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THE EFFECT OF CULTURE ON SUSTAINABLE BEHAVIOUR IN A DESIGN CONTEXT

Jak Spencer & Dr. Debra Lilley
Loughborough University Design School, UK.
Email: j.a.spencer@lboro.ac.uk

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ABSTRACT

Over the last few decades the consumption patterns of the world's wealthiest countries has led to the degradation of the environment and exploitation of the world's finite resources. The developed world currently consumes at a level that requires up to five planets' resources. The world average consumption, however, is a much lower 1.5 planets', which is brought down by the lower consumption rates and more sustainable behaviours of developing countries.

Culture is of particular importance, as the change in consumer culture in rapidly developing nations will have major consequences on global household resource use. Culture is a key factor in the formation of habits or routines that shape behaviours and lifestyles; however it has not yet been holistically explored in a design context. This paper introduces a cross-cultural comparison of everyday household behaviours from an extensive study between the UK, India and Brazil. The findings show that culture plays a significant part on the resource impact of households due to the formation of habits and routines, with particular regard to bathing habits, washing clothes, meat consumption and energy services and the design implications of this are discussed.

1. INTRODUCTION

Over the last two centuries the seemingly infinite demands of human activity have grated against the finite resources of the planet (Jackson, 2009). This intensity has accelerated rapidly since the end of the Second World War when the goal for continually increasing GDP through consumption led to the degradation of the environment and exploitation of the world's natural resources. Estimates are contentious, however many authors talk of 'peak everything' (particularly energy sources) whereby each year less resources are available to us for the same amount of effort to extract them (Heinberg, 2005). Coupled with this, rapid increases in development and growth in population, particularly in 'developing' countries, is putting even more strain on these already depleted resources.

Consumers play a key role in the depletion of resources. In Europe households account for 25% of total direct resource consumption (Kuijjer & de Jong, 2009). In the UK, per capita carbon emissions are 9.66 metric tonnes whilst in Brazil this is estimated to be 2.01 and in India just 1.16 (EIA, 2006). Economists tell us that this is due to simple economics; higher income means higher consumption. Whilst to some extent this is true, the few studies conducted on the subject of cultural influences on household resource use, namely by Whilite (1999), Matsushashi et al

(2010) and Elizondo (2012) have suggested that culture plays a significant role in the resource impact of household behaviours.

If we all lived like the average person from the UK we would require 3.4 planets to support our resource use. This figure jumps to five planets if we take on the lifestyle of the average North American. The reason that the world average is just 1.5 planets is due to the lighter impact countries with a lower GDP have. The average Indian resource use is just 0.4 planets, whilst even China currently consumes on a level equal to what the earth can provide (Global Footprint Network, 2010).

Design plays an important role in shaping the impact of human activity on the environment as it influences people and their surroundings and also acts as an interface between consumers and the activities of consumption (Bhamra et al., 2011). It can help to change conventional systems by influencing the environmental and social impacts of the life-cycle of a product or service. Historically, sustainable design has tended to focus on reducing environmental impacts during the manufacturing or disposal stages of a product, however more recently, research has focused on developing strategies to reduce the negative environmental and social impacts of product use by moderating users' interaction with them (Lilley, 2009).

This paper presents the findings from a global extensive study that is part of an on-going PhD project aiming to generate insights into the impact of culture on sustainable household behaviours and the role design can play in creating new products which result in less resource intensive use behaviours.

2. LITERATURE REVIEW

Research into culture in a design context is scarce, yet the research that has been conducted shows that culture can have a dramatic influence on behaviour. Part of the explanation for the limited research might be the ambiguity of the term culture itself which can be defined in many different ways. Trying to understand anything about everyday life in a human context can be described as a *cultural* research project (Wilhite, 1999). Wilhite (1999) describes a *cross-cultural* project as one that "explicitly aims to highlight cultural similarities and differences in one or another aspect of everyday life, and use them to open avenues of theoretical inquiry" (p.2). Other anthropologists have narrowed down traditional definitions of culture; the common themes that appear throughout are; the importance of symbolic values, shared knowledge and learned behaviour (Kroeber & Kluckhohn, 1952; Banks & McGee, 1989; Geertz, 1973). Culture is collective with people living within a defined social environment with shared patterns and perceptions which impact heavily on their attitudes and behaviours (Chau et al, 2002). For this research, culture has therefore been defined as: The shared patterns of behaviours, interactions and understanding learned by a collective group of people.

