Psychographics and Consumer Energy Consumption Patterns - An Assessment of Energy Sector Opportunities

Research Workstream Developed by Freya Espir, Lucy Lui, Mark Workman and Graham Oakes

Abstract

Individuals are leaving digital trails across a broader spectrum of their daily lives via social networks, energy utility meters, smart phone interactions with GPS, and increasing amounts of electronic data is stored public and private databases. These digital footprints are an opportunity for psychographic profiles to be developed as to individual's behaviour and preferences. In sectors such as finance, retail grocery and online advertising the use of psychographics based on personal digital footprints and Facebook profiles has revolutionised the capacity to understand and predict consumer behaviours - sometimes with questionable ethical implications.

The electricity sector has operated with little understanding of individual consumers' energy consumption e.g. quarterly meter readings and even smart metering will only allow fidelity down to half hourly readings. This research seeks to develop insights as to whether psychographic approaches can be introduced to the energy sector to predict and manage energy consumption patterns by segmenting customers based on behaviour.

The initial research sought to assess whether psychographic approaches could be leveraged by the energy sector - both for targeted marketing and to shift energy consumption patterns. The opportunity, as a function of the recent surge of energy data from smart meters, which has provided substantial information about a households' energy consumption is growing - see figures A1 and A2, below. Clustering similar daily demand profiles into a single 'profile class' filters the data into actionable insights. Applications using such insights might be as follows: (1) Classifying residential occupants based on their energy pattern profiles and forecasting and predicting demand. Clustering domestic households remains untapped potential; (2) Recent advancements in smart meter technology has led to individual appliances being characterised by their power signature, adding a further level of sophistication to the clustering models which could be capitalised by utilities; (3) Combining personality data with this granular electricity demand data could reveal not only when people use appliances but also their motives for doing so; and (4) It is hypothesised that machine learning could devise precise energy customer segments which are iterated and refined as new digital touch points become available, thus allowing demand-shifting incentives, products and services to be dynamically and precisely matched to consumers to influence their habits. This untapped technique could be game-changing for energy sector business model innovation.

To test the viability of these possible applications, a method has been devised which segmented domestic energy consumers by combining electricity profiles with psychographic profiles, using data from participants. K-means clustering was used to segment the granular electricity use data and psychographic data independently and were later correlated to identify a higher dimension energy user segment. Participants' responses to a personality and energy motive survey were used to define the psychographic segments. The survey questions could be extracted from digital data - if the sources were made available.

Initial research has demonstrated that psychographic data shows potential to enhance the value of the electricity demand profiles obtained from smart meters, as it was found some indication of correlations between people with a similar daily demand pattern and their behaviour and attitudes towards energy use. Thus, the likelihood of precise energy consumer segments being devised, and incentives matched accordingly is highly probable.

It is recommended that applying the same technique at scale could result in unpacking: (1) reliable correlations and segments to be established; (2) testing incentives on these new segments with a view to referring to their electricity data at a later date to assess whether energy demand habits were adapted; and (3) how the method of incentive delivery and message communicated via the incentive might also be matched to the segment.

In a related workstream, research is being undertaken to assess the governance, regulation and policy dimensions of developing detailed psychographic data profiling of consumers. This is a function of the present suite of consumer protection legislation, regulation and policy being anachronistic and unfit for purpose around the potential for digital psychographic techniques to manipulate consumers.

