, technology and infrastructure availability, etc.) need to coexist in harmony so that better, more-sustainable behaviours can be carried out. Designing good products that fit the user can be a viable way of reducing social and environmental impacts, either by redirecting/redesigning old behaviours, or by creating new ones.

8.3 Understanding the user is required to change behaviour

In order to change behaviour, a thorough knowledge of its triggers has to be considered in the design process to design products that guide people's actions towards more sustainable ones. Beyond coming up with products that are able to steer towards good behaviours or stop

harmful ones, this research acknowledges the importance of the products being accepted and used by people in order for them to be successful. For that to happen, designers have to understand the influential factors and their complex relationships. As Gaver (2007) points out:

> *'It is no longer sufficient to evaluate whether people can use a given design to achieve a task easily and efficiently. We also need—sometimes primarily—to understand how the design resonates aesthetically, emotionally, socially and culturally, both with particular users and with a larger audience'.*

A range of behaviour models from the fields of psychology and sociology were reviewed in chapter 2, most of which acknowledge the influence of internal, as well as external factors in people's behaviour (either rational or automatic). In the field of product design, approaches that take into account the context of the user-product interaction and human factors have evolved and taken special importance in the last decades. Emotion design, slow design, and design for happiness are just a couple of examples of design approaches that try to understand human behaviour and the specific contexts of use when designing. The Design for Sustainable Behaviour strategies discussed in chapter 2 feed from these and other disciplines to produce different solutions to *guide* or *design* sustainable behaviour by foreseeing people's reactions and interaction with the product (or service). As Lilley (2009) points out, by exploring and understanding context and emotions, designers can come up with products that provide experiences that have special meanings for people that restrains or persuade certain behaviour, or simply makes the user aware of their actions. A good number of examples (concepts, prototypes and in-the-market products) are illustrated and related back to DfSB strategies in the design-behaviour website (Lilley, 2011). The outcomes of the design studies (phase 4) expand the list of the application of DfSB strategies in practice, and clearly show how the potential benefits of the outcomes are not restricted to the environmental side of sustainability, but also are tightly related to the social or community side, which supports the notion of the DfSB strategies being holistic to the sustainability concept, and not merely staying in one-pillar of it (such as LCA tools focus in the environmental aspects). Environmental impact measuring tools and DfSB strategies could benefit in being used side by side, the first to identify the points of interest in design (when is it that most of the impacts are produced) and possibly to measure the effectiveness of the re-design once tested; whilst DfSB strategies and UCD user-research can be applied in the design process itself.

8.4 Discussing the framework

This research proposes a DfSB framework –a mix of Cultural Probes and Personas– which proved successful in gathering and transmitting users' emotional-level insights, unveiling personal/sensitive data that can very well be used by designers to empathise with users direct needs, but also, with users' more complex desires and aspirations. The use of Cultural Probes, which gave a holistic understanding of what people think and do during dishwashing, coupled with the further development of Personas, allowed a *mechanism* to be created, that provides designers with an organized set of data about functionality, emotional, aesthetic and contextual information that proved to be beneficial for the design process. The framework falls in the territory of user centred design, developing a comprehensive view of the user and gives him a central role in the early design process.

Similar to this research, Lilley (2007) and Tang (2010) also perform user-research on a specific topic (social impacts of phone use, and fridge uses and misuses, respectively) and, in doing so, recognise the importance of fully understanding users to design for sustainable behaviour. The key difference between these prior studies and this research being the specific focus on cultural differences. Furthermore, this research not only provides insightful information on user behaviour, but promotes an alternative way of using user research to encourage empathy from the designer, and also explores how to better transfer the acquired knowledge in a rich way that keeps promoting empathy, creativity and innovation throughout the design process.

The Cultural Probes designed and applied in this project were mainly inspired by Gaver's work (1999; 2004; 2007) and, just as his approach; the Probes were kept open-ended, aesthetically attractive, and rather ludic and ambiguous. This research brought interesting information and insights (both from the users and from the method itself) when applying the *same* Probe packs to two completely different populations. Also, as other research studies (i.e. Jääskö and Mattelmäki, 2003) Cultural Probes were complemented with (indirect) observation through videoing. By combining both methods one can get a more holistic understanding of the user-experience researched, as each one of them brings insights from different perspectives, as illustrated in Jääskö's figure below.

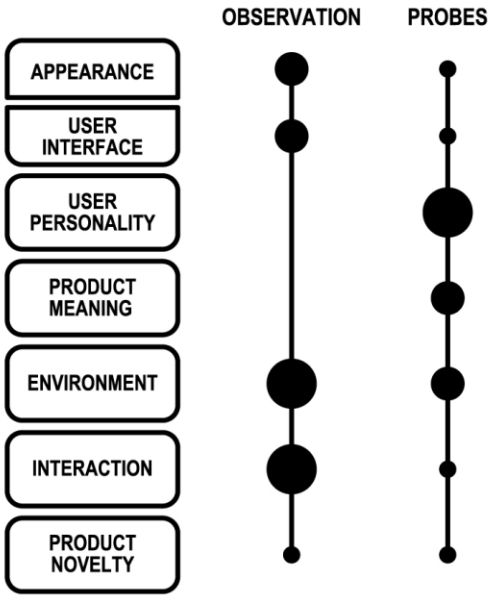

Figure 8-1. Reach of observation and probes techniques in regards of the understanding obtained in the different elements of user-experience. Image from Jääskö (2003)

from the time when Gaver and Dunne (Gaver *et al.*, 1999) established Cultural Probes as a user-research/inspirational tool, the technology used (*i.e.* analogue cameras) has evolved and affordable digital technology is now in the market. Since then, various projects have taken the *digital approach*, with new elements to the probes, such as Gaver's use of digital memo takers (2004), and Iversen's use of mobile phones with camera and Dictaphone functions (2003). In this project, the early CP kits included an analogue disposable camera. After the first pilot of the Probes it became clear that low-resolution (cheap) digital cameras would benefit the study, as many of the pilot photos came *all black* (people would forget to use the flash, or it wouldn't work) or *all white* pictures (the picture would be taken with the flash, but too close to the object). Some pilot participants expressed that they *'never remembered to use the flash'* or how close or far they should take the picture because they *'had forgotten how to use an analogue camera'* (turning the wheel for the flash, etc.) being so used now to digital ones. Bringing digital cameras to the Probe kit allowed people checking if the picture was taken correctly before moving on to the next; and also decreased costs (developing/printing pictures) and shortened time, as the pictures could be reviewed by the researcher directly on a computer.

8.5 On the translation of Cultural Probes

It is well known that designers have highly visual thinking processes. That is one of the reasons why Cultural Probes provide useful and effective insights for designers. Some researchers have used storyboard-scenarios (i.e. Horst *et al.*, 2004) after having done Cultural Probes, and some

others prefer to use them more in a more *'inspirational'* mode interpreting and challenging those interpretations every time the designers go back and work with the Probes, taking the best out of the ambiguity and subjectivity of the probe results (i.e. Gaver *et al.*, 2004). This research takes a little bit of both. Although the completed Probes can very well be used directly by the designer or design team, as proved in various design studies (i.e. Gaver *et al.*, 1999; Kjeldskov *et al.*, 2004), the researcher believes the complexity and the volume of the data they generate can become barriers in the practical design world when transferring knowledge between team members. Time is of the essence in a design project, and design-related activities involve a variety of specialised people (*i.e.* communication, marketing, engineering, IT) that need to work *on the same page*. The idea of having the user-information compiled in a useful and usable manner helps envisaging working in teams that are multi-disciplinary or even geographically dispersed. It is then that transforming the rich insights from the Probes into Personas becomes useful.

Streitz (2007) illustrates the basis of our argument for the *reinterpretation* of the Cultural Probes into Personas when applied in a design team.

> *'Successfully working together involves and requires more than exchanging only data and information. To act as a team, people have to develop commonalities on at least two dimensions. First, they have to develop and experience a common basis of understanding, i.e., a mental model of the task domain and the procedures that is shared by all team members. Second, they have to develop a common feeling as a teal, the "corps d'espirit". Establishing the shared mental model and the common feeling is dependent on the type of communication channels and media available. They determine the social cohesion and other croup processes'.* (Streitz *et al.*, 2007 p.4)

With the translation of probes into Personas, it is possible to keep the rich details from the CP, avoid producing *average users*, and use the information of the CP have the information still in a *storytelling* mode (including story-boards or scenarios, and photos and videos from the CP), encouraging imagination and creativity. During the early stages of the design studies, it came to light that novice designers would not take the Personas seriously until they knew that the information contained in them was based on real user-data. This is in line with some studies that show that designers tend to mistrust any sort of information that has been somehow interpreted into something else (i.e. McGinley *et al.*, 2011). Personas, always based on previous user-research, can give designers a 'feel' of having the *raw* information, and interpreting it themselves. In this research, Personas are presented as a way of reorganising the original user-data into a more efficient and effective way for the design team.

8.6 On the Personas, their building and their use

Although Personas have been increasingly studied and used in the design world, there is less emphasis in the study of them for the design of consumer goods. Studies around Personas tend to be more related to information technology and human computer interaction. This research has tried to move this into the design of products and physical spaces.

An issue to consider about the building and use of Personas, raised by novice designers during the design studies, was the reasoning behind the hierarchical distribution of the Personas. As discussed in chapter 6, Personas' needs and wants are given different weights according to their importance to the design brief. In the case of this study, the quantitative data used to base this distribution on came from a relatively small sample, mainly due to the time and resource constraints of the project. Nevertheless, Personas were indeed created based entirely on the data gathered through the online survey and the Cultural Probes. In future studies especially if carried out with projects in industry, it is recommended to deepen the work behind the hierarchical distribution phase and back it up with stronger quantitative data.

During the design studies, Personas were used early in the design process, and not so much in more detailed/deep stages of the project (taking into account that the 'project' resulted in concept designs rather than finished products). A designer's need for data inputs is variable depending on the design stage in question. The *double diamond* design process model, produced by the Design Council, UK (in: McGinley and Dong, 2009), explains that user data is needed typically at the beginning of a design process, where designers are exploiting their creativity and exploring solutions. The need for data diminishes as the concepts are being developed and specified, then it peaks again when evaluating and testing the concepts (designers need to see the relationship between user-product).

Personas proved extremely useful in unblocking creativity and innovation in the design process, whilst creating a true understanding of the users. The question remains if the framework could be approached successfully in *'real world'* of design practice.

Using Cultural Probes and translating the knowledge gathered into Personas, although potentially beneficial, certainly represents a longer pre-design stage, with a specific group of designers/researcher in charge of the user-research design, tool building, and keeping the Personas alive during the design process (by following up their evolution, development and integration in the different teams).

8.7 Other sources of empathy

Having available detailed user information is important in design. Personas appeared to provide in clear, simple and visually attractive ways the user research. As such, they can prevent the appearance of self-referential design, which disassociates the user needs from the design, swapping them with the designers' own beliefs (see chapter 6). However, as discussed in chapter 7, self-referential design can come in positive and negative ways. As McGinley's (2011) research shows, experienced designers do sometimes benefit from their previous user knowledge when dealing with design briefs that fall in their previous areas of experience (providing ideas, creativity, previous knowledge of solutions), but if the design brief is new to them, or if we are dealing with novice designers or students rather than experienced designers, effective resources and methods to do apply user-research come handy.

Personas were used in this framework as the main information source for designers, but still, during the design studies, it was obvious that designers liked to *try out themselves* what they were designing for, using role play or scenarios. This appeared to be helpful for most designers to make the final link between knowing what the users do/want/need, and really understanding it and being able to act on it. This brings up what some design research (Chamorro-Koc *et al.*, 2009) has previously shown about the importance of experiential knowledge for designers, which, if being used correctly can benefit greatly empathy building and understanding towards the user.

8.8 On using the framework: generalisation and transferability

The literature review and the discussions above reinforce the importance of a well-founded user-understanding in the design of products and services. Nevertheless, some studies show how, due to the limitations that normally exist in the design practice (time constraints, limited economic resources and skills), the user-research stage in the design process tends to be taken lightly or entirely omitted (McGinley *et al.*, 2011).

The framework presented in this research has valuable positive repercussions for the design process. For once, with the process of ideating the Cultural Probes also begins a process of searching the *'inside'* of people's heads, to design elements that bring interesting information to the researchers/designers. The empathy journey starts at that point, even *before* the involvement of real users. Then, with the analysis of people's information in the form of quotes, pictures, videos, sketches and comments, the designers continue the process of building a real relationship with the users. The building of the Personas represents another step in the empathy

process. Personas are the bridging tool between the raw data and the transferable version of the rich information, and the use of Persona templates and activities and the design for behavioural change approaches (*i.e.* Lilley, 2009, Lockton, 2010) help moving forward in designing in a creative way, being constantly reminded (by the Personas) of the real context of the users, ensuring (as much as possible) the avoidance of self-referential design, promoting empathy towards the real users.

Regarding the designer's need and preference for information in highly visual forms (in which the Personas fall), there are a number of research projects that have identified the opportunity in the building of interactive resources that bring to the designers' fingertips a series of rich, contextual, emotional, and even ergonomic and anthropometrical user-data, allowing the designer to browse for specific information according to the brief they are working on. The *RealPeople* project (Porter *et al.*, 2008) is a design resource that consists on a highly visual database of general consumer needs and trends that allows designers to browse through more personal 'lifestyle' information of users (videos, images, etc.) and generate more empathy with users for whom they are designing. Other work has been developed by McGinley (2011), with a project of a resource for highly visual anthropometric data, for which he used Probes not to research users, but to research what *designers* consider to be useful in such type of resource. Ndiwalana's (2004) LINK-UP scenario-based repository was conceptualised visualising the use of Personas in the HCI area. In hindsight, the Personas built for this research had certain similarities to the ones of *RealPeople* project, as they too embedded the different specific Persona-videos to help designers get a full understanding of the user, though staying in a mixture of paper-based Personas with additional components (the videos and working templates, for example).

With the aid of a Persona-resource similar to the abovementioned ones, providing they have suitable different functionalities (*i.e.* search and filtering data) the design experiences presented in chapter 7 could be applied in context of design teaching without difficulty (instead of carrying out a complete user-research phase before). With the Personas at their disposal (as in this research's design studies) design students can focus on certain aspects of the design of products, 'skipping' the user-research and having the user knowledge being transferred to them in a visual, understandable way, getting straight on with the design stage, ideal with the constrained timeframe of academic courses. But *how usable could this be in the business world?* The question still remains. Although ready-made resources like the ones mentioned above, seem like a fine solution, the researcher beliefs that both Probes and Personas should be **created with the specific design brief in mind** to have the best results in the design brief, even if they give a holistic, yet detailed reflection of the users, Probes and Personas still should have a specific

focus (as it was dishwashing in this project). Also, one of the key aspects of Personas is how detailed they are in the context of the specific design brief.

This doesn't mean that the researcher is against generalised user-understanding tools. In fact, theory and tools that engage the designers with different methods or ways of achieving design for behaviour results, such as Lockton's (2010) *Design with intent toolkit*, or Lilley's (2011) *Design-behaviour*, provide extremely valuable information for designers as starting point (inspiration, design approaches, examples) for their work. This research recognises that acquiring specific user-knowledge is just as important as knowing what to do with it, how to apply it and use it in the designing of products. User-research, and Design for Sustainable Behaviour methods work very well in tandem and promote creativity and innovation from the beginning of a design project, inspiring the designers with information of ways of achieving the intended (behavioural) result.

8.9 The ongoing discussion on Personas and their limitations

Despite the advantages using Personas can bring to the design process, not all researchers/designers consider the tool to be so valuable in the design process. Some disapproving positions towards Personas refuse to consider them as an collaborative design tool, because with Personas, real, *'flesh and blood'* people only have a presence during the pre-design phase of the whole design cycle, being substituted by the ('*fake*') Personas once the actual design process starts (Blomquist and Arvola, 2002). Nevertheless, as Personas are intended to become and be treated as *real people* in the designer's mind, and as they are based on detailed qualitative data from real users, this research does think of Personas to be within the margins of co-design tools.

