



Evaluating Personalised Energy Feedback Information for Behaviour Change in Commercial Buildings

Michael Coleman, Katherine Irvine, Mark Lemon, Li Shao

Institute of Energy and Sustainable Development, De Montfort University, Leicester, UK

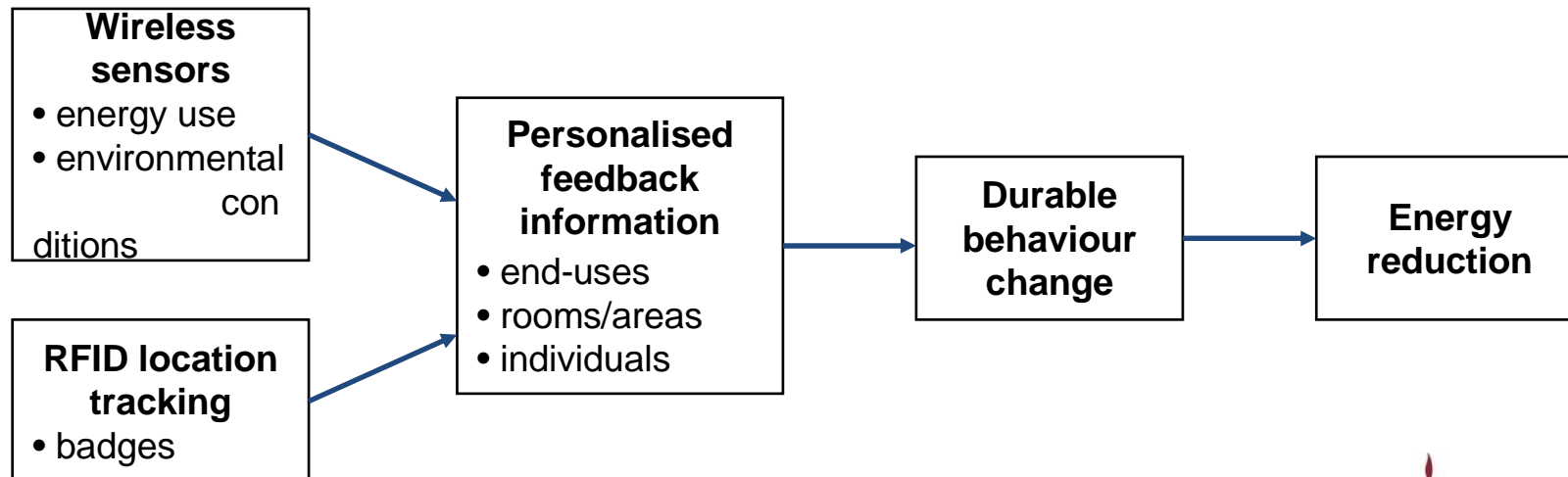
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Overview




- Wi-be project
- Energy feedback information
- Initial results – interviews
- Summary

Wi-be project (1)

- **Reduction of Energy Demand in Buildings through Optimal Use of Wireless Behaviour Information (Wi-be) Systems**
 - Research Councils UK (TEDDI Programme)
 - Project aims to evaluate the use of wireless technologies to deliver personalised energy feedback



