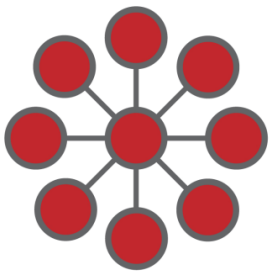
The performance of practice: An alternative approach to attitudinal and behavioural 'customer segmentation' for the UK Water industry.



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The Performance of Practice:

An alternative approach to attitudinal and behavioural 'customer segmentation' for the UK water industry

Discussion Paper 5

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Abstract

Developing a comprehensive picture of the nature of current water demand is important as it is on this basis that forecasts for future water demand are currently made, as well as it being used as a way to inform demand management interventions and water efficiency programs. One way that water companies in the UK are starting to develop this picture is through the use of proxy variables such as demographics that are then used to segment people to explain patterns in people's water use based on values, attitudes, and behaviours. However, as is the case with many environmental management settings, this current approach to attitudinal or behavioural segmentation fails to take into account the constantly observed value/attitude behaviour gap in water use, and offers little to the idea of intervention beyond a simple provision of technology and information to similarly 'averaged' customers. This paper offers an alternative theoretical and methodological perspective to the idea of segmentation based on depth of understanding of everyday practice, and highlights how a change of the unit of analysis from 'individuals' to 'practices' opens up a wealth of possibility for understanding water demand, and conceptualising forecasting and intervention for the water industry.

Keywords: social practices, consumption, water demand, water efficiency, segmentation, showering, bathing

1. Introduction

Understanding the ways in which domestic customers use water is becoming increasingly important for water companies and utilities that face a future of providing water for customers in the face of uncertain climatic and other social changes. This understanding of household water use is also important due to the energy embedded in the production of hot water in homes. Developing a comprehensive picture of the nature of current demand is important as it is on this basis that forecasts for future water demand are currently made, as well as being used to inform demand management interventions and water efficiency programs. Further developing this understanding of demand is seen to be particularly important in the UK where there is a low percentage of household metering comparatively to the rest of the developed world, and therefore only fairly limited estimate of actual per capita consumption (pcc).

These understandings of average pcc are then used, problematically, to construct 'the average consumer' skipping over the diversity of ways that consumers actually use water, and for what reasons (Sofoulis 2011; Browne et al. 2012; Medd and Shove 2006). One way that water companies in the UK are trying to develop their understandings of their customers is through the use of 'proxy' variables such as demographics, and environmental values and attitudes that are then used to segment and explain patterns in peoples' water use. However, as is the case with many environmental management settings, this current approach fails to take into account the constantly observed value/attitude behaviour gap in water use (eg, Kurz et al. 2005; Finger 1994; Syme et al. 2000; Aitken et al. 1994; Russell and Fielding 2010; Bickman 1972; Harlan et al. 2009; Gregory and Leo 2003; Geller et al. 1983). It also offers little to the idea of intervention beyond the simple provision of water efficient technology and information provision appealing to the economic rationalist consumer (who is trying to save money) and/or attempting to change people's attitudes to water and the environment; approaches that characterises most water efficiency and water demand management programs.

This article highlights an alternative methodology for understanding household water demand based on 'theories of practice', which shifts the focus from the individual to the elements within and beyond the individual that make up everyday practice and could be used as a basis for future attempts of customer segmentation. This new approach is timely as the UK water industry is currently being compelled to consider approaches to customer segmentation in their water forecasting and water efficiency programs (Waterwise 2011b; DEFRA 2008; Collier et al. 2010; Ipsos Mori 2007), and yet the approaches that they are being asked to consider (eg, CACI 2010; Experian

2010; DEFRA 2008) have little or anything to do with behaviours related to *water (and related energy) or the services that it provides in people's daily lives.* This is reflective of a broader international trend amongst the utilities industries to consider customer segmentation based on demographics and related indicators as a way to inform supply and demand systems (Merlin 2010; Deloite no date). This paper reflects upon novel quantitative research undertaken by the authors that sought to understand, and quantify, the patterns of water use in homes and gardens across the south and south East of England.

Following on from similar water research conducted at Lancaster University (Medd and Shove 2006; Medd and Chappells 2008; Chappels and Medd 2008; Chappells et al. 2011a; Shove 2003) this article overviews the development and methodological approach taken for a 1802 respondent practice based questionnaire conducted across the south and south east of England in the summer of 2011. Although we developed a similar analysis for practices in the bathroom, laundry and garden, we use bathing and showering as a demonstrative example of the way that this theoretical perspective could potentially be used to inform the development of segmentation methodologies (e.g., cluster analysis) based on patterns of practice. .We will highlight the potential impacts of having practice as the unit of analysis in segmentation methodologies in the water industry and other utility sectors in the UK and internationally. These potential impacts include opening up an understanding of the nature and potential location of points of change, dispelling the idea of the 'average consumer' and highlighting potential strategies for intervention.