The use of Personas in the design studies of this research brought to light the importance of them being specifically prepared according to the design brief, bringing best results when they are carefully designed to include key information about the behaviours and context to re-design. A study by Blonquist and Arvola (2002) in which Personas are less-successful followed closely the design cycle of a product in a company that frequently used Personas in their design processes. In the case of their study, the company *recycled* a set of Personas from an earlier project to feed into the one of interest. The shadowing of the process showed a lack of integration between the design team and the Personas, which were always referred to as *the user,* rather than *Richard* or *Eric* (their Persona-names). Even though the Personas were not successfully *'brought to life'* (possibly for having recycled them) the study reported a parallel positive impact that came from having the Personas and scenarios in posters in the corridors,

and all around the place: the Personas lead to many spontaneous design meetings with people from within the project and with others that passed by and saw the posters every day. They were successful in inspiring, encouraging the exchange of ideas and building a cooperative spirit throughout the multidisciplinary teams involved in the design of the product.

Personas have also been criticised for the lack of methods to validate the data they assemble, as they are based on gathering together the stories of a large set of previously studied individuals into a few detailed examples. Personas, some claim, cannot be verified to be accurate, nor can they represent large proportions of the potential user space, as they are made up from scattered data points from many users assembled together (Chapman and Milham, 2006). This point, although valid, is balanced with the already mentioned numerous advantages that Personas bring to the design process, and can be tackled, if desired, by using quantitative research to validate the qualitative segmentation of the user-population when creating the Personas (the next chapter links this with the limitations of this project).

8.10 On the user research findings: daily routines – dishwashing practices

The following sections encompass the discussion of specific user-research findings from phases 1 and 2 of the project (focused on dishwashing practices), and the interactions of designers and design outcomes during phase 4 (design studies), making reference to related studies and interesting issues that arose.

The literature review illustrated how most water-related activities happen in the form of routines that people tend to follow with little variations that are shaped by the immediate context that surrounds them (see chapter 1, section 1.3.3); the early scoping study, described in chapter 4, showed how washing-up practices were no exception to this. Studies carried out by Stammingger *et. al.* (2003, 2007) provide quantitative insights of dishwashing patterns in different countries in Europe. Their research, showed how people subdivide the activity of dishwashing in little *personal* practices that lead to similar (personal) results –in time, hygiene and water consumption– every time they repeated the activity. Along the same lines, the findings presented in chapters 4 and 5 (user research phases of the project) substantiated how (Mexican and British) people indeed *build* a washing-up routine based on their specific context (kitchen layout, usual washing-up tools, usual items to wash) and carry it out in the same way every time they do the dishes. The hypothesis that cultural background does have an influence on the development of (washing-up) routines grows stronger with this investigation.

Similarly to how Graham and Hansen (2008) point out the important influence of word of mouth, family and friends, and media influence (*i.e.* TV, films) in the shaping of individual routines, the qualitative findings gathered through the survey, the Cultural Probes and the subsequent informal conversation with the participants also back-up the notion. This *'social influence'* is especially conspicuous in the washing-up practices. The scoping study (see chapter 4) brought results that support that people carry out routines and habits regarding dishwashing without really thinking through why they do what they do. People's comments, such as '[I don't rinse off the soap suds] *because my mum never did it, nor did my granny'* show that dishwashing may be an activities done in *automatic pilot*, without challenging the *why's* and *how's* of one's own actions.

The *cultural background* (see connotation used in chapter 1) that surrounds the creation of the routine can be indeed pointed out as a defining factor for one's behaviour. This phenomenon, in the context of dishwashing, can be illustrated with an example on the *'British way'* of washing-up identified in chapter 5 (with the use of a washing up bowl or a semi-full sink). This practice has been reinforced as a common dishwashing practice through (though not only) the *Fairy Liquid* T.V. advertisements (a well-known washing-up liquid brand, see Figure 8-2) that have run on the British television for decades now, and certainly have shaped people's perception and understanding of the dishwashing process. In the different ads, the mum (generally) is sponging an item in a sink full of foamy water, and placing it to dry next to it. The media is of course, not the only, nor the most important factor that influences the evolution of (dishwashing) routines, but is an example of how our behaviour is clearly influenced by the context.

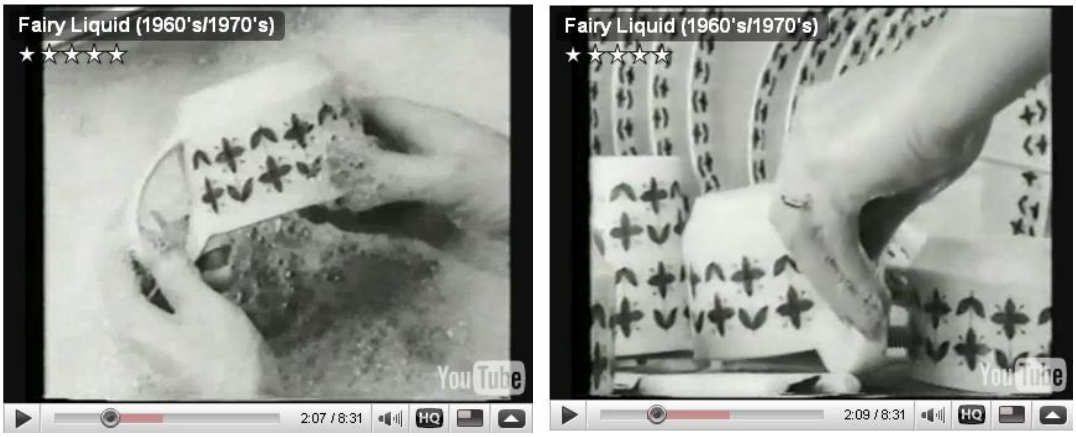

Figure 8-2. Fairy liquid advertisement snapshots show the use of a semi-full sink with soap foam, and no final rinse before placing the items to drip-dry.

8.10.1 A comparison with similar, contemporary studies on dishwashing

It is only recently, that researchers interested on dishwashing practices are beginning to realise the importance of understanding the social and psychological context of the dishwashing practices. In contemporary to this research Fuß (2011), based on Stamminger's (2003, 2007) research, and observational studies in Spanish and German households, has an ongoing project on producing a series of *Best Practice Tips* for manual dishwashing –which are tested out in a laboratory–. In her research up to now, Fuß proposes a method similar to the *British-washing-up bowl* one described in chapter 5, which theoretically produces the best results in cleaning performance and resource consumption. A strong limitation of this kind of study, which tries to bring *different* cultures into one single dishwashing practice, is the potential of acceptability as a long-term habit, as it does not consider the importance of social and psychological factors. The *Best Practice Tips* propose a method very similar to the one of most of the German population, and so can potentially be well-accepted among Germans. Then again, it would require a challenging change of habits if it were to be embraced by Spanish users, as their original practice commonly involves the running tap rather than contained water, and the new practice, although much more efficient in water consumption, would call for a change in a well-established habit that would include a shift in people's hygiene perceptions, both personally, and at a community level (linked with *'what others think of me'*).

People's perception towards cleanliness and hygiene is a critical factor in water-related behaviours and routines, as it has a major influence on the frequency, duration and resource consumption during the activity. Hygiene can be considered a relative term, as it is influenced by local and temporal circumstances. In the washing-up process the perception of cleanliness appears as a determinant factor for water consumption. The definition of *clean* dishes varies, and thus, the cleaning routine varies too from one person to another. This reinforces the argument set out in this thesis that there is a distinct need for the inclusion of contextual knowledge in the designing of products and services.

8.10.2 Differences in the washing-up context (Mexico and the UK)

The user research stages observed how dishwashing practices in the two sites were in essence the same: water, soap, sponge. Nevertheless, the practices in the two countries had different, distinct basic elements. Examples of these differences in habits came up during the research. Asking Mexican people if they rinsed-off the soap at the end of a wash was invariably (mis)understood as rinsing-off the little bowl they used to place the soapy water for the sponge (see chapter 4): not rinsing the soap suds off the previously sponged dishes was not even a possibility in Mexican respondents' minds. As another example, the mention of a washing-up

bowl (in the British sense) in the scoping study was also a term not understood by Mexican respondents, who automatically translated the mention of a 'bowl' with what is most similar in their practice: the small container for the sponge and soapy water.

Many different behavioural patterns were recognized in both countries, such as the different and unobvious uses that people give to their kitchen sinks and the distribution of the work-spaces in the kitchen; the amount of washing media (soap) used in both countries and the importance of the foam that it produces during the washing up process, and the perceived relationship between the later and the grade of hygiene achieved. It was also considered that the washing-up practices also vary with the type of *cuisine* of the region. The Mexican cooking of the Cultural Probes participants proved to be more greasy and colourful (sauce-wise) than the British one, and that could be a reason for which the Mexican wouldn't consider using a bowl full of water to soak all their dishes, as the water would very soon become dirty to the eye, and it would be pointless to try to wash the items under such conditions. Other personal differences between the participants can be seen in the logistics of the dishwashing process, such as the number of times and the duration of the opening-closing of the tap, some due to the kitchen distribution, having a single or double sink, and due to the different context where the activity is developed. The user-research carried out showed how sustainable consumption (of water) goes beyond having a positive attitude towards it, supporting Thorpe and Røpke's (1999) conclusions: putting aside the psycho-social context, the physical context that surrounds the dishwashing activities (*i.e.* technology available, kitchen spaces and layout) also can have a big impact in constraining certain behaviours or reinforcing others.

Even though it is not feasible to generalize the washing up practices for all Mexicans and all British people, the user research studies carried out demonstrated how one could still make the distinction between the (two) country practices if regarded in an overall fashion.

8.10.3 Rebound effect in dishwashing

Solutions come in different shapes for different people. Designers have to *get into* people's heads and contexts to come up with the best solution that provides the results wanted in a way that best fits the user. Dishwashing can be said to be, both from the literature and from these research results, a dull activity that people tend to avoid. A very interesting issue that arose early in the user research was how people from Mexico and the UK dealt with this 'dislike'. People that had the means would get an electric dishwasher (in the UK) or hire home-help (in Mexico).

The Cultural Probes put in evidence an existent relationship between the amount of items used and the use of an electric dishwasher or home-help. Various participants recognised that they

tend to use more items (plates, cutlery) when they know they are not going to do the work of washing dishes (*i.e.* when the maid is soon to arrive, or if they have the option of using the electric dishwasher). People allow themselves to use more stuff when using dishes has no palpable consequence or punishment (in having to do the dull dishwashing process).

8.10.4 Implications of culture on design

The literature review discussed and ongoing project by Kuijer and de Jong (2009, 2011) that investigates how cultural diversity can be used as inspiration for designing. Putting aside the identification of the most sustainable practices from diverse washing-up methods (which was outside the scope of the research questions), this research also brought to light a potential supplementary benefit for designers. Design teams could profit from immersing themselves in alternative 'ways' of doing things (sometimes found in different cultures), encouraging *out-of-the-box* thinking, and using creative approaches to adapt the most sustainable or effective practices to the users' context and the persuade them to adopt these *ways*.

8.11 On the particularities of the design process' from the design studies

The DfSB strategies from the *Loughborough Model* (Lilley, 2009; Tang, 2010), and some from the *Design with Intent toolkit* (Lockton *et al.*, 2010) that were fed to designers before the carrying out the design brief were effective, not only in producing a wide range of concepts to reduce water consumption, but also in opening designer's creativity and effectively encouraging an *outside-of-the-box* thinking.

DfSB strategies were widely used to tackle water consumption, but also to tackle other resource consumption issues. Although the initial design brief asked for a reduction of water use in the dishwashing process, it was not unusual for designers to consider other sustainability-objectives, such as the reduction of energy used, time consumed, soap used, the increase of hygiene or order (visual) in the surrounding area, or the creation of a sense of community. Design for sustainable behaviour strategies sometimes directed designers into other sustainable design sub-fields, such as slow design (Thorpe, 2010) and emotional design.

Understanding the context of water use also helped designers coming up with *unusual* solutions. For example, one designer (MX01_4MX) ideated a system to involve all household members in the dishwashing process, creating a sort of *game* that would measure people's water consumption

in the process and reward the 'best' one, creating a sense of community, healthy competition, and sharing the workload of the chore. A possible extension of this concept would be to expand the *community* to include other homes in the neighbourhood. This idea goes in line with the context information of water being a natural resource shared by everyone. Therefore people's perception of other people's consumption (either responsible or abusive) has a strong influence on one's will to preserve it.

9 Conclusions

This chapter brings together the general conclusions from all chapters, making a link with the completion of the general aim and the objectives of the project. It discusses the contribution to knowledge of this research and reflects on the limitations and recommendations for further research.

9.1 Fulfilment of research objectives

The overall aim of this research was to build an understanding of the influence of cultural differences on behaviour, and link this with Design for Sustainable Behaviour strategies. Hence, the research activities described in this thesis were designed according to the specific objectives described in the introduction chapter.

The literature review provided a general background for the user research stages, and identified a potential gap in knowledge, leading into the specific exploration of dishwashing practices in both Mexico and the UK and bridging it with user research methods and design for sustainable behaviour. The findings from the subsequent stages fed into the design studies, through a series of tools in the form of Personas created to assist designers in the brief of designing for a sustainable washing-up practice, focusing on two different cultural background users. These design studies, and all the elements involved, were tailored to assess such tools and explore the design process and outcomes that designing for specific cultures brings about. Table 9-1 presents a clear relation between the specific research objectives and their completion during the different stages of the research project, indicating the respective thesis chapter for reference.

Table 9-1. Attainment of aims and objectives of this research

Objective	Means	Achieved in:
1. *To carry out a literature review in the fields of sustainable consumption, behaviour and routines (relating the findings to water consumption), Design for Sustainable Behaviour and other relevant subjects.*	The issues researched give a strong background to the thesis. Examples are linked back to the water consumption context.	Chapters 1 & 2
2. *To explore parallel routines of people with different cultural backgrounds, by using washing-up practices and perceptions in the UK and Mexico as a case study:*	This is objective was attained through two different stages of user research, which ultimately constituted the foundation for objectives 3 and 4.	Chapters 4 & 5
2a. *To carry out a survey on washing and cleaning habits and water perception in both locations.*	An online questionnaire was applied in both Mexico and the UK, revealing generalities of water use in the home, identifying issues to further research in objective 2b.	Chapter 4
2b. *To carry out ethnographic studies to gain a detailed understanding of individual/personal dishwashing practices.*	A Cultural Probe pack was designed, produced and given away, resulting in a successful deepening of the understanding of MX and UK dishwashing practices. Video recordings complemented this data collection stage	Chapter 5
3. *To develop from the identified practices and perceptions, tools to support the process of designing for sustainable water consumption during the washing-up, producing a methodological framework for supporting designers working in cross-cultural contexts.*	This was achieved by merging together the findings from the literature review, the survey, the Cultural Probes and the videoing. These were used to inform the creation of sets of Personas that feed into the completion of objective 4.	Chapter 6
4. *To assess the use of the methodological framework produced, through a series of design studies that aim to build awareness of, and empathy with the user, their context and cultural differences when Designing for Sustainable Behaviour*	This was achieved through the setting and completion of a series of design studies carried out in an academic environment, with a design brief on dishwashing and assisted with the Personas created in phase 3.	Chapter 7

9.2 General conclusions from the thesis

This research addressed a gap in knowledge bridging sustainability and design, with the understanding of differences in water-patterns in the home, studied from the cultural-background point of view. This research recognises the importance of the two sides of the coin: acquiring/possessing user knowledge, as well as understanding how to use it when designing with the intention of encouraging more sustainable behaviour. Detailed conclusions of each research phase are at the end of each chapter, but the following paragraphs encompass a general vision of them.

