

Using digital technologies to test the Social Norms Approach to reducing electricity consumption

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An 18-week experimental intervention with 316 Bristol householders used digital technologies to collect and feed back hourly data on participants' own electricity consumption and that of others in their neighbourhood. By providing digital feedback (by email and web) to two thirds of participants and only giving half of these the social data, the study set out to test the effectiveness of the *social norms approach* at reducing domestic electricity consumption in a UK setting. Initial findings suggest little difference between the impact of individual feedback and individual plus social feedback but point to the importance of the granularity of feedback data and the inclusion, in future research, of large samples, extended data collection periods and adequate experimental controls.

Keywords: Social norms approach; framing; domestic electricity; greenhouse gases; households; mixed methods.

1. INTRODUCTION

Funded by the RCUK Digital Economy Programme, and part of the CHARM suite of studies, this research sought to test a behaviour change method known as the *social norms approach*. This approach had previously been used successfully in campaigns to reduce alcohol consumption and substance abuse and, in several US studies, had been shown to reduce household electricity consumption. The CHARM study set out to conduct a more rigorous test of the approach, using digital technologies to deliver feedback more frequently and cost-effectively; comparing the impacts of social feedback with those of feedback that only included information on individual consumption levels, and combining consumption analysis with surveys and in-depth exploratory research.

2. THE SOCIAL NORMS APPROACH

Conventional approaches to behaviour change often assume a direct relationship between attitudes and behaviour (see McGuire, 1986). However, this long-disputed assumption is of limited validity for pro-environmental behaviours (for example Young et al., 2010), for which cognitive, attitude-driven decision-making should be viewed as a special case rather than as the norm (Bentler and Speckart, 1979).

Other approaches emphasise the role of heuristic short-cuts, or "nudges", that simplify or bypass decision-making. One such, the *social norms approach*, employs the phenomenon of conformity and relies on the notion that heuristics for the selection of effective adaptive behaviour are

provided by two types of norms: *descriptive norms*, which describe what others do, and *injunctive norms*, which describe or imply what they ought to do (Cialdini, 2001). The approach deploys these norms in marketing campaigns that aim to change behaviours and has successfully been used to influence substance abuse (e.g. Neighbors et al. 2008), household recycling (Nomura et al., 2011) and hotel towel re-use (Goldstein et al., 2008).

In the area of domestic energy consumption, three large-scale tests of the social norms approach have been conducted in the US (Schultz et al., 2007; Nolan et al., 2008; Allcott, 2011) and one small-scale test in the UK (Brandon and Lewis, 1999). The most recent and largest of these (Allcott, 2011) analysed experimental programmes in the US involving 600,000 households over two years. In these programmes, reports containing descriptive and injunctive social norms were posted to intervention groups with their normal electricity bills at bimonthly or quarterly intervals. While Schultz et al and Nolan et al had associated use of the social norms approach with reduction of between 4% and 7%, Allcott found that, after two years, the groups receiving social norms information had a 2% reduction in electricity use compared to households whose bills displayed only their own usage.

3. THE CHARM RESEARCH

The CHARM research involved 316 households from two wards in Bristol, UK: one affluent ward and one less affluent. Recruitment was conducted by a professional agency that was given a quota for the age of recruits and was told to recruit at

weekends, weekdays and weekday evenings. Recruitment was door-to-door and included the offer of an £80 incentive. Recruits were randomly allocated to a control group, a group that received social norms information (the social norms group) or a group in which householders received information about their own consumption only (the individual group). The demographic make-up of the achieved sample is shown in Table 1.

Graphs provided to members of the social norms group contained data not provided to those in the individual group. One additional line on the graph represented the average usage of other participants in the neighbourhood and another showed the average used by the 20% lowest consumers in the neighbourhood (see Figure 1). The graphs also included injunctive norms messages such as “Your energy consumption was

Table 1: Characteristics of the sample, shown as per cent

Gender		Social class		Age				Household structure			Experimental group		
F	M	AB C1	C2 DE	16-34	35-54	55-65	65+	Adults & kids	Single adult	Adults no kids	Control	Individual	Social Norms
59	41	68	32	18	46	22	14	46	8	46	107	103	106

Participants received purpose-built monitoring devices capable of measuring consumption changes of 1 Watt or more. Each householder fitted onto their electricity meter a clamp that transmitted usage data at two-second intervals, via a local radio link, to a mains-powered monitor. This monitor sent hourly usage data to the study server via a mobile telephony service, with small flashing lights indicating that they were functioning properly.