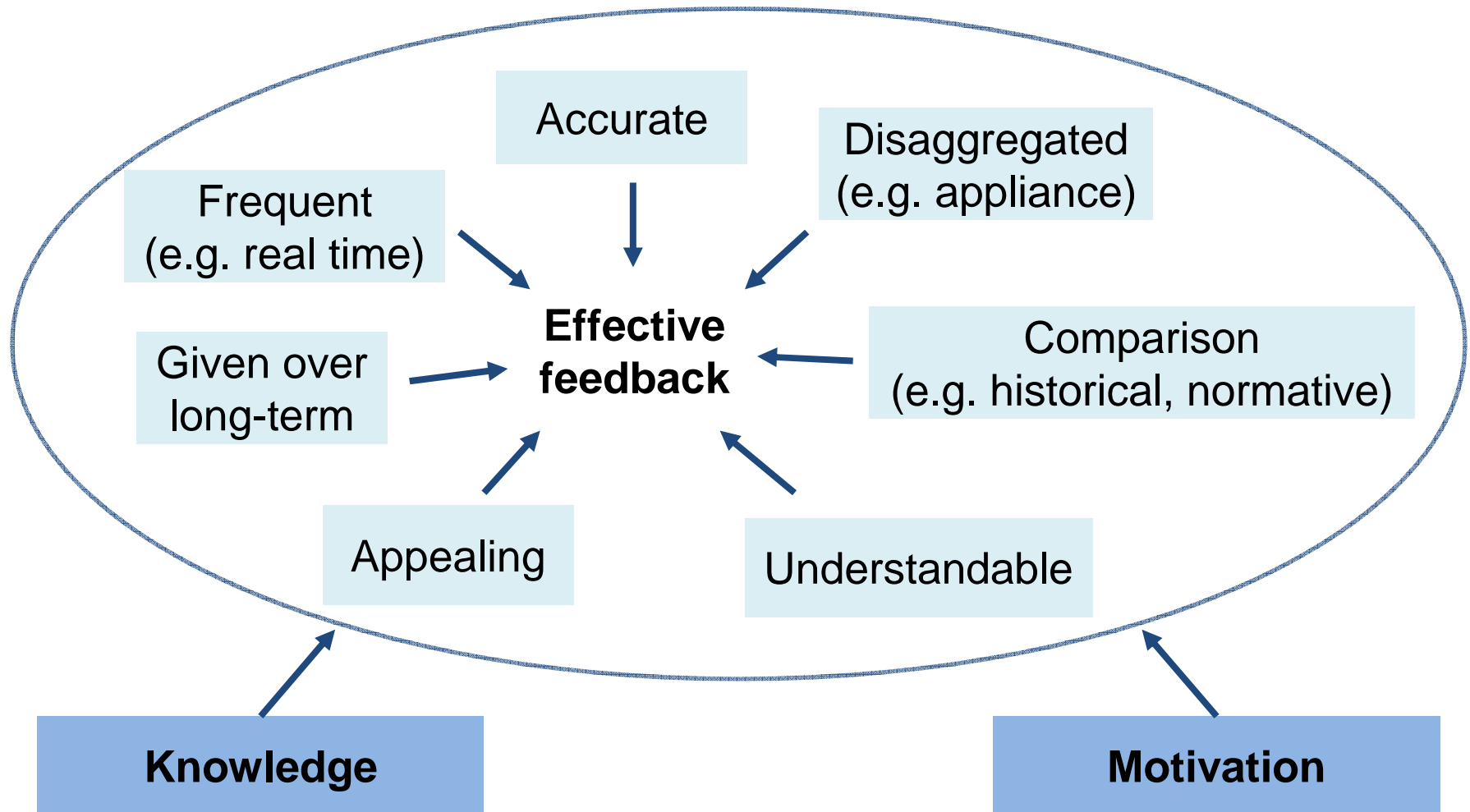
Wi-be project (2)

- 3 UK universities -  DE MONTFORT UNIVERSITY LEICESTER  The University of Nottingham 
- Two in depth Wi-be case studies (residential and commercial)
 - Evaluating and developing Wi-be systems (feedback and technology)
 - Mixed methods (qualitative and quantitative)
- Additional in-depth interviews with building users
 - Evaluate perceptions of feedback and Wi-be systems
 - Initial results are focus of this presentation

Energy feedback information

- Recent reviews of feedback studies indicate feedback can help reduce electricity use in homes
 - Ehrhardt-Martinez et al. 2010; around 4-14%
 - Fischer 2008; around 5-12%
- Growing interest in the provision of energy feedback
 - e.g. in-home displays, smart metering

