i-STUTE: WP1

Advisory Board #5 & Management Meeting #9

Oct 2015

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WP1's Work Packages

◉ **WP1.1: Review and synthesis of existing activities.**

  • A review of how economic, policy and behavioural factors influence the adoption of new technologies relevant to heating/cooling technologies.

◉ **WP1.2: Business model typology.**

  • What are the existing business models adopted by energy service providers in the UK? What are the new alternatives are under consideration? How do they match the requirements for successful introduction identified in our review?

◉ **WP1.3: Behavioural Insights – Case studies.**

  • Case studies analysis of where business models succeed or fail to build their understanding of customer needs and behaviours, develop relationships with those customers and provide propositions that customers adopt.

◉ **WP1.4: Behavioural Insights – Experiments and focus groups.**

  • Focus groups & to provide converging evidence on a range of value propositions, zeroing in on features likely to lead to success or failure.

WP1.1: Review and synthesis

◉ WP Completed: Dissemination Tasks as follows

◉ Review of behavioural vs economic influences on the adoption of new heating/cooling technologies relevant to i-Stute.

- Presented as paper at SUSTEM 2015 conference, July 2015, organised by the Newcastle IDRIST, one of the working with EUED teams
  - http://research.ncl.ac.uk/sustem/sustem2015conference/proceedings/
- Revised & submitted paper for publication in Journal of Applied Energy
- Paper & design for Experiment 1.4.1 presented as a poster at the energy-choice symposium in the 11th Biennial Conference on Environmental Psychology, August 2015 in Groningen, The Netherlands.
  - http://bcep2015.nl/scientific-program/monday-poster-session/poster-session/ see #26

WP1.1: Review and synthesis

◉ Business model side: Dissemination tasks

- Teaching Case Study about changes to E.On's business model; revised to reflect the split into two business models, Dec 2014
  - Used with the Arup Future Energy Transitions Programme, the IATL Climate Change module, the WBA Full-Time MBA, the WBS Global Energy MBA, the Tongji University SEM International Programme and the IIMA European Immersion Programme (over 350 managers & students in total)
- "Business Models in the Energy Industry" Review by Fred Dahlmann
  - Teaching syllabus for the Global Energy MBA (July 2014 & July 2015) and the Arup Energy Futures & Transitions programme (May 2015)
- MBA Dissertation: Business model & marketing channels for mCHP

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The Warwick Global Energy MBA

E.On Case Study

Prepared by: Professor David Elmes, WBS
Version 2.0 May 2015

WP1.1: Review and synthesis of psychological barriers to behaviour change

Promoting Behavioural Change to Reduce Thermal Energy Demand in Households

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Abstract (199 words)

A reduction in thermal energy consumption in buildings is vital for achieving the reductions in CO_2 emissions that are part of EU-2020 targets. A key challenge faced by behavioural scientists is to understand what encourages people to adopt more efficient ways of achieving a satisfactory thermal experience. We review the psychological barriers to reducing thermal energy demand in the context of energy-efficient technology adoption, and discuss ways these barriers may be overcome. The barriers include: demand on cognitive resources due to decision complexity; the tendency to procrastinate and discount future consequences; deferral to simplifying strategies including repeating past experience and copying the behaviour of others; the desire to act in ways that maintain a positive self-image; and inertia due to fear of regret that one's decision might be wrong. We discuss behavioural approaches to overcome these barriers, such as emphasising public choice of "green" technology, reframing of benefits, simplifying and optimising the choice environment, focusing on symbolic attributes of new technologies, and changing the temporal structure of costs and benefits. We provide a framework of suggestions for future research which together constitute an important first step in informing behaviour change efforts designed to reduce thermal energy consumption in buildings.

Keywords   Behavioural science; sustainability; energy-efficient technology; demand reduction; behaviour change; choice optimisation

- Action inertia: Why do I have to change?
- Social norms: What do my friends or neighbours do?
- Messenger effects: Who told us?
- Emotions: How does it make me feel?
- Perceived behavioural control: Can I do it?
- Delay discounting: When will I get it?
- Habit: What do I usually do?