This research's purpose was exploratory, and as such, it brought to light new insights on the influence of cultural background on the creation of routines, and identified and tested Cultural Probes and Personas as successful techniques that aid the designing for behavioural change for specific users. In brief, the originality of this thesis lies in the putting together a design *framework* that encompasses three main elements:

- **Cultural Probes** (CP) as a user research method (which creates a link between the CP designer and the users);
- **Personas** as a translation of the rich data outcome (being in a format ideal for knowledge transfer and sharing in multi-background teams –marketing, IT, design, engineers);
- and **sustainable product design strategies** (through Design for Sustainable Behaviour approaches considered in the *design studies*).

A clear finding from the user research stages of this project (phases 1 and 2) is that water-related routines (dishwashing included) are based on habits that are clearly influenced by the context in which they are carried out, and the context that surrounds the user (past and present circumstances), which in this thesis is referred to as *cultural background*. Chapters 4 and 5 provide specific insights on attitudes and behaviours related to water use in Mexico and the UK, with particularities on dishwashing practices. These results, although not generalisable for all British or Mexican households, allow distinguishing a partition between these two culture's dishwashing patterns into two obvious groups of general behaviours, which can evidently be broken down into the individual washing-up practices.

The most interesting differences encountered lie in the main elements' usage and configuration during the dishwashing process. Mexican users tend to work on an open/close tap basis, whilst British users have the habit of using a water container (sink or washing-up bowl) with soap to do the dishes in. The investigation also shed light on other differences in the dishwashing process, such as the rinsing or not rinsing of the soap suds, the household's chore division in

both cultures, in the priority given to the activity, in the *alternatives* used to avoid the task, in the reasons for the preferred temperature of the water, the additional activities performed in the kitchen sink, the general logistics of the activity, and other factors explained in detail in this thesis (refer to chapter 5).

This research is based on the premise that design can help reduce a product's social and environmental impact through the *directing* of user's behaviour, encouraging a responsible and sustainable one. The findings from the user research phases (1 and 2) are linked to the bigger aim of this research of bringing together culture-specific user knowledge with the design process, through a series of support tools for designers, presented in chapter 6. These tools came together in the form of Personas, and as explained in the discussion chapter, they proved to be successful in transmitting user knowledge in a highly visual way, and create empathy towards the user. They were well accepted and found very useful by the novice designers that participated in the design studies.

The framework proposed in this research (user research–translation–DfSB) had each tool and element involved tailored with the specific design context and design brief in mind. With that established, it is important to consider how this methodology, although used in a specific background and context, could be tried and tested in other environments. From an overall view, the elements comprising the design studies (the tools, methods, activities and presentation of DfSB theory) functioned effectively for concept design. Every run of the design studies (with each of the groups) was implemented without any major issue arising. Supporting material was indeed perfected during the trials, particularly after the first run, adding elements and different forms of support for the students.

The design studies made evident how the feeding of the designers with design approaches for behavioural change and sustainability opened a window for deep reflection in the design process. The use of Personas with the additional video footage material and design and brainstorming templates brought the best results.

Designers responded positively to the design for both known (to them) and unknown users, and were able through the design framework proposed, to truly understand and empathise with users, even in the short timeframe available for the projects. Although the results came only in the form of concept designs, various characteristics of good design, as well as a setting-off of creativity and a clear breaking of their own metal barriers could be seen in a number of them.

9.3 Limitations of the work

This project delivered a range of very interesting findings, discussions and conclusions that come united to a series of limitations that is important to acknowledge. Some of them have been discussed throughout the thesis, some others are described below.

9.3.1 Time limitations

Firstly, the time constraint of a PhD project (three years) had an impact on the way the research was planned and carried out. If the time had been more flexible, each of the stages of the user research would have been reinforced with a larger sample size. The online survey (the only quantitative data source of the project), although achieving more replies than expected, is not the ideal size to be used in the building and hierarchical distribution of the Personas (based mainly, but not only on the Cultural Probes). In the same way, the amount of data provided by the Probes was already large enough, and rich in form and content; nevertheless, they could have benefited from a longer response timeframe from the users, united with extra elements and activities for the users.

Time also had a key role during the analysis of the data. The analysis of the on-line survey was focused on the dishwashing practices, whilst having a 'lighter' assessment of the other water activities, which although outside of the scope of this thesis, could provide interesting data to complement other studies.

The repetition of the design studies also had an impact on the time-management of the project. The trials had to be timed according to the academic calendars (which are different in both countries) and had to be designed and adjusted so that they would comply with the learning objectives of each of the universities. The sustainable design course in UDEM had a biannual appearance, with sometimes various groups running in parallel, and so it was possible to carry out the different groups in parallel, and repeat the studies for three academic semesters in a row.

9.3.2 Logistics limitations

Doing research in two different countries brought rich and interesting experiences and knowledge for this research. Nevertheless, the geographical distances between both sites played an important role (along with time and money needed to do so) both in the user research stage, and in the design studies. A grant that covered one trip to Mexico's expenses was granted in

early stages of the project. With the flight dates fixed in advance, the envisaging, design, piloting and producing of the Cultural Probes to apply in Mexico had a tight schedule. The results were of high quality; nevertheless, they could be further developed to enhance their usability and effectiveness for future studies. The available time in Mexico to engage participants, find a convenient week for them, deliver the Probes, and do the follow-up was of four weeks. It proved to be a challenge to work around people's lives and previous engagements (going away for the weekend, not being at home for on particular days, and so on).

Regarding the design studies, the participation of both UDEM and Loughborough University brought a good level of richness to the findings of how designers think, behave and (re)act to the design brief and support material. Today's communication technologies made it possible to carry out the design studies with UDEM in a distance teaching mode, and still have a certain level of interaction with the designers. Nevertheless, as discussed in chapter 7, not being face to face with them, recording every little detail of their design process and thinking brought the limitation of having to depend on what they reported to the researcher, and in their feedback. Although tackled as best as possible during the project, and having one face to face visit at the end of each trial, it cannot be compared with real-time, same-location interaction.

9.3.3 About the academic environment of the Design Studies

Both time and logistics allowed this framework to be tested only in an academic environment, using industrial design students (undergraduate and masters) as main subjects. Although the results of the design studies were indeed valuable, this limitation restricted the research from the *'real world'* experience, but opened the door to further research opportunities (see section 9.5). The key elements involved in the proposed framework can be relevant in different design contexts and disciplines, as discussed in section 8.8.

9.4 Contribution to knowledge

This research draws from existing techniques and theories, and links them together to use Cultural Probes and Personas in the specific field of Design for Sustainable Behaviour. Novelty has been demonstrated through the linking of the particular *ethnographic* user research methods used, and Design for Sustainable Behaviour approaches through the creation of assisting material for designers. The paths and methodology that the project undertook shed new light on each of the elements and methodologies used, resulting in the design framework presented in section 7.7.

This research contributed also to a deeper understanding of washing-up practices, and gave specific and interesting insights from both Mexican and UK cultures, facilitating discussion on domestic routines and their influential factors, but most importantly, and setting qualitative grounds for further quantitative research on the same subjects, which could compare effectively the *sustainability* rate of each of the approaches. The insights provided, although not enough to generalise country-wide patterns, may still be of interest for the domain-specific ideas they get across.

In the field of academic teaching for sustainable behaviour, this research has provided with a framework to build on a new teaching approach, one that benefits and encourages sharing of ideas between designers, and engages designers to a conscious empathising process, which ultimately leads to the minimising of self-referential design and the account for users needs and wants during the whole design process.

9.5 Recommended further work

This research provides evidence of the potential of the proposed framework that encompasses collaborative user-research, a translation of the data for the design team, and the application of design for sustainable behaviour approaches. As the discussion chapter demonstrated, there are a number of further directions that this project can take. Some issues have been previously discussed, other are presented in the following paragraphs.

To begin with, the user-research itself was limited to two countries, and to one single *issue* (dishwashing). The constraints of the project did not allow for the design studies to bring working prototypes to place, nor to subject them to rigorous testing in order to assess their *success* in actually shifting behaviour and reducing water consumption. A collaborative project between academics and industry could be proposed, opening the door to test the framework in a real-practice environment that should produce tangible and measurable results.

Future research can link this framework with collaborative design, in which the Cultural Probe participants are later (re)integrated in the design, testing and evaluation of the produced outcomes. Users can be taken to a higher role in the design of products, having a previous-user research stage with ludic and engaging methods, similar to the Cultural probes proposed in this thesis.

Regarding the academic applicability of this research, although the Cultural Probes and Personas proposed require a high-level of set-up time, it is the belief of the researcher that a simpler version of the 'Persona resources' discussed in chapter 8 could be beneficial for an easy

application of design for sustainable behaviour projects at an undergraduate and master's level. This, although limiting the student's development on user-research, would bring the students' full concentration on the design development process, applying the design skills learnt and having the extra-time to produce more developed outcomes. Alternatively students can also benefit from experiencing the whole process of user-research, analysis/interpretations, and building of their own tools to design (if time allowed it).

9.5.1 Future research questions

Identifying and understanding where behaviour comes from can be extremely beneficial to the designing of products or services for behavioural change. It raises questions like: *do people do what they do, just because that it is the only way they know of?* Or because they choose to do it that way? The answer to that question, although outside of the scope of this research, might very well be true, especially when comparing two cultures that have no particular connection, as it was the case of this research with the study of British and Mexican washing up practices.

The focus of this investigation was to explore how culture influences user behaviour, and how designing for such users is influenced by this. Nonetheless, throughout the project, a further research endeavour was identified in the opposite direction: how designers can benefit by multicultural user-knowledge, adding to their creativity and *out of the box* thinking. In fact, recent research done in the Netherlands (Matsuhashi *et al.*, 2009; Kuijer and Jong de, 2011) focus on the influence (not in the scope of this research) of the impact of multi-cultural design teams in the design outcomes for behavioural change, bringing yet another turn to possible further work to build on from this thesis.

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Appendix A

Appendix A: Examples of water saving products on the market

There is a wide range of products in the market that have been designed to achieve water reductions on the market, some examples are shown in the table below.

Aqua

A domestic washing machine that (Sanyo, 2006, Japanese market) that features two different modes: ozoned water cycle an dry cycle with ozoned air (Japan Echo Inc., 2006). The ozone has been used on industrial hygiene appliances as it helps breaking up dirt and disinfects by killing bacteria.

The use of this technology brings savings in energy and water – by making shorter cycles and using cold water and injecting ozone to the water used to disinfect it and store it until the next washing cycle (Iona Communications Ltd, 2008).

Re-cycle Laundry Center

One of the three compartments is used for the washing, then the used water is directed to the second one, where it gets filtered, disinfected and stored for the next one (Villanueva and Ariño, 2008). A third compartment exists as a dryer.

Washup

This concept integrating a washing machine and toilet proposed by Sevin Coskun was entered in the Greener Gadget Competition 2008. It is suitable for small apartments and has the ergonomic advantage of the height (not needing to bend or crouch) although when unloading, clothes risk to fall in the toilet. The water used in the wash can be used to flush the toilet (Core 77 Inc, 2008).

Laundry Pure

This add-on to current washing machines pre-treats the water used in the cycle with oxygen (ozone), ultraviolet light and silver ions. It eliminates the need of hot water, and reduces the wash-cycle as the need of detergent is eliminated (Ecoquest, 2007).

Ecoballs

Ecoballs (The Guardian Ecostore, 2009) are a product by the British company Ecozone that replace detergent used during the washing cycle. They are chemical-free, hypoallergenic and kill bacteria. Cloths have no odour at the end, and so people might reject the idea of them as being clean (Rowlatt, 2006).

Concept kitchen designs: Aion

Aion is a future-kitchen multifunctional appliance that combines technology and natural elements. When open, the appliance can be used to cook. The plants on top act as a filter for water and air. When the cover is closed, the washing mode starts, cleaning the worktop and the dishes previously placed in the sink. Water savings are achieved by the reuse of it grace the filtering plants (Lebrun, 2007).

Green kitchen

Whirlpool's Green Kitchen combines technologies in an integrated kitchen that saves water, heat and energy (Dunn, 2008). The key part of the water saving feature is a series of sensors that measure the degree of soil in water used, and divert the unused clean water into a special tank to be later re-utilised (Whirlpool, 2006).

Hughie

A portable kitchen bowl that fits inside the kitchen sink to do the washing-up. It features handles that help removing it to reuse the water on indoor plants or in the garden. Hughie was awarded product of the year 2008 (Australia) as it is a simple, easy to use product that can achieve big savings in water (N/A, 2008).

Eulo sink

This concept-sink reuses water by making it pass through a series of carbon filters and disinfects it with UV light. Detergent is mixed to water automatically before being pumped through the tap. Once the washing cycle is completed, the water used is diverted to the garden (Asher, 2008).

Water saving system for manual dishwashing

This concept uses heavy mist sprayers to pre-rinse dishes (get rid of food particles) with filtered/recycled water which goes down the drain. After soaping dishes, the water from the rinsing filtered and stored for the pre-rinse stage of the next wash (Elizondo, 2008).

Electrolux Pure

Electrolux conceptualized this half sink, half dishwasher. Its eco-friendly properties lie in the fact that it is detergent free as it uses degassed water to get rid of oil and grease. It also optimizes the amount of water and energy used according to the volume of dishes inside. When people place their dirty dishes in the 'sink' it rotates under the bench and washes them (Electrolux Design Lab, 2007).

Kitchenaid® in sink dishwasher Briva

A small automatic dishwasher that 'hides' on what is otherwise a dripping area for hand-washed dishes. Its volume permits as much as five place settings, less if pans and pots are placed. This makes it ideal for small households, where people would struggle to fill up a normal sized washing machine (around 10 place settings).

Gota

This personal dishwasher concept was designed specifically for single people or couples without children that, as in the case presented above, use fewer dishes than large households. *'In its pre-wash cycle the dishwasher steams up the dishes and recycles the cooled down residual H2O for the later-on cycles'* (Caldas, 2009).

Hydrosave

This retrofit system allows one to redirect the water that is normally let run while waiting for it to get to the temperature wanted (when washing the dishes in the sink, for example). The (cold) water is directed to a water butt until it reaches temperature wanted (Hydrosaveonline).

Faucet Buddy

With the intention of making the user aware of the water consumed –and energy used to heat it up– this device displays the temperature and water dispensed through the tap (Quench Solutions Pty Ltd, 2008).

Bware water meter

This water meter can be attached to any water consuming device in the house, giving real-time feedback to the user. An advanced kit will include Wi-Fi connection and log software, making it easier to trace the water usage (Gunzelmann, 2009).

Retrofit infrared sensor

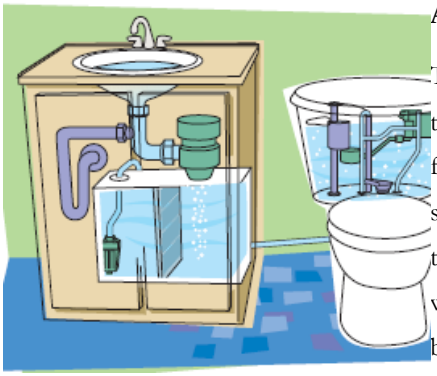
Motion sensors in taps are an effective way of reducing water consumption in taps up to 80% (Lallana et al., 2001).This retroffitable device makes available the feature in the household taps. Autotaps is a British company that produces ATA series (at an affordable price for the household market. (Autotaps.com, 2008)

Profile™

In late 2007 the Australian bathroom producer Caroma® made available to the market a toilet with an integrated hand basin. It features a double flush button of 3L or 4.5L. When the toilet is flushed, the freshwater that fills the reservoir goes through the faucet, allowing –encouraging- the user to wash their hands right after using the toilet (Caroma, 2007).

Sinkpositive

Following the same line as Caroma's *Profile*, the American company Environmental Designworks came up with a retrofittable toilet lid with integrated hand basin. It fits most toilets with handle either on the front or side (Environmental Designworks, 2008). It is not meant to replace the usual sink in the bathroom, since it is not ergonomically ideal for activities like face-washing or tooth brushing, or to wash with substances that can change some of the water's characteristics as colour or odour.