After an initial fortnight for the collection of baseline data, usage information and tips on saving electricity were communicated to the intervention groups for a period of 16 weeks between March and August 2011. Feedback and tips were delivered by email, SMS and personalised websites, with electricity use being depicted in four different graphs: consumption for the current day, consumption for the previous day and day-by-day consumption for the previous week and since the start of the study. On each graph, the horizontal axis represented the time of day and the vertical axis the kilowatt-hours used.

above average” or “Your energy consumption was just below average. 😊 Well done, keep it up!”

Once they had installed their monitors, members of the control group were not asked to take any further action until after the end of the monitoring period. During the study, the only communication with this group was an Easter card posted during week 8 of the study. This thanked them for their participation and was intended to reassure them that they had not been forgotten and were still participating.

Five types of data were collected in the study: 1/ frequency with which participants viewed the graphs in the emails and on the web pages; 2/ electricity consumption; 3/ attitudinal and demographic data from a face-to-face recruitment survey and an online post-study survey, and transcripts of 4/ focus group interviews with three groups of eight social feedback participants and 5/ in-depth interviews with one participant from the control group, three from the individual group and 13 from the social norms group.

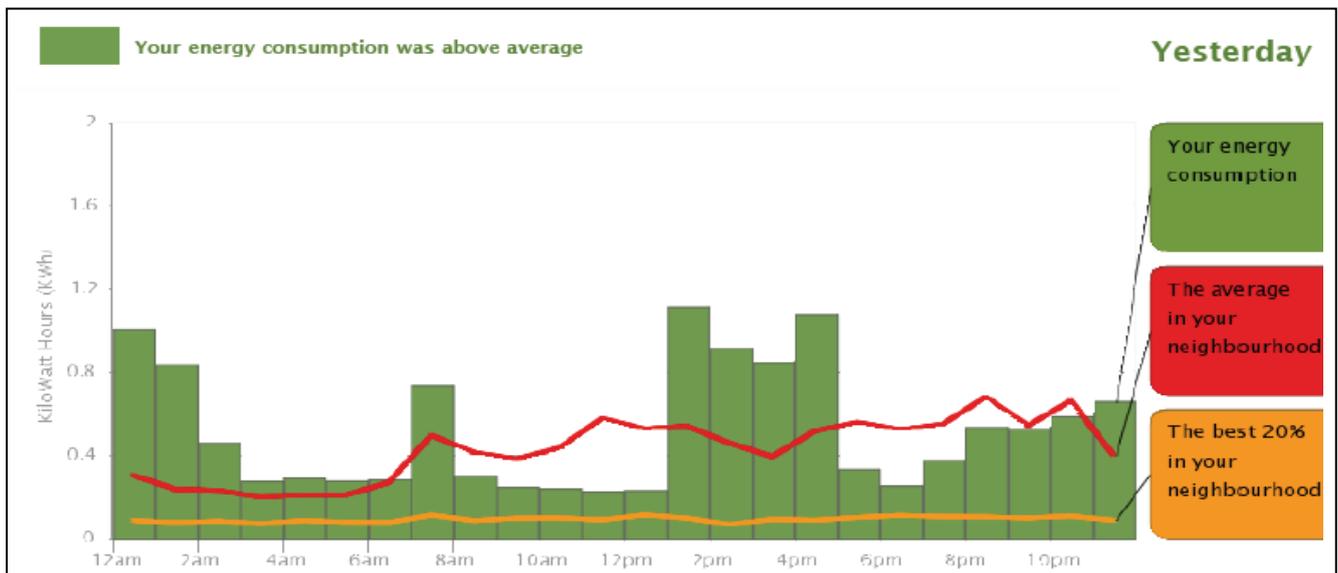


Figure 1: Example of the feedback provided to members of the social norms group

4. FINDINGS

The qualitative research indicates that participants found it easy to understand the graphical social norm feedback and, contrary to Roberts et al. (2007), were not adverse to social group feedback. In fact, feedback generated considerable interest and engagement – in spite of scepticism about whether the other homes in the study were comparable. Some participants, indeed, sought to maintain or achieve consumption levels within the '20% best' range.

Although this report draws on an initial, thematic analysis of the interviews and focus groups, its main focus is the analysis of the quantitative data. In this analysis, regression was used to assess the impact of the interventions on three outcome variables: engagement with the feedback, reported changes in electricity consumption and consumption change. While experimental group was the main predictor variable, demographic variables thought likely to have an influence were also included as predictors.

The statistical analysis revealed that emails sent to the social-norms group were significantly more likely to be read than those sent to the individual group ($N=232$, $B=.16$, Standard error 2.32, $p<.05$, $OR=1.44$). This suggests that social norms communications are more engaging to householders than communications limited to their own usage – a finding supported by data from the questionnaires and qualitative interviews.

