Digitally Engaging and Empowering Employees for Energy Demand Reduction: A New Approach for the Next Generation?

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ABSTRACT

Opinion is divided over whether technical solutions or behavioural change strategies offer the best energy savings potential in buildings. Behaviour change initiatives could have impact given current estimates that 30% of energy in buildings is wasted. However, technical solutions epitomised by 'smart' cities and buildings, exhort the role of information and communications technology (IT) and the digital economy as offering significant potential for carbon reduction. Yet both technical and behavioural approaches share the same contested assumption: users are a hurdle to overcome rather than a resource to be utilized. This paper presents an alternative approach, informed by social media and public participation experts, reframing the relationships between energy management personnel and those using the energy. This paper presents new findings from a UK research project funded by the Engineering and Physical Research Council. Working with a local authority energy team and a user-group of building users (from energy managers to 'ordinary' users), Gooddeeds developed and tested digital technologies social media/smartphone tools to engage with, and empower, employees in the reduction of their building's environmental impact. Findings from the first set of focus groups with the user group offer insight into the potential for a more collaborative approach to benefit building users through raising awareness of best practice with regards building energy management. In particular, collaborative approaches have the potential to empower building users with the tools and contacts to resolve issues more quickly. Yet there can be no 'one-size' fits all approach to non-domestic buildings with this research highlighting clear variations of engagement and interest in this approach dependent on building type.

Introduction – The Challenge of Energy in Non-domestic Buildings

Academics and policy makers agree that buildings across America and Europe represent approximately 40% of gross energy consumption and account for approximately 35% of carbon dioxide (CO_2) emissions (Lombard et al 2008; Dascalaki et al. 2010). Intelligent efficiency and the 'internet of things' (SMART 2020; Rogers et al. 2013) is often seen as a step-change towards a more sustainable world, as the SMART 2020 report states, "better building design, management and automation could save 15% of North America's building emissions" (2008: page 9). Yet the faith in technical solutions is questionable given that the literature tells us that it is the behaviour of users that wastes around 30% of energy in their buildings (Brown, Bull et al. 2012) with much IT office equipment being under-utilised and left on-overnight (Mulville et al, 2014). Smart or intelligent buildings were once heralded as the solution. Clements Croombe (1997) notes the definition of an intelligent building by the Intelligent Building Institution in Washington is "one which integrates various systems to effectively manage resources in a coordinated mode to maximise: technical performance; investment and operating cost savings; flexibility" (1997:396). Wong et al (2005) chronicle the history of intelligent buildings and note

that although these early definitions of intelligent buildings were heavily biased towards technical solutions to building management, a second generation of buildings did start to emerge which responded to user-requirement. Despite this, Zeiler et al. (2014) note that the techno-centric interpretation of the problem stems from the building occupants only ever being treated as an after-thought rather than as being central to the buildings function and systems (for a fuller history of the development of smart buildings see Bull et al. 2013).

Increasingly, research within the digital economy literature has explored ways to re-connect people to energy through the use of systems that show price, unit-cost or CO_2-cost through live feeds or half-hourly metering, and the effects this has on the building-users (Darby 2010). Feedback in the domestic context shows potential for reducing consumption, between 5-15% on average (Burgess and Nye 2008), definitive conclusions are limited because the implementation of household smart metering is in its infancy and varies greatly depending on the type of feedback. Common themes have emerged from research in this field about the limitations of feedback but are unclear, especially in complex and contested workplace environments where, depending on the building type, people have limited control and agency (Lehrer and Vasudev 2010; Weiss et al. 2010). This is further complicated by the complex interplay of organisational culture and concerns over ethics and trust and their impact on behaviour (Coleman et al, 2013).

A range of environmental psychology models are often employed to underpin these approaches to understand an individual's attitudes (A), behaviour (B) and context (C) in relation to energy (Stern 2000). This 'ABC' approach to behaviour change is criticized by academics (Shove 2010) who argue that behaviour is the result of social practices that constrain our choices. Owens and Driffill (2008) argue for a reframing of the relationships between those responsible for energy management and those using the energy that requires "more interactive, deliberative communication between decision-makers, technical experts, other stakeholders and the public" (2208: 4414).