Aqus

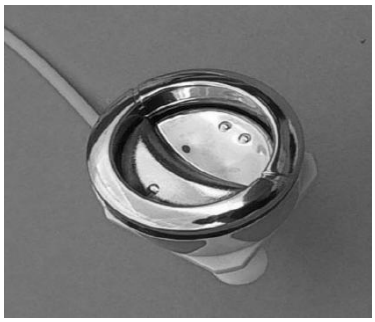
This grey water recycling system links the bathroom's sink and the toilet by using the water used in the sink to fill (partially or fully) the toilet's cistern. It disinfects, filters, and stores the sink's water until the toilet is flushed and the water is pumped to refill the cistern. If there is not enough water, freshwater would be used. The product is available in the market and can be installed by the home-owner (WaterSaver Technologies, 2007).

Peterton's Dualflush and Variflush

A retrofittable device to convert the single flush W.C. cistern into a dual (low-hi) or triple (low-med-hi) flush. It is relatively economical and can be easily fitted. It is only suitable for cisterns with front mounted levers (Joo and yankodesign, 2007).

***Mecon* water saver**

This is another product that can be fitted in current siphon toilet cisterns to alter the flush duration (and water use) as the user considers needed, when the push-button is released the flushing stops (Thomas, 2005).



***Wirquin* mechanisms**

Double flush mechanisms allow users to choose between light or full flush, providing the user with the option of choosing the most resource efficient solution (CME Sanitary Systems Limited).

Cistern displacement devices

By occupying a volume on the toilet's cistern, these devices save water in each flush. It is debated whether they actually make savings due to the risk of provoking a double flush when the first one is unsuccessful. Cistern displacement devices are a cheap alternative to reduce water use, bags with expandable pellets (save a flush bags) are given away for free by most Water Companies in the UK (Severn Trent Water, 2005).

Ecoplay system

The system links bath and shower water and uses it to flush toilets. It can be installed in single or double storey houses, and claims to reduce water consumption up to 30% in a typical household. It can only been installed in new built or renovating houses (CME Sanitary Systems Limited).

Domestic water meter

This concept design is a digital water meter attachable to the shower, powered by batteries that recharge as water runs through a small internal turbine. The figure in the left is a render done for Instituto para el estudio de la biosfera 2007).

Every drop shower saver

Much water is wasted in the shower, whist the water gets to the desired temperature (Hydrosaveonline). In the shower, temperature adjusting when having two handles is one of the main reasons for people not to turn off the water while soaping or shampooing. *Everydrop shower saver* is a retrofittable handle that acts as a shut off valve allowing one to shut the water flow from the shower and reset it fin an easy way, without wasting time getting the right temperature again from the two temperature handles (h+c).

Eco Showerdrop

Showering accounts for 20-30% of the water used at home (Butler, 2005). Daily showers (Hand et al., 2003) are becoming more and more popular. In order to facilitate keeping track of the water used during a shower, Eco Showerdrop (McDonough and Braungart, 2002) can be calibrated with your shower; it sets off an alarm to when you have used the 35L recommended by the British authorities through Waterwise (Steffen, 2008).

Electrolux Fog Shower

This concept shower uses a flow of heated water vapour instead of liquid water, using as little as 1/12 of the water used by the most efficient showerheads currently available in the market. That is, as little as 2L of water for a five minute shower (Joo and yankodesign, 2007). Electrolux Fog Shower was a finalist in the 2007 Electrolux Design Lab.

Wow Shower

This device allows you re-circulate the warm water in the shower, so one could enjoy the shower experience without wasting much water. It permits to easily switch back to the conventional shower when in need of a final rinse (Wow Shower, 2005).

Quench shower

After soaping, shampooing and rinsing, the shower changes to save mode, where new water starts being re-circulated (filtered and pumped back up) so one could enjoy a long shower without spending more water than needed (Quench Solutions Pty Ltd, 2008).

Users might regard the system as an investment for the home, since it contains the shower cubicle to be installed in the bathroom, it is not clear if consumers have embraced the idea of using recycled water for showering. Savings would be made only if people did a rapid wash or their bodies and then wanted to stay for a long period of time in the shower.

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Appendix B

Appendix B: Online survey analysis sheet (extract)

Filters allowed modifying the view according to the different coded responses, searching for links between the coded

continues

Table extends withtwith all respondents and all questions

	Q1	Q1_Other	Q1_Other CODED	Q1_a	bowl	sink	plug	tap	soapy water	cloth	sponge	temperature	detergent	order	other	Q2 Rinse soap	Q2- rinse Yes/no/sometimes	Sometimes?
UK27	3	I use both running water and a washing up bowl occasionally. The majority of the time i use the dish washer.	DWshr, Bwl, Runtap	if i use a washing up bowl i put everything into it. Fill it with warm water and washing up liquid. I then remove each item and wash them one-by-one under a running warm tap. This tap runs into the bowl with the unwashed items in. I just allow the bowl to overflow.	bowl			tap-constant	soapy water			warm			uses bowl to soak with hot-soapy water, then washes under the tap one by one.	1	Y	
UK28	2			i run the tap for ages to get the water hot. then i turn it down to a trickle once i've filled the sink to enable me to get the suds off		sink	plug	tap-constant trickle to rinse				hot			concern water wasted from cold to hot	1	Y	
UK29	2			running tap, close while scrubbing dishes, open to rinse.				tap -openclose			sponge					1	Y	
UK30	3	I use water in a sink with a plug	Fsnk	insert plug, run hot water, add washing liquid.		sink	plug		soapy water			hot				2	N	
UK32	2			Washing-up liquid on a dishscrubbber under hand-hot water, cold rinse							sponge	hot. Cold for rinsing				1	Y	
UK33	3	dishwasher	DWshr	I never use running water												2	N	
UK34	3	Dishwasher	DWshr	Open-close as needed. For greasy deposits warm, otherwise cold.				tap -openclose				cold			warm for greasy	1	Y	
UK35	3	Dishwasher occasionally	DWshr	run tap till hot, fill bowl	bowl							hot				2	N	
UK36	3	I use a washing up bowl and running water	bowl, Runtap	running tap into a washing up bowl. use warm water. Add in water into bowl with fairy liquid. then wash. Then use running water to rinse.	bowl			tap-constan-rinse	soapy water			warm	fairy liquid			1	Y	
UK37	3	dishwasher	DWshr	normally used every other day. occasionally do some items by hand in bowl no running water	bowl											1	Y	
UK38	3	I wash up in the sink.	Fsnk	I wash glasses and mugs first then bowls and plates and then saucepans and oven trays etc. Working from the cleanest to the dirtiest.		sink						hot. Cold for rinsing		glasses, plates, bowls, saucepans. Clean to dirty	second bowl to rinse	1	S	

Open-ended answers were broken down and analysed

Appendix C

Appendix C: On-line survey

Activities in the home - UK

Loughborough University

Habits in the home survey 2009

Part of a PhD study by G.M. Elizondo

Welcome

This **10 minute** survey aims to capture your views and experiences regarding your **habits and routines** while using water around the home. By taking part in this study you will make a *real* difference in the development and direction of this research. Your honest response is much appreciated.

Thank you in advance for your time.

This survey contains images. If prompted by your web browser, please allow the display of *non-secure items*

Regards,

Gloria Elizondo
Researcher
Loughborough University,
Department of Design and Technology
G.M.Elizondo@lboro.ac.uk

Continue >

Activities in the home - UK

Loughborough University

Habits in the home survey 2009
Part of a PhD study by G.M. Elizondo

Data Protection

All data collected in this survey will be held anonymously and securely.
Aggregate data may be retained to benchmark future surveys.

Continue >

e. **Is there a particular reason for that?**

f. **In general, do you wait until the dishwasher is full to use it?**

- Yes
- No
- Other *(please specify)*:

i. **Is there a particular reason for that?**

4. **Do you have any of the following devices installed in your kitchen?**
(select all that apply)

☐ Individual cold+hot taps ☐ One handle monomixer ☐ Two handle monomixer

Individual taps

One handle monomixer

Two handle monomixer

LAUNDRY

5. **How do you decide it is time to wash something (clothes, sheets, towels etc.)** You may choose more than one option
(select all that apply)

- When it has been used once
- When it starts smelling
- When it looks dirty
- When it is wrinkled
- Other *(please specify)*:

6. **When do you wash clothes by hand?**
(select all that apply)

- Always, I wash all my clothes by hand
- Prewash by hand where there are tough stains
- When washing delicate garments
- When I need a specific piece of clothing and there are not enough clothes for a machine wash
- Never
- Other *(please specify)*:

7. **In general, do you wait until there are enough clothes to fill the washing machine to wash a load?**

- Yes

- ○ No

8. How often do you use the washing machine?

- ○ Every day
- ○ Every other day
- ○ Twice a week
- ○ Once a week
- ○ Every other week
- ○ Other *(please specify)*:

Do you do multiple washes in one day?

- ○ Yes
- ○ No

i. If yes, how many washes do you do on the *washing day*

- ○ 1
- ○ 2
- ○ 3
- ○ >4

9. What kind of washing machine do you have?

- ○ Front loader
- ○ Top loader
- ○ Other *(please specify)*:

Front loader

Top loader

BATHROOM

10. Do you have any of the following devices installed in any of the bathroomso of your home?

Double flush option

Cistern displacing device (such as hippo or save-a-flush-bag)

Gray water recycliyng from either shower or hand basin

Individual taps in hand basin

Water efficient showerhead

Tap aerators

Individual handles

One temperature control

Power-shower

(select all that apply)

- ☐ Dual flush option
- ☐ Cistern displacing device (such as hippo or save a flush bag)
- ☐ Adjustable flush volume device
- ☐ Gray water recycling from either shower or sink
- ☐ Individual taps in hand basin
- ☐ Water efficient showerhead
- ☐ Tap aerators
- ☐ Individual handles in the shower or bath
- ☐ One temperature control handle in the shower or bath
- ☐ Power-shower
- ☐ None of the above
- ☐ I don't know
- ☐ Other *(please specify)*:

11. How often do you bathe? (tick the appropriate boxes)

	Twice a day or more	Daily	Every other day	Once a week	Once a month	Never	Other *(please specify)*
a. Shower	○	○	○	○	○	○	○
b. Take a bath	○	○	○	○	○	○	○
c. Wash your hair	○	○	○	○	○	○	○

12. Please give a rough estimate of the time it takes you to shower

- ○ Less than 5 minutes
- ○ 5-10 minutes
- ○ 11-15 minutes
- ○ 15-20 minutes
- ○ +20 minutes

YOUR PERCEPTION OF WATER USE

13. Do you have a water meter?

- ○ Yes
- ○ No
- ○ I don't know

14. Are there or have there been any water restrictions in your area that you are aware of? (hosepipe bans, lawn sprinklers, etc.)

- ○ Yes

- No
- I don't know

If yes, please comment on which ones:

15. Are there any water-rationing programs in your area? (e.g. having access to water only at certain times of day)

- Yes
- No
- I don't know

If yes, please comment on which ones:

16. Which of these activities do you think use the most water in the home? in a monthly time-frame. Please rank once each activity, choosing from 1 to 5.

1 = MOST water used
5 = LEAST water used

	Laundry	Dishwashing	Showering/bathing	Hand-washing and tooth brushing	Toilet flushing
a. 1 MOST water used					
b. 2					
c. 3					
d. 4					
e. 5 LEAST"' water used					

17. Do you consider yourself water-conscious in the home? If yes, please comment on which behaviours (of yours) you consider water-friendly?

- No
- Yes

Please mention some of your *responsible* actions

18. How much do the following issues encourage you to conserve water?

	High influence	Medium influence	Low influence	No influence	Why?
a. Climate change					
b. Cost of water bill					
c. Regional water scarcity					
d. Educating/example for children					
e. It's the right thing to do					

f. Self-rewarding	○	○	○	○	

19. Do you have any domestic-help?

- ○ Yes
- ○ No

a. Which chores do they perform? *(select all that apply)*

- ☐ Laundry
- ☐ Ironing
- ☐ Cooking
- ☐ Washing-up
- ☐ Dusting
- ☐ Hovering
- ☐ Window cleaning
- ☐ Bathroom cleaning
- ☐ Other *(please specify)*:

b. How regularly do they come?

- ○ Daily
- ○ Every other day
- ○ Twice a week
- ○ Weekly
- ○ Every other week
- ○ Other *(please specify)*:

PERSONAL INFORMATION

20. Please give us your name *(Optional)*

21. Age

- ○ <20
- ○ 20-35
- ○ 36-50
- ○ 51-65
- ○ +65

22. Gender

- ○ Male
- ○ Female

23. What is your household make-up?

- ○ Single home (one person)
- ○ Two people
- ○ Shared (>2, students or professionals)
- ○ Family house (>2, family members living together)
- ○ Other *(please specify)*:

24. Where do you live in England?

- ○ Midlands
- ○ East of England
- ○ Other *(please specify)*:

25. Please tick your academic studies level

- Secondary school/college
- University

26. Nationality

- British
- Other *(please specify)*:

WANT TO KNOW MORE?

27. If you are **interested** in the outcomes of this survey and the research being carried out, please laeve your **EMAIL** and I will send you the final report once it has been produced.

Thank you again!

Gloria Elizondo
PhD Candidate
Loughborough University
G.M.Elizondo@lboro.ac.uk

28. Click **Continue** to submit your answers

Continue >

Survey testing only

Check Answers & Continue >

Appendix D

Appendix D: Basic coding for Cultural Probes analysis

A full list of the coding used to analyse the diaries is shown in the table below. General codes could be multi-linked, creating more specific codes, for example, Hygiene perception (HYG PRCP) could be linked with *rinsing the soap from dishes* (HYG PRCP_RNS), or made even more specific when linking it with more than one other codes: electric dishwasher, avoidance of the chore, better use of time, trust, hygiene perception (DW+AV+TIME_USE+TRST+HYG PRCP).

HARDWARE & SPACE	
DBL	double bowl sink
SNGL	single bowl sink
1&HLF	one and a half bowl sink
DW	dishwasher
WU_BWL	washing up bowl
SOAP_BWL	soap bowl
TV	television
HELP	house help/maid
SMLL_HUS	small household
WSH_UP	washing up (by hand)
WTR	water
SPC	space
NXT	dirty dishes next to sink
INSDMPTY	dirty dishes inside empty sink
CLN2DRTY	washing up order clean to dirty
GRC	grease
GRC_LOW	low grease

TEMPORAL	
LW_USE	low use
SMTMS	sometimes
ALWYS	always
TIME	time
TIME_long	time consuming
TIME_USE	better use of time

CONTEXT	
FGT	forget
ORD	order
FN	fun
SFTY	safety
AV	avoid
PRACT	practicality
EZ	ease
HYG PRCP	hygiene perception
CMFRT	comfort
TRST	trust/tre sure
NO_NEED	no need
NEED	need
DSGUST	disgusting
ERGO	ergonomics/accessibility
BK_ACHE	back ache
LOW_IMP	low importance
HG_IMP	important
NDWSH	need/wish
REMND	reminder/need to know
LACK	lack of
LKS	looks/aesthetics
HIDE	hide dishes/aesthetics
SOAP_OK	right amount of soap
CHRE	chore
JOB	job/obligation
TMWORK	teamwork
CMPNY	company

ACTIONS			
RUN_TAP	tap running	RCYCLN	recycling packaging
CLS_TAP	close tap	RNS	rinse
FULL_SNK	washes with water in sink (plug on)	PR-RNS	pre-RNS
SOAK	soak	NO-RNS	no RNS soap
FOAM	foam	WTR_CHN	replace water
SOAP	soap/dishwashing liquid	EATN	eating habits
2ND_USE	give a second use of water	DSTRCT	distraction
AFTR_CLN	cleaning after washing up	RLX	relaxation
DRP_DRY	drip dry	RFLCT	reflect
TWL_DRY	tea towel dry	TAP	TAP access

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Appendix E

Appendix E: Cultural Probe tasks completed by respondents

LUNES

Completa las frases **con tus propias ideas y experiencias.** Luego explica tantito.