Behaviour is a topic of similar complexity. Literature regarding what shapes people's behaviour is extensive and originates from a wide range of different disciplines. Theoretical models have been developed that seek to understand the processes that influence people's behaviour. Models such as those by Ajzen & Fishbein (1980) and Schwartz (1977) suggest that either the beliefs or morals of the

person or the views of others will shape the intention or trigger a behaviour. These models, however, rely on behaviour being a deliberate cognitive process. In reality, behaviours around the home are formed as part of habits or routines with little or no cognitive thought past the first completion of the task (Goldsmith & Goldsmith, 2011, Jackson, 2005; Steg and Vlek, 2009). Tirandi's (1980) model includes internal (attitudes, values etc) and external (physical constraints, social practices etc) characteristics which are strongly related to a cultural context. Habits are built up over a long period of time with social, environmental, and contextual influences, and are affected by the *understanding, motivation, and ability* of individuals to change their actions (Abrahamse, 2005; Steg, 2008).

A major influence on behaviour is personal *motivations*. Social theorists argue that individuals' perceptions of themselves and others will determine behaviour (Steg and Vlek, 2009). Changing behaviour and consumption patterns to fit into a social order is common amongst consumers (Wilk, 2002). However, individual choice theorists argue that consumer's motivations come from weighing up the greatest benefit from the lowest cost (Steg and Vlek, 2009).

Motivational factors are not, however, the sole attribute to influence individuals' behaviour. The context or physical arrangement of an individuals' surroundings such as culture, social class, education, climate, geography, public policy, taxes, regulations, income, cost of goods etc. will also influence their behaviour (Stern, 1999). Habitual behaviour refers to a behaviour that is performed regularly, without reflection, to a re-occurring event that has already been solved to a users satisfaction; whilst cognitive behaviour is the result of a choice influenced by contextual factors, solved through reasoning (Jackson, 2005; Steg and Vlek, 2009).

As previously mentioned, research into the affect culture has on behaviour in a design context is fairly limited. Below, the main studies by Wilhite (1999), Matsushashi et al (2010) and Elizondo (2012) are discussed.

Bathing practices is one area that has been looked at in previous research largely because of its resource intensive nature. Studies in the Netherlands show that bathing is the single largest water consumption behaviour in the home, whilst in the UK bathing constitutes one third of all water consumption in the home (Dardel, 2008; Karakat, 2009). Matsushashi's cross-cultural study compared bathing habits in Japan, the Netherlands and India and noted that the Japanese bathing style was the most water intensive – using nearly 200 litres of water, the Netherlands averaged 50-100 litres by showering, and the Indian participants used the least water with 20 litres using a 'reservoir' bathing technique (2010). The research led to new innovative designs being created in collaboration with a leading bathroom manufacturer, with potential water savings of 90%, which are currently in testing in the Netherlands (Karakat, 2009; Kuijer & de Jong, 2011). Whilhite (1996), similarly, looked at bathing habits in Japan from an ethnographic viewpoint and noted that the bathing procedure is deeply rooted in Japanese culture, being used to cleanse as well as comfort. The resource intensity of the behaviour is due to numerous transitions between the shower and the bathtub, although inter-

estingly he suggests the whole family will bathe in the same water, with an element to reheat the water between users.

Wilhite has also looked ethnographically at space heating, cooling, and lighting between Norway and Japan. He suggests that these behaviours are deeply rooted in culture, as symbolic values are fixed in the social and cultural presentation of the home. He argues that energy intensive behaviours such as heating in Norway and bathing in Japan have become ‘cultural energy services’ and advises promoting technologies which provide the same cultural service with less energy (Wilhite 1999).

