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IMPACTS OF DIGITAL FEEDBACK ON THE PRECURSORS OF BEHAVIOUR CHANGE: FINDINGS FROM A LARGE EXPERIMENTAL FIELD STUDY

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1. INTRODUCTION

This paper describes results from a study evaluating the long-term effects of an innovative domestic energy feedback system. It reports on people's engagement with the feedback, and effects on their self-reported values, attitudes, and knowledge about their energy using activities and options for changing them. The results are from a five year experimental research study, the IDEAL project, a UK EPSRC-funded project that has developed and tested new energy monitoring and feedback technology and HCI designs. The results have implications for the design of smart meter In-Home Displays intended to support and encourage energy saving behaviour changes.

2. CONTEXT

Digital home energy feedback, such as that provided with many smart meters, is hoped to support and encourage occupants to change their energy using activities, as a way to reduce domestic energy demand, costs and carbon emissions [1]. However, smart meter programmes vary substantially in which, if any, feedback features are provided to occupants [2],[3].

Determining which features most influence energy using activities, and hence which would best be included in energy feedback systems, is also challenging. The impacts of feedback content and design are not easily separable. Large scale experimental field studies are expensive to run. Research typically finds impacts on final energy use vary between 0% and 15% [4], but with questions over the duration of such changes and scope for continued behaviour changes [5],[1]. Energy using activities are shaped by a number of factors, such as the daily rhythms of life, existing skills and materials, the meaning of the activity for the person and outcomes it has, their level of knowledge about their energy use and ways to change it, habit and whether existing routines are in flux due to a changing context (such as the birth of a new child, or moving home) [2]. These all shape and constrain which activities a person is both able to and willing to consider performing, at which times, and in which manners. Not all these elements are necessarily amenable to change at any given time, and vary in the extent to which a feedback system may support or encourage a participant to change them. As such, even if a feedback system leads to change in some of these elements, the activity itself may not change. Effective evaluation of the impacts

of a feedback system should therefore include evaluation of changes in these important precursors to behaviour change (energy awareness, attitudes to behaviour change, etc.).

3. RESEARCH AIMS AND METHOD

This paper reports on changes in such precursors to behaviour change in the IDEAL project. Participants were recruited from in and around Edinburgh (UK) from a range of occupant and property types. Participation in the experimental study lasted between 3 and 20 months, ending June 2018. Participating homes were installed with whole house gas, electricity and boiler monitors, and air temperature and humidity sensors in each room. Participants were given a tablet pre-installed with the 'IDEAL feedback app'. Participants were randomly assigned to either a control or treatment group. A detailed description of the experimental design is presented in the following paper: [6]. Both groups initially received features similar to the requirements for a standard European Union smart meter display. This includes: dials displaying current usage and cost of electricity and gas; and historic usage and cost charts that can display different time periods, from hours of the day up to months of the year.

Over the course of the study, the control group kept the same feedback features whilst the treatment group received a range of additional new features. Participants were notified of new features via email and by their appearance in the app. New feature content and designs were developed through a mixture of drawing on existing literature, expert opinion and co-design with a subset of participating homes.

3. RESULTS

Initial results suggest that the treatment group has maintained a substantially higher and longer-lasting level of engagement with the feedback system compared to the control, in terms of frequency and cumulative duration of logins. We will report on the statistical significance of this and on the impact of this intervention on the range of other outcome variables described in the introduction, exploring which features were most used and which household and other factors influence participant engagement.

4. FINAL CONSIDERATIONS AND CONCLUSIONS

Initial results suggest that the steady release of new features combined with announcements via email lead to higher and more sustained engagement with the feedback system compared to the control group, which received no substantive changes. Further analysis of results will evaluate the impact this had on energy using activities and energy use. The results suggest that such an approach could help to counter the disengagement found among recipients of smart meter In-Home Displays, potentially increasing their eventual impact on behaviour change.

REFERENCES

[1] T. Hargreaves, M. Nye, and J. Burgess,."Keeping energy visible? Exploring how householders interact with feedback from smart energy monitors in the longer term", *En. Pol.*, Vol. 52, pp. 126–134 (2013).

[2] M. Pullinger, H. Lovell, and J. Webb, "Influencing household energy practices: a critical review of UK smart metering standards and commercial feedback devices", *Technol. Anal. Strateg. Manage.*, Vol. 26, no. 10, pp. 1144–1162 (2014).

[3] H. Lovell, M. Pullinger, and J. Webb, "How do meters mediate? Energy meters, boundary objects and household transitions in Australia and the United Kingdom", *En. Res. & Soc. Sci.*, Vol. 34, pp. 252–259 (2017).

[4] Y. Strengers, *Smart energy technologies in everyday life: smart utopia?* New York: Palgrave Macmillan, p. 74 (2013).

[5] S. Snow, L. Buys, P. Roe, and M. Brereton, "Curiosity to cupboard: self reported disengagement with energy use feedback over time", in *Proc. 25th Austral. CHI Conf.*, pp. 245–254 (2013).

[6] M. Pullinger, N. Goddard and J. Webb, "An experimental research design for evaluating energy feedback", *BEHAVE 2016*, Coimbra (8-9 September 2016)