Yo cierro la llave mientras enjabono para que no esté corriendo el agua.

Yo siempre diluyo en una tinaja el jabón lavatrastes antes de empezar a lavar.

Cuando lavo ollas y cacerolas, yo las dejo hasta el final porque son lo que más grasa tiene. Las pongo a remojar con agua caliente mientras lavo lo demás.

Hoy, los trastes se quedaron ahí por un buen rato antes de lavarlos

- [x] Si, y ahí seguirán hasta mañana → porque viene la señora y los lava
- [ ] un ratito, unos ____ ¿min/hr?
- [ ] No, los lavé luego luego después de comer.

Tarea de foto:

¿hecho?

① Del fregadero y a su alrededor, como está AHORITA ☑

② Del fregadero y su alrededor justo antes de comenzar a lavar los trastes ☑

③ Del fregadero y su alrededor luego de haber lavado los trastes ☑

Ponle paloma cuando esté hecho

Notas del lunes

Este espacio es para dibujos, diagramas, notitas y todo tipo de ideas que surjan mientras llenas el libro y mientras vas tomando las fotos!

Mi papel/puesto en la casa es: Roomie (una de tres)

Cuando se trata de lavar los platos, yo...

① lavo los míos cuando ensucio muchos al mismo tiempo (cuando cocino).

② Lavo cuando necesito algo y está sucio porque lo usé alguien más y no lo ha lavado.

③ Los dejo pendientes cuando sé que al día siguiente viene la señora que nos ayuda en el depa.

¿De qué fueron las fotos que tomé hoy? (notas para acordarme cuando se las platique a gloria)

① Como me recibió el depa cuando llegué en la noche, de después de cenar acomodé las ② trastes a un lado del fregadero" la tomé al día siguiente ③ después de que lavó la señora, (contando desde que llegué de la ofi.).

#la oficina. lunes después del fin de semana "mañana viene la señora").

** los enjuagué y apilé para la señora mañana. cubiertos dentro del fregadero.

Hoy lavé los platos ...	No	Sí	¿Cuánta gente?	¿Qué comí/comimos?	¿Qué fue/era cocinado en el momento, (y no recalentado)?	¿Quedaron algunos platos y cosas sin lavar?
después del Desayuno	☒	☐	1	cereal y sandwich	Desayuné en la oficina llevé la comida de mi casa.	Los lavó la señora que ayuda en la ofi.
después de la comida	☒	☐	1	frijoles charros con aricheras	comí en la oficina llevé la comida de mi casa.	
después de la Cena antes	☒	☐	1	sandwich de nuevo estirado con jamón y queso	Todo lo cociné antes de comer.	Lavé una paleta y cubiertos ANTES de hacer de cenar xq' los necesitaba. Quedaron los de desayuno de la cena y los del fin de semana para mañana que viene la señora.

para lavarlos en otra ocasión

Tuesday's notes

I washed the dishes today:

	No	Yes	What did I/we eat?	Amount of people	What (if anything) did I/ we cook from scratch?	Mention any items left unwashed
after Breakfast	✓	☐	1x cereals	2	Nothing	1x plate 2x mugs
after Lunch	✓	☐				
after Dinner	☐	☐				

left there to wash → some other time

Express yourself by writing a short story about what goes on in your kitchen sink throughout a week... It's recommended to write in first person and as if YOU were the sink

rest of the washing up. Clean stuff gets left on the draining board to dry.
2-3 times a week I give the sink + draining board a scrub with anti-bacterial spray (worktops get sprayed more frequently.

What did I photograph today?
(these are notes for you, so that you can remember later which picture corresponds to which photo-task)

④ utensils used to wash dishes
⑤ Items used to clean
⑥ hated implement to clean

TUESDAY

A week in the life of my kitchen sink -reveal the storyteller side of you

I leave dirty items to the right of the sink. I squirt washing liquid into the bowl and fill it half way with hot water. I rinse dishes after scrubbing them to remove bubbles. After washing all the easy stuff I leave burnt dishes/saucepans to soak in the used water. Then I forget about it and find it still soaking the next evening, so I empty the old water out the bowl, scrub the soaked dish and carry on with the rest of the washing up.

In the kitchen sink, besides washing dishes, I... (reflect!)

- leave teabags in the sink before throwing into bin so they drain.
- Wash hands
- Fill up kettle
- flush ground coffee down sink

Today's photo tasks:	done?
④ Utensils I use the most whilst washing dishes	✓
⑤ What makes a dish/item clean (up to you what you photograph)	✓
⑥ What I hate to wash the most	✓

tick box when photo is taken

*ITEMS: cutlery, dishes, saucepans, and any other item that you needed to wash after cooking/eating

WEDNESDAY

Today's washing-up

Hot or cold water?

Hot ☐ Cold ☑ Depends ☐

Why? left breakfast pots in sink soaking before putting in dishwasher when got home in the evening
when?

The ONE thing I change in the washing-up routine when there are other people around -possibly watching-. Why would that be?

Don't wash up pots when other people are around

New tap would be good!

Detergent: how do I use it? how much, when in what way, with which utensils

Not very often - only when cannot put pots in dishwasher. Use more than probably should. Sometimes use a dishwasher brush and scourer pad.

Today's photo tasks

take a picture from each of the following inspirational words:

	done?
⑦ Dirty	☑
⑧ Clean	☑
⑨ Sort of clean, not super clean but still usable	☑

tick box when photo is taken

Wednesday's notes

Space to express yourself, to draw and scribble as you please, to further explain the stuff you answered and the pictures you took, to record any thoughts at all....

What did I photograph today?
(these are notes for you, so that you can remember later which picture corresponds to which photo-task)

⑦ Dirty plate
⑧ Clean wine glass
⑨ Stained mug

Let's draw a picture of that:

I washed the dishes today:

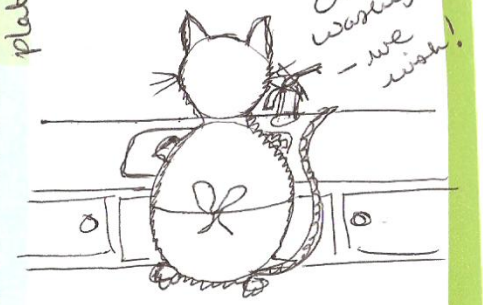
		No	Yes	What did I/we eat?	Amount of people	What (if anything) did I/ we cook from scratch?	Mention any items left unwashed
Breakfast	after	☑	☐	Porridge	2	Porridge	2 bowls/spoons tea cup
Lunch	after	☑	☐	fruit (at work)	—	—	—
Dinner	after	☑	☐	Chicken Tracker Pasta Vegetables	2	Roast chicken potatoes / veg.	Plates / cutlery Saucepan

left there to wash some other time

DAY 6

Thursday's notes

Below find a space to express yourself, to draw and scribble as you please, to further explain the stuff you answered and the pictures you took, to record any thoughts at all!...



left there to wash some other time

I washed the dishes today:

	after Breakfast	after Lunch	after Dinner
Yes	☐	☐	☐
No	☐	☐	☑
What did I/we eat?			Green Thai Curry
Amount of people			2
What (if anything) did I/ we cook from scratch?			am
Mention any items left unwashed			am - 2 pans, plates in dishwasher

What did I photograph today?
(these are notes for you, so that you can remember later which picture corresponds to which photo-task)

⑩ Clio
⑪ Oscar
⑫ Wedding Candle holder.

THURSDAY

Today's washing-up

Does foam matter? (from the diswashing detergent)

Yes ☑ Not really ☐

Why? in which cases?
So you can see how it's mixed, and where it's gone.

I use a dish (or glass or anything really) and afterwards, it goes:

☐ in the empty sink (soon to be filled with dirty dishes)
☑ in the countertop next to the sink

SITDERE !!

really? and why's that?

Mixture
Bowls, plates, pans = Laziness! Will get put in dishwasher/washed up later.

Glass/cup = will use it again.

Quick rinse for items that had only liquids in them.

☐ In favour
☐ Against
☑ Well, I do it sometimes

if it's mine, as mark's & just had squash or water or coffee/tea + going to use it again immediately.

Today's photo tasks:	done?
⑩ The one that rarely washes the dishes in my home	☑
⑪ It slows me down when dish-washing...	☑
⑫ What I enjoy washing the most -or what I dislike washing the least?	☑

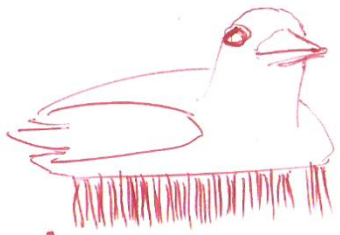
tick box when photo is taken

Friday's notes

To express yourself, to draw and scribble as you please, to further explain the stuff you answered and the pictures you took, to record any thoughts at all!...

Notes, comments, thoughts, drawings

(Sorry for the rubbish drawing)



↑Rubber duck sponge/brush to make washing up more interesting (still not very interesting but it's a start!)

I washed the dishes today:

	Yes	No	What did I/we eat?	Amount of people	What (if anything) did I/ we cook from scratch?	Mention any items left unwashed
after **Breakfast**	☐	☐	1x bowl of cereals	2	Nothing	1x bowl 2x mugs
after **Lunch**	☐	☐				Baking tray, 2x plates, knives, forks, saucepan
after **Dinner**	☐	☑	Fish, chips + vegetables	2	Vegetables	

What did I photograph today?
(these are notes for you, so that you can remember later which picture corresponds to which photo-task)

⑬ fairy liquid in bowl
⑭ cleaned dishes
⑮ _____

FRIDAY

One thing I would change about the dishwashing experience:

To have another person available to wash the dishes occasionally - Perhaps have more interesting things available to help with wash whilst entertaining me... i.e. a rubber duck sponge!

I find it frustrating that:

I am the only one that does the washing up, but my partner cannot do it instead of me because he has an allergy to detergents - his skin reacts very violently to interaction with washing liquids

When washing dishes, I go for:

- ☑ Squeaky clean dishes
- ☐ Whatever, as long as it looks clean
- ☐ Whatever as long as It doen't take too long

Please explain thoughts and reasons behind your answer: If you're doing a job, you might as well do it properly!

Today's photo tasks:	*done?*
⑬ Washing detergent ready to be used	☑
⑭ Dishes RIGHT AFTER being washed	☑
⑮ Today's big meal	☐

tick box when photo is taken

Notas del sábado

Este espacio es para dibujos, diagramas, notitas y todo tipo de ideas que surjan mientras llenas el libro y mientras vas tomando las fotos!

Menciona algo de cada persona que vive en tu hogar:

Lili.- Ensucia de todo cuando cocina. Sartén, olla, tapas, cubiertos, tablas, etc. etc. A veces los fines de semana lava todo lo que hay sucio. Entre semana casi nunca lava.

Angie.- Casi nunca está, en sus palabras "nunca lava".

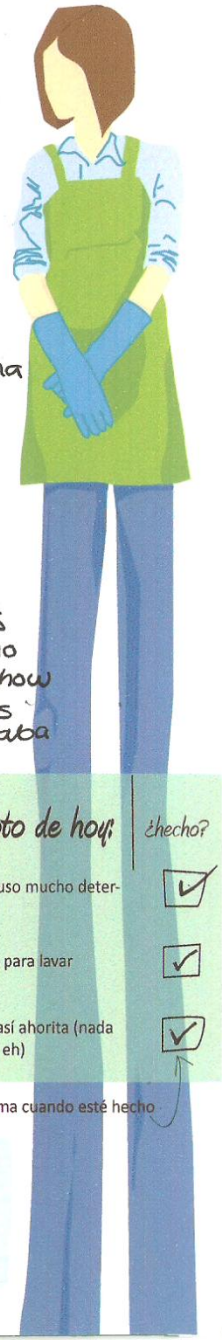
¿De qué fueron las fotos que tomé hoy? (notas para acordarme cuando se las platique a gloria)

⑯ Sartenes y ollas
⑰ los cubiertos, le tomé foto al cajón de cubiertos limpios
⑱ El fregadero con ollas como lo dejó Lili

no salió

Hoy lavé los platos ...	Si	No	¿Qué comí/comimos?	¿Cuánta gente?	¿Qué fue/era cocinado en el momento, (y no recalentado)?	¿Qué platos y cosas quedaron sin lavar? para lavarlos en otra ocasión
después del Desayuno	☐	X	Hot cakes con jamón asado.	1	Todo lo cociné	Lave el sartén que quería usar primero xq estaba sucio.
después de la comida	☐	X	Enchiladas verdes.	1	Todo lo cociné	Lavé la palita que quería usar primero porque estaba sucia. Ya después quedó todo para después.
después de la Cena	☐	☐				

SÁBADO



Reflexionando, ¿durante los fines de semana salen más trastes para lavar que durante la semana?

Definitivamente ☐ Pues no tanto ☐ Depende ☒

explicación: Hay veces que los fines de semana comemos más fuera y no ensuciamos y hay veces que como aquí y cocino y sí salen más trastes que en la semana porque entre semana desayuno y como en la oficina.

Platos desechables... ¿los uso de vez en cuando?

Si ☒ No ☐

¿Cuándo y por qué? Para el uso común no, sólo para reuniones grandes o carnes asadas en la terraza. Para mi vajilla no tiene suficientes platos, porque es mucho show subir y bajar todo a la terraza y son más prácticos para recoger rápido cuando se acaba la reunión.

Lavar los trastes es ... palomea lo que va contigo, y/o escribe tu experiencia personal

- ☑ una tarea (algo que se tiene que hacer.)
- ☐ algo que disfruto
- ☐ algo que odio
- ☐ algo mundano
- ☐ terapia
- ☐ tiempo de reflexión
- ☐ otro:

Tarea de Foto de hoy:	¿hecho?
⑯ Cuando lavo ésto, uso mucho detergente	☑
⑰ La cosa más rápida para lavar	☑
⑱ El fregadero se ve así ahorita (nada de medio arreglar! eh)	☑

Ponle paloma cuando esté hecho

Notas del domingo

Este espacio es para dibujos, diagramas, notitas y todo tipo de ideas que surjan mientras llenas el libro y mientras vas tomando las fotos!

¿De qué fueron las fotos que tomé hoy? (notas para acordarme cuando se las platique a gloria)

⑲ ⑤ Lo + imp. al lavar platos

⑳

㉑

Creo que lo + importante es quitar los restos de comida, dejar remojando un rato el sartén para que no se pegue. Creo que ahorra agua y quitando el exceso de comida antes no "ensucias" el jabón ☺

Hoy lavé los platos ...	Si	No	¿Qué comí/comimos?	¿Cuánta gente?	¿Qué fue/era cocinado en el momento, (y no recalentado)?	¿Qué platos y cosas quedaron sin lavar?
después del Desayuno	☐	☒	fruta y yogurt	1	nada	los de ayer + plato fruta taza de yogurt y cubierto
después de la comida	☐ antes	☐	fajitas de pollo	1	todo	lavé antes de empezar, guardé la parrilla de ayer y lo de la comida, sartén, plato, cubierto, vaso
después de la Cena	☒	☐	barra de la zona	1	nada	ahora sí lavé todo ¡felicidades! jajaja

para lavarlos en otra ocasión

Las fotos para hoy:

		¿hecho?
⑲	Una foto de la cuenta de agua *(muestra los m³usados, la cantidad ($) de pago y el período (tiempo) al que pertenece)*	☐
⑳	La cosa más importante al lavar platos es... (foto)	☑
㉑	Lo que hace (o haría) el lavar platos una tarea mas agradable	☐

Ponle paloma cuando esté hecho

Domingo

DOMINGO

¿Alguien más ha lavado los trastes en esta semana?