- Consideration of these seven psychological barriers to behaviour change, with consideration of when & how each may counteract or supersede rational economic choices.

WP1.2: Business model typology

- ⊙ Start postponed: staff recruited allowed WP1.4 to start earlier.
  - WBS Assistant Professor Frederik Dahlmann started
    - ○ Still resolving details for submission to EPSRC for confirmation.
  - FD attended sessions on Business Model Innovation & other topics at the 75th Annual Meeting of the Academy of Management (August 2015, Vancouver, Canada)
    - ○ Update with key academics (Chesbrough, Zott, Amit, Barney, Eisenhardt, Tushman, et al.) and identified potential publication paths (JLRP).
  - Confirmed research questions with FD:
    - ○ Explore the existence and application of business model thinking among key players in the UK home heating industry.
    - ○ Investigate the changing nature of these business models over time.
    - ○ Assess the validity and contribution of the business model concept to strategic thinking and industry evolution.

WP1.2: Business model typology

⦿ Initial review of core company group completed using the HPA membership

- Defined the traditional OEM-Distributer-Installer-Customer value chain.

- Preparing for company interviews to define the extended value network (e.g. to include utilities, advisory sites such as Which?, etc.) and so the elements of company business models.

- Will seek review with Tony Bowen after AB.

⦿ Work plan for next six months (to April 2016)

○ Q4 2015: Review initial industry value chain participants with Tony Bowen. Confirm & schedule interviews.

○ Q4 2015: Prepare structured interviews & analysis templates to cover historical, present and what views of future can be shared

○ Q1 2016: Conduct initial wave of interviews

○ Q1 2016: Analyse interviews to propose extended value network and business model elements vs literature models

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WP1.3: Behavioural Insights - Case studies.

◉ Work package started September 2014, as scheduled

◉ Case Studies Overview

- Thermal stores (LU)
  - To understand the user requirements for future thermal stores for domestic heating and hot water systems.
- Heat emitters (LU)
  - To understand the user requirements for future low temperature heat emitters for domestic heating.
- Smart displays (WBS, leveraging Innovate UK funded work)
  - Understanding planned behaviour and norm activation in the design of display choices
  - Collaboration with Lightwave RF and WMG (separate Innovate UK Funding)
- Perception Gaps (WBS, leveraging Innovate UK funded work)
  - Does what people think are the important actions to save energy match reality?
  - Warwick survey as part of KTP with Honeywell (separate Innovate UK funding)

WP1.3: Behavioural Insights - Case studies.

◉ Progress since April report

- Case Study 1: Thermal stores

- The on-line survey has been distributed and completed by 278

  ○ Considering alternative channel to broaden demographics

  ○ Early analysis has been undertaken.

- An in-home, contextual interview has been developed, including a 'game' to engage householders with thermal storage.

  ○ Piloted then completed in 19 households, including 10 with hot water tanks, 5 with combi-boilers and 4 with solar PV.

  ○ Difficulties in finding participants with heat pumps properties so not included these in this study, interviews are on-going.

WP1.3: Behavioural Insights - Case studies.

⊙ Progress since April report

- Case Study 2: Heat emitters (appears as WP3.5 as well)
- See comments under Case Study 1 re: online survey
  - ○ includes elements that will inform the heat emitters case study.
- A series of separate in home interviews will be conducted during the heating season 2015-16 to explore issues specifically relating to heat emitters.
  - ○ The interview has been developed and will be rolled out in the next few months.

WP1.3: Behavioural Insights - Case studies.

⦿ Progress since April report

- Case Study 3: Smart displays (WBS, leveraging Innovate UK funded work)
- Work on the Smart Displays field trial halted due to technical issues.
  - ○ Unlikely to be solved & little experimental data gained.
- Alternative approach: use as an example in ongoing work where crowd sourcing techniques are used to design display content and structure
  - ○ Led by Dr Dawn Eubanks, Associate Professor of Behavioural Science & Strategy.
  - ○ Review of literature completed and methodology proposed that uses familiar technology.

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WP1.3: Behavioural Insights - Case studies.