1.1 Current approaches to customer segmentation in the water industry

Segmentation is heavily used in the business world as a way to understand sub-groups of a population, in order to target customer service, marketing and sales. These segments are usually derived through some combination of lifestyle and psychological variables, and demographic information. Segmentation is an approach that has wide application – from the traditional targeting and marketing of products (Bucklin et al. 1998; Morwitz and Schmittlein 1992; Zoltners and Sinha 2005), to addressing more wide scale social issues such as health promotion and environmental conservation (eg, Kreuter and McClure 2004; Slater and Flora 1991; Geller 1989). In the UK Water Industry, there are currently two ways identified to target segments of domestic customers – customer segmentation and household property benchmarking (Waterwise 2011b). The types of factors used in customer segmentation elicited through ACORN or MOSAIC geo-demographic population segmentation tools are based on characteristics of the household (e.g., age, gender, education level, proxies of income, educational status, culture/ethnicity), the house itself (e.g.,

dwelling age, type), and/or area statistics (e.g., population density, distance to city centre), and ideas of willingness and ability to change behaviours in the home (Experian 2010; CACI 2010; Waterwise 2011b; Ipsos Mori 2007).

However, it has been identified that "the experience of the use of these segmentation tools as a means of targeting water efficiency and metering programmes has been that they are of limited use. There is very little correlation between the segments that are defined and the amount of water consumed by a customer or how much water a customer is likely to save" (Waterwise 2011b, p. 17). Although the DEFRA pro-environmental behaviours approach is currently under a substantive review (DEFRA 2012) this government backed approach - based on understandings of environmental attitudes and beliefs - is also starting to be considered as a way to understand likely behaviour, motivators, barriers to behaviour and the potential for behavioural change associated with water use (Collier et al. 2010; DEFRA 2008). However, as has been previously highlighted (Waterwise 2011b) very little within this segmentation model reflects the actual activities that consume water in the household, and therefore there is little correlation between these segments and actual water used – it would be anticipated because of the lack of correlation between environmental and water related attitudes and actual behaviours. From a practice perspective, there is no strong theoretical reason to expect that there would be correlations between the generic range of environmental behaviours used in this segmentation model and practices that use water in the home (Shove et al. 2012).

Other reports have shown that the greatest predictor of water use after a particular water intervention is the previous water use and consumption in the household (Waterwise 2011a). Therefore, it is important to understand what people actually do with water (now), in order to understand how their use may or may not change in the future. In practice based approaches this is assumed to be the case, for example, getting people to consider other forms of washing (Kuijer et al. 2010; Scott et al. 2009; Scott et al. 2012) is difficult due to the technological and cultural 'lock in' that has occurred with the development of showering technology and related ideas about home, health and hygiene (Hand et al. 2005; Geels 2005; Quitzau and Ropke 2009). Given that current consumption is the greatest 'predictor' of future consumption, and that geo-demographic factors have been found to be fairly poor predictors of current and future water use, it follows then that an approach that considers the actual pattern of water use in the home may be more useful for determine current and future use of households, and potential segmentations of these related behaviours.

1.2 Beyond customer segmentation: Introducing a concept of practices

Our perspective prioritises the need to understand what people do, how people do it, and what technologies and infrastructures they use while consuming water in the home rather than using the types of variables described in the previous section. Social/cultural and historical approaches have shown the ways that demand has formed, emerged and come into being through a complex set of historical processes encompassing changing ideas about consumer rights, emerging water and waste infrastructures, and evolving public health agendas (eg, Allon and Sofoulis 2006; Chappells and Medd 2008; Medd and Chappells 2008; Chappells et al. 2011b; Medd and Chappells 2007; Medd and Shove 2006; Taylor et al. 2009; Strengers 2011; Sofoulis 2011, 2005; Shove 2003; Browne et al. 2012; Strengers and Maller 2012). The development of these public infrastructures, political and social images are linked to the development of practices associated with water use in the internal space of homes, routines and habits around personal and family care (e.g., bathing, showering, toilets, cooking), and the use of home and garden spaces (e.g., gardening, food production) (Trentmann and Taylor 2007, 2006; Shove 2003; Hand et al. 2005). Understanding demand therefore means understanding its creation, maintenance and transition as distributed across space and time (Shove et al. 2009; Schatzki 2010). We have discussed this concept in previous articles (Browne et al. in press 2013; Browne et al. 2012) but suffice to say that it is about infrastructural and technological innovations, changes in expectations and values in society and across individuals, and changes to the routines of everyday life for example modern lives where showering becomes associated with speed and convenience in increasingly pressured lives (Shove 2003). We also need to consider the distributed nature of demand (Browne et al. 2012) including the institutions and regulatory relationships that ensure water (and energy) is supplied consistently and of the right quality and pressure to households. Although a lot of research identifying this perspective to water use and consumption have been qualitative (Sharp et al. 2011; Halkier et al. 2011) in the next sections we will explore how quantitative methodologies can enhance this perspective.