Si ☐ No ☒

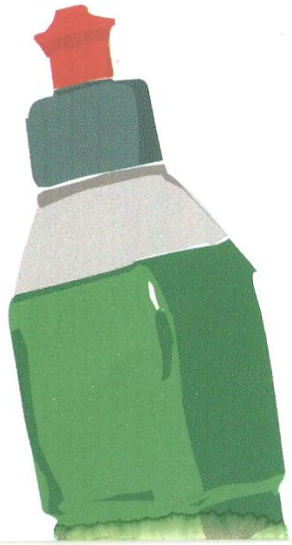
¿Y han pasado el control de calidad -o sea yo? ¿Lavan los trastes diferente a mi?

Hoy, ¿cuántas personas participaron al lavar los platos? ¿qué hizo cada quien?

I, solo yo ☺ y hago todo, enjuagar, enjabonar, enjuagar y poner en el escurridor para guardar más tarde

¿Y es siempre así? Por favor explica...

Sí, normalmente lo hago sola. A veces varía si lavo justo antes de cocinar y necesito lo que estoy lavando, seco las cosas con un secador, las uso y más tarde lo vuelvo a lavar.



Appendix F

Appendix F: Persona sets: MX and UK

1UK - Mark — Clean freak-environmentalist

Background

Mark is a British engineer, working in Manufacturing and Research. He lives with his wife in a little town in the Midlands.
They have an electric dishwasher which they use regularly, but they are very careful about which items go in there: knives, teflon pans, glasses and big items are always hand-washed.
Housechores are distributed between he and his wife, and he usually does the washing up. Mark always rinses tetra-packs, cans and glass bottles before placing them in the recycling bin.

"when I wash dishes I always check there are no remains of food or grease on them"

About him:
- British
- In his 40's, in a 2 person household
- On weekdays they have breakfast and dinner at home, they make their lunch and take it to the office in a *tupperware*
- Uses an electric dishwasher for some items, which he pre-rinses under running tap.

Motivation
- Mark likes his kitchen sparkling clean.
- Uses the washing-up time to listen to the radio (1h) and relax.

Washing-up process
- Mark opens the hot water tap, waits until water reaches a high temperature, places inside the sink a washing-up bowl, squeezes a bit of dish-washing liquid and fills the bowl to 3/4 of its capacity.
- Dirty dishes are placed next to the sink, and he grabs one by one, inmmerses it in the hot water and sponges it (still half-down in the soapy hot water).
- After sponging, Mark places the item on the counter next to the sink and leaves to dry - with no final rinsing.

Space for washing-up
- Single bowl sink with a central half bowl, used to dispose of liquids when main sink is in use.
- He uses a washing-up bowl inside the sink (removible)
- Mono tap with two handles (H+C)
- Integrated flat drip-drying surface with no drying rack (see picture)

Other uses of the sink:
- Rinse vegetables and fruits
- Rinse recycling

Use of water
- After using a dish/item, he rinses it under the tap and places it next to the sink (for hand-wash) or in the dishwasher.
- If he needs an [isolated] plate/item that is dirty and in the dishwasher, he washes it under the running tap [uses a lot of water].
- He does the main wash-up once a day, in the evening, with the use of a washing-up bowl.
- After the wash-up he cleans the sink and washing-up bowl and leaves it to dry inside the sink.

Washing-up tools/utensils
- washing-up bowl
- sponge
- dishwashing liquid (*ecover*)

Needs *(reflect and write down)*
- _____
- _____
- _____
- _____
- _____

turn page to continue writing

Eating habits
- healthy food
- vegetables
- uses oven (cleans grills by handwash)

"I use only water [no soap] with glasses that had water, juice or wine. Coffe, tea and milk mugs need soaping"

1UK - Mark — Clean freak-environmentalist

continue writing Mark's needs

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Mark is in his forties and lives with his wife Joan. House chores are distributed between him and his wife, they say it is all about **teamwork**. Mark is the one that generally does the washing up. Manual washing up is regarded as reliable in terms of **hygiene perception**; nevertheless they do have an **electric dishwasher** to help with time management and because of their busy lifestyles. Items that are good to go in the dishwasher are always **pre-rinsed thoroughly** before, turning the tap on and sponging the plate (or other item) under the running tap. This occurs right after the item was used.

When there is the odd item that lies dirty in the dishwasher but is needed right away, it is washed by hand **under the running tap**. Otherwise, all the washing up happens with the use of a washing up bowl once a day, generally in the evenings after dinner.

After using a dish or other item, it is placed next to the sink (right hand side) to "wait" until the wash-up.This contributes to an easy access to the tap keeping the sink clear for an easy tap access.

Foam is regarded as a sign of hygiene and an indicator of having enough soap to battle grease and bacteria.

The water contained in the washing up bowl after a wash, is kept there for around 30 minutes, to wash up any items that might have been forgotten. At the end, the water is disposed of either directly to the drain or **reused** to water plants or do the first rinse of **recycling** bottles or cans. Then the bowl is rinsed with the open tap, as is the bottom of the sink and surfaces.

In the case of recycling, it was observed that containers would be filled with little water, then shaked with the lid on, and the process repeated. This comes very different from Elaine's way of rinsing recycling (overflowing with open tap).

2UK - Graham — Husband with little baby

Background

Graham is a british designer, he is married to Brenda and they have a one year old daughter. Graham avoids washing the dishes, and even though they he is supposed to do it three times a week, he often tries to *get out* of his duty. He takes a long time when doing the dishes, he says he is a "perfectionist". Brenda, on the other hand, prefers saving time over a perfect quality. Graham says dirty dishes are never-ending.

"I start by washing the least dirty items"

Other uses of the sink:
- Wash baby's toys
- Rinse vegetables
- Rinse pasta and other meals

Use of washing media

Let's draw a picture of that:

"when the water in the sink gets gray and greasy, it's time to change it"

About him:
- In his 30's
- Has a little daughter (3 person household)
- Often has people over for dinner (=more dishes)
- Sometimes he does the washing-up, sometimes it's his wife

Motivation
- He **hates** washing dishes, often tries to avoid it.
- He takes a long time and it often gives him a **backache**.
- Chatting with Brenda or having an ipod on help him bear with the task.

Washing-up process
- Some dishes pile up in the sink throughout the day. Before washing up he places all dirty items next to the sink. Using a brush and the running tap, he cleans the sink's bottom and walls, rinsing regularly the brush.
- Turns on the hot tap and when the temperature is hot enough, he places the plug in the bottom of the sink and as it fills up, he adds a squirt of washing liquid, which foams-up. Once the sink is 3/4 ful he turns off the tap and places inside the sink the least dirty items, and proceeds to wash-up.
- He grabs an item from the sink, scrubs it with the handbrush, he inmmerses it (dips) in the water to get rid of food residues and places it to drip-dry (no rinse). He uses a sponge for glasses. When he finishes, he uses the full sink to soak burnt dishes, or simply takes the plug out and the water goes down the drain.

Space for washing-up
- Single bowl sink with a central half bowl, used to dispose of liquid substances when sink is in use.
- Mono tap with two handles (H + C)
- Removable drying rack

Use of water
- He washes always with the full sink, using a set amount of water. Even if he get's distracted or takes a long time to do the washing up, it does not affect the amount of water used.
- He does NOT do a final rinse after scrubbing, soapy water from items drips from them in the drying rack.
- He reuses the sink water he washed-up with to soak pans and dishes with stuck-on food. He washes those the day after, with a new full sink with soapy water.

Washing-up tools/utensils
- sink plug
- hadheld brush
- sponge/scourer (glasses)
- dishwashing liquid
- plastic gloves

Needs *(reflect and write down)*
- _____
- _____
- _____
- _____

turn page to continue writing

Eating habits
- washing loads of baby bottles and pap containers
- loads of vegetables
- often uses oven (washing pyrexes and oven-grill)
- often bakes cookies and cakes

"hot water cleans better. When there is no foam left, then the water needs changing"

2UK - Graham — Husband with little baby

continue writing Graham's needs

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"I start by washing the least dirty items"

Use of washing media

Let's draw a picture of that:

"when the water in the sink gets gray and greasy, it's time to change it"

Foam is regarded as an indicator of the quality of the soaking **water**, when foam disappears it's time to change the water. He follows an **order** to wash the dishes, starts by soaking the glasses and least dirty items, and the proceeds with greasy ones. When there is **burnt** Pyrexes or dishes, he does the washing and leaves the dish **soaking** in the same water overnight.

The **drip-drying** space is a **slowdown** for the process, as it gets full quite quickly and so he must stop the washing up until that dries, and only then he can continue the washing up.

Another drawback that Graham recognizes from manual dishwashing is the position one must take, as it gives him a **backache.** Also, the factor of it being such a **dull** the activity. Something **fun** or **distracting** in the washing up routine would make it more bearable for him.

"hot water cleans better. When there is no foam left, then the water needs changing"

3UK - Elaine

Seeking comfort!

Background

Elaine comes from England, she works as an accountant and lives with her husband Frank. She rarely does the washing-up since they bought an electrical dishwasher 2 years ago. Frank is now in charge of loanding the dishwasher and doing the rest of the manual washing-up.
When they go to dinner at her son's or at a friend's Elaine is the one that ends up doing the washing-up. "why don't they have a dishwasher? it would make it all a lot simpler".

"when I bake, I end up using loads of dishes, more than I should or needed, but it doesn't really matter, I just put them in the dishwasher and *voila*, they get clean"

"I know I always use more washing liquid than needed, especially when pans are greasy"

About her
- In her 50's
- 2 people household, they eat small portions of very healthy food (rarely greasy)
- She used to do all washing-up manually, but they recently purchased a dishwasher

Motivation
- She doesn't dislike dishwashing, but she feels that if she didn't have the dishwasher, she would spend her whole time washing-up.
- She likes to think that the dishwasher sterelises the dishes, so she considers it very hygienic.

Dishwashing process
- After using any item, they lightly rinse it under a running tap and and leave with a bit water until the evening, when Frank loads the dishwasher.
- They wash (by hand) the things that don't fit the dishwasher. Frank places the plug in the bottom of the sink, squirts washing up liquid and fills the sink up with water. Frank then uses dishwashing liquid directly the brush or a scourer to sponge the plates and place them in the drying rack.

- **Space for washing-up**
  Single bowl sink, with a central half bowl and an integrated flat drip-drying surface with no
- drying rack (see picture).
  White surface that stains easily. Dishes go inside the sink to "hide" them until the eveninig (wash-up + dishwasher)

- **Other uses of the sink**
- Washing recycling packaging
- Leave soaking breakfast dishes during the day.
- Needs tap access for kettle
  Hide dirty dishes from eyesight.

Use of water
- She runs the dishwasher only when full or almost full
- Rinses dirty items right after using them and places them inside sink. Rinses **again** before loading the dishwasher (one by one under the running tap).
- Uses vast amounts of soap when doing the dishes by hand.
- Uses a lot of water when rinsing recyling: she places them under the running tap and waits until they are full and water starts coming out clean from them (overflow). Twice.

Washing-up tools/utensils
- Sponge/scourer
- Brush
- Dishwashing liquid

Needs *(reflect and write down)*
- _____
- _____
- _____
- _____

turn page to continue writing

Eating habits
- Healthy eating: salads, vegetables and fish.
- Makes herself *lunch* to take to work (a sandwich or fuit)

"about a year ago we changed our eating habits, now we eat healty and that reduces the amount of plates and pans to wash, we hardly ever eat greasy food"

3UK - Elaine

Seeking comfort!

continue writing Elaine's needs

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"when I bake, I end up using loads of dishes, more than I should or needed, but it doesn't really matter, I just put them in the dishwasher and *voila*, they get clean"

In her home, dishwashing is a task to **avoid** at all costs, everything that fits in the **electric dishwasher** would get washed there. Only big pots and pans, and oven trays are washed by hand. Nevertheless, all dishes and mugs, and in general, most items used, are first **pre-rinsed** before placing them in the dishwasher.

Elaine turns on the tap and lets the water flow directly onto dirty dishes, leaving them soaking in the sink during the day. Then in the evening she **rinses** them **again** and either places them in the dishwasher or sets them aside to start the washing up process by hand. Any food residues are removed either by hand or with a washing **brush** before placing the items in the dishwasher.

Recycling is also rinsed twice beneath the tap, until water overflows- and much water is used this way.

Elaine recognizes that since they have a **dishwasher**, the use of items [plates, cutlery] whilst cooking and eating has **increased**, as it is no longer a problem to wash up [or dirtying up items is no longer seen to have the consequence of hard work in washing them up]. There is then a marked **dependence** on the electrical dishwasher, for time purposes, hygiene perception [thought to be better achieved with ultra-hot dishwasher] and an overall avoidance of the task.

For Elaine, having aTV or other gadgets in use when doing the dishes is very important, to provide some sort of distraction and make the time go by faster.

4UK - Mary — Working mum

Background

Mary is British, mom of two children: Jen (11) and Alex (8). She is married to Tom. They often use the electric dishwasher, but despite this there are always plenty of items that they wash-up by hand: glasses, the teapot, oven grills, cutlery and other items that are of common use and can't wait until the dishwasher runs (a couple of times a week). They do not have a water meter, and so they have no idea of the actual amount of water they consume, or if their consumption varies during the year. They pay a fixed amount twice a year.

"if there are glasses that only had water in them, then I just rinse them with water, no need for anything more"

"the area around the kitchen sink is a central point where family members leave messages and notes to the others"

About her

- Working mum in her 40's.
- Shares housechores with Tom, her husband
- They have breakfast and dinner at home. Luch is at school or work.
- Uses an electric dishwasher, runs it only whith full loads. Still needs to wash-up some items by hand.

Motivation

- Vicky reckons that it is much better when there is someone with her drying up the dishes with a teatowel. It keeps her company and that way she can do the whole lot of dishes without running out of spsace to let them dry.

Washing-up process

- She places the plug in the bottom of the sink, opens the hot tap and adds a squirt of wasing liquid so that with the water flow it foams-up.
- They have a big sink, and so she doesn't let it completely fill, she turns off the tap when it reaches about 3"deep. If there are many items to wash, she reuses the same water, even when she stops for a while and then continues with the washing up. If an item is too oily, she adds washing up liquid directly onto it. She stops washing when the drying area is full, waits for the items to dry and then puts them away and then continues washing-up.

Space for washing-up

- Big ceramic single bowl sink (they are careful with the items they wash, not to chip the sink)
- No drying rack, place washed dishes next to sink on a tea towel (see picture).
- Surface next to sink made out of treated wood.

Other uses of the sink

- handwash clothes
- rinse recycling packaging and bottles
- dispose of liquid wastes (remaining of soup, coffee, etc.)

Use of water

- Water used to rinse things remains in the sink (with the plug) throughout the day, so that more items can be let to soak there until the "real wash" is done.
- There is an important amount of water wasted whilst waiting for the temperature to get hot enough to fill the sink for the wash-up.

Washing-up tools/utensils (see bottom left photo)

- Sponge
- Metalic scourer
- Brush for dishes
- Brush for cleanning the sink.

Needs *(reflect and write down)*

- _____
- _____
- _____
- _____
- _____

turn page to continue writing

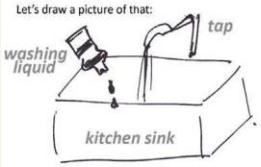
Eating habits

- Kids have often people over, and *fun* meals are cooked. Cakes, muffins and pancakes are common [and many dishes are needed to make them]

"I really hate the food rests that remain in the bottom of the sink after doing the washing-up. It takes me a while to get that clean"

Use of washing media UK

Let's draw a picture of that:



4UK - Mary — Working mum

continue writing Mary's needs

Mary has a full 5 person household, and so she finds having an electric **dishwasher** a very convenient and practical thing. Nevertheless, she does find that there are plenty of items that she prefers to be **washed by hand** (such as tefal items, cutlery, glass items, big pots and pans).

When washing up, she opens the tap and waits for the water to be at a "hot" temperature (subjective to her point of view), sets the plug, pours a squirt of dishwashing liquid and lets the water fill the sink up for about 3". In the meantime, Mary starts washing glasses and other not-so-dirty items in the soapy water, scrubbing with a cloth (at the same time as the tap is filling the sink). She **does not rinse** the soap suds off most items, only if it is a transparent bowl or a glass.