Work by Elizondo (2012) focused on exploring cultural differences in dishwashing habits between the UK and Mexico. Her findings showed great differences in the process of dishwashing between the two regions. Mexican participants used an ‘open/close tap’ approach to washing dishes, soaping the dishes and then rinsing them, whilst British participants filled a large bowl with hot, soapy water, and didn’t wash off the soap after cleaning. She concluded that energy related routines are based on habits influenced by people’s personal and environmental contexts. From these findings ‘Personas’ were created which designers used to empathise with the user, creating concept designs aiming to reduce the impact of the dishwashing process.

3. RESEARCH METHODS

To gain a broad overview of people’s perceptions and their everyday behaviours regarding domestic resource use, an online, self-completion questionnaire was devised. The questionnaire was designed to gauge people’s general perceptions and behaviours on different themes relating to everyday behaviours within the home and their varying resource impacts. Participants were gathered from the UK, India and Brazil.

3.1. SAMPLING STRATEGY

The sample regions were chosen for a variety of different reasons. First and foremost the regions were chosen as they show widely different cultures, the logic being the more varied the cultures the greater the insights generated would be. The regions were also chosen as they show a contrast in levels of economic development and environmental rankings whilst also having large populations and either established or growing markets. Table 1 compares the three countries chosen using data from the CIA World Factbook (CIA, 2011).

Table 1: Country comparison

	UK	India	Brazil

Economic	High economic level of development by World Bank standards, 14th most wealthy country in the world by GNI	Low GNI ranking 114th in world Commonly cited as a 'rapidly emerging economy' due to large population and recent increase in economic growth.	Middle income country – ranking 67th in the world by GNI Commonly cited as a 'rapidly emerging economy' due to large population and recent increase in economic growth.
Happy Planet Index (combining ecological footprint, life satisfaction, and life expectancy)	Low Happy Planet Index – ranks 74th in the world	Relatively high Happy Planet Index of 35th in the world	High Happy Planet Index – ranking 9th in the world
Geography	9 geographic regions (East, West Midlands, East Midlands, London, and the North West)	6 geographic regions (The Himalayan Mountains, Northern Plains, The Great Indian Desert, The Peninsular Plateau, Coastal Plains, Islands)	5 geographic regions (north, northeast, central-west, southeast, south)

Environment	Met Kyoto Protocol target of a 12.5% reduction from 1990 levels and intends to cut 20% in emissions by 2020); 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.	Deforestation; soil erosion; overgrazing; desertification; air pollution from industrial effluents and vehicle emissions; water pollution from raw sewage and runoff of agricultural pesticides; tap water is not potable throughout the country; huge and growing population is overstraining natural resources	Deforestation in Amazon Basin destroys the habitat and endangers a multitude of plant and animal species indigenous to the area; there is a lucrative illegal wildlife trade; air and water pollution in Rio de Janeiro, Sao Paulo, and several other large cities; land degradation and water pollution caused by improper mining activities; wetland degradation; severe oil spills
Religion	Christian 71.6%, Muslim 2.7%, Hindu 1%, other 1.6%, unspecified or none 23.1%	Hindu 80.5%, Muslim 13.4%, Christian 2.3%, Sikh 1.9%, other 1.8%, unspecified 0.1%	Roman Catholic 73.6%, Protestant 15.4%, Spiritualist 1.3%, Bantu/voodoo 0.3%, other 1.8%, unspecified 0.2%, none 7.4%
Population	62,698,362	1,189,172,906	203,429,773

Urban population	80%	30%	87%
Climate	Temperate; moderated by prevailing southwest winds over the North Atlantic Current; more than one-half of the days are overcast	Varies from tropical monsoon in south to temperate in north	Mostly tropical, but temperate in south

The questionnaire was presented in two languages; English and Portuguese so as to be as natural to the participants from the selected countries as possible. The original questionnaire was written in English (by a native speaker) and then back-translated to Portuguese (by a native speaker) so as to ensure the translated content was as close to the original meaning as possible (Liamputtong, 2010). The translated version was then cross-checked by another Brazilian who was familiar with the research project, following guidelines by Liamputtong (2010).