This paper presents initial findings from an evaluation of a UK research project. Funded by the Engineering and Physical Research Council Gooddeeds attempted to test this new approach for behaviour change through engaging and empowering employees to reduce the environmental impact of a set of public buildings in Leicester City Council. A brief overview of the relevant themes from the social media and public engagement literature are discussed before presenting the case study, research approach and initial findings.

A New Approach: Social Media and Public Engagement

Social media has emerged as a worldwide phenomenon with applications like Facebook and Twitter credited with everything from Obama's 2008 election victory (Zhang, Johnson et al. 2009), to the Arab Spring (Ghonin, 2012). It is a defined as a "collection of internet based applications that facilitate social interaction via the creation and exchange of user-generated content" (Stewart, Ambrose-Oji et al. 2012: 8). Devised on the principles of Web 2.0 – user-generated content and collaboration –sites such as MySpace, Facebook and Twitter have witnessed incredible success and popularity. Clay Shirky (2008) cites numerous examples of social media to connect and mobilize people for collective action such as the ability of people to self-organise photographs on Flickr, contribute their knowledge on shared documents such as Wikipedia and engage in social activism.

Social media's impact has been, in part at least, due to the huge rise in smartphone usage. In the UK currently 30% of the UK population use smartphones and this is expected to rise to 80-90% within 10 years, in the USA this is over 50% of Americans (Google/MMA 2011). At its

core, Web 2.0 and social media is about participation and it is here that the link between social media and theories of public engagement emerge. These twin attributes of the digital economy find their home in the public engagement literature which in-turn has evolved out of risk communication (Fischoff 1995), theories of deliberative democracy (Habermas 1979; Dryzek 2000) and citizen science (Irwin 1995).

Public engagement methods have previously been tried and tested in the siting of controversial facilities such as waste facilities (Bull, Petts et al. 2010), transport (Bickerstaff and Walker 2005) and urban river restoration (Petts 2006). The basic premise is that by engaging all those involved in a specific issue, the decision-making process is enhanced (Apostolakis and Pickett 1998), decisions are more legitimate and can lead to better results (Fioriono 1990). The theoretical underpinnings find their roots in Habermas' theory of communicative competence and developed by Thomas Webler (1995). Working from the premise that participation is "interaction among individuals through the medium of language" (Webler 1995, 40), he applied Habermasian principles of communication to the formulation of a set of criteria and rules that would transform democratic ideals of deliberative democracy into practice.

Increasingly, links are made between public engagement and behaviour change (Webler et al. 1995, Bull, Petts et al. 2008). A successful process of engagement is normally predicated on an ideal of dialogue as a means to 'induce reflection upon preferences in a non-coercive fashion' (Dryzek 2000) and emphasises the importance of drawing upon the knowledge of all members of a community (Healy 1992). The parallels are clear then between the risk communication/public engagement schools of thought and the social media gurus: people (lay and expert) talking and working together can generate new forms of knowledge and contribute to more effective governance. But can this approach work in non-domestic buildings?

Research Context and Methodology

In 2013 researchers, funded through the Engineering and Physical Research Councils Digital Economy's 'Research in the Wild' programme started working with the Energy Team at Leicester City Council (LCC) in the East Midlands, England, to explore a participatory approach through the Gooddeeds project and the development of a web-application to help building-users reduce energy. LCC has a progressive approach to energy management and has been collecting and analysing half hourly electricity, gas, heat and water data since the 1990s. A sample of 15 buildings was selected to form a trial with a core of five forming the pool from which a user-group was formed; the purpose was firstly to facilitate interactions and knowledge sharing between lay building users and experts and to see whether the group interactions would lead to increased awareness of effective energy management. It was hoped that members would act as 'champions' once the application was launched for city administrators. Second, to help develop of an IT based application to foster interaction between building users across the city council and test the opportunity for smartphones to help manage energy and reduce consumption.

The team leader from LCC Energy Services acted as 'gatekeeper' to the city council. An email was sent to 16 employees from various locations with a range of roles and responsibilities. After a couple of attempts to recruit a suitable group a core of eight was formed. Further reflection is provided later as to the structure of the group, suffice to say here it was not possible to get everyone who was approached, due to organisational complexities and politics (as the project started Property Services, home to the energy management team, began a process of cost-cutting and redundancy)–see Table 1 for the members of the group, which included two

members of the energy services team alongside staff members with no specific responsibilities for energy.