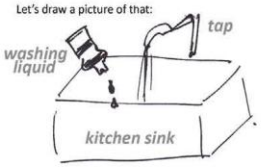
At the end she places the item in the right hand side worktop to dry. Drip-drying space is an aspect that needs improving, as she has only the flat workspace that she uses as dying board –not very volume efficient.

She leaves the used water in the sink, to keep reusing it for that same wash (if there are more items coming). When the washing-up is done, Mary takes out the plug, and lets the water drain, she uses a wet cloth to finish cleaning the surfaces next to the sink.

Hot water is used for hygiene reasons and to help cutting through grease. Having the sink clear from bulky items is important for Mary, as she often needs easy tap access to fill kettles or jugs of water.

Use of washing media UK

Let's draw a picture of that:



5UK - Claire — house-sharing

Background

Claire is British, she is in her twenties and lives with 3 other girls. She is a painter and professional swimmer, so she has quite a busy life and spends little time at home, even less in the kitchen. She still manages to use many items when she cooks, specially when she has people over for dinner.
She doesn't mind dishwashing, and often does it in "automatic pilot", always thinking of something else more important than dishwashing, which makes her often forget turning the tap off when she is washing up.

"when I have company and am washing the dishes, I take more time in soaping and scrubbing, to show I really clean the dishes"

her sketch

"I often only rinse glasses, I only wash them properly if they had coffee or black tea"

About her
- British, in her 20's
- Into sports and health
- Sharing house
- Cooks for herself, cleans up her own mess
- Doesn't have an electric dishwasher

Motivation
- She does not wash-up because she likes it, but because she must clean up after herself, as all her housemates do, otherwise the house would be a chaos.
- For her, the quickest the better, even if it means having not-so-perfect results. And so sometimes her housemates find her hygiene standards are not enough and find themselves re-washing the dishes. Her mind is always somewhere else when washing-up.

Washing-up process
- She places the dirty dishes next to the sink.
- Then uses a washing-up bowl half full with foamy-soapy water . She starts washing the "easy stuff" and at the end she leaves soaking in the bowl the bigger pots and pans she used, leaving them until the day after. Foam is important for her:

bubbles = cleanliness

Space for washing-up
- She has a single bowl sink with a central half bowl and a flat drip-drying surface with no drying rack.
- She often uses a round washing-up bowl inside the sink.

Other uses of the sink:
- Place used tea bags to drip,
- Dispose of ground coffee from the filters (rinse away with water from the tap)

Use of water
- The washing up bowl used is smaller than the sink, and so less water is used when filling it up. (see pic on the right)
- **If there are only an handful of items to wash** [happens often] she doesn't bother with the washing up bowl and washes by opening/closing the tap: she often leaves it open throughout the process and much water is wasted.

Washing-up tools/utensils
- sponge
- washing-up liquid
- *washing-up bowl*

Needs *(reflect and write down)*

keep the sink clean, it gets messy when everyone "washes up" and doesnt do a proper cleanning

turn page to continue writing

Eating habits
- loads of salads
- chicken and fish with different sauces, most of them stain the dishes and *tupperwares*

"dishwashing would be more entretaining if I had some fun and interesting utensils"
(see Claire's drawing on the left)

5UK - Claire — house-sharing

continue writing Claire's needs

her sketch

"I often only rinse glasses, I only wash them properly if they had coffee or black tea"

Claire lives in a **shared** house and has little care about dishwashing. She often eats little and with no grease, and so the washing up is quite **quick**. She makes it quick, and prefers **time saving over quality or hygiene.**

Dishwashing is considered to have a **low importance** in the chores list. Big pots and pans, along with items with burnt food attached to them are filled up with water to soak before being washed, for ease and practicality.

Hot water is used, first, for comfort [in cold weather] and second, for ease with the greasy items.

If she only has a few dirty items she doesn't bother with the washing-up bowl. She squirts **dishwashing liquid into each item** and sponges with the open tap. She **doesn't rinse** afterwards.

There is a need or wish of novelty and **fun** to be introduced into the manual dishwashing process.

"dishwashing would be more entretaining if I had some fun and interesting utensils"
(see Claire's drawing on the left)

MX1 Mariana

Joven profesional en habitación compartida

Background

Marta tiene 25 años, es diseñadora y vive en un depa en Santa Catarina con otras 2 profesionistas. Como trabajan, se ven sólo de vez en cuando, y por lo mismo no cocinan ni comen juntas.
Marta desayuna y cena en casa, y se prepara en las noches un *tupper* de comida para la oficina.
Tienen a una señora que viene hacer el aseo dos veces por semana, por lo que el día antes de que vaya no lavan los trastes, sino que los dejan para que ello lo haga. El resto de los días *supuestamente* cada quien lava lo suyo. No tienen lavadora de trastes automática.
Cuando Marta necesita algo que está sucio, lava solamente esa cosa y deja el resto para después.
No le encanta lavar platos, pero poner su ipod con música le ayuda a tolerarlo más. Lo malo es que muchas veces se distrae (platicando o haciendo otra cosa) y se le va la onda mientras enjuaga o limpia algo y deja la llave abierta por tantito tiempo.
Tiene fregadero doble, en uno enjabona y en el otro enjuaga. Y cuando termina, al limpiar el fregadero la espuma pasa por la tubería de un fregadero al otro, y se usa mucha agua para que se disuelva la espuma.

"me choca cuando otra gente lava platos y deja la esponja con restos de comida"

Características
- Joven
- Activa
- Tiene 2 roomates
- Desayuna y cena en casa
- La comida la prepara en tupperware para la oficina

Motivación
- No le gusta lavar platos
- La música de su ipod la mantiene entretenida cuando tiene mucho que lavar
- Cuando sabe que va a venir la señora a lavar al dia siguiente, de plano deja los platos sin lavar

Proceso de lavar los platos
- Enjuaga las cosas y las deja al lado del fregadero para luego lavarlas
- Con la esponja y el agua jabonosa enjabona los platos y utensilios, los pone en uno de los fregaderos. No usa agua ahorita.
- Abre la llave y enjuaga, poniendo los platos en el escurridor.

Espacio para lavar platos
- Fregadero doble
- Mono-llave con dos manijas
- Escurridor extra
- Espacio de los dos lados del fregadero

Otros usos del sink
- poner los hielos durante una fiesta
- lavar verduras abajo del chorro de agua
- lavar latas antes de abrir
- descongelar pollo o comida en el chorro
- tirar liquidos echados a perder

Uso del agua
- Cierra la llave al enjabonar, pero usa bastante agua al enjuagar los trastes y al limpiar la t*ela yes (magitel)*. Se enjuaga las manos varias veces al cocinar.
- Al enjuagar, dirige el agua con una mano para que caiga done le quedan burbujas a los trastes

Utensilios al lavar
- Tupperware para agua y jabon
- esponja
- jabón liquido
- tela yes
- agua!

Necesidades
- Se distrae y deja abierta la llave mas de lo que necesita al lavar.

Hábitos alimenticios
- Cereales y galletas de desayuno
- Comida mexicana
- Salsas
- Frijoles y moles
- Pasteles y brownies
- Muchos platos sucios

Tiene un 'ritual'

"me gusta pre-enjuagar los trastes después de usarlos para dejarlos sin restos de comida, y así si los lavo después no tienen cosas pegadas y es más facil"

Su método: pre-enjuaga - reposar - enjabona - enjuaga - secar

MX2 Adriana

Madre de familia vive en depa

Background

Adriana es arquitecta retirada, viuda y mamá de 3 hijos. Viven en un depa en Monterrey. La hermana de Adriana vive con ellos también, tiene parálisis cerebral. Adriana usa muletas para caminar por haber tenido tuberculosis en su juventud. Cuando lava los platos lo hace sentada en una silla de ruedas, y por lo mismo es difícil alcanzar las llaves para abrir y cerrarlas. Tienen una muchacha que viene a hacer el aseo y cocinar tres veces a la semana. Sus hijos ya son *grandes* (el más chico acaba de terminar la carrera) y casi nunca lavan los trastes. Los días que no viene la muchacha, Adriana trata de evitar que los trastes se apilen, lavando algunas cosas de vez en cuando. Lo *grande* y difícil de lavar lo deja para la muchacha.

"cuando lavo sartenes, ollas y cacerolas las remojo un rato antes"

"siempre me tardo al tratar de quitar con agua TODO el jabón lavatrastes "

Características
- En sus 50 y tantos
- Usa muletas
- Vive en departamento con 3 hijos y su hermana
- Cada quien tiene sus horarios de comida
- La muchacha viene y lava 3 veces por semana

Motivación
- Le gusta que todo este limpio en casa, por eso lava (no porque le guste)
- Si va a venir la muchacha, no lava el dia anterior

Proceso de lavar los platos
- Los platos se acomulan durante el día en las dos tarjas. Al empezar a lavar enjuaga el *tupper* del jabón, y le pone agua y jabón nuevos. Abre la llave y pasa el chorro de agua en los dos fregaderos, pre-enjuagando los platos que tengan restos de comida. Pone todo lo sucio de un lado, luego enjabona con la llave cerrada empezando con lo menos sucio. Cuando se medio llena la tarja de enjabonados, empieza a enjuagar y pone a secar en el escurridor. Luego enjabona el resto y enjuaga. Al final limpia toda la superficie de trabajo con la *magitel*, la enjuaga con jabón y extiende.

Espacio para lavar platos
- Fregadero doble
- Mono-llave con dos manijas
- Escurridor extra
- Espacio de trabajo en un solo lado del fregadero

Otros usos del sink
- Pelar fruta
- Preparar carne (plato para empanizar en sink)

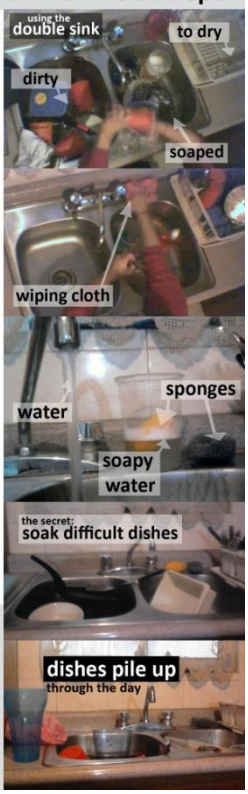
Uso del agua
- Le gusta lavar con agua caliente lo grasoso, pero como tarda en calentarse, usa el agua tibia/fría del principio para los vasos y cosas no grasosas.

Utensilios al lavar
- Tupperware para agua y jabón
- esponja
- jabón liquido
- tela *yes/magitel*
- agua!

Necesidades
- por facilidad, deja abierta la llave en todo el proceso de lavado.
- accesibilidad
- hace falta espacio de trabajo (cocina chica)

Hábitos alimenticios
- comida frita (grasosa)
- comida mexicana y salsas
- frijoles y moles (textura masocotuda)
- sandwiches y hot dogs (para esto usan desechabes)
- muchos platos sucios que se apilan en el sink

"Uso mucho jabón porque siento que la espuma es lo que limpia los platos. Luego me tardo en enjuagar porque no me gustan los residuos de jabón en platos limpios"



MX3 María — Empleada doméstica

Background

María es empleada doméstica en una casa de Monterrey donde viven una pareja y sus 3 hijas (2, 8 y 15 años). El trabajo de Gaby es *"asear la casa y siempre tenela limpia"* . Ella trabaja y duerme en la casa todos los días, y tiene el domingo libre.
Tienen una cocina grande con un fregadero de doble tarja y un escurridor que 'esconden' en la alacena cuando no se usa, para que la cocina se vea despejada. Los platos sucios los ponen en una de las tarjas, la otra se mantiene limpiecita porque ahí solo seponen trastes enjabonados, asi es *"más higiénico"* (dicen ellos).

"algo está limpio cuando se ve limpio y HUELE a jabón"

"pongo los platos en el fregadero hasta que se llene y luego los lavo"

Características
- Vive en casa de sus patrones
- Prepara la comida y lava todos los días, menos el domingo
- Le dicen que debe hacer
- Ensucia muchos trastes al preparar la comida

Motivación
- De las tareas de la casa, lavar los trastes es lo que más le gusta, porque es *"fácil"*
- Lava después de cada comida, para que se vea limpia la cocina

Proceso de lavar los platos
- Los platos se acomulan en una de las tarjas en el día y mientras María prepara las comidas. Cuando empieza toma un plato o vaso, y si tiene comida o residuos abre la llave y lo medio enjuaga, luego enjabona con la esponja que había sumergido en el agua jabonosa. A veces deja la llave abierta entre plato y plato si *'cree'* que va a enjabonar rápido, para no abrir y cerrar al quitarle los residuos (ahorro de tiempo). Pone los platos enjabonados en la otra tarja. Cuando ya esta todo con jabón, desliza la llave al lado de la otra tarja, abre la llave y enjuaga los utensilios uno por uno (también cubiertos), poniéndo cada cosa a secar en el escurridor. Al final limpia las superficies muy bien con la *magitel*, para que no queden marcas de jabón o gotas en el acero inoxidbale.

Espacio para lavar platos
- Mono-llave con una manija de temperatura
- Fregadero doble
- Escurridor extra-removible
- Mucho espacio alrededor (inox)

Uso del agua
- Le gusta lavar lo grasoso con agua caliente, y mucho jabón. Al terminar de lavar, usa mucha agua para limpiar las superficies de trabajo con la esponja y la magitel. Se lavan las manos mucho también en la cocina, y dejan la llave correr al enjabonarse.

Utensilios al lavar
- Tupperware para agua y jabón
- Esponjas distintas para distintos tipos de utensilios
- Jabón liquido
- Tela *yes/magitel*
- Agua, caliente para cosas grasosas

Necesidades/peculiaridades
- Se distrae con el teléfono que suena, o la tele, o gente que le habla, y a veces deja la llave abierta
- Se tarda más de lo necesario con la llave abierta al enjuagar trastes (en promedio por traste)

Otros usos del sink
- Lavar frutas y verduras
- Lavar los trapos de la cocina

Hábitos alimenticios
- Comidas con varios platos acompañantes
- Picar entre comidas (más platos)
- Comida de bebé (y utensilios de bebé)
- Comida mexicana

"el fin de semana usan la lavadora de trastes, a mi patrona no le gusta lavar los pone ahi y se lavan solos"

4 Daniela — Esposa joven, sin hijos

Background

Daniela es una joven emprendedora de 26 años. Tiene una empresa de diseño industrial que le absorbe muchísimo tiempo de su día, le echa todas las ganas porque está aún arrancando. Daniela vive con su esposo Eric, de 32 años. Él es ingeniero y también trabaja de tiempo completo. tienen 2 perros que viven adentro de la casa. El papel de Daniela es de todóloga. Como los dos trabajan, siempre comen fuera, y desayunos y cenas son comidas rápidas y fáciles de preparar. No ensucian muchos platos, y generalmente dejan algunos platos sin lavar, hasta que Daniela tiene tiempo de hacerlo, o hata el sábado, que viene la muchacha.

"cuando lavo sartenes, ollas y cacerolas les pongo agua y los dejo remojar para después lavar"

"cuando lavo los trastes me fijo en que se vean limpios, o sea que no quede comida o grasa "

Características
- Joven
- Muy activa, siempre corriendo
- Son sólo 2 en la casa
- No tiene lavavajillas

Motivación
- Lava cuando se juntan muchos platos en el fregadero. A partir del jueves los deja, para que se acomulen para la señora de la limpieza del sábado. El domingo se usan desechables.
- Para nada le gusta lavar platos, ahora es como *'su tarea'*, y Eric no ayuda... antes ella lavaba y el secaba al mismo tiempo, y esto hacia mas agradable la tarea.

Proceso de lavar los platos
- Empieza enjuagando vasos que solo hayan tenido agua, y poniéndolos a secar en el escurridor. Pone los platos sucies al lado del sink, y empieza a enjabonar vasos y platos, poniéndolos adentro del fregardero, abriendo y cerrando la llave para quitar residuos de comida o enjuagar la esponja. Cuando se llena el fregadero empieza a enjuagar y poner en el escurridor. Al final hace los sartenes y cosas grandes. Los deja remojar antes de lavar.