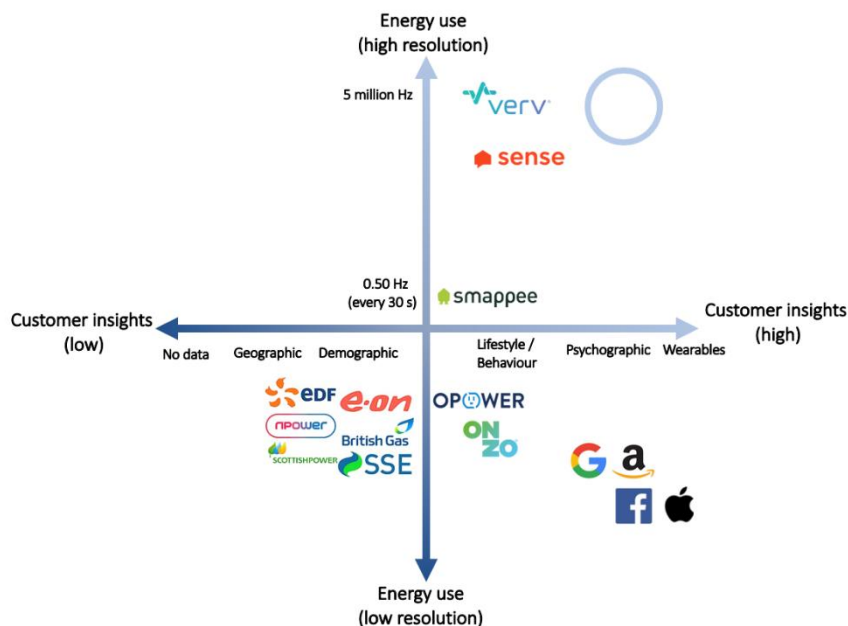For further information email mark.workman07@imperial.ac.uk or call M: +44 (0)7788 110802.

Figure A1: Landscaping the state of knowledge on customers energy use and insights. Utility companies currently use standard demographics and smart meters (which record energy use every 15 - 30 minutes) to profile their customers. Tech companies with advanced smart monitoring technologies are able to retrieve high granularity energy use data which can be analysed to infer information about customers e.g. when they use their washing machine. The tech giants know the most about people's personalities left by their digital footprints which can be analysed to infer psychographic insights. The action gap lies in the top right corner: high customer insight and high resolution of energy use. Correlating information from both sources could lead to hugely successful targeted marketing strategies.
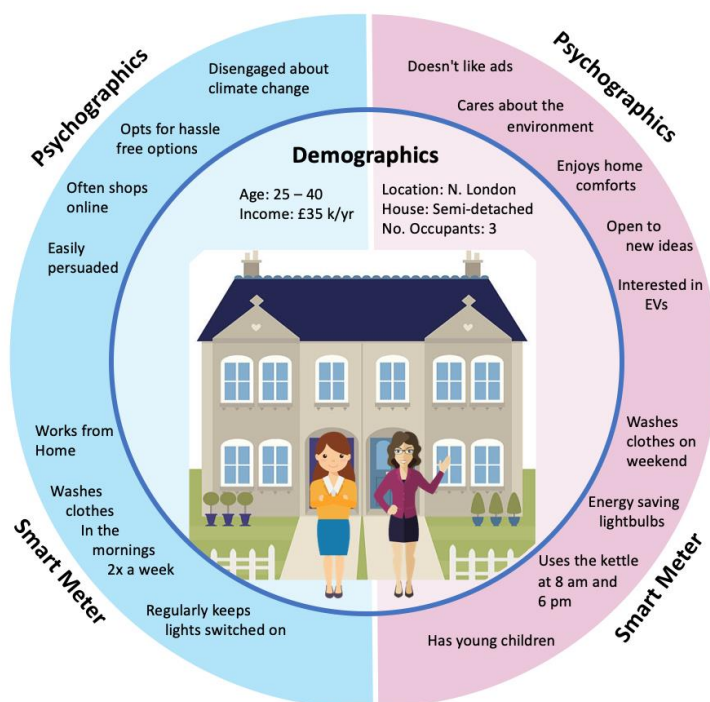

Figure A2: Two woman of the same age, household income and family size can portray very different energy consumption patterns, interests, personalities and lifestyles. Demographics capture a limited window of information about homeowners. Utility companies currently tailor tariffs to customers using demographic data. This limits the value propositions utility companies can offer because they don't know their customers well enough. High fidelity smart meter data and psychographic profiles can capture a people's energy use and personality, which could be leveraged to create new value propositions or incentives specific to the customers. Therefore, customers can be more engaged with their energy use and encouraged to lower then power consumption, for example. Also, customer satisfaction is likely to increase because utilities will forge new relationships with their customers.