Table 1. Members of the Gooddeeds user-group

Code (used for interview analysis)	Role	Building
F1	Senior Library Assistant,	Leicester Central Library
M4	Senior Community Librarian,	Leicester Central Library
M2	Duty Officer (in charge of buildings)	Braunstone Leisure Centre
M3	Admin and Business Support Team Leader,	1-3 Grey Friars (Social Services Administrative Building)
Absent from the focus group	Housing Options Officer,	Phoenix House (Housing Administrative Building)
Absent from the focus group	Energy Services – energy officer	16 New Walk (Property Services Building)
M5	Energy Services – team leader	16 New Walk (Property Services Building)
P8 left mid-way through the project. Replaced by Energy Services project officer (M6)	Assistant Facilities Manager	16 New Walk (Property Services Building)

The interim evaluation of the user-group process was undertaken through a focus group independently chaired by a Professor from the IESD. This was preferred to interviewing the participants individually because focus groups allow for greater exploration of why people feel the way they do about a particular issue (Bryman 2001). Moreover, if managed appropriately, participants have greater opportunity to express their viewpoint and the researchers can witness how "individuals collectively make sense of a phenomenon and construct meanings around it" (Bryman, 2001: 348). Six members of the user-group attended the focus group which was digitally recorded and professionally transcribed by a third party and subsequently coded and analysed. This research contravenes the 'pure spirit' of grounded theory by commencing the analysis with a theoretically determined framework that shaped the codings. Sidestepping the deductive or inductive approach, this direction has become known as the adbuctive approach (Dubois and Gadde, 2002) and has been tested in a similar research context (Christina et al 2014).

Research Findings

The research findings are structured into two broad areas –the user group approach and the role of social media and smartphones. Emerging out of these areas are an interesting set of reflections on the future management of energy in non-domestic buildings and the role of the building-user that are pulled together in the conclusion.

User-group Approach

The user group met fortnightly for two months between May and July 2013. Expert presentations were provided by the research team on the relationship between people and buildings, energy and buildings and social media (see Table 2); iPhones were provided to all members of the group who, during the initial meetings, were guided through the range of functions – texting, social media and the camera. On the fourth meeting participants reported on what form the application should take. The group decided that Twitter and Facebook had useful functionality (Twitter – the ability to share information, Facebook the ability to comment on posts) and therefore the team would build a bespoke web application enabling users to view through both web browsers and mobile devices. In monthly meetings between September 2013 and January 2014 the group provided feedback to the development team on the design and functionality of the 'application' This included key features such as being able to view the application on either webpages or smartphones, allow any building user to raise an issue with a building and then comment on what needs to happen to resolve the issue (see figure 1 for screenshots of the application).

