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Published PDF deposited in Curve February 2016

Original citation:
Wilson, C. (2014) 'A persuasive case for ex ante evaluation of energy savings campaigns?' In: Sharing and Accelerating the Value and Use of Monitoring, Reporting and Verification Practices, 'International Energy Program and Policy Evaluation Conference'. Held 9-11 September 2014 at Berlin, Germany. www.ieppec.org

URL: http://www.iepec.org/?p=6929

Publisher: www.iepec.org

A persuasive case for ex ante evaluation of energy savings campaigns?

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Abstract

Energy saving by building users is now one of the top sustainable behaviour change priorities of both public and private sector organisations, and communication of information is the most popular strategy to deliver such voluntary change. A major challenge to this type of strategy is that what makes information persuasive is contextual, according to the communication situation and the interests, cultural expectations and needs of the audience. Further, such behaviour change initiatives across Europe do not currently have a track record of quality evaluation.

The Elaboration Likelihood Model (Petty & Cacioppo 1986a) offers a potential framework for assessing this type of strategy ahead of implementation, as it focusses on the features of communication that exert influence on attitudes. This paper reports on the use of the framework to pre-test a project to engage building users with a new feedback mechanism. The building users and public buildings in this research are a sub-set of the EU-funded SMARTSPACES project to deliver more energy efficient use of such property. Quantitative findings show that the proposed intervention contains information which is credible and believable and associated with raised intentions. Qualitative feedback from focus groups provides insights into the aspects which fail to motivate.

As well as learning for the SMARTSPACES project, there are observations which are useful to others trying to engage building users in adopting more energy efficient behaviour. These insights indicate that using communication theory to frame an ex ante evaluation has potential to help address the gap in preparatory work to find out what works ahead of engaging building users in saving energy.

Introduction

Energy efficiency is of increasing importance as a method to help the UK and the EU meet obligations to reduce carbon emissions (e.g. UK Climate Change Act in 2008, Directive 2012/27/EU on energy efficiency). Some of the changes needed to the way we consume energy will be achieved through regulation, others will require us to choose to behave differently. Energy performance of buildings, for instance, is highly dependent on consumer behaviour (Faiers, Cook & Neame 2007)

As a reflection of this, employee energy saving is now one of the top sustainable behaviour change priorities of both public and private sector organisations based in the UK. While attention so far has been focused on domestic settings and householders, there is considerable scope to reduce energy consumption in non-domestic buildings; it is estimated that in the UK 17% of carbon emissions result from the operation of these building types (UK Green Building Council 2013). Switching the focus to non-domestic buildings presents an interesting challenge. For the ordinary building user many of the barriers to reducing energy (e.g. up front cost of measures, hassle factor, distrust of energy suppliers) are removed (HM Treasury &

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DEFRA 2005). One the other hand a major incentive, direct personal cost savings, are also no longer applicable.

Communication is the most popular strategy to deliver voluntary change (Corporate Culture 2013). However a major challenge to this type of strategy is that what makes information persuasive is contextual, according to the communication situation and the interests, cultural expectations and needs of the audience. Such behaviour change initiatives do not currently have a track record of quality evaluation (EEA 2013). Ex-ante evaluation would provide organisations with much-needed guidance on whether such initiatives would be likely to be successful, or indeed identify the risk that they might be counter-productive.

A key problem with campaigns to encourage reduction in energy consumption is that such consumption operates at the level of the subconscious for most people, with 'energy' and 'power' not everyday terms (Dobbyn & Thomas 2005, 6). People can be 'energy conscious, but not energy knowledgeable', in that they know that low energy use is important, but may not know how to achieve it (EEA 2013, 29). Another key factor with provision of energy advice information is trust in the provider of the advice (ibid).

The three year (2012 to 2014) EU-funded SMARTSPACES energy-saving project focuses on public buildings and uses data generated from smart metering systems to better communicate consumption to building users. Pilot sites at eleven European cities are involved. The SMARTSPACES system being developed in the Leicester pilot site aims to provide building users with data on energy (electricity and gas) performance across 25 public buildings (Stuart et al. 2013). Non-technical users, the focus of this research, were to be presented with a simple visualisation of the energy performance of their building, as shown in Figure 1, to allow them to better understand their building's performance and compare it with other monitored buildings.