The questionnaire was distributed via the internet as this was the simplest way to reach a global audience and could be completed by the participant at their convenience. The flexible and global nature of the study meant that probability sampling such as random or systematic would be unhelpful and dilatory. Instead, the questionnaire took on a purposive sampling strategy, using a small sample of relevant cases. The contacts from these cases acted as representatives to help draw out further individuals for research through a cascade or snowball effect. This small sample size of preselected representative individuals also allowed for a greater rapport to be created between the participant and researcher and aid in increasing response rates, a factor that lowered the impact of any perceived bias (Robson, 2011). The construction of the questionnaire to measure identical content in each language also aided in avoiding bias (Leung & Vijver, 1997).

Although the distribution of the questionnaire through the internet allowed a larger number of participants to be reached, obvious issues arose that affected the data; namely individuals having unequal access to the internet putting a skew on the demographics of the participants. Studies have shown that in certain populations various groups such as women, people on low incomes, people with low levels of education, and the elderly, are often underrepresented (Zhang, 2000). Al-

though this may have been the case, the questionnaire was not designed to be representative of the country as a whole; the idea was to get many insights into the lives of people from different regions to open avenues for further investigation and thus full representation for a region was not required.

In total there were one hundred and fifty seven participants; 63 from the UK, 63 from Brazil and 31 from India. In Brazil the questionnaire was answered by at least one participant in each of the five regions, with 86.8% of participants from the south or southeast regions. In the UK, participants lived in five of the nine geographic regions, with the majority of the participants (56%) from the East Midlands. In India participants were generally split between the North and South.

The majority of Brazilian and Indian participants (57.6% and 79.3% respectively) were in the 18 – 30 age brackets, with 31 – 50 year olds being the next most common. In the UK this was reversed with almost 50% of participants in the 31 – 50 age range. The UK was also the only country with a participant over the age of 65. In the UK and Brazil there were more female participants than male with roughly a 60 – 40 split, whilst in India it was the opposite.

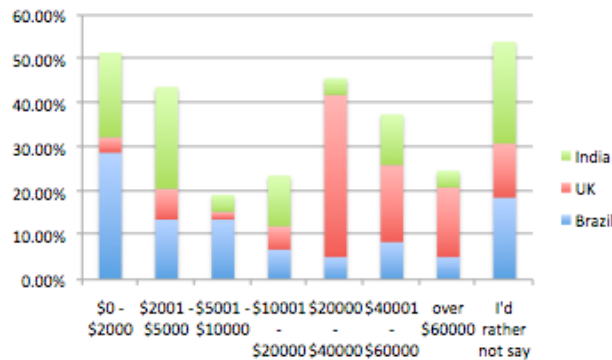


Figure 1 - Average Incomes

In terms of income, the majority of Brazilians (62.8%) earned in the lowest three income bands (US\$0 – US\$20,000), whilst the majority of participants from the UK (70.1%) had an income in the top three income bands (US\$20,000 +). Indian participants had a similar income to Brazilian participants (Figure 1). The Indian sample had the highest rate of students at nearly 26%, whilst the UK and Brazil had a similar rate of 13.8% and 15% respectively.

In all of the countries surveyed more than 80% of the participants were educated to degree or postgraduate level. This might be due to the contacts used to gather the data, with participants tending to be recruited via friends or family of an individual at a university. Most participants lived in households with five people or fewer.

Nearly all of the participants considered themselves to be 'pro-environmental'. The majority believed environmental issues are critical and therefore try to consume less environmentally damaging products where possible. India had the high-

est number of participants (20%) who wanted to do more to protect the environment but didn't think they could in their current situation, whilst the UK was the only country that had participants (3.5%) who believed environmental issues had been exaggerated.

4. FINDINGS

The following section presents the findings from the questionnaire relating to the main themes of food, water, energy and materials, and governmental schemes. Findings of particular interest are discussed in the subsequent chapter.

4.1. FOOD

In Brazil, 55% of participants eat meat at least once a day, compared with 28% of British participants and 17.2% of Indian participants. India had the most number of vegetarians at 27.6% (Figure 2). Interestingly the UK had the largest range when looking at the budget for meat each week. 35.1% of the meat eating UK sample spent less than US\$10 per week on meat, similar to that of India at 37.9%, with the Brazil sample at 21.7%. The majority of Brazilian participants (53.3%) spent over US\$10 per week on meat, a similar figure to the UK at 52.7%, with Indian participants less likely to spend highly on meat (24%). It should be noted, however that a large proportion (18.3%) of Brazilian participants preferred not to answer this question.