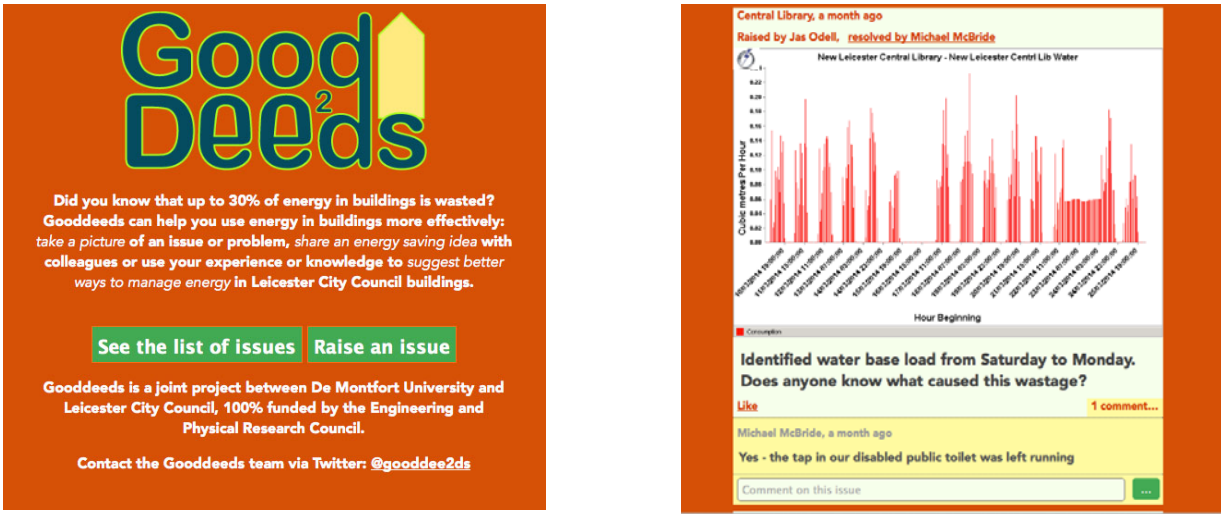

Figure 1. Screenshots of the Gooddeeds application.

The purpose of the focus group discussion was not to review the design of the application but to reflect on the process and experience of being in a user-group with a range of employees with different roles and responsibilities for energy.

Table 2. Schedule of the user-group

	Agenda
Meeting 1, 22 May 2013	Introductory presentation by Dr. Bull "Are people the problem or the solution?"
Meeting 2, 11 June 2013	Presentation by an energy and buildings expert, "The problem and opportunity of energy and buildings". "Start-stop-continue" ideas generation.

Meeting 3, 25 June 2013	Presentation by a social media expert, "An introduction to social media/web2.0". Completion of online survey on social media awareness and use.
Meeting 4, 16 July 2013	Handover of smartphones. "Who, what, how" exercise.
Meeting 5 onwards, monthly from September 2013	Monthly review groups informing the development of the application. The app was developed and finally tested in December before being launched in February 2014 across the City Council

Function and Expectation of the Group

People came to the group with a range of expectations but it is clear from discussions in the focus group that the main reason centred on practical knowledge sharing – how can energy be managed better? The library assistant (F1) for example said she hoped to "*find out more about how this energy, power and everything is worked out . . . and to look at how we can reduce wastage*". Another member (M3) reflected on a positive encounter of being in a different user-group, stating, "*a monthly user group meeting is the best way that we can communicate any of the issues that we have*". This was echoed by the energy services team leader (M5):

> *Having a group that shares knowledge is always important . . . there isn't one good way of doing a particular thing, and therefore sharing what's around the table is the whole idea.*

Aside from the desire to share knowledge and discover practical ways to manage energy better, it was evident that people valued the opportunity to actually meet and get to know other people in the organization. This is a significant issue within Leicester City Council which is a large multi-site organization with over 12,000 employees; one member of the group admitted:

> *We don't have a lot of contact with other city council departments about this kind of thing. What I actually find quite useful here is the fact that if we can report something we get a named person who will become responsible for it, and also as part of this user group . . . I've met them now. (M4)*

Leicester City Council has a small energy services team looking after a multi-site organization; a clear benefit for this participant was the ability to put faces to names. Through the user-group a range of people had now come into contact with those formally responsible for energy management. M4 is also referring to a forthcoming benefit of the application being developed for the project which will enable building users to post energy issues on-line enabling anyone to comment and take 'responsibility' for resolving the problem.

Membership of the Group

The success of a user group is dependent upon getting the right people to attend. For this project the intention was to ensure representation of the full range of people involved in energy management in buildings – from ordinary building users, energy services team, the help desk, engineering and facilities management. For reasons of internal politics our 'gatekeeper,' the team leader in energy services (M5), limited access to representatives of the help desk, facilities

management/contractors and the engineers. In part we believe this to be that as this project began, staff in property services (the directorate in which all of these roles sit) were identified as 'at risk' and began a process of re-organisation and possible staff redundancy. With regards to the contractors for example he said they would not attend "*because they're just looking at, you know, this is our job, we complete that job, and that's signed off and that's the end of their sort of role."* He went on to admit though that they may have actually found it useful, *"the only bit that they [the contractors] may find useful is the user's point of view of what the problems and issues are."*

While this highlights the downside of working through gatekeepers it also did not go unnoticed in the group. The role of the central estates' help desk and the lack of representation from it was of particular interest with the whole group. This, being typical:

> *I think someone from the help desk, being on a group like this would really help, because they're a very focal point aren't they? (F6)*