Figure 1. Prototype of energy feedback system

A key feature of the proposed communication was the feedback facility, with all building users able to report or comment on building performance, or problems in their building[1]. This was to be provided by commonly available social networking, such as twitter, and also via a discussion forum to allow for open discussion of issues. Bringing disparate stakeholders together in this way can lead to a dialogue which can generate collaborative behaviour change.

The intended provision for participative communication in the SMARTSPACES project

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[1] Since this study the feedback system has gone live, incorporating feedback from this research. See http://smartspaces.dmu.ac.uk and the forum at http://forum.smartspaces.dmu.ac.uk.

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bears many hallmarks of a bottom-up approach to communication, where individuals are actively involved rather than passive (Filmer-Wilson & Anderson 2005; Owens & Driffill 2008). The characteristics of a bottom-up communication approach include dialogue, participation and involvement in the process, as opposed to a top-down approach to communication featuring scientific persuasion or instructional transmission of information (Wilson & Irvine 2013). Participatory methods are advocated for greater effectiveness (Anable, Lane & Kelay 2006; Collins et al. 2003) due to being more appropriate in Western societies for today's less deferential citizens.

In summary then, inadequate knowledge is a barrier to energy-saving behaviour and as such information has a key role in any package of measures to change behaviour. This information needs to be involving, or engaging, and trustworthy. The Elaboration Likelihood Model (Petty & Cacioppo 1986a) offers a potential framework for assessing persuasive messages ahead of their implementation. This paper reports on the use of the framework to assess a proposal to engage building users with a feedback mechanism designed to deliver more efficient energy use in public buildings. It should be stressed that the purpose here was not to test theory but to use theoretical insights to identify and monitor the communication processes underlying the proposed SMARTSPACES intervention (Riemer & Bickman 2011).

Theoretical context

The Elaboration Likelihood Model (ELM) is a 'framework for organizing, categorizing and understanding the basic processes underlying the effectiveness of persuasive communications' (Petty & Cacioppo 1986b, 125). This framework is useful 'for investigating factors that may increase or decrease the likelihood of a message receiving thoughtful consideration' (Lundy 2005, 267). The ELM addresses four features, or independent variables, which influence the impact of communication. Two of these are internal to the message receiver: the extent to which they motivate or involve the receiver in the issue being communicated, and the extent to which receivers are able to process the message. Two are external features: a receiver's judgement on the perceived quality of the argument in the message and on the trustworthiness of the source of the message. The model describes how people process information to varying degrees of thoroughness, the depth of processing being a function of motivation and ability. If involvement and ability levels are high, thoughtful elaboration is more likely to occur (Petty & Cacioppo 1986b).

Objectives and methods

The purpose of the research is to discover the optimum way to communicate the SMARTSPACES project in order to achieve attention, interest and engagement with key categories of building user in the Leicester pilot site. Given what makes information persuasive is contextual, a second purpose is to assess the efficacy of using the ELM as a framework to evaluate the proposed introduction of this and similar energy use engagement projects.

The Leicester pilot involves five large De Montfort University campus buildings. Student users were identified as potentially the hardest to motivate. They have a shorter term stake in the financial economy of the university than staff. The cost of being at the university has recently increased dramatically (Paton 2013) and the fee remains the same regardless of energy consumption. This creates a potential 'commons dilemma' (Hardin 1968) in which students may understandably feel it is their right to extract maximum individual benefits by having resources at their disposal at minimum inconvenience. A convenience sample was necessary due to the difficulty in attracting students to volunteer in early summer 2013, a period with many deadlines,

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but also the required time in order to inform the rollout of the intervention in the autumn of the same year. All of the students were from a humanities faculty, studying courses with no specific energy or environmental focus. Three focus groups were conducted with nine, six and five participants (20 student participants in total). Males and females were represented in both student and staff focus groups.

The profile of the staff group (nine participants) was deliberately different. A group of environment champions was targeted for their familiarity with promoting energy saving at the university. These staff were judged to offer insights into current staff attitudes to energy saving. The questionnaire focussed on their own individual behaviour, whilst,the focus group questions included comments on their own responses and those they might expect from disinterested colleagues.

The conduct for administering the questionnaires and follow-up focus groups was the same for students and staff. Each focus group first received a short presentation of the proposed SMARTSPACES service, including what it might look like, its purpose and how it was expected to work. Each participant was then asked to complete a questionnaire, with questions formed using keywords gathered from existing literature on how the four independent variables of the ELM should be operationalised. For example *ability to process* was assessed by asking participants to indicate to what extent information was 'understandable' or 'clear' (Park, Lee & Han 2007). For *source credibility* participants were asked questions around whether they thought the university was an 'expert' (Wood & Kallgren 1988) who was 'credible' (Jones et al. 2004). Questions were also posed about energy behaviour intentions as a result of receiving this new information.