Meanwhile, although the electricity usage data suggests some evidence of measurable impacts on behaviour, it shows that the social norms feedback had no greater impact than the individual data. Compared to the control group, members of the individual group were 2.45 times more likely ($N=217$, $\chi^2=50.50$, $d.f.=1$, $p<.005$) and members of the social norms group 2.39 times more likely ($N=217$, $\chi^2=46.37$, $d.f.=1$, $p<.005$) to claim they had tried to reduce their electricity consumption during the study. A comparison of energy consumption in the last four weeks of the study with the two-week baseline period found that, compared to the control group (standard deviation .19; $N=105$), the reduction between these two periods was 3% greater for both the social norms group (standard deviation .18; $N=106$) and the individual group (standard deviation .20; $N=103$).

These findings throw some doubt over the applicability of the social norms approach to electricity consumption. The difference between these findings and the higher effects identified by Schultz et al (2007) and Nolan et al (2008) might be explained by differences in consumption

patterns between the US and the UK, where air-conditioning and electric heating are less common. The mode and format of the feedback is a second key difference between CHARM and earlier studies. In the Schultz et al and Nolan et al studies, researchers took manual meter readings and hand-delivered printed reports to participants' doors. The more automated process used in CHARM may have reduced the social potency of the feedback; and the greater granularity of the CHARM data enabled participants to identify and target particular activities that led to the greatest electricity use.

There is also the question of the duration of the consumption monitoring. Although he identified a smaller effect than the indicative change indicated by CHARM, Allcott (2011, p7) suggests that reductions in consumption were most evident twelve months after the first social norms feedback was provided. CHARM collected consumption data for 18 weeks and there is evidence that some behaviour changes may only have occurred after the end of this monitoring period.

It is unclear whether householders' perceptions of the relevance of the data distinguish CHARM from previous studies. Like Schultz et al (2007) and Nolan et al (2008), the CHARM study used averages that did not distinguish by house type or occupancy, while OPOWER's proprietary algorithm allowed social norms feedback to base comparisons on data from broadly similar households. However, although some interviewees reported doubts over the relevance of the social norms data to their circumstances, interview data indicates that this did not necessarily reduce the effectiveness of the feedback.

CHARM set out to improve on the design of previous studies by including a no-intervention group as well as an individual-feedback-only group. Schultz et al. (2007) had no comparison group that did not receive social norms feedback, while Nolan et al (2008) only compared the social norms approach to other interventions and Allcott (2011) was only able to compare social norms groups with participants who received their usual electricity bill. The results of the CHARM study call into question the need for social norms feedback and indicate that sufficiently detailed individual feedback might be an adequate substitute.

This research generates a number of recommendations for future studies. The first regards sample size and its implications for the reliability of hypothesis testing. To avoid the rejection of true hypotheses, a test requires statistical power – a function of sample size, effect size and standard deviation – to be at least .80 (Field, 2005). In the CHARM study, factors such as the smaller, less tractable nature of UK domestic

consumption reduced the size of the effect to the point where the sample was too small to provide power of more than .30. This emphasises the importance of sample size for experimental tests of behaviour change interventions.

A second lesson relates to the dangers posed by the *hawthorne effect* – participants' tendency to react to the fact that they are being studied, regardless of whether they are in an intervention group. By reducing the difference between control and intervention groups, this effect enhances the risk that effective interventions appear ineffective. The size of the hawthorne effect can be reduced either by minimising awareness of participation amongst the control group or by increasing the impact of the interventions. The physical presence of the monitors in the CHARM study may have exacerbated the effect by reminding people that they were participating in a study. In future projects, researchers should consider reducing the size of monitors and powering them by battery rather than with mains current, so they do not need to be positioned by mains sockets and can be placed in less visible locations. Alternatively, it might be worth researching the effectiveness of the monitors themselves at reducing consumption – even in the absence of feedback. Much as speed cameras act deter against speeding even when they have no film in them, so too might electricity consumption be reduced simply by signalling to people that their consumption is in some way being observed.

The study suggests that the style of feedback used by CHARM successfully engaged participants. The in-depth interviews indicate that householders found it interesting to associate peaks and troughs in the graph with the activities that originally caused them, and this perhaps explains why participants opened so many of the feedback emails. Such a detailed level of engagement was not possible in the earlier studies and is not facilitated by most other feedback systems such as those that utilise real-time display monitors. As engagement is often one of the greatest challenges facing efforts to reduce domestic consumption, this is itself an important finding.

A final point regards the duration of the data collection. It would be interesting to know when and how quickly awareness of the monitor and engagement with the feedback fall away and whether any consumption reductions are short-term or more permanent. This indicates the need for longer studies.

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