2. Methods

In the summer of 2011 we conducted a survey on water use practices focused on the range of practices in which water is implicated in the home, with a desire to get at the diversity of the nature and range of these habits in the home. The questionnaire collected information on the habits and practices of gardening, personal hygiene and care, cooking and washing up, cleaning the home,

laundry and other water using activities such as car washing. We also did a household audit of water consuming technologies in the home and garden and collected other data such as socio-demographics, presence of meter, and a suite of questions exploring other environmental habits. The following sections describe the processes involved in sample selection and fieldwork, as well as methodological notes on cluster analysis which informs the results section, although for more information on the details of the methodology and results please refer to our technical report (Pullinger et al. 2012).

2.1 Technical notes on questionnaire

From the outset a co-ordinated approach to sampling was adopted that would produce an overall sample of some 1802 respondents but with two specific sub-samples. The first sample was to be a randomly selected sample of households in the Government Office Regions of the South, East and South East of England to provide a *random sample representative* of those three regions with a regional sample size proportional to the population size in each. The second was to be an identical survey administered to randomly selected households within specific *case study areas* of those Government Office Regions where our collaborating water companies were able to provide area-based metering penetration and water consumption data through their own network monitoring systems. Overall the survey produced a main sample of 997 responses with an additional 805 case study responses. Non-response weights to correct for non-response bias were produced in both the main and case study samples and they are analysed together as one sample for the purposes of this paper. Fieldwork dates during which the 1,802 'door stop' interviews were completed (using CAPI – computer assisted self-interviewing - due to the sensitive nature of the questions) were 13th June – 8th September 2011.

2.2. Details of the cluster analysis approach

Clustering is a method to aid in the identification of a set of distinct groupings in a sample (categorisation), and the assignment (classification) of the cases in the sample into those groups (Aldenderfer and Blashfield 1984). Cluster analysis aims to group cases (survey respondents, in this research) into clusters that share more similarity within groups than between them. A population can be classified into entire unrelated groups depending on which variables are selected upon which to define categories. Therefore, a clear theoretical understanding of along which variables (or dimensions) it is relevant to look for groupings which represent distinct categories is thus needed

before engaging in any classification exercise, including cluster analysis. For our research we wanted to create clusters based on variables which represent recognisable dimensions of water using practices, and which capture those variations in each practice that are likely to have implications for water use. Four clustering dimensions, described in Table 1, were selected. The method used to analyse the data follows that of Medd and Shove (2006), with a few modifications, and is a commonly used method that theoretically maximises the chances of identifying real groups in the data where these exist.

3. Results: The Example of Washing, Showering and Bathing

This section provides an overview as well as a detailed analysis of each of the six clusters of practice represented in Figure 1 (p.22). It is already known that washing and bathing is a practice which has changed substantially for many people in the last few decades, particularly in the UK, with daily showers increasingly becoming the norm representing a shift in both the technology used for washing (flannel washing and baths versus showering), and the temporality (weekly full immersion bath to daily showering) (Critchley and Phipps 2007; Shove 2003; Hand et al. 2005). Our data reflects this change with nearly three quarters of the population having a bath or shower at least daily (7 times a week). Showering is the preferred way of having a full body wash – 50% of respondents never have a bath, compared to just 17% that never have a shower. For most of those who do have baths, it is combined with showering, and is an occasional but additional event. Among those who only have baths, and no showers, the majority have one about daily. Only 29% of people have a flannel or similar wash at all, although among those who do, two thirds do so at least 7 times a week. 75% of those who flannel wash at least seven times a week also take a bath or a shower at least seven times a week – they are clearly complementary practices for most people, rather than alternative forms of washing.