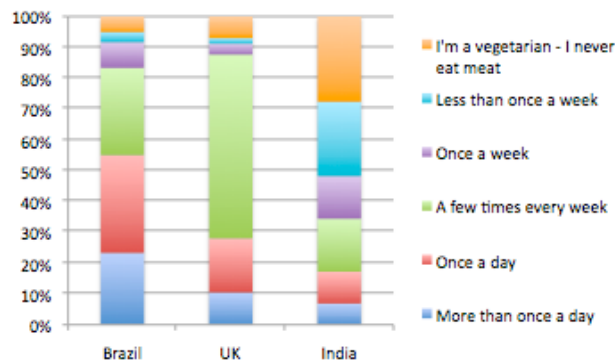


Figure 2 - Frequency of meat consumption

The UK had the highest number of participants that ate imported foods either everyday or a few times per week at 68.4% compared with 16.7% of Brazilians and 34.4% of Indian participants, whilst 20% of Brazilian participants and 13.8% of Indian participants responded that they never ate imported foods compared with 0 participants from the UK. It should be stated however that in many cases the participants did not know how much imported foods they ate each week (Brazil: 28%, UK: 15.8%, India: 20.7%). In terms of eating locally grown food, in all regions eating local food everyday or a few times a week was by far the most common answer, although once again it was common for participants to not know the origin of their food (Brazil: 31.7%, UK: 17.5%, India: 24.1%).

In all regions the most common place to buy meat was the supermarket, with a similar range in packaging materials across the regions. The UK participants were more likely to grow food with 45.6% of participants growing food themselves compared to 23.3% of Brazilians and 37.9% of Indian participants.

4.2. WATER

In all regions the most common bathing type was showering. In Brazil none of the participants used a bath to wash compared to 8.8% in the UK and 24.1% in India. Brazil and India both had participants (1.7% and 17.2%) who used the reservoir bathing technique, whilst the UK didn't have any. Having a fully plumbed in shower was noted by all of the Brazilian participants and 93% of the British participants, whilst 20.7% of Indians didn't have a fully plumbed in shower.

In the UK a gas boiler was the most common way of heating water, whilst in Brazil it was the electric shower. Interestingly, in India use of a 'geyser' was mentioned (28.5%). A geyser is a small electric hot water heater designed to save electricity when showering by only heating the water needed, it is often solar powered, although the participants did not mention this.

Indian participants were most likely to have non-potable water supplied to household appliances (shower, toilet, tap etc), with 38.5% of participants having non potable water direct to appliances compared to 23.7% in Brazil and 10.9% in the UK.

Brazil, the UK and India all had high levels of washing machine use (95%, 94.5%, and 85.7% respectively). For those who didn't regularly use a washing machine there was a fairly even split between using a launderette, doing it manually, or using a friend's washing machine.

Indian participants washed their clothes the most regularly, 24.1% stated they washed clothes everyday compared with 5% in Brazil and 7.1% in the UK. Washing clothes once or twice per week was the most common practice in all regions studied.

Average washing temperatures had interesting results. 88.1% of Brazilian participants stated that they always washed clothes in cold water. This figure was also relatively high in India (55.2%), whilst the UK had a lower response of 10.9%. UK participants were more likely to never wash clothes in cold water with 47.3% of participants suggesting this compared to 20.7% in India and none of the participants in Brazil (Figure 3).

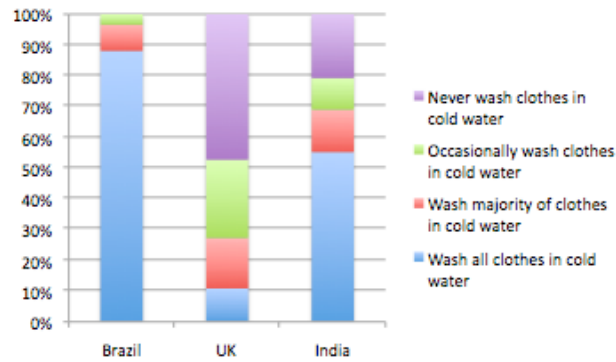


Figure 3 - Washing temperatures

4.3 ENERGY AND MATERIALS

The UK participants had the highest number of electrical appliances. Out of the list provided the majority of participants had most of the appliances with the exception of a lower ownership of tumble dryers, blenders, and dishwashers. The majority of Brazilian participants also had most of the appliances listed, although low ownership was noted of kettles, toasters, tumble dryers, dishwashers, and vacuum cleaners. Unlike the UK most Brazilian participants owned a blender. The Indian participants showed a low ownership of the appliances noted by both the UK and Brazilian participants.