All participants who completed the questionnaire were then invited, and agreed to take part in, one of a series of focus groups in which questions were again based on the four independent variables of the ELM. The goal of the focus group was to explore reasons for respondents' questionnaire responses. In the final phase of the focus group, respondents were shown alternative prototype sources for the intervention. The purpose of this was to assess whether these alternative sources would be more or less credible than the one proposed. One proposed prototype was a specially designed *product brand* (Balmer & Gray 2003) comprised of the words 'My Energywatch' and an anthropomorphised animal cartoon character. Researchers used the focus group discussion to elicit whether a brand new product brand such as this was appropriate. Alternatives shown were existing product brands already associated with energy use or environmental action, or the more *corporate brand* (ibid) of the university.

Quantitative results

It is worth recalling here that this research is not intended to be a test of theory, but using theoretical insights to identify and evaluate impact on the causal determinants underlying the behaviour change intervention. Therefore a lack of a significant finding is treated here as an indicator of potential failure of the campaign to have an impact on its intended audience, rather than a failure of theory.

Responses to groups of questions designed to measure each persuasion variable were tested for whether they reliably measured the same concepts. This was done by using only question sets that scored higher than .7 in Cronbach Alpha analysis[2]. While all of the predictor variables met this threshold, the questions assessing the proposed dependent variable, behavioural intention, were exposed as not measuring a single concept (Cronbach Alpha = .389)

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[2] Cronbach's test uses the mean score of question items to measure the strength of their relationship to others it is proposed to group with them.

but potentially assessing different types of intention: intention to change own behaviour, and intention to report energy wastage in buildings more generally. As a result, the following statistical tests were therefore conducted using each intention question as a separate independent variable.

Prediction

Repeated testing and meta-analytic reviews provide strong evidence that *ability to process* and *argument quality* predict changed attitudes, intentions or behaivours (Johnson & Eagly 1989; Keller &Lehmann 2008). Statistical analysis explored this causal hypothesis, i.e. whether those respondents giving positive responses for persuasion indicator questions from the ELM are also more likely to change their own behaviour or to report an energy saving opportunity. The persuasion variable responses were scored on a scale from 1 for 'strongly agree' to 5 for 'strongly disagree'. In Table 1 it can be seen that for all four ELM predictor variables, mean scores are lower in every case for participants who say they intend to report an energy saving opportunity than for those who do not.

Table 1. Results of the Mann-Whitney U test to see if there is a difference in intention to report for those who find the campaign persuasive

Variable	Intention to report	N	Mean	U	Sig.
Ability to Process	yes	13	10.19	114.500	**.046**
	no	12	16.04		
Involvement	yes	13	10.73	94.500	.186
	no	11	14.59		
Argument quality	yes	13	10.08	116.000	**.040**
	no	12	16.17		
Source credibility	yes	13	12.12	76.500	.776
	no	11	12.95		

The data was analysed using the Mann Whitney U Test. The difference in responses was statistically significant ($p < .05$), for two of the ELM variables indicating that when building users found the information offered *believable* and *credible* (argument quality) they were also likely to intend to report energy savings opportunities. When they found the information *useful, enjoyable* and *engaging* (ability to process), they were also more likely to intend to report energy savings opportunities. For the other two ELM variables, *involvement* and *source credibility*, it cannot be concluded that the difference in distribution of responses between high and low scorers found in the sample are sufficient to make them predictable throughout the university staff and student population during intervention rollout. Similar analysis analysing the impact of persuasion indicator questions on intention to change own behaviour was non-significant in all cases, indicating that the information was less persuasive in focussing people's attention on their own energy behaviour.

Student/staff differences

One final test was undertaken to see if staff and students were responding in the same way. As previously discussed, the staff participants were environment champions and could be expected to respond favourably. A Mann-Whitney test, conducted to compare the staff and

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student responses, revealed a statistically significant difference in that students reported a greater sense of involvement, ability to process and argument quality. There was no statistically significant difference in the responses to source credibility (see Table 2). There was also no significant difference between staff and student responses to the *intention to report* dependent variable (p = .13, Fisher's Exact Test) suggesting that while the students are giving more positive responses to the predictor variables than the staff, the resulting intentions are similar.