3.2 Six clusters of washing practices

A cluster analysis led to the selection of six quite distinct groups of washing practices (Figure 1). Washing cluster membership was defined along four dimensions characterising different aspects of washing, described in Table 1 (p.24). The first bubble plot on Figure 1 shows the distribution of all the respondents in the population on the four dimensions by which clusters are defined. The bubble sizes on all of the figures represent the weighted percentages of respondents having value on that

dimension. Six variants of washing were identified through the cluster analysis. The rest of Figure 1 shows the distribution of members of each of the six clusters in turn on these same dimensions, so that their relative differences from each other and from the population overall can be seen.

As well as differing along these dimensions, members of the different clusters also have distinct differences in other aspects of their personal care regime which were asked about in the survey, such as different reasons for washing and showering (e.g., to get clean, for relaxation), how and when they brush their teeth, and whether and how they shave different parts of their body, all of which potentially affects water use. We found for washing that how people wash their bodies varies strongly with age, so that this socio-demographic characteristic to some degree predicts to which cluster an individual is more likely to belong (Figure 2), although it should be cautioned that we do not do this in the way that traditional segmentation uses demographics. In our analysis the practice cluster is determined first and socio-demographic characteristics explored successively along with other factors influencing practice. By far the largest variation of practice arising from the cluster analysis is '*Simple Daily Showering'*, a variation of practice performed by almost 40% of the population. The characteristics of this practice are fairly simple - the performance involves washing usually every day, sometimes more (and occasionally just six times per week), and usually only showers. Shower length or bath water level is rarely changed for any particular reason, and showers are never taken outside of the home. It appears to be a variant of practice where the daily shower is just the 'done thing', performed out of habit as the accepted, and most convenient, way to stay clean and fresh. Brushing teeth twice a day is also the norm, slightly more so than for the rest of the population (89% vs 80% do so).

The next two groups in size, both representing about 15% of the population each, are *'Out and About Showering'* and *'Attentive Cleaning'.* Out and About Showering differs from Simple Daily Showering primarily in that showers or baths are also taken outside of the home, particularly at the gym, where two thirds shower (compared to just 5% of the rest of the population), and at a friend's, family or partner's place (38% compared to 4%). Washing tends to happen more than once daily, and legs and underarms are more likely to be shaved for women. The characteristics of recruits to this variant of practice are substantially younger on average than the rest of the population, more likely in full time work, and more likely male.

The performance of Attentive Cleaning meanwhile is rarely ever performed outside the home, but people performing this variant of practice are likely to have 8 or more showers or baths per week. The proportion of baths and showers is varied, with a fair share of baths, and a variety in the length of the bath for a wider range of reasons suggesting care with washing and grooming. Both

men and women are substantially more likely to shave their body, particularly under arms and legs for men (41% and 22% do, respectively, compared to 17% and 13% in the rest of the population). The 'metrosexual' stereotype and lifestyle would seem to fit in this group linked to both heterosexual and homosexual masculinities and the rising incidence of male depilation (Boroughs, Cafri, & Thompson, 2005; Pompper, 2010; Shugart, 2008). People with children are also more likely to be recruits to this variant of practice. In short, both these groups seem to be young and socially and/or physically active, with water intensive washing practices, perhaps representing rising new variants of personal care.

Two smaller variants of practice are '*Low Frequency Showering*' and '*Low Frequency Bathing'*, at 12% and 7% of the population respectively, both averaging about 4 baths or showers per week, but often fewer, with the first group usually only having showers, the other almost always just having baths. Recruits of these variants of practice are markedly older than average and more likely to be retired. These groups could represent variants of washing that have been carried by the members of this group for years – echoes and traces of an era where once daily or more showering was not a common practice (Hand, et al., 2005). One can question whether the patterns of practice that represent these two smaller low frequency washing groups will be transmitted to younger generations, or disappear altogether. The final group is '*High Frequency Bathing'*, characterised by a mostly daily bath, but almost never a shower. There is a suggestion in the data that this might be simply because a shower is not available and there are restrictions on getting one installed - people performing this variant of practice are more likely to be less affluent than average, unemployed, and to be renting, all identified barriers to installing showering technology in the home (Waterwise, 2009).

4. Discussion

The analysis presented above provides an initial proof of concept that an approach focused on actual practices related to water use could potentially be used as an alternative to segmentation of water consumers. Although this research represents an initial proof of concept for a new approach to customer segmentation, there are a number of caveats and cautions that need to be presented, as well as considerations of future trajectories of research to enhance this initial outline of methodology.