Espacio para lavar platos
- Fregadero sencillo (una tarja)
- Mono-llave con dos manijas
- Escurridor extra, chico (para dos *sets* de platos)
- Poco espacio de trabajo

Otros usos del sink
- Lavar el filtro de la pecera
- Lavarse los dientes después del desayuno
- Tirar el agua de las latas (elote, atún, etc.)

Uso del agua
- Lo que le importa a Daniela es el tiempo, entre más rápido lave, mejor. Es por eso a veces deja abierta la llave entre que enjabona y enjuaga

Utensilios al lavar
- Tupperware para agua y jabón
- esponja
- cepillos (2)
- jabón liquido
- agua!

Necesidades
- Le gustaría poder:
- enjuagar más rápido,
- tallar menos los platos,
- remojarlos antes de usar el jabón
- hay utensilios que no caben en el fregadero, y necesita dirigir el agua con las dos manos (foto)

Hábitos alimenticios
- comida rápida de preparar
- sandwiches,
- huevos revueltos,
- cereales
- tacos

"Se me hace frustrante que se junten los platos en el fregadero, porque luego nos da aún más flojera lavarlos"

MX5 Verónica

Ama de casa, relaaax

Background

Verónica es ama de casa, vive en un depa de un piso junto con su esposo, su hijo y un perro chihuahua. Su trabajo en casa es "hacer todo". Ella es la única que lava los platos en casa. Generalmente no cocina, sino que compra compida preparada (que viene en platos desechables) y luego los pasa a platos normales a la hora de comida.
Dos veces a la semana viene una amiga suya y sus hijos a comer, a veces comen directamente de los desechables, en especial los niños.
Para Vero, el lavar los platos es un tiempo de reflexión y de pensar, le gusta ver por la ventana cuando lava, así se distrae.
Bien interesante, porque cuando hace frío lava con agua caliente, y cuando hace calor con agua fría.

"mi esposo usa muchas tazas de café, cada café es una taza nueva"

(porque se le olvidan por la casa y se le hace fácil agarrar otra en lugar de encontrar la suya)

"cuando lavo los trastes me fijo en que se vean limpios, o sea que no quede comida o grasa "

Características
- 30 y tantos
- Pinta y hace manualidades durante el día
- No tiene lavavajillas

Motivación
- Al final del día lava todo junto.
- Aprovecha el tiempo de lavar los platos para pensar y reflexionar, tranquila. Le gusta.
- Enjabona los platos con la llave cerrada, porque si no, *"me presiona que este corriendo el agua, y lavo más rápido y los platos no quedan bien limpios"*

Proceso de lavar los platos
- Pocas veces tiene más cosas que un par de platos y *muuuchas* tazas y vasos. Éstos se acomulan en el sink durante el día, los platos y bowls de salsa los enjuaga antes de dejar en el fregadero. Primero enjabona vasos y tazas, y los enjuaga de un jalón. Cambia el agua del jabón, y enjabona cubiertos y platos, luego enjuaga de un jalón. Si con los vasos y tazas se llena el escurridor, entonces deja el resto para después que se sequen las tazas (al temp. ambiente) y las pueda guardar, y luego sigue lavando. Al final limpia con la magitel la superficie alrededor del fregadero, y el fregadero, enjuaga y lo vuelve a hacer.

Espacio para lavar platos
- Fregadero sencillo (una tarja)
- Mono-llave con dos manijas
- Escurridor extra, plástico

Otros usos del sink
- Lavar frutas y verduras
- Lavar los pinceles (pinta con acrílicos)
- Tirar el agua de las latas (elote, atún, etc.)

Uso del agua
- Se lava muchas veces las manos en la cocina, y cuando se enjabona no usa agua, pero la tiene abierta.
- Enjuaga las esponjas varias veces y cambia el agua del jabón cada que cambia de vasos a platos o cubiertos.
- Usa mucho jabón y por lo mismo usa bastante agua para quitarlo todo de los platos

Utensilios al lavar
- Tupperware para agua y jabón
- esponjas (3 diferentes)
- jabón lavatrastes líquido
- jabón lava-manos
- agua!

Necesidades
- Que su esposo deje de usar tantas tazas, esto hace que tenga que lavar más y use más agua.
- No le gusta secar, así que cuando el escurridor se llena deja de lavar.

Hábitos alimenticios
- comida preparada
- pan con mantequilla por las mañanas y
- mucho café

"utilizo 3 tipo sde esponjas, una suave para los vasos, fibra para sartenes y una tejida para platos y cubiertos"

enjoys looking through the window while washing dishes

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Appendix G

Appendix G: Design studies coding scheme, codes and definitions

Understanding the user phase	
UNDuser_PERS_FAMconxt	Use of personas to familiarize himself with context of use of the product
UNDuser_PERS_PRITY	Prioritise the Personas' needs to design
UNDuser-PERS-IDneed	Use of Personas to identify the user's needs to cover by design
UNDuser-XTRsrc-JUDG	Use of sources of information other than the Personas, making judgement or assumptions from own opinions
UNDuser-XTRsrc-psyc	Use of sources of information other than the Personas, research on psychology theories of happiness and behaviour
UNDuser-XTRsrc-LITwup	Use of sources of information other than the Personas, research on literature on the washing-up subject (manual or by electric dishwasher)
UNDuser-XTRsrc-SLFexpl	Use of sources of information other than the Personas, trying out "their ways" hands on, to empathise with users
UNDuser-PERS-MIX	Uses Personas to make an "average user" by mixing their needs.
UNDuser-Nopers	No use of personas during the "understanding the user" phase
UNDuser-PERS	example of comments on using personas
Concept design phase	
CPTdes_IDEAgen_BRAINST_DfSB	Use of DfSB techniques in brainstorming in the idea generation stage of concept design
CPTdes_IDEAgen_PERS	Generation of ideas and concepts using specific personas as an inspiration or basis
CPTdes_IDEAgen_SELFref	Use of own ideas, perceptions or experiences in the idea generation stage
CPTdes_CPTdev_SKTCH	Use of only sketches and drawings in the concept development
CPTdes_CPTdev_MCKUP	Use of messy mock ups to develop ideas and concepts
CPTdes_CPTdev_PERS_imPERS	Referring to the users as PERSONAS and not by their names
CPTdes_EVAL_PERS	Evaluation of different ideas based on the Personas' needs and wants
CPTdes_EVAL_FEAS	Evaluation of different ideas based on the feasibility of the idea
CPTdes_EVAL_PERcmplx	Evaluation of different ideas based on the perceived complexity of the task that the user was to carry out
CPTdes_EVAL_WATERsave	Evaluation of different ideas based on the potential water savings
CPTdes_EVAL_SUStrdoff	Evaluation of different ideas taking into account different sustainability trade-offs

Design outcomes	
DESout_DESobj_DfSB_SMRTdes	Clever designs that make the product use less water by using a certain technology, or designing in a way that the water or soap use is restricted regardless of the behaviour
DESout_DESobj_DfSB_CONSC	Call for conscious resource use mostly by giving visual or audible feedback to the user about their water consumption
DESout_DESobj_DfSB_carr&stck	Reward or punish certain behaviours or amounts of resource use
DESout_DESobj_DfSB_choice	the user has the option to act sustainably thanks to the product design
DESout_DESobj_DfSB_ecosteer	the product has constraints towards certain behaviours or certain uses of water (*i.e.* stops after x amount of litres used)
DESout_DESobj_SAVEres_SOAP	Has as a design objective the responsible use of soap
DESout_DESobj_SAVEres_engy	Has as a design objective the responsible use of energy
DESout_DESobj_SAVEres_WATR	Has as a design objective the responsible use of water
DESout_DESobj_SAVEres_TIME	Has as a design objective an optimal use of time
DESout_DESobj_HYGN	Has as a design objective to maximise hygiene standards
DESout_DESobj_DUR	Has as a design objective durability by the easy replace of parts
DESout_DESobj_order	Has as a design objective to maintain order (visually) in the washing up area.
DESout_ADPT_RtrFIT	The outcome is an add on for current kitchens
DESout_ADPT_ACCSOR	the outcome includes accessories for different situations or elements to wash
DESout_ADPT_TAGT_SPEC	The outcome adapts specifically to the Personas
DESout_ADPT_TAGT_NOspec	The outcome could be adapted for non-specific users. *in this case, the "other" culture, either MX or UK
DESout_CMPLX_STATprt	Complexity of the chosen design to pursuit, made out of static parts
DESout_CMPLX_MOVprt	Complexity of the chosen design to pursuit, made out of parts that interact and move (*i.e.* mechanisms)
DESout_CMPLX_ELECTR	Complexity of the chosen design to pursuit, containing basic electronics
DESout_CMPLX_SMRTtech	Complexity of the chosen design to pursuit, containing more advanced technology that the designer might not understand. Assumes it works after a little research
DESout_DESnat_Tap	The outcome is a variation of a tap
DESout_DESnat_TOOL	the outcome involves a tool used in the washing up process
DESout_DESnat_SNKbwl	the outcome involves a redesign of the sink or washing up bowl
DESout_DESnat_GDGT	the outcome revolves around a new accessory or gadget
DESout_DESnat_system	the outcome goes beyond one product, into a system
DESout_DESmatur_IDEA	The outcome is in the form of a sketched idea
DESout_DESmatur_Functn	the outcome has the functionality sorted out or thought of
DESout_DESmatur_MCKUP	the outcome comes with a mock up
DESout_DESnat_DRY	the outcome involves an element for drying dishes

Appendix G: Design studies coding scheme, codes and definitions

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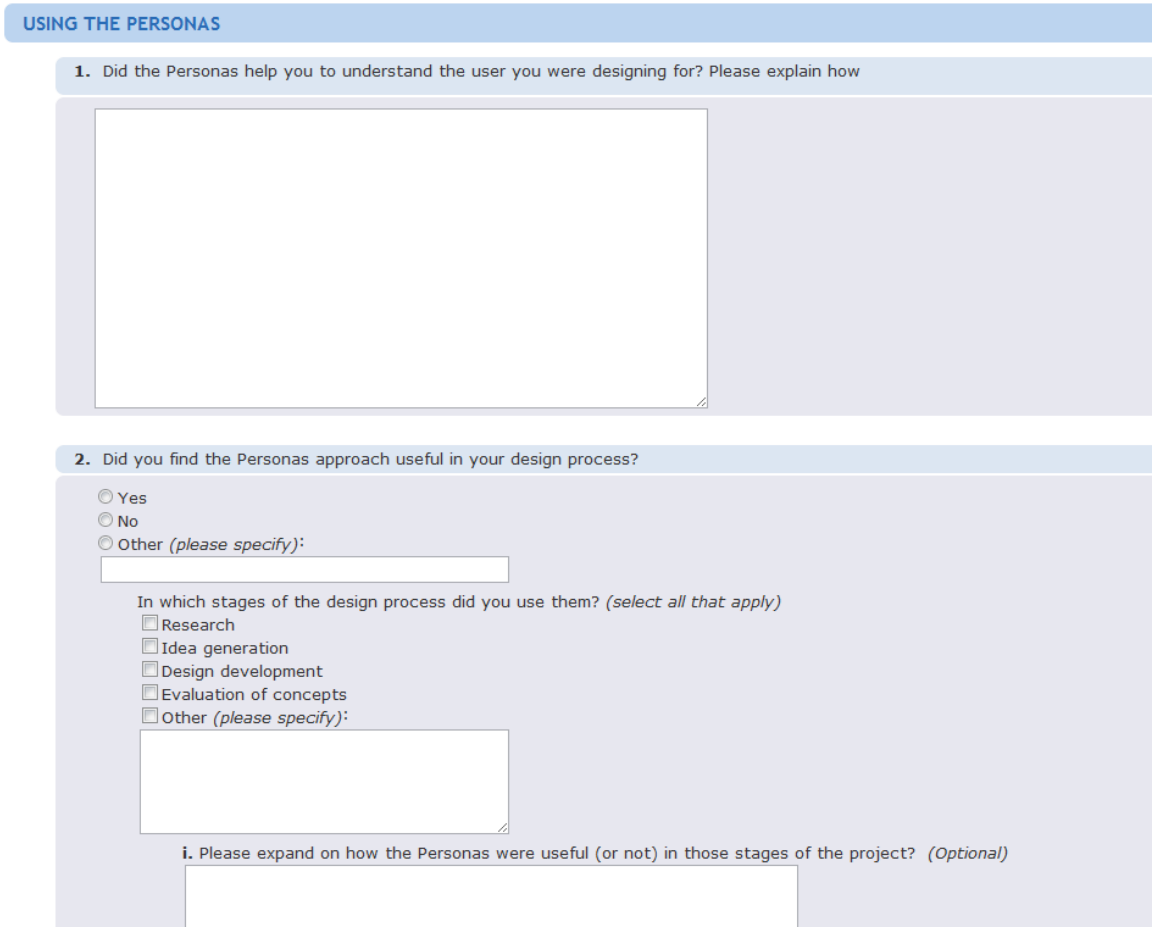
Appendix H

Appendix H: Feedback questionnaire after the design studies

The questionnaire was applied through an online platform (BOS), which appeared in the form of the image below. The questions themselves can be found right afterwards.



[Introductory page]

Hi guys!

It would help me loads if you could complete this short survey with some insights on how you felt during the sustainability course (particularly the part on Personas), and during the different stages of the design process. This survey is completely unrelated to the grading of your project. I would be extremely grateful if you could share with me your thoughts in an open, honest way, it would really help for my research, future teaching and better designing of support material (such as the presentations and the personas).
It was great working with you guys!

Thanks!

Gloria E.
Loughborough University,
Design School
G.M.Elizondo@lboro.ac.uk

Tell me about your project's design process...

Take a look at the questions below and reflect a bit. Try giving honest, open and detailed answers... I am interested in both positive and negative sides of your experiences!

thanks!

Using the personas

1. Did the Personas help you to understand the user you were designing for? Please explain how

[textbox]

2. Did you find the Personas approach useful in your design process?

- ☑ Yes
- ☑ No
- ☑ Other (please specify): [textbox]

2a. In which stages of the design process did you use them? *(select all that apply*

- ☑ Research
- ☑ Idea generation
- ☑ Design development
- ☑ Evaluation of concepts
- ☑ Other (please specify): [textbox]

2b. Please expand on how the Personas were useful (or not) in those stages of the project (optional):

[textbox]

3. Did you find you needed more information on the users to empathize with them? Did you have any doubts or find any gaps of information that you needed to fill?

- ☑ Yes
- ☑ No
- ☑ Other (please specify): [textbox]

3a. Did you use any other user research methods? (***i.e.*** did you carry out observation with any other users, or try out your designs with friends or some other people, did you ask around about how people washed up???)

[textbox]

3b. Please elaborate on which other methods you used, how and why? *(Optional)*

[textbox]

4. Could you describe how you used the Personas in your design process? (*i.e.* how did you interact with them? what exactly did you do with them? when?)

[textbox]

5. Did you find useful the information displayed in the Personas' posters? Would you have preferred the info to come in another format, or to be presented to you in a different way? Please comment and expand on your answers:

[textbox]

About YOUR design outcomes

6. Could you give a brief description of your product and its use, mentioning how it fits the user?

[textbox]

6a. Please describe how your product encourages a responsible water use?

[textbox]

Photos and images

If you have any photos or images from when you were designing and using the Personas, it would be very helpful if you could send them to me by email. I would be extremely grateful!

G.M.Elizondo@lboro.ac.uk

Thanks for your help

Thanks so much for completing the survey, it will certainly be extra-helpful in understanding how the presentation and use of the Personas were useful (or not) for you in your design process.
If you have any other comments, or feedback on it, please don't hesitate to email me, or comment on the text-box below.

PLEASE CLICK ON CONTINUE TO SAVE AND SEND YOUR ANSWERS!

Again, many thanks for your time and effort on this project!