◉ Progress since April report

- Case Study 4: Perception Gaps (WBS, leveraging Innovate UK funding)
- Work on behavioural factors influencing energy saving actions in situations where economic incentives are not at play.
  - ○ Work with Honeywell to support and follow on from a KTP contract
- Experimental work across buildings in the estate of a major Honeywell energy services client and across the Warwick campus have illustrated the gaps people have in what actions to take that will save energy and whether they see themselves able to impact energy use.
- Honeywell are developing this into a revised service for use with future clients.
  - ○ This will help achieve the behaviour change component that's now often included in energy services management contracts.
  - ○ Proposal with Honeywell for HE to support further service offering development and research into what motivates people to modify behaviours regarding energy consumption.

WP1.4: Behavioural Insights

◉ WP Start pulled forward from July 2015 to Oct 2014 as this is the focus of RH

◉ A series of experiments aiming to explore the theoretical choice processes underpinning decisions made in the energy retail market

　◉ Experiments to understand the *relative* importance of the ten behavioural factors identified for decisions relevant to i-Stute in the Lit review

◉ Experiment 1.4.1: Aligned & non-aligned information

　○ First experiment focusing on the role of information structure and type on choice outcomes: specifically exploring the role of alignable versus non-alignable information, using boiler versus heat pump plus popcorn control.

◉ Experiment 1.4.2: Eye-tracking insight into heating choice

　○ Study aims to provide an alternative perspective of the same research question, whilst allowing us to explore potential discrepancies between stated and revealed motivations within choice, using non-conscious eye-movements.

◉ Experiments 1.4.3 onwards: see later discussion

WP1.4: Behavioural Insights

◎ Progress since last AB:

◎ Experiment 1.4.1 – Boiler/Heat Pump Choice (Aligned & non-aligned)

  ◎ Initial data collection complete (200 participants), but bug detected in programme which meant data unfortunately unusable, so now re-testing (around 170 completes received so far)

  ◎ Preliminary analyses on first 100 participants' results:

    ◎ Results appear to be consistent with previous literature

    ◎ Participants are found to be more likely to prefer whichever option has stronger alignable features when options are similar (boiler/boiler)

    ◎ Marginally more likely to prefer stronger non-alignable options when options are dissimilar (boiler/heat pump).

    ◎ This may be due to an increased likelihood to copy non-aligned information over from one option to the next when options are similar.

WP1.4: Behavioural Insights

◉ Experiment 1.4.2 – Eye-tracking insight into heating choice

  ◉ An alternative perspective on 1.4.1 to explore potential discrepancies between stated and revealed motivations

  ◉ Continued preparations while dealing with rework needed in Experiment 1.4.1.

    • Further literature reviewed to inform the design of the study

    • Securing use of Psychology department's eye-tracker resources.

◉ Experiments 1.4.3 onwards

  • Based on the initial two experiments we are:

    ○ Identifying further areas to focus on first

    ○ Standardising experimental procedures to determine relative importance of factors

    ○ Becoming more familiar with the experimental technology involved!

  ◉ Experiment 1.4.3 in design stage – incorporating intertemporal choice literature (delay discounting in the Review) to establish how debt aversion scales interact with 'green' decision making

    ○ Can reframing debts as investments encourage debt averse decision makers to invest in new technologies?

Summary

◉ **WP1.1: Review and synthesis of existing activities.**

   • Completed – Ongoing dissemination through papers & cases

◉ **WP1.2: Business model typology.**

   • Work now underway after staffing change.

   • Reconfirmed research questions. Updated academic perspective.

   • Initial value chain for UK HP industry reviewed in preparation for interview programme

◉ **WP1.3: Behavioural Insights – Case studies.**

   • Started as per schedule; Ongoing work in the four cases

   • Recommend Case 4 work with Honeywell; review next AB

◉ **WP1.4: Behavioural Insights – Experiments and focus groups.**

   • Started earlier than plan (Oct 2014 vs July 2015)

   • Experiment 1.4.1 reaching completion; delayed by programming error.

   • Initial discussion and dissemination through academic channels.

   • Preparation for subsequent experiments ongoing, based on WP1.1 review