4.1 Caveats and cautions

Although we feel our analysis has been a success, there are a number of strong cautions that we feel should be applied to the interpretation of the results that we have presented in this paper! If we go back to the analysis and creation of clusters in cluster analysis, we should highlight the subjective nature of that analysis – both in the creation of the clusters through applying a theoretical perspective, and that they are descriptive rather than actually existing groups. That is, we are not saying that these are definitive and fixed examples of the only variations in washing practices that exist in this and other populations. Rather than being fixed categories these clusters are an example of how if you shift the unit of analysis from individuals (and associated demographic and attitudinal data) to that of actual practices, you get a more comprehensive picture of what water use within homes actually looks like, and how diverse these patterns of practice actually are. Although there was not room to explore this data in any detail in this article, we also conducted in-depth qualitative interviews with 22 people who took part in our quantitative questionnaire (an example of the way that this qualitative information can inform the quantitative analysis has been presented elsewhere (Browne et al. under review)). The use and integration of qualitative data highlights the 'subjectivity' and 'non-fixed' nature of the characteristics of these groups. For example, we identified which qualitative interview participants 'loaded' on different clusters. In some of these examples the features of the cluster (eg, a group predominantly made up of young people like those who practiced Attentive Cleaning) did not necessarily match with the features of the individuals being interviewed who were in this cluster (eg, one participant loaded on the Attentive Cleaning cluster even though they were of retirement age).

Integration of qualitative information facilitates the maintenance of an analytical awareness that these are descriptive categories, useful for considering future points of intervention or change to particular patterns of practice, rather than discrete and fixed categories that can be characterised by particular demographic and other 'proxy indicator' information. There may indeed be different groups that form if you were to conduct this with different populations across the UK (southern British versus northern British practices), with populations in different countries and cultures, at different points in time (change to practice throughout life course and cultural change over time), or if you were to come to the idea of clusters of washing practices based starting from qualitative rather than quantitative analysis. In fact we would advocate that what our research highlights is the need for more sustained collection mixed methodologies of quantitative and qualitative data focused on 'practices' so that the utility of the practice based approach to water demand can be

developed and evaluated in other parts of the UK and internationally (see Browne et al. in press 2013).

4.2 Potential locations of change and intervention

The descriptive and cluster analysis revealed that showering is indeed now a dominant practice, and also potentially reflected traces of 'disappearing' practices. That is, the Low Frequency Bathing and Low Frequency Showering clusters could represent variants of washing that have been carried by the (largely older) members of this group for years, with the Low Frequency Showering group potentially having made a switch from infrequent baths to infrequent showers as that technology became more commonplace and available. Equally they could represent that people move into different routines with age – possibly influenced by changing work/leisure patterns (revealed in our qualitative interviews not presented in this article), and changing mobility and age related disability. As these two groups are sufficiently older than the rest of the population we suggest that they are likely to be variants of practice that will not be transmitted to younger generations, with younger generations more likely to be associated with more high frequency and attentive cleaning practices (e.g., Out and About Showering, Simple Daily Showering and Attentive Cleaning), although more longitudinal and repeated measures research would be required to identify this.

This analysis also highlights the opportunities for different models of understanding future changes to water consumption, and also intervention – one less reliant on changing people's attitudes towards water and the environment and more focused on the different elements that make up practice; ranging from the individual performances of practices to broader socio-cultural-technological-regulatory changes that underpin and shape those performances (for a comprehensive theoretical discussion of the potentials for practice theories to inform theories of change see: Shove et al. 2012). We will discuss some initial tentative thoughts about the opportunities for intervention that this analysis highlights; however, further research is needed to identify the limitations and potential opportunities for this methodological approach to influence intervention and strategies for change.

One way to think of the way these clusters influence potential average water consumption, is if we were to think about the impact of generational change on water consumption in the home. As we have addressed elsewhere in the paper, Low Frequency Showering and Bathing is are possibly fairly low water intensity variations of washing practices (although this would need to be backed up with micro-component data) that might be 'disappearing' with the older generations, and younger generations may be associated with more water intensive, daily cleaning practices that will possibly

stay stable over time (eg, Simple Daily Showering, Out and About Showering, and the Attentive Cleaning). Therefore, if we were to assume that the patterns of washing practices are accounted for by generational variability in 'what is normal washing' then we could assume that these lower water consuming clusters may disappear with baby boomers and older populations over the next 20 years. Although we have not done any 'forecasts' with this information, this could leave the largest proportion of the population engaged in once daily or more showering/bathing which is a particular concern if we are to consider that the population is estimated to increase by 10 million by 2035 (e.g., 2012 estimates show an increase in population from 62.3 million in 2010 to 73.2 million by 2035 (ONS 2012)). That is, with more people overall participating in once daily (or more) showering then the consumption of water related to showers in the UK could increase in the future simply by the increased dominance of daily or more frequent showering as a practice across the population.