The absence of people from the help desk and the engineering team from property services was especially frustrating as many in the group identified the process of having to report problems to "*an anonymous help desk* (M4)" as the key barrier to, and opportunity for, improving energy management across the councils. A couple of members however saw the opportunity of the user-group process, and the forthcoming web-application, to do *"away with the middleman, which is what we call the help desk* (F1). Central to this problem is what people perceived as the increasing lack of control they have both over their local energy needs, especially heating, and then control over the fixing issues. As one of the energy team said:

> *Don't forget, they're getting outside contractors to come and look at stuff. Nothing is in house. If there was an engineer in house they would just pick up their hand and say, 'By the way, can you go down and look at this.' We can't do that anymore. (F6)*

Now, when a complaint is made to the help desk they have to pass the issue to the engineering team in property services (a different team to the energy services team) who then outsource contractors to fix the issue. In some buildings an added layer of complexity has been created as the city has moved to a district-heating scheme. The Gooddeeds application is an attempt to see whether a more collaborative approach can help cut through this more bureaucratic structure. Building users expect a quick response to the issues they raise and value being able to put a face to the name in terms of who is actually responsible.

> *Now, instead of just reporting to an anonymous help desk and them reporting on to somebody else . . . now I will have a name and I can hassle that person if necessary, and try and get something done . . . which is quite useful from this kind of group. (M4)*

> *This is really very, very good, because you've just highlighted the fact that if you call the help desk it takes time for them to react . . . but when you put something like this in the user group, you put something in the app, then people will pick it up, saying that it is not fast enough. (F6)*

The user-group process, whilst not being ideal in terms of who was 'round the table', highlighted some key issues around expectations of energy management, the role of the Help Desk and also alluded to some of the complex 'politics' involved both in energy management, and public engagement in the workplace. As a member of the energy team summed up:

> *The difficult thing is everyone has now got quite a lot of work to do. A lot of people are being made redundant. People are doing two or three jobs, and will people have time to look at this, or will they just carry on with their jobs. (F6)*

Social Media and Smart Phone Use

The second half of the focus group was directed at exploring user-experiences and perceptions around the potential for smartphones and social media in energy and non-domestic buildings. The membership of the user-group was not pre-selected with any prior aptitude for technology and it was clear that for the majority of participants social media and smartphones were quite novel; only two out of the six members of the focus group owned or had used a smartphone prior to the project. Social media also seemed to be something had people had limited experience or understanding with Facebook or Twitter being used for social reasons. For example:

> *I just used Facebook to find out what my family is up to, and Twitter just to keep informed with some things. But I never tweeted until I joined this group. And I very rarely post anything on Facebook. (M4)*

> *I've got a Facebook account, but I'm very inactive on it. Twitter I didn't have until I joined this group. I actually find that more interesting and fun than Facebook, because I just joined all the football tweets, and it's given me all the latest signings. (M3)*

Of course what is interesting about both of these quotes is that as a result of being in the user-group, they both have signed up for a Twitter account, even though their usage is limited mainly for following news and sports. One member did mention that the Energy Services officer had been using Twitter to post *"when there was a blip in the energy service, and we responded to that. It was quite interesting*" (F1). The age of the respondents, mid thirties to fifties, was probably a factor here, and an interesting extension to the study would be to involve a younger cohort who have more experience of smart technology and social media; they may also of course also have significantly different views on energy management and the reasons for it.

On first impressions there appeared to be limited interest or vision for the role that smartphones or social media could play. Due to the nature of the participants' roles, and the size of the buildings in which they work, some felt that whilst they may engage with the forthcoming Gooddeeds they would not use their smartphones to do so. For example:

> *I probably won't use the phone. If I've got the website up, then I might well use it, but it's not that big a building. I don't carry my phone around with me when I'm in the building. If I have something I want to report on it . . . I'll go and use the computer. (M4)*

> *I've never been very active on the phone for using these things. I would say I was more active on the computer. Most probably it's the nature of my work. I'm mainly around the desk, therefore more likely to use that. (M5)*