In Brazil and the UK the most common amount spent on electricity was between US\$50 – US\$80 per month (35% and 37.5% respectively), whilst in India the distribution was more evenly spread with 19.2% of participants spending US\$10 – US\$20 per month (Figure 4). Brazil had the most participants who bought ‘green energy’ or bio-fuel with 20% compared to 3.5% in the UK and none in India.

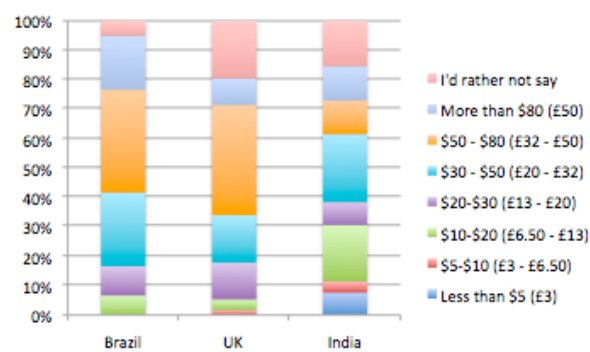


Figure 4 - Income on Energy

In the UK 75.4% of participants got their household energy by gas. India had a more even split between gas (32.1%) and electric (50%), whilst in Brazil the split was between electric (46.7%) and no heating at all (38%).

The UK participants were most likely to own something made by themselves (33.3%). In terms of buying used or pre-owned products, 82.5% of UK participants suggested they try to buy used products where possible, compared to 43.3% of Brazilians and 40.7% of Indians.

4.4. GOVERNMENT SCHEMES

All regions showed a lack of awareness by participants of any government schemes that could help them reduce their environmental footprint. In Brazil 75% were unaware of any schemes, whilst in the UK it was 63.2%, and India with 64.3%.

Recycling was an interesting issue. The UK had high rates of recycling, with all but one participant in the UK declaring they recycle. In Brazil and India there was a much more mixed response, with 40% of Brazilian participants confessing they don't recycle and 57.1% of Indian participants (Figure 5).

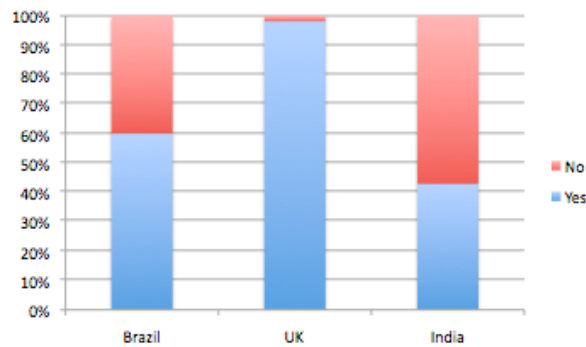


Figure 5 - Recycling rates

5. DISCUSSION

The questionnaire was not designed to draw out statements that could be considered indicative of the behaviours of an entire nation. As well as being an oversimplification of the subject, the sample size was too small and the sampling was not representative for this to be achieved. However the results did illuminate some interesting insights, which support findings from previous research and literature, as well as open new avenues for exploration.

Overall there was a good response rate over a widespread area. The majority of Brazilian participants coming from the South and Southeast regions was generally expected as these regions are by far the most populated in Brazil, accounting for well over half of the total population and containing the major cities of Rio de Janeiro, Sao Paulo, Belo Horizonte, and Porto Alegre. They are generally regarded

as the economic powerhouses of Brazil (CIA, 2011). The majority of UK participants coming from the East Midlands is likely due to the proximity of the researcher to this area, but there was also a good spread of participants from other regions of the UK. In India the main split between the North and central-south is influenced by the major cities of Mumbai and Delhi.