Similarly, if active sporty and social lifestyles are on the rise one might expect an out and about showering practice to grow, implying shower facilities at gyms and workplaces might become more used in future. Or alternatively it may remain a variant for younger people who become Simple Daily Showerers with age, and (normatively) increased home responsibilities. Regardless of whether this is a broad social trend, or something that remains associated with young people only, thinking about intervention for this cluster pushes the idea of 'water efficiency' beyond the household to the range of locations across space and time that are implicated in people's cleanliness and washing routines. Although this is not a radical move beyond current water efficiency programs, an obvious way to intervene in water use identified by this cluster might be to consider the water efficiency of gym, leisure centres and work shower and bathing facilities. Similarly related to existing water efficiency programs, High Frequency Bathing represents a group that clearly value 'getting wet' everyday, however in many cases they have a bath rather than a shower possibly because of technology driven reasons, such as not having a shower in the home. Given that this might be a group with barriers or restrictions in installing more efficient technology (more likely to be of low income and in rented or social housing), this could possibly provide justification for further intervention within current water efficiency programs – that is targeting rented accommodation and/or social housing with subsidised (or free) water efficient shower installations (Walker 2009).

However, beyond the realms of 'normal' water use interventions that are currently seen in the behaviour and technology driven water efficiency programs in the UK, there are a range of other options that are opened up by the identification of these diverse patterns of washing practice. One example of this is the way that a practices approach is increasingly being applied to the area of household and product design. The idea of user led design is one that has been gaining significant popularity in the field of design over a number of years from everything to elements of the users'

experiences on the web and information systems to designing the emotive elements of outdoor spaces (Burns 2002; Garrett 2011; Sanders and Stappers 2008). However, there has recently been a surge of writing exploring the implications of designing for *practices*, rather than design for designs sake which includes focusing on the performances of users related to the design, and participatory co-design (eg, Suchman 2002; Scott et al. 2012; Sanders 2002). Of particular significance for the area of water efficiency is the work of a designer from the Netherlands – Lenneke Kuijer and colleagues – whose research focuses on innovative bathroom design in order to open up the possibilities of practices that can take place within bathroom spaces and the home (eg, Kuijer and de Jong 2009; Kuijer and De Jong 2011; Kuijer et al. 2010). This approach includes engaging participants to innovate their own alternative bathing practices through experimental and participatory approaches and using this knowledge of participants actual innovative practices to shape future bathroom design – such as 'Splash' which allows people to sit while washing and splashing water over themselves in a reconfigured washing space. Although it might seem a radical intervention compared to just providing more water efficient shower heads, such an approach reconfigures the acceptable and potential boundaries of washing and bathing, with the playful and experimental approach potentially allowing users more flexibility in how they use their bathroom spaces. Similarly, it engages a range of distributed intermediaries and actors – such as designers, product manufacturers, and lifestyle product retailers – in the creation and maintenance of alternative and potentially less water intensive practices.

4.3 Future research opportunities: Data to collect beyond clusters of reported practice (aka our ideal dataset)

An obvious limitation of the current study is the difficulty we had in linking with household water metering data, particularly considering that our critique of current approaches to water use and segmentation is that they fail to explain actual consumption in homes (Waterwise 2011b)! We did try to link our survey to 'hard' data on consumption in peoples home – by oversampling in areas with higher metering penetration, and by asking permissions to link with metered data of all participants within our sample. Despite our hardest efforts, due to difficulties in collecting this data (issues to do with the UK Data Protection Act, and low response rates for linkage) we were not able to provide a strong example of the link between the practice perspective presented here and actual household water consumption. However, we would argue that due to our approach focused on actual practices it is much easier to estimate what actual consumption will be due to the data that we collected. For

example, by using a practice based perspective to ‘segmentation’ we know the predominate pattern of practice is daily showering, or some other variation of this daily or more frequent shower. These groups are highly likely to consume more water in the enactment of their washing practices than those that have infrequent showers, or small baths (Low Frequency Showering and Bathing). Future research should ideally continue to try to link to actual consumption within households, through the collection of metered household level consumption, and micro-component (end-use) data (for a full list of the data linkages we suggest see: Browne et al. in press 2013) in combination with the types of qualitative and quantitative data collections of practice that we have advocated in this article.