Table 2. Results of the Mann-Whitney U test of the difference between staff and students

Variable	User type	N	Mean	U	Sig.
Ability to Process	student	16	16.31	19.000	**.003**
	staff	9	7.11		
Involvement	student	16	15.09	22.500	**.010**
	staff	8	7.31		
Argument quality	student	16	16.91	9.500	**.000**
	staff	9	6.06		
Source credibility	student	15	12.10	61.500	.716
	staff	9	13.17		

Quantitative results discussion

The results indicate that when building users find the information presented believable, credible and engaging, they are also likely to intend to report energy savings opportunities. Differentiating staff and students indicates that students find the campaign more persuasive than staff, although the intentions between the two groups are not significantly different. This suggests that staff, who are likely to already be energy aware and alert to energy saving opportunities, were less affected by the proposed intervention but reported similar intentions to report energy savings (suggesting they were already persuaded). For students, who had fewer energy associations than the staff participants, the results suggest the campaign was more effective in triggering intention.

Qualitative results

Student focus groups

Student participants observed that the message should be more explicit and quantified. As was shown in Figure 1, the prototype information about the performance of buildings used cartoon 'smiley' faces. While students liked the smiley face concept they struggled to relate to how much worse an unhappy face was than a happy face. They recommended some indication of what each face meant in cost terms, environmental or financial, with financial quantification more favoured than environmental. Other suggestions included clearer guidance as to what actions to take, such as reminders to switch off lights or computers.

On *involvement*, some students questioned whether energy saving was their responsibility: "I think a lot of people might think it's not really up to them, as in they have no control over it ... right now we think somebody else controls electricity and controls the gas and we just turn up basically. That's how it is for us". (Female, focus group 2)

As regards whether they would feel sufficiently involved to interact they thought this unlikely, even though use of a social media tool like twitter made it an easy option. There were

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comments about such action being neither the role of a student or something they could identify with doing: "I don't tweet that much and when I do it's about stuff that goes on in my life. I can't imagine myself tweeting about electricity and the uni". (Female, focus group 2)

One group felt the main achievement of the proposed intervention would be to make the student body more energy-aware and change the mind-set and the culture of the university towards energy waste, rather than have it judged on numbers of comments made.

There was no clear guidance as to which of the potential brand images shown would be more credible to act as the source of the intervention. Participants felt a product brand was positive, but there was strong agreement from all three groups that it should be clearly underpinned by a clear use of the university corporate brand: "From our point of view it would probably best for it to be from the university. Because it's something that you are closely engaged with. We're all connected in that way because we're all at the same university". (Male, student focus group 1)

University branding was also recommended to be felt through the 'channel' used to communicate, with the staff and student portal or common internet landing page recommended as communication channels. One important unplanned finding from two of the focus groups was about the need for training in order for staff to act as role models. Examples were given of staff observed using energy unnecessarily, either because they were not aware how to avoid this, or because they were unconcerned by the consequences.

Staff focus group

Staff also liked the smiley face concept but offered lots of suggestions to make the campaign more involving and engaging. A female member of staff said that employees (as opposed to students) would be motivated by clear signals about the potential for energy saving to reduce cost. She also approved of information being provided at a building level, so that the focus wasn't on individuals. There was a consensus that the campaign message had to do more than highlight performance, it had to give information about what staff could do: "Once you've looked at and seen it's red [the face], what do I then do?" (Male, staff focus group). Another male member of staff agreed that to only receive information about relative energy use might leave staff, particularly those without a strong interest in sustainability or energy, feeling helpless: "I think it's a bit overwhelming for the individual at times to see an issue like that and think, what am I going to do?"

As described in the literature review, a key feature of participative communication is that it is conducted two-way, yet staff identified several hurdles to participation, around immediacy, competing priorities and existing culture. One staff member said that unless the response could be made instantly, interaction was unlikely. Staff intranet pages which open automatically with their browser were also seen to have limited value: "As soon as that thing flashes up on my screen in a morning I just switch it straight off because there's so much for me to get involved in and do, I'm not interested. I can only do what I have to do as part of my job." (male, staff focus group)

As with the student focus groups, part-way through the discussion participants were shown a range of alternative brands and asked to discuss their merits. The consensus was that the brand needed to look like a professional established brand for credibility and that some of the alternatives seen achieved this better than the prototype. Staff were less keen than students for the university brand to act as the source of the intervention, as this would mean it was less likely for staff to feel ownership.