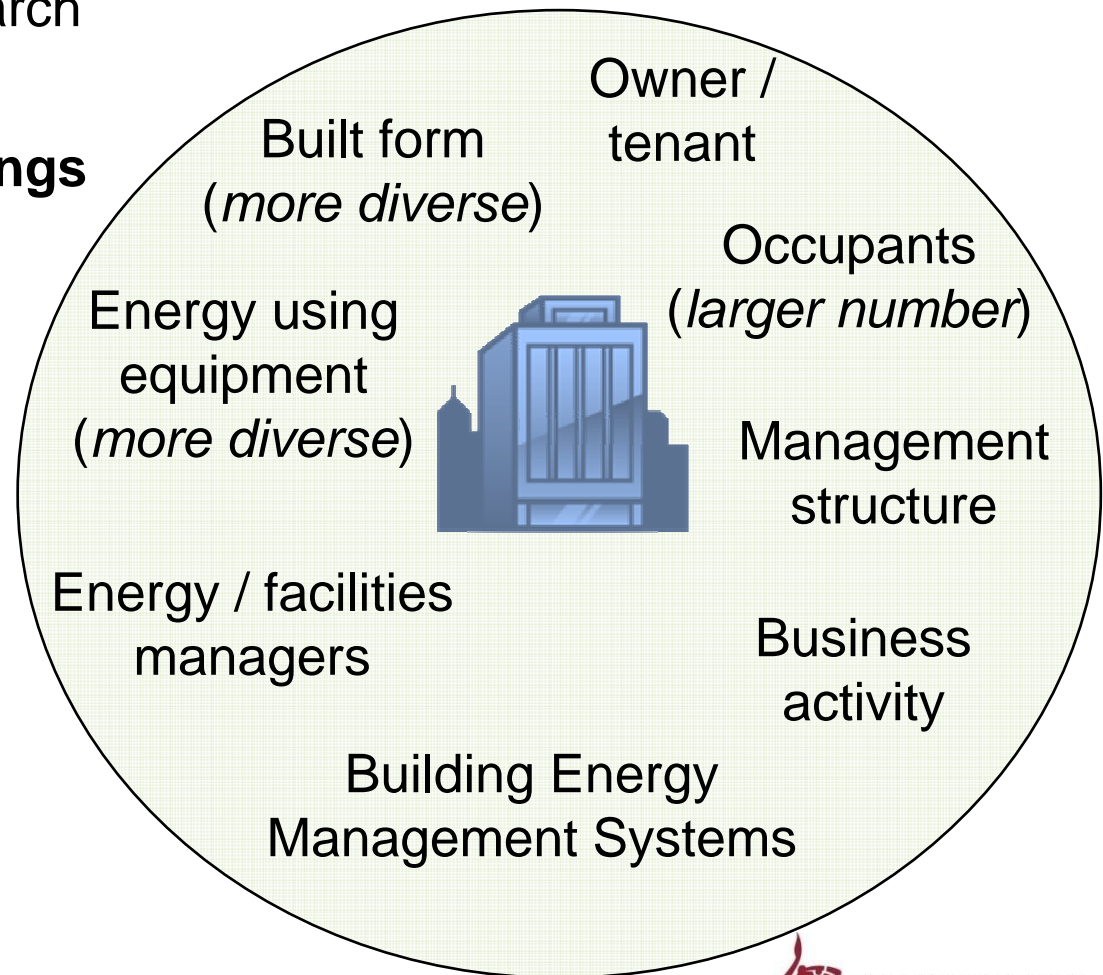
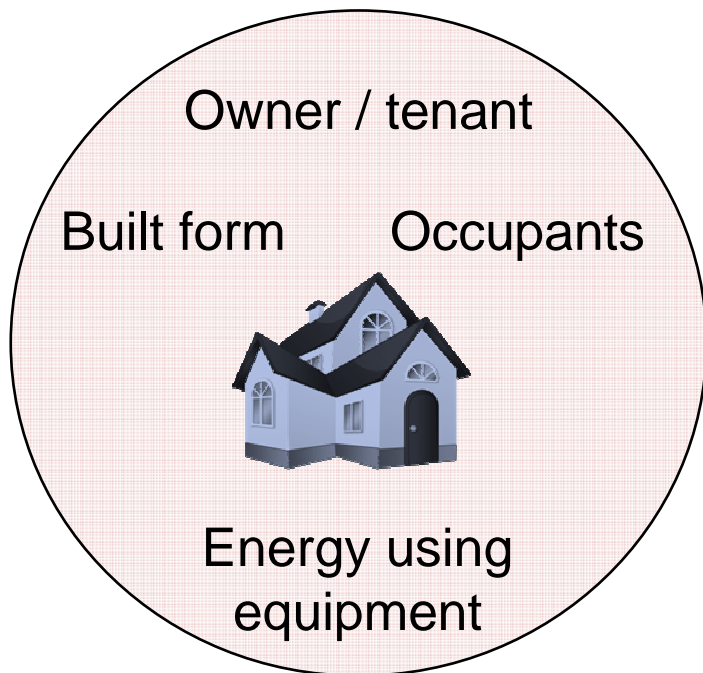
Effective energy feedback