It is interesting that it is not necessarily the use of a social media based application that staff are questioning, but the use of it on their phones. The participants were desk-bound with access to a computer and less need of smart phone technology Three users did however note the ability to take photographs and then send and receive via email or social media was beneficial. For example, M4 who, having said he would not use his phone, added, "*the only exception would be if I wanted to take a photograph.*" The two other group members who had used the phone for taking photographs added:

> *I must admit I have sent some photographs through Gmail and things like that to contractors. (M2)*
>
> *I take a photo on my phone and I'll send it by email to people. The good thing for me with this is that I don't have to go to the site now. (M3)*

Participants seemed much more concerned about the public nature of social media and the potentially negative affects of posting messages on other building users and customers (in the case of the library and leisure center). People are "*always trying to find faults or whatever*" said M2 from the leisure center, and the participant from the library echoed the difficulty of getting constructive customer feedback. "*We welcome customer feedback as long as it's coherent customer feedback about things that we can actually do something about*" (M4). This was noted as particularly evident given the financial situation of local authorities like Leicester who have to make difficult decisions around budget cuts. The energy services team leader (M5) observed that "*in an organisation where there's lots of change taking place, you know, cuts and various things, they may be quite, you know, 'I've seen this problem here. That could have saved four jobs . . . you don't want the abuse."*

Conclusions: Implications for Energy and Non-domestic Buildings

Gooddeeds, in partnership with Leicester City Council, is attempting a more collaborative approach to energy management that is informed by the latest trends in social media and smartphone use. It is clear from our review of the literature and the findings reported above that energy management in non-domestic buildings has become highly complex and disaggregated with the ordinary building user feeling detached, disconnected and disempowered from their environment; in short, experiencing a lack of control and agency over their space. While people are not overly concerned about energy consumption per se, but comfort, they do expect to a quick response when things are not right and the sub-contracting of facilities management and the separation of powers from energy services and property management seems overly hierarchical and impedes customer satisfaction. Herein lies an obvious opportunity for a more collaborative approach to energy management. However, successfully managing this, in a workplace characterised by job losses and budget cuts, poses a challenge, as people are highly attuned and protective of their roles and responsibilities.

Policy wise, it is also too easy to speak of generic 'non-domestic buildings'. Within the city council there is a diverse range of building types, functions and sizes and it is clear that there cannot be a 'one-size-fits all' solution. Participants even distinguished between spaces within buildings – one floor may be comfortable, another not, and in smaller, more socially connected

spaces, people are more likely to make personal contact with who they feel is responsible for energy, or communicating energy issues, than engage with the new technology.

Finally, in terms of social media and smartphone, the user-group in Leicester was divided over the benefits and opportunities of the approach. On the one hand members are quite dismissive of their smartphones, on the other, utilizing the benefits of being able to stay in touch and share content (especially photographs). Differences can probably at this stage be best explained by variations in the types of buildings users inhabit; in general those most benefiting from the smartphones are the ones who are operating in larger buildings. At this stage, all participants seemed cautious about the public nature of social media and the potential for complaints and abuse. It is possible this may be in part due to the demographics of the group – for example none of the user-group previously had Twitter accounts, and only a small percentage owned smartphones. This was a new approach for a specific demographic cohort; not exactly the next generation!

This mid-term project evaluation has proved insightful. In large organizations such as city councils, user-groups seem beneficial for sharing knowledge and building relationships - faces have been put to names. As to the future of smartphones/social media as a tool for energy management: the user group had a mixed response, but further analysis is to be conducted once the application has been tested across the wider sample city council buildings so that recommendations can be made as to the future of digital technologies within non-domestic buildings on energy demand reduction.

Recommendations for Engaging Employees

1. Conducting monthly user-groups can play a key role in engaging employees and connecting them to the environmental aspects of their workspaces and other users.
2. Membership should include all parties involved in the building (that is, those with formal responsibilities and those without) and be conducted at a time and place convenient to all.
3. Building users are more concerned with comfort, rather than ‘energy’ –users experience comfort (and discomfort) in multiple ways within a single building. Solutions and applications must factor in these variations and be ‘fit for purpose’.
4. Applications and solutions should be available on both personal computer and mobile devices to accommodate different patterns.
5. Trust and security issues are a concern for organisations. Bespoke social media applications may be preferable to Twitter and Facebook in order to ensure security.

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