5. Conclusion

In summary, by changing the unit of analysis from ‘individuals’ to ‘practices’ and focusing on the elements that make up a certain practices such as showering and bathing as they are actually performed in homes, our analysis revealed a much more complete picture of the current diversity of washing practices than the approaches that rely on individual attitudes and other demographic data. By adopting an approach that prioritises practice as the unit of analysis, we argue that a more complete picture of potential sites of intervention and change is identified, which could have a significantly positive influence on the design of water demand management and efficiency interventions, and forecasting, in the UK and internationally.

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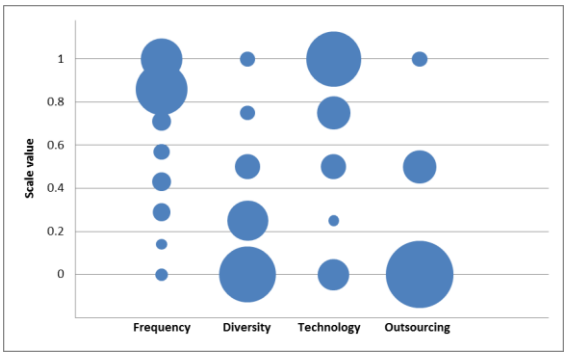
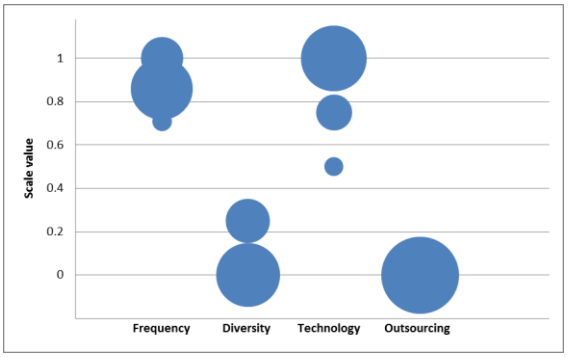
Figure 1: Population and Cluster Results

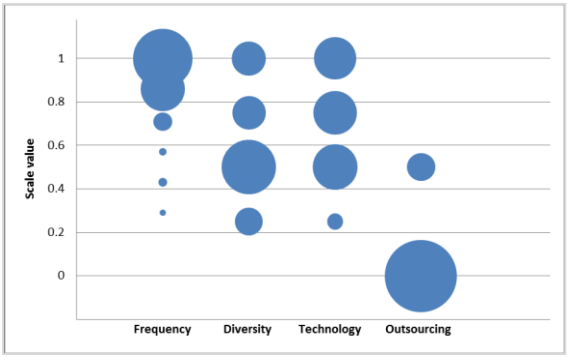
Population as a whole n=1802



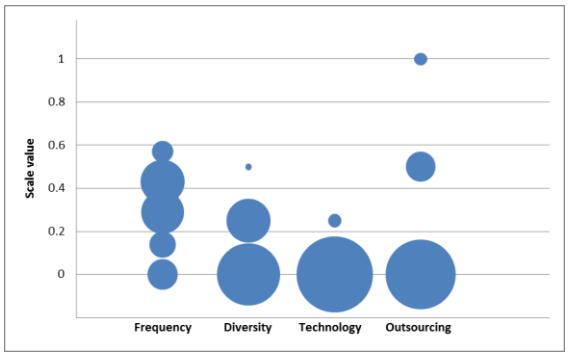
Simple daily showering n=674 (39%)



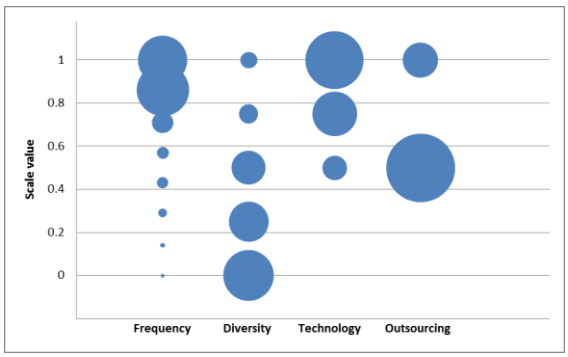
Attentive cleaning n=261 (15%)