(Adapted from Darby, 2010; Fischer, 2008)

Energy use: different contexts

- Little energy feedback research in commercial buildings
- **How transferable are findings from residential studies?**



Adapted from Lehrer, 2009

Preliminary results: interviews with commercial building occupants

- In-depth interviews
 - Two energy managers; five building users
- Participants thought personalised and disaggregated feedback would be useful

“...I think I turn it down most of the time... possibly I don’t.”

“...turning a PC off every night doesn’t show up...”

“...at the moment, it’s quite difficult for us to actually see what our personal input is...”

- However, themes emerged that suggest limitations
 - Key themes: Control; Knowledge; Ethics

Control

- Control often perceived to be restricted to desks

“...there’s no real control over the energy consumption of the heating system...”

“...that doesn’t just depend upon me... it has to work in with the other people using the same large space...”

- Introduce more indirect control?

Energy manager – *“rather than opening the windows... ask somebody to come and check why”*

Building user – *“...if we knew that, then we’d know which managers should be in charge of reducing...”*

Knowledge

- Limited understanding of technical terms (kWh, W, etc)

“I’m afraid that doesn’t mean anything to me”

- Knowledge of equipment and “know-how”

“You need the information to make an informed decision of how to change your behaviour, to do something about it...”

- Which communally used appliances can you turn off?
- How does the buildings heating system work?
- Who to speak to?

Ethics and privacy (1)

- Concern over privacy and misuse of data

“Part of me wants to say, well what’s the problem with it... another part of me thinks, well why would somebody need to know all that?”

- Especially from tracking equipment

“...I think it’s absolutely shocking, I think it’s a level of surveillance that is encroaching on civil liberties...”

- ‘Naming and shaming’ – normative comparison

“...to point out how you’re wasting De Montfort’s money... I think that wouldn’t go down very well”

Ethics and privacy (2)

- Surveillance and privacy issues reflect other research
 - Concerns appliance monitoring could be used to assess work performance (Schwartz et al. 2010)
 - Feedback and household surveillance (Hargreaves et al. 2011)
 - Third party access to smart meter data, privacy of detailed consumption patterns (Darby 2011)
 - Tracking issues in hospitals: “Big Brother” (Fisher and Monahan 2008; Kurkovsky et al. 2011)

Summary

- Personal and disaggregated feedback could be a useful way to elicit energy reductions in buildings
- Its effectiveness could be limited in commercial buildings due to building users' limited control and knowledge
- Monitoring personal energy use and occupancy has important ethical implications
 - Ignoring privacy and surveillance issues could damage other work dynamics (e.g. morale, trust, work performance)