Census population data suggests the median age in Brazil is 29.3 years and 26.2 years in India, compared with the older age of 40 years in the UK (CIA, 2010). This helps to explain the younger age of the participants from Brazil and India compared with the older participants in the UK. Similarly in terms of income, the results from the survey generally fit into global economic data. GDP per capita in Brazil is US\$10,800, compared to US\$34,800 in the UK – correlating with survey responses. The income levels with this relatively small sample size will also be affected by other personal factors, for example the generally higher incomes in the UK may be due to the older nature of the participants, as they will potentially be further along their career paths. Other individual factors may also contribute such as the type of job, although generally there was an even distribution and good range of jobs in the sample. The proportion of students in each sample was also very similar which helped make the results more comparative.

Meat eating figures in Brazil and India were generally as expected. According to 2002 data Brazilians eat on average 82.4kg of meat per person per year compared to just 5.2kg in India (Earthtrends, 2002), whilst India has a very high proportion of vegetarians, which was reflected in the study. High consumption rates in Brazil can generally be attributed to traditional patterns of meat consumption within the cuisine and also because the agricultural sector is a major contributor to the Brazilian economy, with cattle farming accounting for a large proportion of this (CIA, 2011; Marcelo & Fernando, 2005). In India low consumption of meat and a high rate of vegetarians is due to religious beliefs deeply embedded within the traditions of the country, although meat consumption can generally be linked to GDP and is expected to rise as GDP rises (Speedy, 2003). The surprising figure was from UK participants. Data suggests that the UK population also eat a large amount of meat, close to that of Brazil, with the average person consuming 79.6kg of meat per year (Earthtrends, 2002), yet data from the survey suggested the sample were more conservative with their meat consumption only eating meat a few times per week. The reasons for this are varied; general perception within the UK that too much meat, particularly processed and red meat, is unhealthy and thus a change in behaviour since the last per capita measurements were taken in 2002 (Hughes, 2011). It could also be due to participants trying to answer the question in a way that reflects well on them (Robson, 2011), or the fact that the question did not specify which meals to measure or a potential confusion over whether fish counts as meat. Further closer investigation will help to clarify results.

India had the highest levels of adoption of the reservoir bathing technique, and subsequently the lowest levels of a fully plumbed in shower. Matsuhashi (2009) and Karakat (2010) suggest that this is by far the most resource efficient bathing technique, using just 20 litres of water compared to 100 litres in the shower and

nearly 200 litres in the bath. Interestingly Brazilian participants also used this technique, but in much fewer numbers. Perhaps as part of ‘development’ one of the first changes is a fully functioning shower. It will be important however to understand in further research why the reservoir technique is adopted; is it due to the climate of the region – not needing a shower for comfort; or is it based on water wastage views; or deeply embedded within the culture.

Gas was the most common water heating fuel in the UK compared with electric in Brazil, which was as expected given the dominance of both energy sources in their respective countries. The high use of geysers in India poses an interesting insight as geysers are designed to only heat a certain amount of water. As with all energy orientated devices it is impossible to calculate the exact efficiency of this, as measurements will depend on the specific model being tested, the environment it is situated in, and the patterns of use of the consumer. However, the behaviour of using a geyser is very different to that of a boiler or electric heater which have instant, on demand hot water. With a geyser there is a time delay between switching the geyser on and receiving hot water, whilst there is also the knowledge that the hot water is limited. This is also true of standard hot water tanks seen in other regions, although these tend to be a lot larger than a geyser, which are often used for just one appliance e.g. the shower. It may therefore be possible to observe various interesting water saving behaviours in houses that have geysers.

Brazilian participants conformed to countrywide data from Greendex (2010), suggesting Brazilians are unlikely to wash clothes in warm water whilst the UK participants were unlikely to wash clothes in cold water. This follows previous research that suggests Brazilian people have very different perceptions of the design of a washing machine (Shimp, 2010), and the link between cleanliness and hot water is clearly a major difference.