Focus Group Discussion

Using the variables of the ELM to structure and analyse discussion around the proposed communication revealed that the information presented was seen as believable and credible. Both staff and students engaged with the material, often seeking more detail and further elaboration of meaning, suggesting satisfaction with *argument quality*. The communication as proposed in the prototype did not appear to prompt user involvement. Energy and participation in use-reduction were not seen as topics either staff or students felt appropriate for them to discuss, and there was a lack of clarity about the meaning of the smiley faces and how to respond. The ELM suggests that if *involvement* is weak, source credibility can step in as a cue for a respondent to engage with the topic (Petty, Gleicher & Jarvis 1993). Students wanted strong university branding but staff thought this might indicate an authoritative initiative not influential to participation.

As described in the introduction, the approach of the proposed intervention was based around an 'invitation to participate' but the mechanisms offered to achieve this were seen as unlikely to engage, partly due to practical barriers such as immediacy and time, but also because commenting on neither twitter nor a proposed forum were seen as something staff or students could see themselves as doing.

Triangulation of quantitative and qualitative data

The quantitative findings indicated that questions were referring to two different types of intention, and the intervention as presented contained argument persuasive to participants reporting on energy use of others/the building but not about changing own behaviour.

The focus group discussions about intention also featured little discussion about participants' own behaviour. Students, especially those in the second of the focus groups, thought that responsibility did not lie with them to change behaviour, but for energy efficiency to be managed by someone else. The staff group, as energy champions, readily gave anecdotes of the sorts of individual behaviours they already practiced, and it could be that as they already practice individual energy saving, their level of intention was unchanged.

The quantitative findings indicated that when building users find the case presented believable and the information useful and engaging, they are also likely to intend to report energy savings opportunities. This appears only partly borne out in the qualitative findings in that participants appeared to accept that the information presented was genuine, and their engagement with it was to suggest how it could be differently presented, often requiring more elaboration. However while participants reported in the questionnaires that they would report energy savings opportunities, focus group discussions focussed on the barriers to doing this. Quantitative and qualitative data indicated that the ELM variable *involvement* was not found to be influencing intentions. *Source credibility* questions about the university also failed to influence intentions in the quantitative phase, and qualitative feedback about the alternative prototype *My Energywatch* brand was that it looked 'amateur' and 'wishy-washy'.

Students reported a greater sense of *involvement*, *ability to process* and *argument quality* than staff. There was no statistically significant difference in the responses to *source credibility*. There was also no significant difference between staff and student responses on *intention to report*, suggesting that while the students gave more positive responses than the staff, the resulting intentions are similar. There is no clear insight into this from the qualitative data. It could be that while the information provided was seen as quite new to the student groups, the staff group, as noted in the methodology section are already familiar with the concept of energy saving and it could be the case that the information was less influential because it is already

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familiar and contained only novel presentation (Rosen 2000).

Conclusion

The purpose of this research was not to seek out generaliseable results to indicate that this campaign would work in other situations, as what works is affected by local context. The purpose was to assess the extent to which theories concerning communication methods and approaches offer practical insight as a framework for an ex ante evaluation of a proposed intervention in which information is a key element. Specifically, the goal was to discover the optimum way to present the SMARTSPACES feedback system in the university buildings of the Leicester pilot. Previous sections have set out how the framework elicited useful guidance on ways to improve a sense of *involvement*, on how to make messaging clearer and what branding to use as the source of the message. A key finding was that an 'invitation to participate', without prompts as to what action to take, risks leaving audiences overwhelmed, which is associated with a sense of powerlessness (Ereaut & Segnit 2006; Fisher 2013; FUTERRA 2005).

As well as learning for this specific intervention, there are observations which are useful to others trying to engage building users in adopting more energy efficient behaviour. It appears that even when the goal is to avoid a top down intervention, initiatives based on an 'invitation to participate' still need guidance for the invitee on how to participate/respond. While avoiding overt persuasion, participative approaches will still want to consider what is persuasive. A key learning is that further support, such as cultural priming, and possibly greater shared knowledge on both sides, is needed before two-way communication is realistic. These insights indicate, that while not a framework to deliver generaliseable results, using communication theory to frame an ex ante evaluation has potential general use. Even though the ELM was originally devised to assess the persuasive communication associated with a top-down approach, it appears to offer useful guidance in how to assess an intervention that is designed to be deliberative and participative.

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