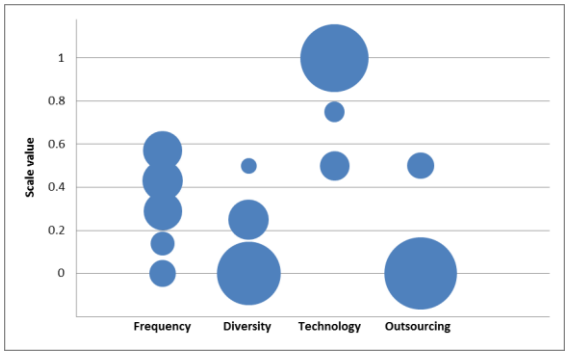
Low frequency bathing n= 120 (7%)



Out and about showering n=281(16%)



Low frequency showering n=211 (12%)



High frequency bathing n=200 (11%)

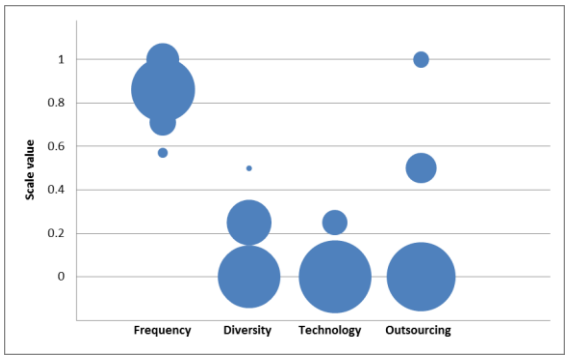


Figure 2: Variation in percentages of cluster membership by age

n = 1725, weighted by respondent

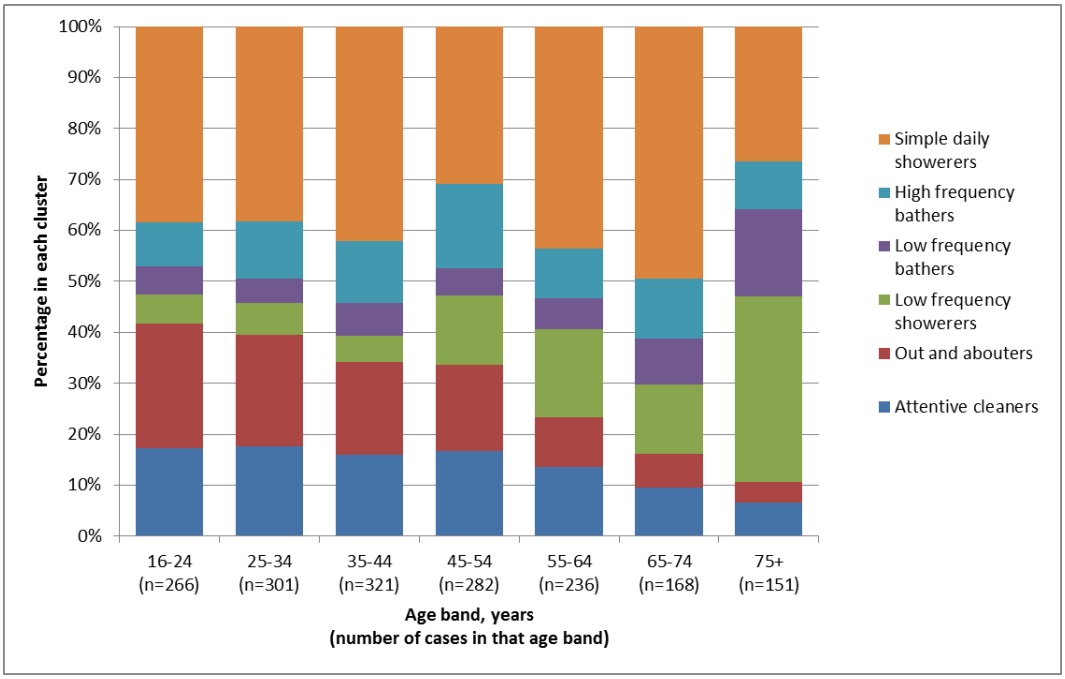


Table 1: Dimensions of bathing practice used to identify variants (clusters) of bathing

Dimension	Definition	Scale values
Frequency	Number of baths and showers per week.	0 indicates 1 or fewer; 1 indicates 8 or more
Diversity	Number of factors which affect shower duration or level of filling the bath.	0 indicates none (never varies); 1 indicates 4 or more factors.
Technology	Shower to bath ratio.	0 indicates always baths; 0.5 indicates about equal; 1 indicates always showers
Outsourcing	Number of places outside the home at which respondent also showers/bathes.	0 indicates none; 0.5 indicates 1; 1 indicates 2 or 3.