As expected there was a lower ownership of tumble dryers and dishwashers across the samples, predominantly because these were the most expensive items on the list. Other factors could also influence this low ownership, such as climate in some regions reducing the need for a tumble dryer. Interestingly, some appliances, which would not have a significant cost to the household, have a very different uptake. Products such as toasters and kettles, owned by nearly all the British participants, had a much lower uptake by Brazilian and Indian participants, suggesting that they either have a different way of boiling water or making toast, or they have different customs and routines that do not require the services of those appliances. Paradoxically, the blender was an item most Brazilian participants owned which was less common in British responses.

In terms of cost, Brazilians pay the highest cost for their electricity as a proportion of their income – spending much the same as UK participants despite their relatively lower incomes. This is interesting considering a significant proportion of participants have no heating costs at all. One area where the extra cost on energy may be going, that was not asked in the survey was on air conditioning. The participants who don’t spend any money on heating may spend on cooling instead, and in hindsight this should have been more thoroughly investigated in the study.

The lack of knowledge of governmental schemes to aid in reducing the household environmental footprint from all the participants was a surprising outcome. This shows that there is either a lack of schemes to help people cut their footprint or a lack of advertising and knowledge of any schemes by the individual households. This is particularly strange in the UK given the high rates of recycling, and may show how recycling has become a habitual behaviour that is not cognitively thought of in households anymore. Recycling by the other samples was low, which again, was a surprise given that nearly all participants viewed themselves as 'pro-environmental' and consumers normally associate recycling and sustainability. Perhaps the lack of recycling schemes in those areas reduced this response rate, which would suggest why many Indian participants didn't feel like they could do much in their current situation.

6. CONCLUSIONS

The questionnaire gives a good general overview of resource related behaviours in the home which have helped to validate existing research and open new avenues of enquiry for future research. The questionnaire has proven particularly useful in identifying differences in resource intensive behaviours, however due to the nature of the study the reasons behind people's behaviours were not identified. Understanding the motivations behind people's behaviours is key to developing products to reduce resource intensive behaviours. This research provides a solid base for further qualitative investigative inquiry.

The findings tell us that UK consumers are more aware of their meat consumption than quantitative per capita data tells us, whilst Brazilian consumers generally follow the quantitative data (Earthtrends, 2002) by responding that they eat meat the most regularly. The UK participants have either tried to cut down on their meat consumption, or portray the appearance of reduced meat consumption. As discussed this could be due to campaigns in the media, whilst the Brazilian attitude may be caused by a relatively recent increase in GDP which may have resulted in a higher demand for meat. In both cases meat consumption is deeply embedded within the culture. From a design perspective qualitative data will help us to understand the effectiveness of any media campaigns in reducing meat consumption and generate insights for possible designs for new tools or systems in the kitchen environment to help reduce resource impacts.

We can also conclude that Indian participants have a less resource intensive bathing behaviour. Research by Matsuhashi (2009), Karakat (2010), and Kuijer (2009) has already looked at the bathing routine and tried to implement a more energy efficient bathing behaviour based on cultural insights. The results from this testing will be extremely valuable to the subject area, as will investigating in more depth the motivations behind the reservoir bathing technique to see if it is possible to design and implement a product based around this low resource impact behaviour in countries where a higher impact behaviour (such as taking a bath) is common.

Results also clarify the difference in behaviours, and subsequently attitudes, to washing clothes. As expected the Brazilian participants didn't wash clothes in warm water, conforming to the hypothesis drawn out by previous research that Brazilian consumers don't make a link between hot water and hygiene or cleanliness (Greendex, 2010). Investigating further why they do not have this link will help to create products for regions, such as the UK, where it is common to wash clothes in hot water. In a similar respect the use of geysers in India require more of a cognitive thought than simply turning the tap on, and it may be possible to observe lower hot water use in households that use a geyser, and thus implement some of the findings into new designs for water heating in high impact cultures.

Finally, the observed lack of knowledge and awareness of all participants regarding government schemes to help reduce a household's environmental impact despite recycling being high in the UK, is of interest. Wilhite (1999) has suggested 'cultural energy services' such as bathing, lighting and space heating, are embedded into the culture and informs us that the most effective way to increase resource efficiency is to implement efficient technologies that keep the same cultural identity. However the recent research and investigation into behaviours suggests that resource intensive habits can be changed by successful implementation of different designs.

7. REFERENCES

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